# Educational methods and technologies in undergraduate veterinary medicine

*A case study of veterinary teaching and learning at Glasgow, 1949-2006*

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# Declaration

"I hereby declare that I am the sole author of this thesis, except where the assistance of others has been acknowledged.

It has not been submitted in any form for another degree or professional qualification."

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June 2008

# Abstract

This case study, of veterinary education at Glasgow between 1949 and 2006, was undertaken to provide an illustrative account of learning and teaching practices over time. Ultimately the aim was to inform discussions on curriculum reshaping in undergraduate veterinary education at Glasgow.

A questionnaire was distributed to 2360 alumni, 513 students and 50 teachers, to obtain quantitative data on the availability and perceived usefulness of different educational methods and technologies, analysed using SPSS. Qualitative data were sought principally through ten student focus groups and interviews with over thirty current and former staff, theoretically coded using NVivo.

Questionnaire responses (from 11.5% of alumni, 23.8% of students and 72% of teachers invited to participate) revealed that lectures, printed notes, tutorials, practical classes and clinical training were used consistently over time and rated highly by stakeholders, confirming the importance of didactic teaching methods coupled with discussion and practical hands-on experience.

The focus groups with students highlighted their strong desire for earlier clinical training, with the recognition that a case-based approach resulted in more meaningful learning. The interviews with staff revealed that whilst all staff welcomed the opportunity for increased vertical integration, problem-based learning was rejected as a wholesale solution.

Highlights of the school's curricular innovations to date include the clinico-pathological integrated sessions, the lecture-free final year, and the introduction of a veterinary biomolecular sciences course that allowed for a seamless vertical integration in years 1 to 4. However, recent efforts to implement self-directed learning and assessment strategies have been hampered by the fact that these were isolated innovations set within a traditional teacher-centred paradigm.

There was little support among stakeholders for undergraduate specialisation. There is still a perceived need for veterinarians to have omni-potential – if not to be omnicompetent. However, it is recommended that the current system of tracking be replaced with a more streamlined core-elective system, to allow students to pursue specific topics of interest in the later years of the course.

Teachers and students cited attributes of 'good' teachers. These generally did not change over time, although technologies did change. Good communication appears to be central to good teaching, with an in-borne desire to enthuse and motivate students to learn for the

pleasure of learning rather than the need to hurdle-jump examinations. Both teachers and students cited good teaching characteristics in terms of the teacher as authority and motivator, rather than as a facilitator of independent learning, reflecting the nature of the traditional, didactic course.

There was little evidence of pedagogical change resulting from technological innovations. If anything, newer technologies compounded surface learning approaches and low level cognitive processing, rather than promoting deep learning and higher order thinking skills.

Identified barriers to teaching innovations included lack of time, reward and support (for teachers and students). Future curricular innovation will require a substantial investment in the scholarship of teaching – rewarding staff for excellence in teaching, putting it on a par with research excellence, and ensuring the necessary support mechanisms and infrastructure are in place to ensure the success of a self-directed learning curriculum.
A guided discovery learning curriculum is recommended, a compromise between traditional teaching and a fully problem-based curriculum.

The study did not specifically focus on assessment, but it is recommended that learning, teaching and assessment practices should be constructively aligned.

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**Dedication**

This work is dedicated to the memory of Colin Naismith, and to all the people of the Faculty of Veterinary Medicine, past, present and future. I am privileged to have worked with some of them, and this work is a celebration of their achievements.

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# Glossary of acronyms

| | |
|---|---|
| AVMA | American Veterinary Medical Association |
| AVS | Association of Veterinary Students |
| AVTRW | Association for Veterinary Teachers and Research Work (formerly the Association of Veterinary Teachers and Research Workers) |
| BVA | British Veterinary Association |
| BVMS | Bachelor of Veterinary Medicine and Surgery |
| CDROM | Compact Disc Read Only Memory |
| CAI | Computer-Aided/Assisted Instruction |
| CAL | Computer-Aided/Assisted Learning |
| CAS | Companion Animal Science (Fourth year course) |
| CIC | Combined Integrated Course<br>(Fourth year farm animal and veterinary public health) |
| CLA | Collaborative Learning Assignment |
| CLIVE | Computer-aided Learning In Veterinary Education |
| CTI | Computers in Teaching Initiative |
| CTICM | Computers in Teaching Initiative Centre for Medicine |
| EAEVE | European Association of Establishments for Veterinary Education |
| EEC | European Economic Community |
| EMS | Extra-Mural Studies |
| HEA | Higher Education Academy |
| ILTHE | Institute of Learning and Teaching in Higher Education |
| IVSA | International Veterinary Students Association |
| LIVE | Lifelong and Independent Veterinary Education |
| LTSN-01 | Learning & Teaching Subject Network for Medicine, Dentistry and Veterinary Medicine |
| NVMA | National Veterinary Medical Association |
| OSCEs | Objective Structured Clinical Examinations |
| PDP | Professional Development Phase |
| PDSA | Peoples Dispensary for Sick Animals |
| RCVS | Royal College of Veterinary Surgeons |
| SDL | Self-Directed Learning |
| SDLA | Self-Directed Learning Assignment |
| SILVER | Supporting Independent Learning in Veterinary Extramural Rotations |
| SSM | Special Study Module |
| TLTP | Teaching and Learning Technology Programme |
| UGC | University Grants Committee |
| VAVA | Veterinary Audio-Visual Association |
| VDS | Veterinary Defence Society |
| VLE | Virtual Learning Environment |

# 1 Outline

## 1.1 Purpose of the thesis

The purpose of this thesis is to attempt to explore the roles of educational methods and technologies in supporting the undergraduate veterinary curriculum; and to determine the impact of the use of these methods on students' learning and teacher experiences at Glasgow. The types of educational methods examined include – for example – lectures, practical classes, small group teaching, overhead transparencies, 35mm slides, closed-circuit and broadcast television, videos, computer-aided learning packages, the internet, and virtual learning environments (VLEs). The focus is on the development and use of such resources at the Faculty of Veterinary Medicine (formerly Glasgow Veterinary College) between 1949 and the present day.

The study considers the use of educational methods and technologies within the context of curricular change, at a time when veterinary schools in the UK are heavily engaged with issues of curricular reform. These include training for omni-potential versus omnicompetence; increased pressure for undergraduate tracking; improved vertical integration; and how to meet critical public health demands and the threats posed by bioterrorism.

This perhaps heralds a new era for veterinary education in the UK, emerging as a unique discipline of study, comparable with the scholarship of medical education.

## 1.2 Research questions

This mixed method study comprises quantitative and qualitative aspects.

The overall strategic question from a *quantitative* perspective for this research is:

> *"What educational methods and technologies have been used to support undergraduate veterinary training at Glasgow between 1949-2006?"*

The overall strategic question for the *qualitative* aspect of the research is:

> *"How do participants construe the use of educational methods and technologies, in supporting undergraduate veterinary training at Glasgow between 1949-2006?"*

The critical points in these questions have been underlined as a basis for mapping out the fields of enquiry.

## 1.3 Fields of enquiry

Major contextual themes of the study include:

- **Historical context of undergraduate veterinary education:**
  - Professional competencies required of veterinary graduates
  - Societal demands
  - Diverse career end-points
  - Education funding and political influences
  - Scholarship of teaching
  - Individual participants' perspectives on historical and political influences
- **Glasgow between 1949-2006:**
  - Local curricular changes and educational strategies
  - Examples of curricular innovation
  - Student demographics
- **Educational methods and technologies:**
  - Availability and use over time
  - Situation within theories of learning and teaching and national/international educational strategies
  - Continuation of lecturing as a predominant means of transmitting information from teachers to students
  - Individual participants' insight into why some methods are more useful to them than others

## 1.4 Sources of information

In trying to address these themes, it was necessary to:

- **Consult the literature, to provide a wider context for discussion:**
  - On the history of veterinary medicine as reflected in scientific discovery, particularly the study of health and disease, and how this influenced the shape of veterinary education within the schools.

    - To identify the main themes of discussion on veterinary education over time, seen as important by the veterinary community. These can be considered to be integral to the historical use of educational methods and technologies.

- **Carry out a targeted analysis of relevant documents:**

    - A number of these e.g. Faculty visitation reports, Faculty Minutes, Board of Studies Minutes, Student Records, were initially distributed between the University's Archive Services department (1949-1968), and the Faculty's own archive store (1968-2006), but were later assembled as a single archive.

- **Conduct a survey into what educational methods and technologies were used over time, and how these were rated by alumni, current students and teachers**

- **Explore emerging concepts through interviews and focus groups with alumni, current students and teachers, and former members of teaching staff**

## *1.5 Brief description of research methods*

A postal questionnaire was selected as a primary means of gathering data, because it was recognised that it would be possible to gather a large amount of quantitative data in a short time, and the responses from different types of respondents (e.g. staff versus students) could be compared, and the data statistically analysed to infer generalisations about study participants (Bartlett, Burton *et al.* 2001).

Different types of teaching methods, sampled throughout the veterinary curriculum, were observed to gain an insight into teaching and learning practices. This helped to inform the design of the semi-structured interviews and focus groups. These qualitative methods were used to gain some insight into *individual* perspectives on teaching and learning in veterinary medicine at Glasgow over time. Theoretical coding was used, with major themes identified, subsequently refined and integrated within an overall understanding of the use of educational technologies in veterinary education.

The combination of complementary research methods is also known as 'triangulation', described by Verma and Mallick (1999, p205) as "a process of corroborating judgements by drawing on evidence from more than one source – for example from interviews, questionnaires and observations." In this instance however, the interviews and focus group have been used after reflecting on the quantitative questionnaire results, to draw *more* information from participants, as well as corroborating evidence from one source against another.

## 1.6 Hypothesis

The hypothesis of this study is that didactic teaching methods have to date dominated the training methods at Glasgow (as at other veterinary schools), because students are still being forced to apply surface learning approaches in order to 'hurdle-jump' traditional examinations. Recent efforts to promote self-directed learning strategies that foster a 'deep learning' approach have failed to become anything more than piecemeal components of the course, because students are not adequately rewarded for the effort they are required to invest; and it would require Faculty-wide reform to support a substantial move away from traditional teaching methods and an overgrown curriculum.

An underlying premise of this thesis is that technology alone does not influence pedagogy, and that successful teaching and learning requires conscious action and an awareness of learning theories to harness technologies in innovative ways for student and teacher benefit. This requires an investment in the scholarship of teaching, and teachers being adequately rewarded for excellence in teaching and assessment.

In summary:

- **Null hypothesis $H_0$: Teaching methods and technologies used to date at Glasgow, employed within a traditional curriculum, have had no impact on the learning approaches employed by students**

- **Alternative hypothesis $H_1$: The predominance of didactic teaching methods and technologies used to date at Glasgow have preserved a teacher-centred paradigm that has encouraged students to adopt a surface approach to learning**

# 2 A History of Glasgow Veterinary School

**Figure 2-1: Animal management class circa 1946, in the old central court of Glasgow Veterinary College, Buccleuch Street ©University of Glasgow ImageBase**

## 2.1 Chronological framework

The history of the school has been well researched and documented (Aitken, Campbell *et al.* 1962; Weipers 1975; Weipers 1976; Keen, Soulsby *et al.* 1991; Moss 1997; Wright 1997). A synopsis of these accounts is provided to contextualise the data arising from the study.

In short, formal veterinary training by James McCall began in 1862. Glasgow Veterinary College became part of the University of Glasgow in 1949, later achieving independent Faculty status as the Faculty of Veterinary Medicine in 1968, and now serving over 500 undergraduate veterinary students every year.

Because of the part that Sir William Weipers played in the development of the school in the post-war period, and the large role he played in veterinary education internationally, the chronological periods of study in this thesis have been named to reflect his influence.

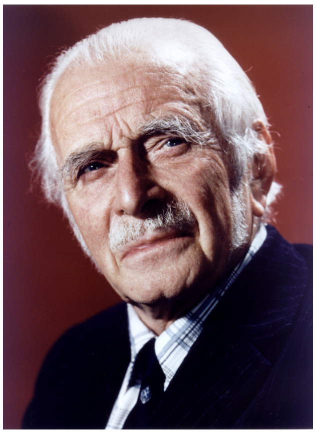

**Figure 2-2: Sir William Weipers, Dean of the Faculty of Veterinary Medicine 1949-1974 ©University of Glasgow ImageBase**

Four main eras in the history of the school have been identified:

- **pre-Weipers era (pre- 1949)**
- **Weipers era (1949-1974)**
- **post-Weipers era (1975-1989)**
- **information era (1990-present)**

The **'pre-Weipers era'** is the pre-1949 period that can be interpreted through the literature; archive material such as photographs, letters, minutes of meetings, financial records; and from discussions with the few remaining graduates from this time.

The period between 1949 and 1974 can be thought of as the **'Weipers era'**. Knowledge of the post-1949 period of the school is much more prolific, not least because of historical events celebrated in 1962 as part of the school's centenary, and in 1999 for Faculty's Golden Jubilee (Anon. 1999), and the fact that many more of the post-1949 alumni are still alive.

The **'post-Weipers era'** frames events between Weipers' retirement in 1974 and the late 80s. Towards the end of this period political and financial difficulties marked a troublesome period in the history of the school, following the publication of the Riley report (University Grants Committee 1989)

The 1990s marks the start of the **'information era'** at Glasgow, characterised by the building of the new James Herriot Library, and advances in veterinary informatics and educational technologies that had major implications for teaching and learning. This era is also characterised by an increasing focus on the development of generic, professional skills and the suggestion of a change in emphasis from omnicompetence to omni-potential, consequences of the Pew report (Pritchard 1989).

This thesis concentrates on the ‘Weipers era’, ‘post-Weipers era’ and the ‘information era’, but it is necessary to re-appraise the main events of the pre-Weipers area, to convey an idea of the school that Weipers helped to transform and bring up to date, and into the worldwide arena.

## *2.2 The ‘pre-Weipers era’*

In 1832, a professor of Veterinary Surgery was appointed at the Medical School of the Andersonian University of Glasgow. Professor Cheetham took on this role for six months, followed by John Stewart until 1840. At that time lectures in the subject were informal and there was no veterinary qualification.

Although many alumni of the school consider Sir William Weipers to be the founder of the Glasgow school, it was James McCall (Figure 2-3) who gave the first formal classes in veterinary training in Glasgow in 1862.

**Figure 2-3: James McCall, founder of Glasgow Veterinary College ©University of Glasgow ImageBase**

When the Glasgow school was established, the school at Lyon – the first in Europe to be established – had already been in existence for 100 years. Glasgow Veterinary College was the second veterinary college to be set up in Scotland, after the Edinburgh Dick School in

1823. McCall qualified from the Edinburgh school in 1857, and after a spell in practice, was appointed by William Dick to teach anatomy and physiology there, which he did for two sessions, replacing John Gamgee in the Chair of Anatomy and Physiology when he left to establish a new school at Edinburgh (that subsequently transferred to Liverpool).

Subsequently, McCall gave some informal training from his practice in Hope Street at Glasgow between 1859-1862. The first formal classes, starting in 1862 at Sauchiehall Lane, had 10 students, and in the following year McCall moved to larger premises in Parliamentary Road (Figure 2-4). There, McCall lectured for three hours each day on veterinary anatomy, physiology and surgery, and students attended materia medica and chemistry classes at the Anderson College of Medicine. A Royal warrant allowing Glasgow students to be examined by the Royal College of Veterinary Surgeons (RCVS) was granted in 1863.

**Figure 2-4: McCall's premises in Parliamentary Road**
**©University of Glasgow ImageBase**

McCall also held a number of public health appointments in Glasgow, advising on human consumption of meat and milk, and was also President of the Royal College of Veterinary Surgeons (1890-1).

### 2.2.1 Buccleuch Street beginnings

By 1873 there were 52 students, and premises had been bought in Buccleuch Street (Figure 2-5) to accommodate them. Glasgow Veterinary College became operational here in 1874.

**Figure 2-5: Painting of Buccleuch Street premises by Angus Dunn**

In 1909 the school was formally recognised by the Scottish Education Department and acquired a Board of Governors, accompanied by a state grant.

McCall remained Principal of the school until his death in 1915, and was succeeded by Hugh Begg, a parasitologist, as an interim measure (1915-17). Many of the late 19$^{th}$ to early 20$^{th}$ century veterinary journals in Glasgow University Library were donated by Professor Begg.

Sidney Gaiger (Figure 2-6) followed as Principal (1917-22). Laboratories and accommodation for experimental animals were established at Buccleuch Street, to support Gaiger's work on sheep diseases, until Gaiger and Thomas Dalling both transferred their work to the Moredun Research Institute in Edinburgh in 1922.

Dr. A.W. Whitehouse (Figure 2-7), former Professor of Anatomy of the veterinary school in Colorado, succeeded Gaiger from 1922 until his death in 1944.

Whitehouse and his colleagues played a significant role in the history of the school, by keeping the school open and continuing to teach, even though the government grant had been withdrawn from the college in 1925, a result of the Constable Report findings that saw no need for two veterinary colleges in Scotland. A further threat to the veterinary college was the Loveday report of 1937 which would have transformed the school into an agricultural research department within the University.

**Figure 2-6: Sidney Gaiger, Principal 1917-1922**
**Image from Adair (1949)**

**Figure 2-7: A.W. Whitehouse, Principal 1922-1944**
**Image from Adair (1949)**

From 1944-45 Donald Campbell was Principal of the School, during a more prolific period, marked by the second Loveday report in 1944 that recommended expansion of veterinary schools. This influenced the University of Glasgow's plans to incorporate the veterinary school within the Faculty of Medicine, which led to the re-instatement of the government grant in 1945.

Albert A. Forsyth served as the next principal (1946-49).

The Veterinary Surgeons Act, which had implications for veterinary training, was implemented in 1948, and in 1949 the school became part of the University of Glasgow, with Sir William Weipers recruited as Director of Veterinary Education.

### 2.2.2 The curriculum in the pre-Weipers era

The curriculum of the pre-Weipers era is shown in Table 2-1.

| Year | Subjects |
|---|---|
| 1st | Anatomy |
| | Chemistry |
| | Physics |
| | Biology |
| 2nd | Anatomy |
| | Histology |
| | Physiology |
| | Animal Management plus Shoeing |
| 3rd | Pathology (inc. Bacteriology & Protozoology) |
| | Materia Medica |
| | Hygiene & Dietetics |
| | Some time spent attending fourth year lectures to allow for clinical instruction |
| 4th | Medicine |
| | Surgery |
| | Clinical Instruction (with local practitioners) |
| | Meat Inspection (with public health officials) |

**Table 2-1: Four year veterinary curriculum, extracted from Whitehouse (1929)**

With regards to teaching methods used, there appears to have been little in the way of textbooks during the pre-Weipers era, with Whitehouse (1929) commenting that "The veterinary student will probably find better text-books in French, while probably the most valuable research work is written in German." Thus lectures in the form of dictation, combined with laboratory work, dissection, and live animal handling were the main methods of teaching during this period.

Towards the end of this era, the curriculum had lengthened to five academic sessions, as evidenced in the 1940-41 prospectus, shown in Table 2-2.

| Year | Subjects |
|---|---|
| 1st | Chemistry and Physics |
| | Biology |
| 2nd | Physiology (and Biochemistry) of the Domesticated Animals |
| | Histology and Embryology |
| | Animal Management |
| 3rd | Anatomy of Domesticated Animals |
| | Pharmacology and Therapeutics, Toxicology and Pharmacy |
| | Veterinary Hygiene, Dietetics and Animal Husbandry |
| 4th | Veterinary Pathology |
| | Veterinary Parasitology |
| 5th | The Principles and Practice of Veterinary Medicine |
| | The Principles and Practice of Veterinary Surgery |
| | Meat Inspection |
| | Jurisprudence |

**Table 2-2: Five year veterinary curriculum, extracted from Whitehouse (1940)**

## 2.3 The ‘Weipers era’

In the post-war period there was increased funding for research, as agriculture and livestock industries had intensified and diversified (Lieberman 1965).

In 1950s a multi-disciplinary team of veterinary researchers (‘The Big Five’, four of which are shown in Figure 2-8) produced the bovine lungworm vaccine ‘Dictol’[1]. This was an outstanding example of researchers with different specialisms combining their knowledge to combat animal disease, producing the only parasitic vaccine available to date.

[1] Dictol was launched by Allen & Hanbury’s Ltd. in 1959, which was later incorporated into Glaxo. Dictol is currently manufactured by Intervet UK Ltd., Walton Manor, Walton, Milton Keynes, MK7 7AJ.

**Figure 2-8: Four of the 'Big Five' – Ian McIntyre, George Urquhart, Bill Jarrett, Bill Mulligan and Frank Jennings (not shown) ©University of Glasgow ImageBase**

### 2.3.1 The move to Garscube

Building at Garscube began in 1950, after the estate was purchased by the University from Sir George Campbell in 1948. Classes started to move out from Buccleuch Street site at Garnethill in 1954.

It is difficult to separate teaching and research activities in the history of the school, as the two are intertwined. Subsequent outstanding research at Glasgow included the innovative use of tissue culture in order to diagnose canine distemper in 1957. The Canine Infectious Diseases Research Group went on to carry out exemplary research into adeno- and herpesviruses in the 1960s, and parvovirus from 1978 into the 1980s. This illustrates the Weipers ethos of the school: that veterinary education should be provided within a first class research environment. This sentiment continues today.

Bill Jarrett, who had been involved in the Dictol research and then the canine infectious disease research, identified Feline Leukaemia Virus (FeLV) in 1964, whilst working with Harry Pfaff, a local practitioner in Glasgow. Bill Jarrett also set up the Experimental Medicine Unit, originally known as the Hospital Pathology Unit, which conducted research into husk (bovine lungworm), and amalgamated in 1969 with the pathology department that had been headed by Prof. Emslie, a well respected lecturer of the traditional school. There is no doubt that this period in the school's history was a very exciting one, with research at the cutting edge heavily influencing learning and teaching.

William Lee Weipers was given a knighthood in 1966, and two years later the school became a separate Faculty, with Sir Weipers becoming the first Dean. Between 1949 and

1968, five additional Chairs had been created, in Veterinary Surgery (William Weipers); Veterinary Pathology (John Emslie); Animal Husbandry and Veterinary Preventive Medicine (John Inglis); Veterinary Medicine (Ian McIntyre); and Veterinary Physiology (William (Bill) Mulligan).

By 1969 the last department to move to Garscube – veterinary anatomy – had relocated to the new site at Garscube.

Professor James Black (who was awarded the Nobel Prize in Physiology and Medicine in 1988) is noted as saying:

> *" … William Weipers … gave me the opportunity to start a new Physiology Department, and during the next eight years I built a state-of-the-art physiology teaching laboratory based on my enduring belief that our brains work best when doing focuses our thinking …*
> *I built a workshop-coupled research laboratory providing the most advanced cardiovascular technology I knew; and persuaded George Smith and Adam Smith, academic surgeons, to join me".*
>
> (Black 1988)

This illustrates the Weipers ethos for harnessing the most recently available technology, and the brains of highly able individuals with the potential to be leaders in their field, working in a collaborative way.

The year 1974 was a significant one, marking the Silver Jubilee of the University of Glasgow Veterinary School, and Sir William Weipers' retirement.

## 2.3.2 The curriculum in the Weipers era

The curriculum for the first part of the Weipers era was as shown in Table 2-3.

| Year | Subjects |
|---|---|
| 1st | Animal Management |
| | Botany |
| | Chemistry |
| | Physics |
| | Zoology |
| 2nd | Anatomy |
| | Animal Management |
| | Biochemistry & Physiology |
| | Histology & Embryology |
| 3rd | Anatomy |
| | Bacteriology |
| | Biochemistry |
| | Clinical Medicine & Surgery |
| | General Pathology |
| | Materia Medica |
| | Morbid Anatomy |
| | Parasitology |
| | Physiology |
| 4th | Animal Husbandry |
| | Microbiology |
| | Morbid Anatomy |
| | Obstetrics and Infertility |
| | Parasitology |
| | Pathology |
| | Systematic Medicine |
| | Systematic Surgery |
| 5th | Clinical Medicine & Surgery |
| | Hospital Cases |
| | Medicine |
| | Medical, Surgical & Obstetric clinics |
| | Meat Hygiene |
| | Operative Surgery |
| | Radiology, Anaesthetics & Obstetrics |
| | Surgery |
| | Surgical Anatomy |

**Table 2-3: Veterinary curriculum, extracted from the University Calendar for 1953-54**

A detailed version, with examinations, is included as Appendix A1.

Most teaching was through lectures and practicals, with clinical instruction in small groups. Six months experience of general practice was also required. This course structure remained virtually the same, with some minor permutations, until the 1966-67 session, when new regulations were brought into force. Botany and Zoology were replaced with

Biology; and Anatomy was combined with Embryology & Histology. In the 1969-70 session, further changes took place, with the merging of Pathology and Medicine in the fourth year. The revised curricular structure is shown in Table 2-4.

| Year | Subjects |
|---|---|
| 1st | Biology |
| | Chemistry |
| | Physics |
| 2nd | Anatomy, Histology & Embryology |
| | Biochemistry |
| | Physiology |
| 3rd | Animal husbandry |
| | Pathology |
| | Microbiology, Morbid Anatomy & Meat Inspection |
| 4th | Clinical conference and visiting lecturer, alternating weeks |
| | Meat Inspection |
| | Pathology / Medicine |
| | Pharmacology |
| | Reproduction |
| | Surgery and Integrated Anatomy |
| 5th | Clinical instruction in groups |
| | Groups (medicine) and clinical conference (surgery), alternating with visiting lecturer |
| | Medicine |
| | Postmortem Demonstrations |
| | Systematic Surgery & Reproduction |

**Table 2-4: Veterinary curriculum, extracted from the University Calendar for 1970-71**

A detailed version, with examinations, is included as Appendix A2.

The curriculum in this era revolves around basic structure and function in the early years of the course, with paraclinical subjects in the third and fourth years, and medicine and surgery in the fourth and final years.

## 2.4 The 'post-Weipers era'

The Silver Jubilee in 1974 was a turning point for the school, with the retirement of Sir Weipers, which was marked by the award of honorary degrees from Glasgow, and also from the University of Stirling for his contribution in an advisory capacity to the founding of the Institute of Aquaculture there by Professor Ron Roberts in 1972.

Sir Weipers was succeeded by Ian McIntyre (Figure 2-9) as Dean, and the following year a Chair of Veterinary Anatomy was established. Deans were then appointed for three years rather than in perpetuity. Ian McIntyre played a key role in setting up the veterinary school in Nairobi, Kenya (Figure 2-10).

**Figure 2-9: Ian McIntyre, Dean 1974-1977**
**©University of Glasgow ImageBase**

**Figure 2-10: Ian McIntyre with colleagues and staff of the Nairobi veterinary school**
**©University of Glasgow ImageBase**

McIntyre was succeeded by Bill Mulligan in 1977, who embraced the concept of quality assurance in the veterinary undergraduate course by overseeing the implementation of student questionnaires in the late 1980s.

**Figure 2-11: Bill Mulligan, Dean 1977-1980**
**©University of Glasgow ImageBase**

Donald Lawson became Dean in 1980, driving the introduction of the lecture-free final year in 1981, a radical idea that was adopted by the other UK veterinary schools. The Feline Virus Unit was established in the same year under the directorship of Os Jarrett.

The students who began studying in 1974, and who graduated in 1979, saw three Deans in control of the school, and the introduction of a fourth. This is evidenced by the photographs of Deans in the 1979 yearbook. That all these academics shared a common philosophy was important to ensure a smooth transition from one Dean to another, so that changes in management were not considered adverse by the students.

Professor Tom Douglas became Dean in 1983, later becoming a controversial figure for serving as part of the committee chaired by Ralph Riley in 1988, that was given the remit to consider the provision of veterinary education in Great Britain, and the scope for its 'rationalisation' (described in further detail in section 3.6.1.2)

Sir James Armour (Figure 2-12) was appointed Dean in 1986, the same year that the new Small Animal Hospital opened. The 1980s also saw the establishment of the Leukaemia Research Fund Virus Centre, marking the continuation of excellence in research rewarded in Research Assessment Exercises in subsequent years.

**Figure 2-12: Sir James Armour, Dean 1986-1991**
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The threat of the veterinary school's closure following the publication of the Riley report (University Grants Committee 1989) led to a massive public campaign. Subsequently,the Page review recommended that all six schools stay open and student numbers increased to satisfy manpower requirements (Anon 1990b).

The 1990s marked the beginning of the 'information era'. While teaching and learning would continue to take place in the context of internationally renowned research, increasing library and computer services would have a large impact on teaching, serving to support an increasingly overloaded curriculum.

### 2.4.1 The curriculum in the post-Weipers era

The curriculum continued in much the same way as the previous era until the 1973-4 session, when Physics was dropped from the syllabus. Then in 1977-78 a new course was introduced, shown in Table 2-5.

| Year | Subjects |
|---|---|
| 1st | Anatomy |
| | Animal Husbandry |
| | Biochemistry |
| | Chemistry |
| | Physiology |
| | Veterinary Botany |
| 2nd | Anatomy |
| | Biochemistry |
| | Integrated Studies |
| | Physiology |
| 3rd | Animal Husbandry |
| | Microbiology |
| | Parasitology |
| | Pathology |
| 4th | Clinical pathology demonstrations |
| | Food Hygiene & Meat Inspection |
| | Pathology / Medicine |
| | Pharmacology |
| | Postmortem Demonstrations |
| | Surgery, Reproduction & Integrated Anatomy |
| | Surgery & Reproduction clinical work in groups |
| | Visiting lecturer, alternate weeks |
| 5th | Clinical Instruction |
| | Groups (medicine) and clinical conference (surgery), alternating with visiting lecturer |
| | Medicine |
| | Postmortem Demonstrations |
| | Surgical Exercises |
| | Systematic Surgery, Reproduction & Integrated Anatomy |

**Table 2-5: Veterinary curriculum, extracted from the University Calendar for 1978-79.**

A detailed version, with examinations, is included as Appendix A3.

Botany was re-introduced at this time, but dropped, with Biology, in 1983. Histology & Embryology was drastically cut and subsumed within Anatomy.

The new course, which was run in tandem with the existing course for students already enrolled, paved the way for the lecture-free final year, known at the start of this period as the ‘intensive year’. Final year lectures were phased out in 1981.

## 2.5 The 'information era'

In 1991, Norman Wright (Figure 2-13), Professor of Anatomy, became Dean of the Faculty until his retirement in 1999. His commitment to creating new facilities for learning and teaching innovations saw that from 1994 Glasgow played a significant role in the CLIVE project (Computer-aided Learning In Veterinary Education).

**Figure 2-13: Professor Norman Wright, Dean 1991-1999**
**©University of Glasgow ImageBase**

At the same time, developments were happening in Veterinary Informatics under the leadership of Professor Stuart Reid, who was developing with his colleagues the first veterinary information systems at Glasgow, of which EqWise has been the most notable to date (Reid, Mellor *et al.* 1996).

The new James Herriot Library was opened by the author's son (James Wight) in 1995, offering students and staff access to increased information for learning, teaching and research, on the shelf and digitally.

As a result of this investment in staff and facilities, in 1997 Glasgow was awarded the highest grade in the first National Teaching Quality Assurance Evaluation.

During this time, attempts were made to revise the curriculum under Professor Wright, led by Professor Martin Sullivan with others, including the subsequent Dean.

Professor Andrea Nolan (Figure 2-14) took over as Dean in 1999, the first woman to do so in a UK veterinary school. She was also the first female Dean of a Faculty at the University of Glasgow. Professor Nolan emphasised the need to ensure continuation in excellence in teaching and research (Anon 1999a), and further developed the University's commitment to excellence in teaching in her subsequent role as Vice-Principal for Learning and Teaching.

Due to the collective efforts of the school under the leadership of Wright and then Nolan, the Faculty obtained recognition from the American Veterinary Medical Association (AVMA) as an approved school in 1999, facilitating student and graduate mobility between Glasgow and North America. This was to have an impact on student demographics – by 2006 approximately one third of the new student intake was to be North American.

During this time the curriculum was again reviewed with the intention to develop a new curriculum. This reappraisal of teaching was based on the efforts of Professor Sandy Love and his colleagues, the output of which was the ‘fantasy curriculum’ (Christley, Gilleard *et al.* 2001; Love, Hutchinson *et al.* 2002).

**Figure 2-14: Professor Andrea Nolan, Dean 1999-2005**
**©University of Glasgow ImageBase**

In 2005 Professor Stuart Reid (Figure 2-15) took over, during a difficult transitory phase, as evidenced by a period of financial plight experienced across the University.

**Figure 2-15: Professor Stuart Reid, Dean 2005-present**
**©University of Glasgow ImageBase**

In 2006, the school was re-accredited by the American Veterinary Medical Association (AVMA), a requirement of approved status being re-accreditation every seven years.

### 2.5.1 The curriculum in the 'information era'

The information era saw another change to the curriculum, shown in Table 2-6, with the formation of Veterinary Biomolecular Sciences in the 1991-92 session, replacing Chemistry and Biochemistry. In this session, Animal Husbandry and Management was relabelled Veterinary Animal Husbandry, and Therapeutics was brought down into the third year. Food Hygiene and Meat Inspection remained within the fourth year of the course but were re-branded as Veterinary Public Health.

| Year | Subjects |
|---|---|
| $1^{st}$ | Veterinary Anatomy |
| | Veterinary Animal Husbandry |
| | Veterinary Biomolecular Sciences |
| | Veterinary Physiology |
| $2^{nd}$ | Veterinary Anatomy |
| | Veterinary Animal Husbandry |
| | Veterinary Physiology |
| $3^{rd}$ | Introduction to Clinical Methods |
| | Veterinary Microbiology |
| | Veterinary Parasitology |
| | Veterinary Pathology |
| | Veterinary Pharmacology and Therapeutics |
| $4^{th}$ | Combined Integrated Studies – Veterinary Pathology, Veterinary Microbiology, Veterinary Parasitology, Veterinary Medicine, Veterinary Public Health and Veterinary Animal Husbandry |
| | Veterinary Surgery and Reproduction |
| $5^{th}$ | Veterinary Jurisprudence |
| | Veterinary Medicine |
| | Veterinary Surgery |

**Table 2-6: Veterinary curriculum, extracted from the University Calendar for 1991-92**

A detailed version, with examinations, is included as Appendix A4.

The syllabus retained a similar structure for the duration of the information era, with some minor changes. In 1995-6, the Combined Integrated Studies course in fourth year was reorganised on a species basis, with courses in Farm Animal Diseases and Veterinary Public Health, Companion Animal Diseases, clinico-pathological case conferences and clinical groups. In 1996-97, the final year was also restructured on a species basis, and comprised Farm Animal Medicine and Production (including Public Health), Equine Clinical Studies, Small Animal Clinical Studies, clinico-pathological case conferences and grand rounds. In recent years the final year courses were split between Small Animal Clinical Studies and Large Animal Clinical Studies (which grouped equine and farm animals and public health).

The current course is shown in Table 2-7, and detailed in Appendix A5.

| Year | Subjects |
|---|---|
| 1st | Veterinary Anatomy |
| | Veterinary Animal Husbandry |
| | Veterinary Biomolecular Sciences |
| | Veterinary Physiology |
| 2nd | Veterinary Anatomy |
| | Veterinary Animal Husbandry |
| | Veterinary Biomolecular Sciences |
| | Veterinary Physiology |
| 3rd | Veterinary Microbiology |
| | Veterinary Parasitology |
| | Veterinary Pathology |
| | Veterinary Pharmacology |
| 4th | Companion Animal Science |
| | Combined Integrated Course |
| 5th | Small Animal Clinical Studies |
| | Large Animal Clinical Studies |

**Table 2-7: The veterinary curriculum in 2006**

## 2.6 Overview of challenges facing the Glasgow school

The Loveday Reports considerably influenced the evolution of all the British veterinary schools. The first in 1938, like the Riley Report in 1989, could have led to the closure of the Glasgow school. It recommended that the veterinary college be replaced with a new facility focusing on agriculture in response to problems in the livestock industry, but the University rejected this. The second Loveday report, published in 1944, had a similar effect to that of the Page report following Riley's recommendations in the late 1980s, in that it argued for the continuation of the Glasgow school. It is clear that development in veterinary medicine follows a cyclical path and that committees regularly present opposing views which can have good and bad implications for a particular school.

In addition, despite common reference to the 'Golden era' of the 1960s and 70s when cutting edge research was being conducted in parasitology and medicine for example, there was no period in the school's history when it was free of financial restrictions, a hallmark of University administration. Despite this, or even because of this, the school has always strived to maintain excellence towards research, clinical work and teaching, and continues to be an internationally recognised stronghold.

# 3 Veterinary Literature Review: the Context

**“Many new problems are but old ones in modern guise …”**

L.E.W. Bevan (1955)

A review of the literature, from 1949 to the present day, reveals that veterinary education has been, and still is, extremely well-debated. The information gathered here provides a veterinary historical background to the work described in Chapter 5.

## *3.1 Sources of veterinary education literature*

Gibb (1990) provided a useful introductory guide from a UK perspective, with a brief historical overview of veterinary medicine, a current overview of the profession, the role of statutory and professional bodies, and some information about education. Gibb also reported on the vast amounts of veterinary literature available, and provided particulars about libraries and other sources of literature, legislation, statistics, audiovisual materials, consortia and conferences.

As suggested by Gibb, *Index Veterinarius* (1933-) and *Veterinary Bulletin* (1931-) were the first index publications consulted, as this study looks back to 1949 as its starting point, and pre-dates digital records. Index headings of ‘education’, and ‘veterinary schools’ were particularly useful.

For the digital records (early 1970s onwards), references to veterinary literature were obtained using Boolean keyword searches, such as “veterinary AND education” or “veterinary AND students AND learning” or “medicine AND educational technology” in library databases. These included CAB Abstracts, Medline (Ovid), and Web of Knowledge. ProceedingsFirst was useful for finding conference proceedings, and student dissertations of use were found in Dissertation Abstracts and UMI ProQuest Digital Dissertations.

For the education policy and educational technology publications, the Educational Research Abstracts database was useful, together with the Australian and British Education Indexes. WorldCat was used to locate books.

## 3.2 Overview of events that impacted on veterinary education in Britain (and particularly Glasgow)

Table 3-1 outlines the main events impinging on the development of veterinary education, especially in Glasgow, during the eighteenth and nineteenth centuries. Those most notable include the emergence of cattle plague in Britain, requiring immediate attention, and the Veterinary Surgeons Act of 1881.

| Date | Event | Description |
|---|---|---|
| 1762 | Establishment of first veterinary school at Lyon | Lyon college established by Claude Bourgelat. |
| 1791 | Veterinary College, London established | First veterinary college in Britain established by Charles Vial St. Bel in London, opened in 1792. |
| 1844 | Royal College of Veterinary Surgeons established | Royal charter led to the establishment of the RCVS as the regulatory body of the newly acknowledged veterinary profession in Britain. |
| 1823 | Precursor to Edinburgh Veterinary College established | Formal veterinary training at Edinburgh began by William Dick. |
| 1862 | Glasgow Veterinary College established | Formal veterinary training at Glasgow began by James McCall. |
| 1865 | Cattle plague emerges in Britain | Cattle plague diagnosed by James Beart Simonds in London, led to the Cattle Plague Prevention Act in 1866. |
| 1876 | RCVS supplemental charter | Charter allowed RCVS to elect Fellow as well as Honorary and Foreign Associates, and made it compulsory for the regulatory body to maintain a list of members. |
| 1881 | Veterinary Surgeons Act (1881) | Confirmed the charter of 1844 and supplemental charter of 1976 and made it illegal for anyone who was not a member of the Royal College of Veterinary Surgeons to use the title veterinary surgeon or practice as such in Britain. |
| 1882 | National Veterinary Association formed | Formation of the National Veterinary Association in Britain, which lasted until shortly after the first world war. |

**Table 3-1: Summary of events during the eighteenth and nineteenth centuries that had an impact on veterinary education in Britain**

Table 3-2 outlines the main events in the first half of the twentieth century. Those most notable include the second Loveday report, which advocated the expansion of veterinary education within the university system, and the Veterinary Surgeons Act of 1948.

| Date | Event | Description |
|---|---|---|
| 1919 | National Veterinary Medical Association formed | Formation of the National Veterinary Medical Association (renamed the British Veterinary Association in 1952). |
| 1919 | Sex Disqualification (Removal) Act | Act which compelled the professions to admit women. |
| 1922 | Aleen Cust admitted to the RCVS | First woman to be registered as a member of the RCVS. Enrolled at the New Veterinary College, Edinburgh, a testimonial by Prof. William Williams deemed her competent in all subjects in 1900. |
| 1938 | First Loveday Report (Loveday 1938) | Called for additional funds to be made available to veterinary research; threatened the Glasgow school with closure after the withdrawal of government funding to the college in 1925. |
| 1942 | Veterinary Educational Trust formed | Formation of the Veterinary Educational Trust (later renamed the Animal Health Trust) formed to research knowledge of animal disease. |
| 1944 | Goodenough Report on medical education (Ministry of Health: Department of Health for Scotland 1944) | Called for radical reorientation of medical education. Argued for a liberal undergraduate education, with emphasis placed on postgraduate training to cater for specialised career requirements. |
| 1944 | Second Loveday Report (Loveday 1944) | Recommended the continuation of the veterinary schools at London, Edinburgh, Glasgow and Liverpool, and the creation of two new ones at Bristol and Cambridge. Also the inclusion of British veterinary schools within the universities, and provision of adequate research facilities. |
| 1948 | Veterinary Surgeons Act (1948) | A result of Loveday and Chancellor Committees, the Act banned all unqualified and unregistered persons from practising veterinary surgery, and transferred authority to award veterinary degrees to Universities. However some unqualified practitioners were allowed to continue to treat minor ailments. |

**Table 3-2: Summary of events during the twentieth century in the pre-Weipers era that had an impact on veterinary education in Britain**

Table 3-3 lists the main events during the Weipers' era. It again sees a new Veterinary Surgeons Act implemented, at the same time as increased scrutiny of teaching methods throughout the UK universities.

| Date | Event | Description |
|---|---|---|
| 1949 | Bristol and Cambridge veterinary schools established. | |
| 1964 | Hale Report (University Grants Committee 1964) | UGC Report of the Committee on University Teaching Methods that reviewed undergraduate teaching methods and practices in British universities. Emphasised the importance of the lecture, the need to remedy curricular overload, and the value of postgraduate training. |
| 1966 | Veterinary Surgeons Act (1966) | Update to 1949 Act, preserving the motion that only qualified veterinary surgeons should be able to practice veterinary surgery, with the exception of certain classes of veterinary students in their clinical years working under the direction of a veterinary surgeon. |

**Table 3-3: Summary of events during the Weipers era that had an impact on veterinary education in Britain**

Table 3-4 lists the influential reports of the post-Weipers era. While Swann and Riley were largely concerned with student intake in the UK, the North American Pew report rejected the concept of omnicompetence, and suggested methods for self-directed learning.

| Date | Event | Description |
|---|---|---|
| 1975 | Swann Report (Swann 1975) | Recommended that the annual intake into the veterinary schools should be maintained at 335, or no more than 80 per school, with no reduction in the number of UK veterinary schools. |
| 1988 | Riley Report (University Grants Committee 1989) | Chaired by Riley, this UGC working party identified the principal constraint on veterinary education as the limited number of clinical staff spread across six sites, and therefore recommended the closure of the Glasgow school and that of the paraclinical and clinical departments at Cambridge, with a view to the remaining four schools each producing 85 students per year. It also recommended the strengthening of basic sciences and research within the schools. Additionally, it proposed a review of EMS structures; and an examination of the final year teaching with a view to maximise hands on training opportunities. |
| 1989 | Pew Report (Pritchard 1989) | Chaired by Pritchard, the Pew report concluded that it was no longer practical to produce universal veterinarians able to administer to 'all creatures great and small'. The report instigated a broad-scale examination of teaching methods in the US and internationally, with a new focus on self-directed learning emphasised, encompassing the skills of problem-solving, critical thinking and cooperative learning. |

**Table 3-4: Summary of events during the post-Weipers era that had an impact on veterinary education in Britain**

Table 3-5 summarises the reports of the information era, again seeing a pre-occupation within the UK of student intake numbers, the heralding of the widening participation agenda, and the RCVS' recommendations to the veterinary schools to embrace a standardised set of Day One Skills, with the foundations laid for lifelong learning through the implementation of a Professional Development Phase.

| Date | Event | Description |
|---|---|---|
| 1990 | Page Report (Page, Hoskin *et al.* 1990) | Its recommendations included removing the upper limit on intake to veterinary schools; calling on the Universities Funding Council (UFC) to contribute to the costs that would enable an expansion of intake to 400 students; and levying the cost of additional students on the students themselves. Supplanting the Riley Committee's recommendations, the report was welcomed as all six schools would need to remain open to satisfy manpower requirements |
| 1993 | Lucke Report (Lucke 1993) | The Lucke Report's recommendations with regard to funding were to encourage the universities to make best use of their resources on a shared rather than individual basis, at the request of the RCVS. New ways of using the resources of other branches of the veterinary profession were called for, through closer integration with the schools. |
| 1997 | Dearing Report (National Committee of Enquiry into Higher Education 1997) | The National Committee of Enquiry into Higher Education had a widening participation agenda and 'lifted the lid' on student admissions. It also pushed for a student-centred learning paradigm focused on the development of *skills* and called for quality control in relation to computer-based learning. It also gave backing to scholarship in higher education via the Institute of Learning and Teaching in Higher Education. |
| 1997 | Selborne Report (Selborne 1997) | The Committee of Enquiry into Veterinary Research called for a new approach to veterinary research funding; increased exposure of undergraduates to veterinary research; and an exploration of opportunities for research collaboration. |
| 2001 | RCVS Education Steering Strategy Group recommendations (RCVS 2001) | Listed the Day One competencies graduates were expected to demonstrate, and outlined plans for a Professional Development Phase (PDP) to enable graduates to attain Year One competencies. |

**Table 3-5: Summary of events during the Information era that had an impact on veterinary education in Britain**

## 3.3 Veterinary education before 1949

An appreciation of the historical background of veterinary medicine is necessary because veterinary education has evolved over time. Innovation has grown out of existing practices, in response to various catalysts, some of which are described below. Rather than going into any detail, for example on the role of cattle in prehistoric societies, the main aim of this section is to refer readers to other more comprehensive sources of information. These texts serve to illustrate the importance of the human-animal bond, and the role of animals in societies for subsistence, companionship, transport and even religious purposes, since prehistoric times.

### 3.3.1 The role of animals throughout history

As well as farm animals, which were domesticated in Anatolia around 8000 years ago, Dunlop and Williams (1996) also looked in detail at the role of companion animals from prehistoric societies around the world in more detail. For example, they highlight the importance of dogs in early Mesopotamian life within a religious context, circa 1050 B.C., and the heavy use of horses for transport and warfare in Assyria around 600 B.C. Swabe (1999) also described human-animal relations from early times, emphasising human dependency on other animals in terms of a social history narrative.

In an unpublished student dissertation, Philippa Moss (pers. comm.) revealed how horses had for centuries played invaluable roles, not only in the military context (in battle as well as dragging artillery and other supplies) but also for transport of civilian people and goods. It is not surprising then that what were considered to be the first 'veterinary surgeons' were farriers, who were part of a larger community of spiritual healers, herbalists, and cow leeches (Pattison 1984). This same point was made by Gibb (1990), who provided a very brief overview of the role of animals in prehistoric and historic societies, as a prelude to his guide on sources of information about veterinary medicine. He noted that, in Britain, practitioners in the fourteenth century were called 'Marshals' (horsemasters), highlighting the importance of equine medicine at that time.

As well as for transport and in war, Hunter (2004) also highlighted the increasing interest in horses in the eighteenth century, for horseracing and fox hunting.

### 3.3.2 Developments in veterinary public health in the 18th and 19th centuries

The importance of animal disease control is realised when one considers that farm animals such as cattle and sheep have since Neolithic times played a crucial role in human subsistence (Swabe 1999). However, it was not until the 18th century that significant strides were made in veterinary public health. Swabe (1999) noted that the ‘unfolding veterinary regime’ took place at this time, due to a changing intellectual climate and the impact of plagues on livestock.

#### 3.3.2.1 The rise in importance of public health

The eighteenth century was particularly a time of change in Europe, when the livestock industries and agriculture were intensified, and selective breeding led to new varieties of livestock.

Various texts reflect on the devastating effects of diseases affecting large animals in the eighteenth century onwards, such as rinderpest, foot and mouth disease, fowl cholera, glanders, anthrax, leptospirosis, and brucellosis, as well as distemper in dogs and other diseases (Schwabe 1978; Pattison 1984; Gibb 1990; Dunlop and Williams 1996). Karasszon (1988) postulated that the European rinderpest panzootic “ended the prevalence of hermetic sciences and moralizing suppositions”. Collaborative research between physicians and veterinary surgeons, in a struggle to combat zoonotic diseases in this period, gave rise to a more scientific approach to disease, and the concept of ‘comparative medicine’ (Schwabe 1978).

Hunter (2004) noted that specialised training at veterinary colleges grew out of the need for specially trained men to meet the demand for a more scientific approach to animal medicine, to protect an increasingly important livestock industry. The major financial repercussions in Europe of zoonotic disease outbreaks led to the development of the first veterinary schools at Lyon and Alfort in France during the late eighteenth century. These were followed by other schools emerging throughout Europe, and in the United Kingdom shortly thereafter.

Kraft (2004) remarked that veterinary curricular reform in Britain in the late 19th century was in part driven by the ‘burgeoning field of public health’, requiring scientific subjects such as pathology and bacteriology to be included in the curriculum, in a move away from a course comprising mainly equine surgery, and anatomy, that produced ‘horse vets’.

#### 3.3.2.1.1 James McCall, first Principal of Glasgow Veterinary College

It is of interest that James McCall, founder of the Glasgow Veterinary College in 1862, was well regarded as an expert in veterinary public health (Aitken, Campbell *et al.* 1962). Around that time, human disease outbreaks in Glasgow, as a result of consumption of infected meat and milk, were highly profiled. McCall, in his role as a sanitary inspector, had condemned carcasses with signs of tuberculosis as “unfit for human consumption” since the 1860s (Waddington 2003).

In recognition of his expertise in meat hygiene, McCall, along with Thomas Whalley from Edinburgh’s Royal (Dick) Veterinary College, and William Williams from Edinburgh’s New Veterinary College, were asked, as veterinary surgeons of high repute, to advise on the presence of pleuro-pneumonia in the transatlantic livestock and meat trade in 1879 (Kastner, Powell *et al.* 2005).

### 3.3.3 The beginnings of formal veterinary education in Britain

Charles Vial St. Bel, a former professor of veterinary medicine in the Royal School at Lyon, became the first professor of the London veterinary school in 1791, offering a short course of instruction that has been cited as having a duration of two years (Anon 1937; Karasszon 1988), but which seems to have in fact been three years long, comprising zootomy and exterior knowledge of the horse in first year; the theory and practice of surgical operation, pharmacy, materia medica and botany in the second year; and horse shoeing, practical work in the infirmary, pathology and epizootic diseases of farm animals in the third year (Pugh 1962; Cotchin and Carter 1990). It seems that William Dick, later to become the first Principal of Edinburgh Veterinary School, was able to obtain his veterinary surgeon diplomas from London in 1817 in less than a year, the curriculum being predominantly equine-based (Bradley 1923).

The nineteenth century was a time of scientific discovery, particularly in the biological sciences, that must have impacted on the early curriculum, represented by the work of Rudolf Virchow on cellular pathology; Pasteur and Koch’s bacteriology studies on germ theory; Charles Darwin’s studies into reproduction; and James Lister’s anaesthesia experiments, some of which were conducted at the veterinary school in Glasgow (Karasszon 1988).

After the cattle plagues of around 1865, advances were made through extension of the curriculum and a prolonged period of study, lectures supplemented with more practical instruction, increased teaching staff, and the insistence upon a higher standard of entry examination (Axe 1889).

Veterinary journals of the late 19th century document debates between staff of different UK veterinary schools on how to advance veterinary training and distinguish it from farriery, and perhaps more importantly, from less scientific approaches to healing. The 1881 Veterinary Surgeons Act was an attempt to overcome this problem. The Act confirmed both the charter of 1844 and the supplemental charter of 1876, and made it illegal for anyone who was not part of the Royal College of Veterinary Surgeons to call himself a veterinary surgeon or practice as one (Hunter 2004).

### 3.3.4 Legislation for animal welfare

Legislation was also introduced against various forms of cruelty to animals in the nineteenth century. Porter (1993) noted that between 1800 and 1935, eleven bills were introduced and while most failed, two important Acts were passed in 1822 – an Act to Prevent the Cruel Treatment of Cattle, and the Cruelty to Animals Act, with the formation of the Royal Society for the Protection of Cruelty to Animals (RSPCA) in 1924. Not only concerned with the welfare of animals, there was a concern for the protection of society – "Cruelty to animals created cruel people, led to cruelty to humans." (Porter 1993)

### 3.3.5 Twentieth century advances

Veterinary medical advances from the earliest times to the present have been analysed (Karasszon 1988; Dunlop and Williams 1996). There is a vast difference between the veterinary knowledge in the early days of formal instruction when the first colleges were created, and the present day. This factor has influenced veterinary teaching in terms of the sheer amount of information that qualified veterinary surgeons have to assimilate, leading to the problem of 'curriculum overload', an issue that was brought to the attention of the veterinary profession relatively early on (Wooldridge 1949; Pugh 1955). The adoption and increasing use of audio-visual aids was seen as a means to overcome this problem (Getty 1967). However, the profession still battles with this problem (European Association of Establishments for Veterinary Education 1999).

Throughout this time, and into the twentieth century, the curriculum was expanded and the course duration increased. With time, different technologies to support education came into use.

The 1948 Veterinary Surgeons Act, drawn up in the light of the 1944 Loveday recommendations, took the power to examine veterinary students from the Royal College of Veterinary Surgeons, and put it in the hands of the six universities into which the UK veterinary schools had been subsumed.

The following sections look at the development of veterinary education in the second half of the twentieth century in more detail.

## *3.4 Veterinary education between 1949-1962*

This 'atomic age' (Weipers 1960b) was marked by the incorporation of the British veterinary schools into the universities. It culminated at Glasgow with the 1962 Centenary celebrations, 100 years after McCall started teaching veterinary students at his practice in Parliamentary Road (Weipers 1963).

### 3.4.1 Veterinary schools join the universities

The inclusion of the veterinary schools within universities was one of the recommendations of the Loveday report (1944). The report also advised the schools about topics and methods of instruction as well as the provision of adequate buildings and facilities, to bridge the gap between teaching and research. However, these and other recommendations could not be implemented until after the second world war (Weipers 1960b; Barber-Lomax 1961).

The embodiment of Glasgow Veterinary College within the University was not a simple process, as the RCVS had to be consulted in relation to the 1948 Veterinary Surgeons Act, because the name 'Glasgow Veterinary College' had ceased to exist legally (Anon 1949i). In addition, there were disagreements about the degrees that should be offered by universities that would reflect the distinction and calibre that a veterinary degree should convey (Kearney 1949; Leach 1949).

The difficulties were overcome, with The University of Glasgow's veterinary degree becoming the third university degree to become registrable with the RCVS, after Liverpool and Bristol (Anon 1951b).

### 3.4.2 The 'Weipers Era'

This period has been referred to as the 'university period' (Aitken, Campbell *et al.* 1962) but it may be better referred to as the 'Weipers era', certainly at Glasgow, because it represents the period when William Lee Weipers – later Sir Weipers – was appointed Director of Veterinary Education (Anon 1949a), and later to the Chair of Veterinary Surgery (Anon 1951d), before receiving an honorary BSc by the University of Glasgow (Anon 1951c), and Fellowship status of the RCVS (Anon 1958a, d). He was also elected President of the AVTRW (Anon 1960a), as well as President of the RCVS (Anon 1963c). Weipers' earlier involvement with the NVMA – which later became the BVA (Anon

1952a) – is also noted (Anon 1949f). The literature suggests that as well as being a devoted enthusiast with regards to developments in veterinary education in Britain, Weipers also played a key role in shaping veterinary education internationally (Anon 1960b).

### 3.4.3 Veterinary Education in the 'Weipers era'

#### 3.4.3.1 The aim of veterinary education

The aim of undergraduate education is to equip veterinary graduates with the skills and knowledge they will need in the workplace. The range of career choices available to graduates of the British veterinary schools at this time included general practice, research, teaching, employment with the Ministry of Agriculture and Fisheries (Animal Health Division), Northern Ireland Ministry of Agriculture, HM Colonial Service, openings in the Dominions, Royal Army Veterinary Corps, Agricultural Research Council (postgraduate scholarships and studentships), cattle breeding centres, and advisory and research appointments with commercial firms and animal welfare societies (Anon 1950d). By 1950, many more graduates were choosing a specialist field other than general practice (Mitchell 1951). Consequently undergraduate training needed to be broad enough to cater for all the individual needs of these employers. It was argued that students had no idea what to do after graduation, with few contacts during their training with veterinarians employed within the various sectors (Merlen 1958). However, the Association of Veterinary Students (AVS) annual conference provided this opportunity (Anon 1949b, 1954a), as did students' clinical societies (Carwardine 1960). At Glasgow, visiting lecturers from the various sectors, representing prospective employers of veterinary graduates, also regularly presented to imbue students with knowledge of what their work entailed (Weipers 1960a).

#### 3.4.3.2 Student intake

##### 3.4.3.2.1 Student selection

Selecting the most appropriate students to fulfil the various professional roles that veterinary graduates were expected to play was a key thread in discussions on veterinary education (Taylor 1955; Wright 1955), and a problem of university education as a whole (Anon 1955f).

A better balance of men and women in the veterinary schools, similar to that exhibited by the Royal Dick Veterinary School, was called for (Anon 1955c), a surprising observation given that it was the last British veterinary school to admit women. Discussion about women in the veterinary profession re-emerged on a much larger scale, after Straiton's (1963) controversial comments on the need to exclude female students from the course unleashed a backlash of comments about the valuable role played by female veterinary surgeons within the profession, the matter being concluded by the editorial board of the Veterinary Record, highlighting the indispensable contribution of women to the profession (Anon 1963a).

The more serious discussions on student intake – the debate on women in the profession clearly being outdated – were concerned with what type of students should be admitted to the course with regards to personality, values and attitudes, as well as academic capacity. The importance placed on academic standards for admission in the United States was such that a Veterinary Aptitude Test was developed as a tool to predict student grades, assessing reading comprehension, knowledge of science, and verbal memory (Scales 1960).

There was a general murmuring of agreement that students with the best mental ability, as assessed by performance in examinations, might not make the best veterinary surgeons (Wright 1955; Burrow 1958). A deep, inborne interest in learning (Taylor 1955) and a sense of values (O'Brien 1958) were regarded as equally important. It was also suggested that the best students were those that could think logically and clearly, show interest in their work and undertake postgraduate training (Pugh 1955). However, there was concern that such a change to the admissions process might lead to falling standards within the profession (Gould and Gould 1958).

Conflicting opinions emerged on the importance of students having had a broader or more liberal education before admission, being valued by some (Wright 1955) and not essential by others (White 1957). It is interesting that the UK chose not to adopt the system in the United States whereby students had to undergo at least two years pre-professional training prior to entering the professional course, a system that did allow for a broad education (Scales 1960), although prior experience with farming or having a farming background was desired.

An overbearing interest in curing disease by students was criticised, with efforts being required to foster in potential students an attitude towards maintaining animal health, implemented at secondary level education (Abrams 1960).

Entrants on both sides of the Atlantic were not restricted to school-leavers. The period under study takes in the immediate post-war period, therefore student intake included ex-service people, mostly men. One quantitative study of Liverpool admissions (White 1957) revealed that because of this, the age of male entrants had increased over time, whereas that for women stayed the same due to competition for places. Ex-servicemen were said to have worked harder and achieved a better average standard than other students despite family and other commitments.

##### 3.4.3.2.2 Manpower

Concerns about manpower also effected deliberations on student intake (Anon 1950b, g, 1954g; Gripper 1961). In one American study, also quantitative (there were no qualitative studies at this time), the author highlighted the problem that there would not be enough veterinary surgeons to satisfy the demand for veterinary services by the year 1975 (Brandly 1961). He noted that attempts to increase the numbers of students being accepted for veterinary study in the post-war period saw the decline in quality of enrolled students in the United States. In defence of admitting students without the appropriate qualifications, Wright (1955) stated that some of Britain's finest veterinary surgeons who entered the course before the 1948 Veterinary Surgeons Act did so without obtaining matriculation standards.

##### 3.4.3.2.3 Obtaining a Balance

Selecting students who were able to combine their studies with recreational sports and hobbies was also regarded as important. The annual AVS conferences (Anon 1950b, 1953a) reflected a work hard and play hard attitude that was demonstrated by veterinary students' extra-mural activities, hobbies and sporting achievements (Anon 1952c, 1953a; Bell 1963).

In contrast, lack in the medical field of student involvement in these activities became a matter of concern about student health, leading to a call for an induction process upon starting university that would give students advice on how to live their lives generally (Anon 1952f).

An address to Edinburgh veterinary graduates emphasised the need to live a balanced life (Boddie 1962), timely advice given that it had been proposed that pressure on pupils was leading to an increased number of neuroses and breakdowns (Anon 1955f). A national concern, stress was the subject of a talk at the 12$^{th}$ AVS congress (Anon 1955a), and linked partly to the sheer amount of information that veterinary students were expected to learn.

#### 3.4.3.3 Curriculum

##### 3.4.3.3.1 Veterinary Syllabus

In addition to selecting the 'right' type of students to train as veterinarians, staff within the veterinary schools also had the responsibility of deciding what topics of instruction should be included, within the context of legislation governing the roles and capabilities of a veterinarian, and societal requirements.

The importance of a broad veterinary education, with unnecessary detail eliminated to avoid overloading students (Wooldridge 1949; Merlens 1961), and students' understanding veterinary medicine processes rather than rote-learning of numerous facts (Anon 1953b; Wallis 1960), are recurrent themes. Discussion and interaction were recognised as contributing to a more valuable experience than that exhibited by excessive note-taking (Peck 1961). Nevertheless, veterinary schools had a duty requirement, bound by the 1948 Veterinary Surgeons Act, to produce graduates that could address diverse societal and economic needs (Abrams 1960).

The shift in importance from the horse to the farm animal and livestock industry in the post-war period had a major impact on teaching, along with the increasing recognition of the importance of clinical training (Anon 1955d). The rearing of different farm animals (first pigs, then sheep then beef cattle) meant that species and their diseases previously not investigated had to be researched (Anderson 1961). Increased multi-species knowledge had to be included in the curriculum, that veterinary undergraduates would be expected to assimilate. As a result, the veterinary curriculum would need to be examined with a view to pruning the 'frills' and integrating courses (Davies 1955). The perceived problem with increasing the length of the veterinary course in the UK from four to five years was that more attention was given to the basic sciences, with additional subjects being added that were not integral to the students' overall understanding, and the course became even more crowded (White 1957).

Weipers viewed the undergraduate course as a stepping-stone to post-graduate work, but providing students with sufficient knowledge and experience to set up as practitioners if they so wished (Weipers and Jennings 1955). In an effort to solve the problems of curriculum overload and the apparent 'irrelevance' of non-clinical subjects, Weipers advocated the importance of small-group instruction for the integration of clinical and pathological knowledge and practice at Glasgow. This was made possible by the supply of clinical material from a nearby knackery as well as contacts with nearby farms, British Railways stables, the police and the riding school, with the latter two also helping with instruction.

As well as having adequate clinical material and integrated teaching, success of veterinary teaching, according to Weipers (1960b), depended on buildings (location and facilities) and having adequate teaching staff. Because this was the post-war period, and an age of mass-production, other people who commented on veterinary education stressed the importance of buildings and facilities to the quality of veterinary teaching, many having to be rebuilt because of the war in any case (Mitchell 1951; Blood 1955; Montgomerie 1962).

#### 3.4.3.3.2 Scholarship of teaching

In addition to having adequate staff to teach students, there was an emphasis on the scholarship of teaching and on lecturers' own performance at this time and the need for self-evaluation, partly due to pressure from students (Milne 1953; Simons 1953). The difficulty in removing 'bad teachers' versus 'bad students' from the system was also noted (Pickering 1960).

#### 3.4.3.3.3 Integration of courses

Providing that all these requirements were met, the ideal syllabus offered students the opportunity of a firm grounding in the basic sciences integrated with knowledge of pathology and clinical experience. Integration, Weipers (1962) argued, would replace the system of two years studying the normal animal, followed by studying pathologies, then studying how to treat disease clinically. However, there were others who argued that the integration of subjects was not the solution to an overcrowded curriculum (for example Merlens 1961).

#### 3.4.3.3.4 Impact of research on the syllabus

Multi-disciplinary collaborative research within the universities was seen as an asset that should not fall to research bodies unconnected with teaching (Anon 1949h). Further, there needed to be a close relationship between universities and research workers to allow university teachers to balance teaching and research commitments (Harbourne 1962).

The Association of Veterinary Teachers and Research Workers (AVTRW, recently renamed the Association for Veterinary Teachers and Research Work) provided a unique forum for exchanges of ideas on veterinary education between teachers and research workers, and Glasgow graduates and staff played key roles on the AVTRW Council (Anon 1963d).

The collection of facts that students had to assimilate was largely the product of increased research during this period, fuelled by 'mass injection' of funds.

#### 3.4.3.3.5 Professional Skills

Although communication skills were not regarded as an important part of the undergraduate curriculum in Britain, they were seen as essential (Anon 1954c; Field 1962). General business skills were not taught in the UK, but literature was beginning to emerge from overseas that offered opportunity for students and graduates to become familiar with guidelines for the successful management of veterinary practices (Anon 1954b).

The overseas schools had also implemented professional skills training, as exhibited for example by the veterinary curricula within the Faculties at Brisbane and Sydney (Davidson 1963). The Australian curricula were more or less identical to those in Britain, and were registrable with the RCVS, but business methods and administration were also included.

### 3.4.3.4 Audio-visual Developments

In this period audio-visual aids rapidly developed, presumably to keep up with the acceleration in research and consequently to convey information in lectures and conferences in an efficient and attractive way. The benefits of using audio-visual aids in teaching were cited as enabling a student to learn more and remember for longer, as well as saving time, imparting uniform information, increasing students' interest and maintaining better morale/attitude (Getty 1954-5). Visual stimuli were seen to be especially effective in teaching detail (Greenough 1960). Particular emphasis on the use of audio-visual aids was placed in relation to clinical teaching (Cardew 1962) to cater for increased student numbers and lack of clinical material. However, one recognised difficulty with 'teaching libraries' (e.g. slide collections) was that they tended to be full of rare conditions rather than typical ones. The increasing use of audio-visual aids for teaching and publicity purposes warranted the creation of the Veterinary Audio-Visual Association (VAVA) (Anon 1962e).

#### 3.4.3.4.1 Projected still images

Getty (1954-5) described the use of a 'Vu-graph' (epidiascope) to project diagrams in class, these serving as negatives for the positive printing of images and graphs for handouts, as well as '2 by 2' images of anatomical dissections that showed the students what a properly dissected area should look like. Other visual aids described include the 3-D camera to view the depth relationships between structures in photos, as well as a B&L micro-projector to project histology slides directly as an aid to discussion.

#### 3.4.3.4.2 Models and pathological specimens

The creation and use in teaching of models to better represent structure and function e.g. of organs, was made possible by development of new plastics (Blaine 1951). Getty (1954-5) advocated the use of specimens mounted in clear plastic as well as 'dry specimens'.

Skeletal material provided an additional resource for 3D visualisation. Information was made available on how to construct skeletal displays for teaching anatomy (Sack 1960).

#### 3.4.3.4.3 Cine

The cine-camera's value as an independent observer of scientific phenomenon was noted (Anon 1949d), as well as its educational value, demonstrated by the increasing availability of British films on a variety of veterinary topics, sometimes being so innovatory as to win awards (Anon 1949e, 1954e). Colour films to illustrate surgical procedures represented a major use of the technology at this time (McLintock 1951; Anon 1952b, d, 1953c) although there was a lack of interest in 3-D techniques being applied to colour surgical films, largely due to lack of awareness of its potential (Anon 1953d). Technologies to add sound to existing films also became available (Getty 1954-5).

As well as educating veterinary students and qualified veterinary surgeons, cine films were also designed with the training needs of farmers in mind (Anon 1949c, 1955e). However, concern was expressed that farmers could diagnose and treat their animals without calling on the intensive training of the veterinarian who would charge for their services (Anon 1954d).

Various catalogues were assembled of scientific films with veterinary interest to show at congresses (Anon 1956a, 1962c) as well as to inform lecturers about what films were available that could be incorporated into teaching (Anon 1952e, 1953e, 1958c).

Despite the benefits of cine films, it was argued that they should not be used to replace students' experience but to supplement it (Burrow and Lewis 1951).

#### 3.4.3.4.4 Lantern slides

Animated lantern slides began to be employed as a cheap alternative, as cine films were considered often too long and the bulk of which were irrelevant for undergraduate teaching (Collard and Engel 1954).

#### 3.4.3.4.5 Television

After cine-films, closed-circuit television was viewed as the next successful innovation in moving images, used first to demonstrate operative techniques at conferences (Anon 1956b). Open-circuit (broadcast) television served to bring the work of the veterinary surgeon into the public eye (Anon 1957).

#### 3.4.3.4.6 Tape-recorded lectures

Audio-visual aids were used for undergraduate and postgraduate teaching. Tape recorded lectures distributed to practitioners served postgraduate distance learning (Greenough 1963).

### 3.4.3.5 Postgraduate training and specialisation

The proposals recently put forward by the RCVS for a curriculum for 2010 and beyond (RCVS, 2001) include a 'Professional Training Phase', a probationary year after graduation, but this was not a novel idea. The Medical Practitioners Bill was viewed as a way of cementing this precautionary step in medical education, in response to the 1944 Goodenough Committee's report (Anon 1950c). The importance of lifelong veterinary education was also stressed relatively early on:

> *"Professional education should be a continuous process extending throughout the practitioner's active life and forming part of the very fabric of practice."*
>
> (Anon 1950e)

A perceived impossibility of equipping students with a detailed knowledge of all animals and systems was noted during this period. The postgraduate study period was seen as the opportunity for graduates to build on their basic training a detailed knowledge of a specific aspect of veterinary work (Wooldridge 1949).

Although Leach (1951) noted the paucity of postgraduate veterinary training available at this time, Glasgow University Veterinary School – as it was generally known then – was seen to be setting an example to other schools by implementing refresher courses as one form of postgraduate training (Crosfield 1953). However, in its sister profession this alone was viewed as insufficient to provide adequate training for medical practitioners (Anon 1950e). Nonetheless, these refresher courses were the foundations of the current system of Continual Personal Development (CPD) at Glasgow, although this dedicated unit was not established until 1990.

Refresher courses were intended for veterinary surgeons in general practice as well as graduates returning from national service (Anon 1954f), covering such subjects as public health and animal nutrition (subjects also receiving greater attention in undergraduate education then), as well as equine, small and farm animal surgery and livestock reproduction.

### 3.4.3.6 Veterinary Medicine and Education in the developing countries

Whilst striving for excellence at home, there was a moral commitment expressed by the British veterinary schools to provide assistance to developing countries, and how veterinary education could be applied to world problems (Anon 1962f). This focused on how British veterinarians and schools could provide region-specific training to serve the livestock industry in developing countries (Anon 1960c).

Glasgow in particular had a strong relationship with Africa. Weipers represented Glasgow as part of the FAO/WHO committee set up to look at this issue (Anon 1960b). Weipers also gained funding from the Rockefeller Institute to travel to Nairobi to give advice on aspects of veterinary education (Anon 1963b). The importance attached to research into the world food situation was such that Professor Boyd Orr of the University of Glasgow was awarded the Nobel Peace Prize (Anon 1949g).

Preventive veterinary medicine was viewed as a key area where the British veterinary profession could contribute to the livestock industries of developing countries (Weipers 1960b). The shortage of veterinary surgeons in East Africa was a critical problem that could be remedied by the establishment of schools to train veterinary assistants in each African country. This was a medium term measure given that it could take some time for the developing countries to have sufficient veterinary surgeons (Anon 1961). In the short term, veterinary surgeons trained in Britain joined the Colonial Service, including David Jawara, a Glasgow-trained African veterinary surgeon who became Principal Veterinary Officer of the Gambia (Anon 1958b).

Postgraduate specialist education in tropical veterinary medicine also offered British graduates another career choice. However, the opportunities for British graduates to join the Colonial Service were seen to be declining, with commonwealth countries gaining their independence (Anon 1962d).

Although specialised postgraduate training in tropical veterinary medicine had been implemented in Edinburgh before and after the second world war (Anon 1955b), the need to train local veterinary surgeons and assistants in how to recognise and treat conditions specific to Africa was considered essential (Anon 1952g; Mitchell 1952; Robertson 1953; Anon 1955b, 1960c), and also Britain's responsibility (Pillai 1952; Carmichael 1962). It was suggested that Britain had not provided for the future of the tropical veterinary medicine system it had created overseas (Polding 1962). Meetings and discussions took place to consider proposals for an Institute of Topical Veterinary Medicine in Britain (Anon 1962a; Beaton 1962); however, other suggestions included the setting up of a trust fund to allow British and African veterinary surgeons to travel back and forth (Matson 1962), a proposal that was quickly derided (Scott 1962).

The establishment of a veterinary faculty from 1962 in Nairobi originated from the collective efforts of Makerere College, Entebbe Research Laboratory and Kabete

Veterinary School (Carmichael 1958; Harthoorn 1959; Polding 1962). This was not the only veterinary faculty in Africa, as Khartoum University also had a veterinary faculty that developed from a school founded in 1937 to train Sudanese veterinary surgeons to replace their British counterparts (Chalmers 1963). Many of the early staff of these institutions were trained in Britain, and some in Glasgow.

#### 3.4.3.7 Glasgow's relationship to the rest of the world

It is clear that Glasgow University Veterinary School was not an autonomous body unconnected with the rest of Britain or internationally. Weipers also visited the US Department of Agriculture and State Colleges to study research programmes in calf diseases with a view to expanding and improving similar schemes in Britain (Anon 1950f). Various travel schemes were available at this time for British and colonial citizens to travel to America for research, study or to give lectures (Anon 1950h). Student travel schemes were also available at this time, between Britain and Europe or the United States (Anon 1950a, 1951a).

With regards to the training of students, there was opportunity for foreign students to 'see practice' within Britain, a reciprocal arrangement driven forward by the AVS (Orr 1949).

### 3.4.4 Summing up 1949-1962

Particular themes have been addressed which influenced veterinary education in Britain and internationally, with particular focus on the Glasgow school. This period culminated at Glasgow in the 1962 centenary celebrations, which like the beginning of this period, marked a time of reflection on achievements (Anon 1962b).

This section considered the challenges driving veterinary education forwards in the post-war period; the changing nature of the curriculum to meet societal and economic needs on a local and global scale; a rapid surge in the development of audio-visual technologies to communicate effectively the mass of information derived from increased research effort; the consequences of the second Loveday Committee's report; and concerns for the types of students being selected and their wellbeing under the pressure of an increasingly full curriculum. The next section looks from this point onward to the steps leading up to the Swann Report of 1975.

## *3.5 Veterinary education between 1963-1974*

This period sees an intensified interest in some of the themes addressed in the previous section: student selection procedures, the growing problem of information overload, increased use of audio-visual teaching aids; postgraduate specialisation and continuing education.

The concern for education within the developing counties was not forgotten (Anon 1966b; Weipers 1966; Anon 1967c) but it became less of a preoccupation, with a new focus on Britain's relationship with the rest of Europe. 'The European Scene' – a regular feature in the Veterinary Record – included summaries of the EEC Veterinary Liaison Committee meetings. Members of this committee were appointed to facilitate standards of training and graduate mobility throughout Europe.

The period culminated at Glasgow with the Silver Jubilee celebrations in 1974.

### 3.5.1 The 'European Scene'

The Veterinary Liaison Committee had a role in advising that veterinary training across Europe be standardised before graduate mobility to other counties could be allowed (Anon 1966a), one of its main remits being the equivalence of diplomas and the approximation of veterinary legislation (Pasfield 1966), although there was an emphasis on harmonisation rather than unification (Merkt 1967).

Standardisation proved to be problematic. There was criticism levelled at the inadequate preparation for meetings and lack of cooperation between the counties in drawing up and circulating papers (Anon 1969b). Although the International Veterinary Students Association (IVSA) communicated their anxieties about the differing standards of veterinary education throughout Europe (Higgins 1971), there was hesitation with regards to implementing standards, as once a European Directive was agreed, there was recognition that it would have legal force (Anon 1973a).

A focus on teaching hours rather than how subjects should be taught or the details of the course led to frustration being voiced by practicing members of the British veterinary profession (Cotchin 1973). It was suggested by White (1973) that a broad educational framework for Europe be laid down to look at entrance standards, duration of the course, staff-student ratios and facilities for laboratory and clinical training.

### 3.5.2 Student Admissions

During this time the debate continued over which students to select for veterinary training. Some disharmony was expressed over introducing a minimum age limit for entrants in Britain (Sharp 1964). In addition, there was concern that the admissions process did not place enough emphasis on students with a promise in research (Jones 1964), and that schools were failing to attract students of outstanding ability, a situation that could be remedied by some promotional work presenting the profession to potential students in a modern light (Anon 1965c, 1967a).

The background of students (e.g. agriculture) was no longer considered to be crucial (Booth 1965). However sociological studies revealed that the likelihood a child of a manual worker gaining entry to veterinary school was one-eighth that for a non-manual worker's child (White 1972), implying that access to the veterinary profession was still considered restricted to those from more privileged backgrounds. The problem was compounded by the recognition that the value of grants were not in line with the cost of living (Anon 1970a).

No one selection tool was thought to be useful in isolation. Hughes (1973) argued that the use of interviews in the selection process should not have been dropped, because although it was not a foolproof method of selecting the best students, it did allow the panel to probe the candidates' motivation. Effort was put into developing models to predict future performance based on school examination scores (Noeth, Smith *et al.* 1974).

It was suggested that manpower audits should be undertaken to estimate the number of veterinary surgeons required in the UK (Anon 1967a).

### 3.5.3 A Fresh Approach to Curriculum Design

A key individual that emerged in the literature (certainly in the United States) was W.W. Armistead, whose article on 'a fresh approach to curriculum design' made the controversial statement that veterinary education had remained fairly static for fifty years (Armistead 1964). It was anticipated that this article would also have a big impact in Britain (Scarnell 1964). Armistead suggested the introduction of clinical subjects at the beginning of the course, to motivate students and allow them to see the relevance of basic science teaching, and a course that would imbue students with an understanding of basic principles because of the rate at which information was becoming obsolete. In a subsequent article he drew attention to the problems of poor teaching, students memorising facts in order to pass examinations, the ‘burgeoning’ curriculum and the fact that schools hindered progress because they did not support flexible learning (Armistead 1965).

In fact, in reviewing the literature it becomes clear that the only way to bring about educational change within the profession is to ‘shock’ readers into understanding the severity of the problems. For example:

> *“The veterinary curriculum is painfully congested, crammed with trivial details, pigeon-holed with artificially divided disciplines, and hide-bound with convention.”*
>
> (King 1964)

King also argued that there were ‘too many lectures in the undergraduate course, probably too many practicals, and certainly too many factual details’.

Carson (1965) argued that the cramming of facts and little integration between basic sciences and clinical and surgical topics would result in “a frustrated, exhausted museum of facts, trying to practice by recipe and not thoughtfully”, whilst Clark (1965) noted that “In teaching students, we have to sort out what is relevant and not try to make Encyclopedia Britannicas out of them.” Hoerlein (1965) concluded that “The best process of learning involves active student participation beyond the reading of textbooks and the parroting of facts learned in the classroom”.

### 3.5.3.1 Inter-disciplinary integration

One proposed solution to the problem of an overcrowded course was to integrate the sub-disciplines:

> *“There appears to be general agreement that the effectiveness of the veterinary curriculum can be facilitated if each discipline is correlated with as many other disciplines as possible.”*
>
> (Julian 1965)

This would result in less duplication of content, and awareness among teaching staff of what students were being taught in other parts of the veterinary course. There were severe consequences for student learning by not integrating courses:

> *“Facts are taught in such a way as to compartmentalise each subject … The student regards each course as a separate subject which must be studied hard enough to pass the midterm examination and receive a passing grade. Following each final examination, the student promptly puts this information behind him and moves on to the next group of subjects.*
>
> (Reed 1965)

As well as 'forgetting' what they have learned, the consequences for students of lack of integration between the basic sciences and clinical training was said to be an inability to diagnose or problem-solve (Draper 1966).

In 1970, the RCVS attempted to address some of the issues, by holding a conference on veterinary education. The event provided an opportunity to assess the needs of preclinical, public health and clinical training; difficulties in recruiting the best students; the information explosion; and postgraduate specialisation and lifelong learning (Anon 1970c). An otherwise commendable effort, there was dissatisfaction expressed that the conference was held during term time, preventing students from attending (Dalton and Winch 1970). In summing up this conference, which ambitiously aimed to illuminate all educational problems within the profession and attempt to find solutions, Sir John Ritchie recapitulated the importance of integrating the sub-disciplines in teaching:

> *"… there is no doubt about it that the consensus is that whatever may be the pattern there has to be a good deal of cross-discipline reference in the schools."*
>
> (RCVS 1970)

Armistead (1970b) made the point that compartmentalisation would prevent students getting a coordinated view of the whole animal in health and disease, with decentralised administration promoting division. His alternative suggestions for teaching included the 'reverse curriculum', starting from the clinical problem perspective; the echelon system of teaching, where students, interns, junior and senior staff are involved in training the level below; and the changing of time-achievement relations, where students could take as long as they needed to qualify rather than being driven by a set course duration.

Michell (1970) suggested that a bridging of preclinical and clinical subjects rather than an amalgamation, through the creation of a clinical physiology training, would result in better graduate researchers and more confident clinicians. Communication between clinical and non-clinical staff was recognised to be essential to inform teaching (Baxter 1971).

The Glasgow school was commended for the integration of subjects at continuing education level (Anon 1973b).

#### 3.5.3.2 Clinical training

'Seeing practice' had clear benefits over clinical training at the veterinary schools – referred cases were rare (Amstutz 1965). In addition to seeing practice being regarded as a means to counter deficits in clinical training in the schools, each veterinary school was advised to draw up and maintain a relationship with extra-mural teachers, as a means of integrating clinical problems with basic science teaching, or bridging the preclinical and clinical phases (Anon 1972). Interaction between academics and practitioners would also result in an increase in successful referrals from practitioners to the schools that would also improve clinical training (Croft 1972).

In terms of student access to clinical material, Low (1971) argued that students should be exposed to a fewer number of clinical cases in great detail, rather than a cursory overview of hundreds of cases.

A survey of British and Irish final and penultimate year students revealed that time allocated for EMS (Extra-Mural Studies) differed markedly between the schools, and that students from different schools had varying experience in particular tasks, with Glasgow students' weakness being in the technique of machine milking (Weaver 1973).

#### 3.5.3.3 Thoughts on undergraduate specialisation

Beveridge (1973) suggested that the schools combine their teaching talent to create an integrated national scheme, with schools retaining their identity but providing specialist training in certain undergraduate and postgraduate areas, with staff mobility between the schools.

For the most part however, specialisation within the undergraduate course was not regarded as a viable option, as it would limit students' career choice too early as well as fragmenting the profession. Hughes (1973) noted that given the undefined role of the veterinary profession for the subsequent 50-year period, a rigid approach could not be taken but training should provide a sufficiently broad-based curriculum to make the graduate adaptable to future change whilst allowing them to become competent to practice.

Electives emerged as a means of incorporating some flexibility into the curriculum overseas (Dorn, Blenden *et al.* 1972; Fowler 1974) although the British schools were perceived to have not made much headway in implementing choice in the undergraduate curriculum (Robertson 1974)

#### 3.5.3.4 Addition of subjects to the curriculum

Radiation science (in the United States and Canada) and genetics emerged as new subjects, to be brought in with an increased focus on nutrition, public health, animal husbandry and preventive medicine (Hoerlein 1965). Nutrition was considered especially important given intensification of livestock and poultry production (Whitehair 1965), and there was demand for poultry diseases also to be given coverage (Ritchie and Appleby 1970).

Toxicology came to the fore because of the increased use of chemicals in livestock husbandry and agriculture (Michaelson and Hodge 1968).

Research in laboratory animal medicine, dermatology and ophthalmology also increased the amount that students were expected to learn (Armistead 1966). Calls were also made for the introduction of animal behavioural studies (Ewbank 1967), with the Glasgow and London veterinary schools criticised for not providing training in this area (Ewbank and Howard 1969).

The prominent focus on laboratory animal medicine was a consequence of increased career prospects in this area (Bleby 1968), a result of increased biomedical research particularly by pharmaceutical companies. By 1970, the veterinary schools in Glasgow, Liverpool and London were providing some undergraduate training in this area, a recommendation of the AVTRW (Bleby 1970).

Exotic and wildlife animal medicine (Fowler 1974) were also to be incorporated into the undergraduate curriculum.

For most of the subjects that received greater attention in this period, undergraduate exposure to the basic principles was considered necessary but postgraduate specialist education would be essential to graduates wishing to pursue a career in these areas.

### 3.5.4 Teaching and learning methods

#### 3.5.4.1 Lectures and laboratories

Laboratory classes accompanying lectures were considered useful in training students in the scientific method, although it was recognised that technical difficulties would discourage student participation, and that class discussions to correlate different experimental results would be necessary (Heath 1965-6). Laboratory teaching was also seen as a means of enabling students to consolidate theoretical knowledge gained in lectures with practical skills.

King (1964) argued that the number of lecture-hours needed to be reduced, quoting Moberly (1949) on this issue:

> *"Whatever the quality of the lectures, the crying evil is that the bulk of students attend far too many of them."*

Grunsell (1969) noted that seminars would provide a useful alternative to lectures, although Stowell (1963), in relation to comparative pathology training, recognised the danger that seminars could easily transform into lectures.

### 3.5.4.2 Audio-visual aids

The range of audio-visual aids available for teaching expanded in this period. It was recommended that a learning resource centre be established in each school that included publications, motion (cine) pictures, slides and filmstrips, and recorded television programs (Lieberman 1965). Nevertheless, there was still a fear that the use of these technologies would lead to replacement of teachers, but it was argued that the increased use of audio-visual aids to disseminate factual information to students would enable better use of teacher time through face to face, small group teaching (Jones 1968). Previously, it had been suggested that use of a good textbook could serve to provide students with detailed knowledge, allowing the teacher time to stimulate and interest the students (Dukes 1965). This sentiment was echoed by Soltys (1966), who also wrote that while film was the most powerful media for the communication of ideas and factual information, it was the most difficult and the most prone to misuse of all available media.

Compression of the curricular time available in some subjects led to the adoption of technologies to try to maximise learning efficiency such as handset devices in lecture theatres with a multiple-choice selector dial for providing student feedback to the lecturer (Bridgman 1965). Such equipment was used at the Royal Veterinary College, London (Appleby 1968).

'How to' guides emerged that included information about the operation of visual aids and the maintenance of lecture theatre equipment (Ashdown 1967).

Getty, a key individual who had previously advocated the use of dry and plasticised specimens, and various projection equipment for teaching (Getty 1953-4), described the benefits of closed-circuit television and videotapes: not overcrowding animals being examined; and allowing students to observe procedures safely, that would not need to be repeated, that dealt with radioisotopes or bacteria (Getty 1967). He also drew attention to the implications for designing new buildings, and noted that audio-visual aids helped to cope with increased student numbers and increased detail in the curriculum to cater for more diverse societal needs.

However, caution was expressed about the predominance of audio-visual teaching methods, at the possible detriment to students' and graduates' reading abilities (Heath 1971).

### 3.5.4.3 Programmed learning tools

Despite Heath's caution, it was recognised that computers could have a major impact on veterinary education, although tape-slide programs continued to be of use (Anon 1974). Benefits of programmed learning machines and computers were perceived to include individualised learning and self-assessment. They were also seen to have transformative capabilities. Knisely (1965) considered that computers would change the content, and perhaps even the goals, of education, as programmed teaching progressed. Findley (1965) postulated that use of programmed learning and videotapes would serve to make the highest quality teaching ubiquitous.

Decker (1965), at a veterinary education conference, documented the use of programmed learning segments, designed to enable students to achieve specific competences within the Armed Forces, offering a useful model to the veterinary profession. Appleby (1968) described programming as presenting a small number of facts and then testing the student's understanding of these with a question, following a linear or branching path.

Jones (1968) noted that in relation to medical education, programmed learning, properly planned, would help first year undergraduates acquire a common core of knowledge and help prevent some student wastage at the end of the first year.

At the Melbourne veterinary school, programmed learning facilitated by an audiovisual carrel, to teach radiological diagnosis, was found to be appropriate for students' needs. In particular it allowed them to progress through the material at their own pace (Wood and Reynolds 1974), a benefit also derived from the use of 'autotutorials' in public health training at Missouri (Dorn, Blenden *et al.* 1972).

The PLATO computer-based education system at the University of Illinois included full multimedia capabilities, with access to text, 35mm colour slides and audio sequences integrated within a single system. The proliferation of case-based programs across the veterinary curriculum served to facilitate the development of students' clinical reasoning skills, through the provision of immediate feedback to their questions (Grimes, Burke *et al.* 1974).

Despite the proliferation of positive endorsements of programmed learning and computer-aided instruction (CAI), it was conceded by Avner (1974) that the technologies could be inappropriately used, either resulting from a lack of appropriate attention to the capabilities of CAI for instruction, or a lack of attention to the current and future needs of students.

#### 3.5.4.4 Libraries

Traditional means of accessing information were not pushed aside for new technologies. The RCVS Wellcome Library, the official opening of which William Weipers presided over, was publicised as a resource for postgraduate education (Anon 1964), and in one editorial in the Veterinary Record appeared the quote:

> *"Libraries – and librarians – are the indispensable adjuncts to learning, and the services they offer increase all the time in quality and in usefulness."*
>
> (Anon 1965d)

The provision of abstracting services and indexes to the literature at this time became an easier operation with the introduction of computerised systems, helping the profession to identify key works to assist practitioner's continued education (Heath 1967; Anon 1968).

### 3.5.5 Scholarship of teaching

An ongoing theme was the need for pedagogically qualified teachers. Veterinary Record readers' attention was drawn to Armistead's proposals:

> *"Teachers should be trained in educational psychology, teaching and testing techniques."*
>
> (Anon 1965b)

Teaching on the basis of first-hand experience (evidence-based teaching) was considered important (Doxey 1965; Ginsberg 1965; Laing 1971). Using exciting visual aids, motivation to enthuse students and stimulate them to become part of the effort to expand knowledge, was also considered to be the hallmark of a good teacher (Poppensiek 1965) – a stimulating, ingenuitive, conscientious individual who would gain reward from seeing their students develop (Innes 1968).

Carwardine (1965) suggested that clinical teachers would need to have experience of general practice and be able to do sabbatical practice work to keep their practice knowledge and skills up to date in order to teach them effectively, the major problem being that lecturers gave priority to research and regarded teaching as an imposition.

There was a feeling that clinical and teaching prowess were not suitably recognised and rewarded (Pinsent 1965), the 'publish or perish' culture influencing appointments (Innes 1968). Teaching tended to be badly paid and performed by researchers who sacrificed some of their time in order to teach (Anon 1969c). A survey of Glasgow lecturers called for improvements in pay to attract and retain teachers in post, with little evidence of a second degree making any difference to conditions of employment (Selman, Reid *et al.* 1970).

In an attempt to improve veterinarians' teaching skills in Britain, the Agricultural Training Board provided courses on instructional techniques (Boundy 1973).

### 3.5.6 The ongoing plea for continuing education and postgraduate specialisation

#### 3.5.6.1 Increasing recognition of importance of continuing education

Despite there being little evidence that continuing education benefited lecturers in terms of monetary gain, the concept of lifelong learning was recognised to be important during this period. For example, Findley (1965) noted that the study of medicine was a 40-year one, not a four-year one, while Allam (1965) commented that the successful veterinarian ought to be a student all of his life. Armistead (1965) recommended that the universities support lifetime education. Undergraduate veterinary training was criticised for not instilling in students lifelong habits of self-education (Reed 1965), while Henderson (1966) noted that the undergraduate course was the basis for future (continued) learning. Pritchard (1966) recommended that teaching methods would need to move away from didactic lectures to foster development of self-learning skills in students to prepare them for lifelong education.

#### 3.5.6.2 Structure of continuing education

Refresher courses, that had emerged in the previous period, were seen as a solution to the problem of the 'obsolete veterinarian' (Edds 1965; Anon 1967b). In Britain, the British Veterinary Association (BVA) played a key role in coordinating these and encouraging schools to develop courses complementary to each others' (Anon 1967b). The RCVS were also expected to take a role in ensuring that this happened (Anon 1965a).

Another form of continuing education included attendance at scientific meetings (Beveridge 1967). Other ways to keep up-to-date included regular reading, professional contacts, conferences, short courses and various audio-visual media, given that the half-life of an undergraduate course was estimated to be 10 years, meaning that a practitioner could be out-dated in 10 years and completely obsolescent in 15-20 years (Christensen, Hoerlein *et al.* 1967).

The veterinary schools were seen to play a significant role in the provision of continuing education. For example, Armistead (1970a) argued that the veterinary schools should provide for continuing education, not just for veterinary surgeons but also for support staff.

Mullen (1971) called for a national coordinator for continuing education to be attached to one of the veterinary schools, and for the coordinator to publish the content of such courses for the benefit of those unable to attend.

#### 3.5.6.3 Distance learning

Postgraduate distance education became possible during this period, exemplified by the use of tape-recorded lectures as a means of disseminating specialist information around the world (Jackson 1964) although the creation of such resources was recognised to be time-consuming (Littlewort 1964). A study at Purdue revealed that programmed learning was favoured over other learning methods for continuing education (Lewis, Welser *et al.* 1973).

#### 3.5.6.4 Postgraduate specialisation

Whilst continuing education focused on keeping practitioners up-to-date with current knowledge, postgraduate degrees offered graduates the chance to gain a specialist qualification, either as a precursor to a career in research, or to allow practitioners to offer specialist services.

A lower proportion of British graduates going into postgraduate training, than those from the United States, was partly attributed to lack of exposure to research during undergraduate training (Betts 1966). Other recognised deterrents were the meagre facilities and stipends for postgraduate specialisation, and the financial attractions of general practice (Weipers 1968). An AVTRW working party was set up to look into reasons why few graduates were undertaking postgraduate training (Betts 1968). Lack of appropriate courses and encouragement also meant that few graduates interested in postgraduate specialisation went on to pursue it (Anon 1970b).

As well as the deficit of clinical training in the schools being addressed by better arrangements for ‘seeing practice’ in the UK(Anon 1972), it was proposed that a pre-registration clinical training phase following graduation would serve to consolidate the theoretical knowledge that students had assimilated at veterinary school, with discipline-based specialisation being favoured over species-based specialisation (Mitchell 1970). Standards in postgraduate specialisation were seen as essential throughout Europe (Anon 1969a). whilst in the US, internships and residencies emerged as opportunities for postgraduate specialisation (Tashjian 1971; Kitchen 1974).

### 3.5.7 Summing up 1964-1974

Against the wider backdrop of the 'European scene', this period marked intensification of the need for continuing education and postgraduate specialist training, to prepare graduates for the increasingly diverse career prospects becoming available, as a result of the 'mass injection' of funds into research in the post-war period.

Teaching was one career option that was not considered to be particularly well paid, that needed dedicated individuals with enthusiasm who would be required to develop pedagogical awareness and an understanding of the best use of teaching methods and audio-visual aids, which seemingly offered a solution to the problem of the information explosion.

Although caveats about its misuse were made, the computer was suggested as a useful aid for undergraduate and continuing education, delivering programmed learning which would form the basis of computer-assisted instruction in the 1980s.

## *3.6 Veterinary education between 1975-1989 (the 'post-Weipers era')*

### 3.6.1 Manpower and funding

There was no clear consensus in this period as to whether there would be a shortage or over-supply of veterinarians in this era. Although in North America an under-supply was predicted every year between 1976 and 2020 in one study (McLaughlin, Bard *et al.* 1976), another US study forecasted a surplus by 1990 (Little 1978). In Britain, there was similar confusion, with workforce studies supplanting earlier recommendations.

#### 3.6.1.1 Swann

The Swann Committee report recommended that the annual intake into the UK veterinary schools should be maintained at 335, or no more than 80 per school, with no reduction in the number of veterinary schools (Anon 1975; Swann 1975). The report also proposed that the manpower requirements of the profession be reviewed every five years. In addition, it highlighted the importance of preventive medicine and the role of the veterinary profession in veterinary public health.

#### 3.6.1.2 The UGC Riley committee

A University Grants Committee (UGC) Working Party, chaired by Sir Ralph Riley in 1987, was charged with the remit to 'consider the provision of veterinary education in the six veterinary schools in Great Britain and the scope for its rationalisation and to make recommendations'.

Concern was expressed about the UGC's proposed 'rationalisation' of veterinary education, with a call made by Glasgow staff for student intake to be maintained at current levels (Bogan, Fisher *et al.* 1986). The RCVS, in its submission to the UGC on veterinary education (Anon 1986), stressed the importance of taking into account the Swann committee's recommendations, particularly since the Swann committee examined issues such as the optimum number of schools and students in much greater depth than was possible for the UGC to do. In particular, the UGC was reminded of the second Loveday and Swann committees' backing of six veterinary schools in the UK.

The Riley report's main conclusion was that a limited number of clinical staff were 'spread thinly' over six university sites, and therefore proposed the closure of the Glasgow school and the clinical and paraclinical departments at Cambridge, with four schools remaining, each capable of teaching 85 students per annum (University Grants Committee 1989). This proposal was met with dismay by the BVA and the RCVS, who considered this to be insufficient to meet the expected level of manpower required in the future. In addition, the RCVS was critical of the extra investment required for restructuring of the schools (Anon 1989c). Much support was enlisted for the continuation of the Glasgow school (Anon 1989b).

### 3.6.2 Intake and admissions criteria

The increasing number of women in the profession was commented on as a positive development in the US (Houpt and Calhoun 1977) although it was suggested by one practitioner who spoke at the 1978 RCVS veterinary education conference that female intake should be limited to 25% (Anon 1978b).

In terms of identifying suitable candidates for entry into veterinary courses, the importance of recruiting for research careers was highlighted (Heath 1978). Work was carried out on the use of grade-point averages as predictors of academic success in veterinary college (Julius and Kaiser 1978). There was also great interest in identifying personality characteristics of applicants (Kelman and Ray 1978), with certain types identified as being more prone to stress (Kelman 1978). At the RCVS conference, the importance of personality was highlighted also by the same practitioner who stated that in addition to passing the course, the qualities required of a new graduate were "an acceptable manner, self-confidence, strong personality, and the ability to work as part of a team", rather than prize-winning academic performance (Anon 1978b).

Demographic profiles were of interest at the European level, where it was noted that all of the nine schools studied admitted students based primarily on their academic ability (Weaver 1979a). Despite the recognised importance of pre-admission qualifications, the relevance of the A-level in biological science to first year students in the UK was questioned (Cole and Tribe 1980).

Holmes (1983) advocated a two-step approach to the selection of students, based on the system at Glasgow where students were asked for written evidence of practical experience, in addition to attending a face to face interview with an admissions panel that enabled the interviewers to probe the candidate's motivation.

### 3.6.3 Curriculum design

Bogan, Fisher and others (1986) called for changes in emphasis in curriculum design, rather than major alterations. Specifically they recommended a closer involvement of preclinical components of the course with clinical subjects, but rejected the concept of undergraduate specialisation. Williams (1975) documented the changes in veterinary schools in the United States from the 1960s – specifically the shift towards a more integrated curriculum, and the adoption of a 'core-elective' curriculum; a compulsory core of subjects with elective options in the later parts of the course. He also noted that:

> *"The emphasis is now towards critical thinking, problem-solving and intellectual curiosity rather than memorising facts … The adoption of a core-elective curriculum with a teaching philosophy based on motivating the student towards a life time of self improvement is the mark of a profession heading in the right direction."*
>
> (Williams 1975)

A proponent of the core-elective model in the UK argued that veterinary practice was showing a continuing trend towards specialisation, partly due to the higher expectations of clients, and that students should follow a core course, but pursue particular species interests in the last half of the final year, if necessary transferring to a different UK veterinary school to complete this part of their training (Ward 1985).

A debate at an Association of Veterinary Students meeting highlighted the need for the curriculum to evolve to cater for the changed demands of the profession (Ward 1985). Speakers at the event also stated that the commonest criticism of new graduates was that they had lots of information but had difficulty applying it; that students retained too little of their anatomy knowledge when it was needed later in the course; that more clinical instruction needed to be provided before students started seeing practice; that preclinical teachers should aim to demonstrate the clinical relevance of their subjects more effectively; and that teachers should be selected for their teaching prowess, and taught how to teach. It was also suggested that that the course should also be training students for a research career. Opponents of this philosophy, Kenyon, Young *et al*. (1986), noted that students with an interest in pure science could pursue this as part of an intercalated BSc and subsequent postgraduate work.

##### 3.6.3.1.1 Extra-Mural Studies

The system of extra-mural studies (EMS) in the UK was observed to play a critical role in veterinary education, complementing the curriculum offered by the schools, although suggestions were made for its improvement at a symposium on EMS organised by the RCVS (Anon 1980). At this event, the Dean of Glasgow veterinary school, Prof. Donald Lawson, acknowledged the great importance of EMS in providing students with practical experience; however, another practitioner conveyed his dismay at the inability of clinical students to be able to perform simple procedures such as intravenous injections or applying dressings, a result he believed was due to the varying extent to which practices gave students responsibility. In contrast, the Bristol system of foster practices was highlighted in terms of the resulting good rapport between the student and the practice, enabling the practitioner to allow the student to participate more in the diagnosis and treatment of cases. The differences between the EMS systems at three different UK veterinary schools (Bristol, Glasgow and Liverpool) and within Europe were also highlighted by Weaver (Weaver 1979b).

#### 3.6.3.2 New curricular subjects

The importance of veterinary public health in the undergraduate curriculum was emphasised (Kampelmacher 1975; Morrow, Conner *et al.* 1977; Davies 1981), particularly swine medicine (Ladwig 1975), preventive medicine (Davies 1983) and dairy herd health (Goodger and Ruppanner 1982). Meat hygiene and preventive medicine were also ‘flagged’ as important subjects to enable veterinarians to support the livestock industries in New Zealand and Australia (Blackmore, Watson *et al.* 1977; Hubbert 1977), and on both sides of the Atlantic (Davies 1981).

While zoological medicine had already been introduced to North American veterinary schools, British veterinary schools were advised to organise collectively opportunities for veterinary students and graduate veterinary surgeons to obtain specialised training in this area (Fowler 1976).

Other subjects which were introduced to the veterinary curriculum at this time or given special mention included animal behaviour (Houpt 1976); nutrition (Lewis 1976); laboratory animal medicine (Harkness 1977; Bivin 1978; Leathers and Bustad 1978; Melby 1978; Cohen, Baker *et al.* 1979); moral philosophy and ethics (Rollin 1977; Fox 1978); avian medicine (Springer, Colwell *et al.* 1977); epidemiology (Hagstad and Archbald 1978; Thrusfield 1978; Thrusfield 1980); veterinary genetics (Womack and Templeton 1978); and pharmacology and toxicology (Frens 1981).

#### 3.6.3.3 Multi-disciplinary integration

With the addition of new subjects to the curriculum, educators were encouraged to consider the relevance of veterinary medical education (DeLahunta 1978). Bennett and Duff (1978) called for the integration of small animal husbandry with clinical courses to avoid unnecessary duplication. The laboratory was viewed as an optimal environment to promote the integration of physiology and pharmacology (Oliver and Sims 1979).

#### 3.6.3.4 Professional skills

In the US, training was made available in veterinary economics and practice management (Morrow 1976; Gallagher and Leininger 1983), while business management was introduced in New Zealand (Hutchinson 1978).

Communication skills were viewed as an essential part of dental education (Wepman 1977; Jackson 1978) as well as in veterinary education (Horvatich and Meyer 1978, 1979; McCulloch 1982), although in medical education, it was revealed that over time, students could forget the communication skills they had learned (Engler, Saltzman *et al.* 1981).

### 3.6.4 Educational technologies

As in the previous era, new teaching technologies were seen to be particularly suitable for teaching anatomy (gross and microscopic) and surgery.

#### 3.6.4.1 Tape-slide programmes and auto-tutorials

The auto-tutorial was seen to be effective in teaching veterinary embryology, with staff and student evaluations suggesting that its use resulted in more meaningful learning than the traditional approach (Czarnecki 1977). Cited benefits included the opportunity for students to engage in a variety of learning activities to master the subject matter, and to learn at their own pace.

### 3.6.4.2 Computer-aided instruction

Computer-aided instruction (CAI), the follow-on from auto-tutorials, was found to be an effective teaching methods for the recognition of normal and abnormal heart sounds at the University of Illinois, again using the PLATO system (Musselman and Grimes 1976). Several practitioners advocated the use of this program, which presented information didactically to the student before presenting them with a random sequence of sounds in test format, that students were required to master to a success level of 80% or above. However, Musselman and Grimes did not view this device as a panacea, explaining that:

> *"Simulation devices still may require the assistance of a teacher in order to exploit fully the variables that may be seen in the living patients. The limitations of these devices are obvious by the inability of the system to interact with the student, as the patient and teacher might."*

Trynda (1979) suggested that CAI could assist an educational program in achieving higher learning outcomes by providing opportunities for student participation, practice and feedback. This, he suggested, could help counter the tendency towards lower learning outcomes – typified by an emphasis on factual recall – resulting from large class sizes and limited clinical resources and faculty.

### 3.6.4.3 TV, video, microscopy and other image-based teaching devices

Video-tape was cited as a useful aid to teaching poultry science (Damron and Janky 1975). Shmarak (1975) described the use of surgery videos for self-study as preparation for laboratories, and afterwards to serve as a reinforcement, noting that students most frequently viewed video recordings of more complex procedures. Anecdotally, laboratory leaders were reported to have observed that students who had viewed the videotapes asked fewer superfluous questions and followed procedures more accurately. Anderson and Claborn (1975) described the use of 'video guided participation' – video instructions used to control the pace and quality of students in laboratories.

Sack and Sadler (1977) described the use of microfiches as teaching aids for veterinary gross anatomy. These postcard sized colour transparencies, each containing 50 images, were used to prime students before an equine dissection and for later review, and could be viewed using a hand-held microfiche reader. Reduced image quality was offset by the lower costs than paper production.

As for other image-based teaching devices, scanning electron microscopy was successfully used as a tool for relating the gross and microscopic structure of the cardiovascular system to morphological function (Anderson and Anderson 1977); television was identified as a useful tool for teaching gross veterinary anatomy at Auburn University, resulting in a television media system being installed to relay live dissection and record video type segments (Rumph 1977); and xeroradiography was highlighted as a new technology for teaching equine radiographic anatomy, with structures imprinted on paper rather than radiographic film (Smallwood and Shively 1980).

#### 3.6.4.4 Textbooks

Although audio-visual aids became more diverse and numerous during this time, the medical textbook was still considered important as an exhaustive resource for undergraduates, although preferably written in such as way as to stimulate thought from a problem-based perspective rather than simply as an 'examination-passing device' (Hoffenberg 1975). Noting that prose would remain the dominant self-instruction medium, Harkness offered an ideal design for prose material that would facilitate acquisition of information (Harkness 1978a). He also suggested that retention and transfer could be achieved through the inclusion of short answer and problem solving questions, worded as a client might pose a question or as a case might be presented (Harkness 1978b).

Heath (1983) stressed the importance of facilitating the development of reading skills at undergraduate level, preparing them to engage with the scientific literature which would serve as a vehicle for continuous self-education.

#### 3.6.4.5 Simulators

A model for teaching venous puncture techniques – a formalin-fixed preparation of a canine extremity in which the cephalic vein was replaced by a silicon tube – was developed as a suitable alternative to the living animal (Galle and Bubna-Littitz 1983). Audio simulators also became available at this time. For example, Calvert (1988) described the use of a heart sound simulator designed to help cope with large student numbers, and because of the insufficient number of patients with the spectrum of possible heart sounds in clinics at any one time. The audio simulator was validated by use of pre-and post-tests to measure changes in students' ability to recognise normal and abnormal heart sounds, and subsequently promoted as a tool for independent self-study, supplementing lectures on the topic.

## 3.6.5 Learning theories in veterinary education

### 3.6.5.1 Prior learning

At this time emerged a growing awareness of the application of learning theory in veterinary education. Heath (1977), citing Ausubel (1969), Gagné (1970), and Gagné and Briggs (1974), emphasised the importance of the student's prior learning, explaining that new material needed to be integrated with what the student already knows.

### 3.6.5.2 Behavioural objectives

Heath (1977) also stressed the importance of learning outcomes, citing Bloom's (1956) taxonomy of cognitive objectives, which also recognised the importance of previous learning experiences. In addition, Heath (1981) argued that much of the material taught to students would not be able to be recalled for future use, whilst they would learn informally more than teachers planned to teach them. He argued that learning would be more effective if the overall objectives were made clear; that vertical transfer of preclinical knowledge would be promoted if the material is presented in a clinically relevant context; and if interference was minimised through getting students to solve problems rather than learning facts.

The importance of learning objectives for effective teaching and learning in human anatomy was also highlighted, to enhance student motivation and facilitate better subject integration and assessment (Blunt 1976).

Herring (1983) described objectives as a way of making transparent to students that information which is essential for examinations, and advised teachers to divide each lecture into sections, and for each section, to state the objective, teach to it, and summarise key points, as a means of concentrating on core material.

### 3.6.5.3 Experiential learning

Experiential learning was viewed as important, with a 'foster farm' developed at Murdoch to give students responsibility for their own learning (Swan, Taylor *et al.* 1982). This was also seen to have aided students' communication skills with farmers. Bushby (1985) also highlighted the need for problem-solving skills to be developed in the context of a real problem in order to foster lifelong learning skills.

### 3.6.6 Assessment

What emerged during this period was a growing awareness of the need for appropriate assessment methods to accompany new forms of learning and teaching. Educators needed to find ways of assessing what students had learned, and how well they had learned it (what Biggs (1982) referred to as quantitative and qualitative evaluation of learning outcomes). Methods of assessment diversified during this period, with an increased emphasis on objective testing and automated marking systems.

Use of the Xerox copying machine for marking multiple-choice question (MCQ) sheets was documented, allowing between seven and 60 papers to be marked per minute (Smallwood 1975). The use of formative quizzes to encourage student effort in a veterinary histology course was cited (Smith 1977). Shively (1978) noted the need for concise, efficient examinations, given the ever expanding volume of knowledge, increasing enrolments, and reduced student-instructor contact time, and provided a framework for the design of effective MCQs. However, Milton (1979) expressed concern that MCQs generally tested isolated facts rather than understanding or problem solving, and advocated the use of essays to assess more complex thinking, noting that the mental activities involved in answering essay questions closely paralleled aspects of professional practice.

Examinations as extrinsic motivators for learning were criticised by Hullinger (1975), who argued that they led to a competitive spirit that ran counter to the personal ideal of collaboration, and a profession based on group identity and cooperation. He also suggested that students might learn independently without this extrinsic motivator in place, and that some of the best practitioners were successful in spite of the system rather than because of it. Given that conventional grading systems promoted anxiety, unhealthy competition and academic dishonesty among students, it was suggested by Armistead (1979-80) that "Grades should always be used to help, never to punish or stigmatize"; citing Mulder (1975), who made the distinction between grading versus 'degrading'. With the increasing emphasis on measuring students' performance, test anxiety in students emerged (Perera, Srikandakumar *et al.* 1982).

### 3.6.7 Evaluation of teaching

Students were not alone in being evaluated. Committed to the scholarship of teaching, suggestions were made for course evaluations, highlighting the importance of course objectives (Getty 1975). In one study, student performance and achievement was identified by students and Faculty as being valid criteria for the documentation of effective teaching (Simpson and Crowell 1975). The importance of scholarship in the academic environment was stressed (Lohse 1978), despite the plight of veterinary teachers with respect to inadequate pay (Anon 1978a). Evaluation of continuing education programmes revealed the importance placed on printed notes and auto-tutorials by practitioners (Teegarden and Hooton 1981).

### 3.6.8 Continuing education and postgraduate specialisation

#### 3.6.8.1 Continuing education

The importance of adult learning principles in continuing veterinary medical education was stressed by Tuttle (1977), who noted that mandatory continuing education could force veterinarians to attend educational programmes, but not to learn.

##### 3.6.8.1.1 The situation in the UK

A working party representing the BSAVA and other professional bodies argued against the case for making continuing education in small animal practice compulsory (Sheridan, Chandler *et al.* 1977), although mandatory continuing education was later argued to be a requirement for membership of the RCVS (Gunn 1982; Scott 1983). The suggestion of the right to practice through periodic licensing was rejected by the joint RCVS/BVA working party, established to consider the future of CPD in the UK (Soulsby, Blackburn *et al.* 1984). Instead, the working party made recommendations as to how members of the profession should be encouraged to participate in voluntary CPD. Proposed methods of CPD included formal meetings, audiovisual aids for self-study, writing publications and the training of others, with individual veterinary surgeons allowed to determine for themselves the valid credit hours derived from each source of continuing education. The use of the self-assessment test was advocated as a means to enable practitioners to identify areas where their knowledge was lacking (Hughes 1977). One of the novel suggestions of this time was made by Prof. James Armour of the Glasgow school, who envisaged the formation of an academy of continuing education, formed of representatives from the RCVS, BVA, MAFF, the universities and the research institutes (Anon 1978b).

##### 3.6.8.1.2 The parallel situation in the United States

Veterinary schools in the US were called upon to accept primary responsibility for provision of continuing education, with the half-life of college-derived information estimated at five years (Gayle 1975) – an even shorter time than that noted by Christensen, Hoerlein *et al.* (1967) less than a decade previously. Multiple choice questions were developed to stimulate discussion at national practitioner meetings in the US (Stowe and Hanson 1977), where self-assessment inventories were also viewed as a means of motivating veterinarians to identify their weaknesses and to address these through pursuing appropriate continuing education (Meyer 1978). An increasing commitment to continuing education was noted due in part to the increasing number of graduates committed to a lifetime of learning, and in part to state legislatures making continuing education compulsory (Gage, VanHoosier *et al.* 1978).

Christensen (1978) emphasised the important role that veterinary schools should play in providing continuing education opportunities, in partnership with other organisations, and he emphasised that continuing education was a world-wide process, requiring veterinarians to know more about veterinary medicine outside their own country.

#### 3.6.8.2 Postgraduate specialisation

An increasing need for postgraduate training in tropical medicine was identified (Campbell 1975). The need to strengthen the postgraduate training activities of the Centre for Tropical Veterinary Medicine was also endorsed by the Swann committee (Anon 1975).

Postgraduate training in preventive medicine was also highlighted as important (Mitchell and Barnum 1977), as was graduate training in toxicology (Robens and Buck 1979), postgraduate training in laboratory animal science (Bleby 1983), and animal health economics (Kouba 1983).

### 3.6.9 The Pew Report

This era culminated in the publication of the Pew National Veterinary Education Program Report (Pritchard 1989, 1990). It concluded that the concept of the universal veterinarian, administering to ‘all creatures great and small’, was an anachronism. It also called for the strengthening of the basic biological content of the course; a focus on finding information rather than accumulating facts; the implementation of clinical electives; and a change in emphasis from clinical practice to public sector needs.

### 3.6.10 Summing up 1975-1989

This era saw a proliferation of workforce surveys attempting to forecast the number of veterinarians and colleges required in the UK and North America. At the same time, subjects were added to the curriculum, with a particular focus on preventive herd health, epidemiology and laboratory animal medicine. New audiovisual technologies adopted for use in veterinary education included the auto-tutorial, computer-assisted instruction, television and video, whilst prose texts continued as an important self-instructional aid at the undergraduate and postgraduate levels. Continuing education as a concept was seen to be increasingly important, with arguments made for it to become mandatory, and increasingly linked with the veterinary schools. The era culminated in the publication of the Pew Report, which provided grounding for a new student-centred learning paradigm.

## 3.7 *Veterinary education between 1990-present (The 'information era')*

> *"The 1990s are proving to be exciting, if uncertain, times for veterinary education."*
>
> (Anon 1994b)

This period is indicative of an increased movement towards raising standards in the UK, throughout Europe, and globally. This is reflected in the creation of organised structures for extra-mural studies (EMS); continuing education; and a harnessing of educational technologies for distance learning to support these structures. With the limited and varied introduction of elective-type courses in the undergraduate curriculum, this 'information era' saw the foundations laid for the beginnings of individualised, personalised learning to enable graduates, armed with professional skills, to choose from a broad spectrum of veterinary careers; and the questioning of the concept of omnicompetence. These developments occurred within the context of increasing pressure on funding for veterinary education, a predominance of women entering the profession, and politically influenced strategies of widening participation and lifelong learning, stimulated largely by the Dearing Report (National Committee of Enquiry into Higher Education 1997).

### 3.7.1 The pressure on funding continues

#### 3.7.1.1 Student numbers and the manpower debate

##### 3.7.1.1.1 The UK 'Scene'

The Page Report was the product of the third committee in the UK assembled to look at workforce requirements since the Swann committee in 1975 (Anon 1990b) and the Riley committee in 1988. Its recommendations included removing the upper limit on intake to veterinary schools; calling on the Universities Funding Council (UFC) to contribute to the costs that would enable an expansion of national intake to 400 students; and levying the cost of additional students on the students themselves. Supplanting the Riley Committee's conclusions, the report was welcomed as all six schools would need to remain open to satisfy manpower requirements. However, the fact that veterinary students would need to contribute to the cost of their education, while students from other disciplines did not, was questioned by the Principal of the University of Glasgow (Anon 1990b). In addition, it was felt that funding from the UFC was underestimated, and that staff – student ratios and available facilities were inadequate, with those proposed by Riley as being preferable (Dyson, Taylor *et al.* 1990; Jones 1990). This led the profession to look towards the RCVS Working Party on Veterinary Education to propose a solution. The result was the 'Lucke Report', named after the working party's chairman (Lucke 1993).

The Lucke Report's recommendations with regard to funding were to encourage the universities to make best use of their resources on a shared rather than individual basis, at the request of the RCVS. New ways of using the resources of other branches of the veterinary profession were called for, through closer integration with the schools.

The Dearing Report, the most comprehensive review of higher education since the Robbins report, called for the lid on admissions to be lifted (National Committee of Enquiry into Higher Education 1997). Lanyon (1996), in his Wooldridge lecture, questioned the deleterious effect of this on teaching, as well as the consequences of introducing student fees. These would adversely affect veterinary students particularly as their course was longer than most, and they were unable to work during vacations due to EMS commitments. Lanyon called for the profession, through the BVA, to assist. His concerns were reiterated by the editor of the *Veterinary Record* (Anon 1997a).

Soulsby (1997), in addressing the matter, called for private practices, diagnostic laboratories, pharmaceutical companies, and government research institutes to contribute, and the Selborne committee – formed to look at the future of veterinary research – also called for veterinary schools to pool resources with other professional veterinary establishments (Anon 1998a). There was a sense of the veterinary schools failing the most able students due to the crisis because of the increasing gap between the cost of providing clinical training for veterinary students and resources provided for it by the government, which were significantly less than those provided for medical education (Anon 1998b).

The funding crises were not restricted to undergraduate education. It was perceived that financial restraints also threatened postgraduate training in tropical veterinary medicine at Edinburgh's Centre for Tropical Medicine (Anon 2002a).

#### 3.7.1.1.2 Australia, North America, and Canada

Funding shortages were not specifically a problem for UK veterinary schools. In Australia too, the issue was a matter of concern (Watson 1996) and the notion of academic autonomy questioned (Collins 1997b). Stockdale (1998) noted that the radical responses to funding crises seen in Britain and New Zealand had not occurred in Canada, but urged the profession to be wary of proposals that offered reduction in public costs for veterinary education. In summing up the manpower debate in the UK and overseas, much of the discussion appears to have been anecdotal and unsubstantiated, with successive reports consecutively supplanting previous recommendations.

### 3.7.2 Clinical teaching

Clinical teaching in the UK was seen to suffer the most in this period of financial uncertainty, with clinical teachers becoming de-motivated by the situation (Holt 1992), and the Lucke Report failing to address this issue (Darke 1992). Clinical teaching in Australia was subject to the same financial pressures (Clark 1999).

Clinical teachers were having to maintain caseloads for cash flow and teaching, and becoming increasingly dissatisfied, according to Michell (1992), who also postulated that the lack of adequate funding from the UGC and UFC in Britain threatened to undermine the foundation for good clinical teaching laid by Sir William Weipers. Weipers' legacy included cooperative teaching between subjects and schools; an emphasis on discussion and participation rather than didactic teaching; and intercalated degrees, electives, residencies and CPD.

Regarding the content of clinical teaching, a survey of new graduates and their employers emphasised the need for increased exposure to common conditions rather than in-depth studies of rare ones, acquired through good quality EMS (Routly, Taylor *et al.* 2002).

#### 3.7.2.1 Extra-mural studies (EMS)

The need for an improved infrastructure for EMS was described in the Lucke report and the BVA's *Guide to Seeing Practice*. Following this, the RCVS set up a second working party devoted to EMS, that recommended rewards for participating practices; for schools to keep a database of practices to share with other schools; the appointment of a clinical tutor responsible for EMS at each school; and the assessment of students undertaking EMS (Anon 1996a). The SILVER project at Liverpool (Supporting Independent Learning in Veterinary Extramural Rotations) found that practitioners had a positive attitude towards systems to assure quality (Taylor and Barnes 1998).

The extension of time spent on EMS after the third and fourth years had been discussed previously; however, this was seen as detrimental to the students in terms of debt, as they would be unable to work during these times (Castagne 1993), and this, coupled with the abolition of maintenance grants in favour of student loans, and the introduction of feepaying, would leave students with large debts (Anon 1997a). Despite potential loss of part-time income, EMS continued to play an important role in the development of students' practical skills (Anon 1999d), a point reinforced by a recent survey of recent UK veterinary graduates (Fitzpatrick and Mellor 2003).

The dedication of practitioners in supporting EMS during the UK foot and mouth disease outbreak was praised by EMS coordinators working collaboratively (Foster, Taylor *et al.* 2001).

#### 3.7.2.2 Inter-disciplinary teaching and integrating concepts

There was still a feeling that undergraduate teaching did not promote subject-integration, and that students were learning in order to pass examinations rather than develop understanding:

> *"… a typical veterinary course … consists of a number of fields such as physiology, animal husbandry and pathology. The veterinary student undertakes a great journey along the Yellow Brick Road, calling into the various fields for the requisite amount of time, ultimately ending up with an MRCVS. But those fields are not the green and pleasant places they seem ... The subject boundaries are guarded; do not trespass. and along the Yellow Brick Road, at the exam barriers, we see little piles of luggage, intellectual luggage discarded by students who have passed those exams and no longer need that junk."*
>
> (Michell 1990a)

However, the 1990s saw a change in emphasis in veterinary education, specifically the beginnings of personalised learning through elective choices, and the integration of subjects through clinically relevant problem-solving.

### 3.7.3 The changing veterinary curriculum: from content to process

#### 3.7.3.1 Introducing the concept of electives

The potential for increased choice in the curriculum was suggested, in the form of elective-type courses, because the concept of the omnicompetent veterinarian was generally considered to be out-dated (Armour 1990; Anon 1991). However, undergraduate specialisation was rejected as inappropriate, and a core curriculum considered necessary to prepare students for a range of veterinary careers. But it was recognised that schools varied in the quality of education they could provide in different clinical areas, and it was proposed by Lanyon (1991) that each school became a centre of excellence in reciprocal subjects, leading to a national integrated system whereby students would move between schools. This suggestion was reinforced in the Lucke Report (1993), which recommended that the veterinary schools complement each other's curricula, and for electives to be offered in the lecture-free final year by schools with strengths in particular areas.

Undergraduate streaming was suggested as a route to providing specialised veterinary healthcare in Canada, although it was appreciated that re-training would be necessary for veterinary surgeons changing careers (Mould 1994).

#### 3.7.3.2 Abandoning omnicompetence

Michell (1990a) argued that it was no longer possible to produce 'all singing, all dancing vets with the same capabilities at the moment of graduation', although he argued for the continuation of the all-species core. Armour (1990), citing the Pew report, also argued for the abandonment of the universal veterinarian, and for a change in emphasis from learning facts to problem-solving.

One comprehensive Australian study revealed that fifth year students and graduates considered there to have been too much unnecessary material in the curriculum (Heath, Lanyon *et al.* 1996). Omnicompetence was also being abandoned in Europe (Anon 1996b), to be replaced by 'omni-potential'.

Arguments for and against omnicompetence were debated within the Association of Veterinary Students (Anon 1999d). An AVTRW initiative was set up to consider what constituted a 'core curriculum' (Fitzpatrick and Mellor 1999), after it was argued that an increasingly overcrowded curricula resulted in students not having adequate time for private study, nor the opportunity to use techniques that promoted deep learning Halliwell (1999) called for an abandonment of the 'cult of coverage', citing similar recommendations in the Pew and Lucke reports, and noting that schools in North America and Europe were introducing 'tracking'.

#### 3.7.3.3 Self-directed and independent learning

It was suggested that the problem-based learning (PBL) approach would be an acceptable alternative to traditional teaching methods, fostering the abilities of problem-solving and critical thinking in veterinary students, and helping to integrate basic and clinical sciences. The Pew Report (Anon 1989a) was the instigator of this approach and a flurry of articles appeared in the veterinary literature on this theme.

In the UK, Lanyon noted the need to restructure the curriculum and examinations to assess comprehension and encourage a problem-solving approach at all times (Anon 1991). Collins (1997a) noted the benefits of the PBL approach from the Australian perspective, and a study of embedding small-scale PBL tasks in fourth year classes at Queensland revealed that a significantly increased number of students felt they had a better understanding of the subject studied (Rand and Baglioni 1997). Another comprehensive Australian study revealed that lectures would need to be revised to incorporate problem-solving, with a focus on deep, active learning (McLennan and Heath 2000), as a consequence of a large proportion of teachers and students feeling that lectures did not encourage thinking. In reviewing the evidence for PBL in medical education, Dolmans and Schmidt (1996) concluded that it increased students' retention of knowledge, enhanced their integration of basic science concepts into clinical problems, aided their development of self-directed learning skills, and enhanced their intrinsic interest in the subject matter. However, the authors also noted a need for further experimental studies on whether discussing a particular problem would subsequently help students to solve similar problems.

In terms of students engaging in workplace learning, an evaluation of the SILVER project (Supporting Independent Learning in Veterinary Extramural Rotations) at Liverpool found that students – with appropriate feedback from staff – were capable of setting and communicating their own learning objectives and becoming directed self-learners, moving away from the problem of spoon-feeding (Barnes and Taylor 1997).

#### 3.7.3.4 Outcome-based education

Quentin-Baxter, Spencer *et al.* (2005) neatly summarised the current thinking in how veterinary curricula should be structured, comparing veterinary and medical education. Outcome-based education, with an increased focus on vertical and horizontal integration, in a move away from the 'Flexnerian' approach to teaching (two years preclinical followed by three years paraclinical and clinical teaching), should tackle curriculum overload, possibly in conjunction with pre-graduation specialisation and 'tracking'. The authors also documented the UK national training framework in place for communication skills training; the current state of extra-mural studies (which is not funded as in medical education); and the growing need for inter-professional education (well-established in medical education), particularly in light of the growing public health role that veterinary graduates will need to play in terms of disease surveillance and major disease outbreaks.

#### 3.7.3.5 Professional skills

Foreign language skills were seen as a desirable attribute of the new veterinary graduate, as well as communication skills (Anon 1990a). Coupled with the need for information-retrieval, critical thinking, and problem-solving skills, veterinary graduates would need good communication and business skills, conceived as the non-clinical side to veterinary practice (Anon 1995). Formal veterinary communication skills training had already been established in the United States since the early 1970s (Reed, Koski *et al.* 1974) and in Australia since the mid 1980s (Heath 1996). A study conducted with students from Queensland indicated that the recognised importance of communication skills increased during the undergraduate course and after graduation (Heath, LynchBlosse *et al.* 1996)

A recommendation to include professional skills – including communication skills – in the UK curriculum was made, after a survey showed that the majority of new graduates did not consider themselves adequately prepared for veterinary practice (Anon 1997c). Problem-based learning was considered as a means of facilitating the development of key skills although it would be costly to implement (Anon 1999c), and EMS was considered to be only effective in communication skills training if practitioners had received formal training in this area (Anon 2001).

The move towards implementing formal communication skills training was not surprising given that interpersonal skills were rated higher than veterinary knowledge by employers of graduates in Australia (Heath and Mills 2000). Communicating with clients, and dealing with finance/legal issues had also been 'flagged up' as an area of concern by new graduates and their employers in the UK (Routly, Taylor *et al.* 2002).

Opportunities in the UK were made available for final year students to learn about the practice side of veterinary medicine – choosing a job, communication, dealing with stress, and practical finance (Anon 2002b). Supported by the VDS (Anon 2001), formal communication skills training was instigated at Liverpool, using simulated clients, which increased students' confidence in communicating with others (Radford, Stockley *et al.* 2003). This was subsequently embedded within the undergraduate curricula of the other UK veterinary schools, using a modified version of the Calgary-Cambridge medical consultation model as its framework (Radford, Stockley *et al.* 2006).

#### 3.7.3.6 Clinical competencies at graduation and one year later

In this era, global attention was concentrated on measurable clinical competencies. This is demonstrated by studies in Australia (Clark, Kane *et al.* 2002) , and described from the Canadian perspective:

> *"Societal forces external to the veterinary profession are driving the need for greater competency in traditional veterinary fields, and exerting pressure for new competencies to meet new situations."*
>
> (Nielsen 2001)

In the UK, the RCVS (2001) distinguished Day One and Year One competencies. Day One competencies represent the skills, knowledge and attitudes required of a new graduate in practice. In addition to mastering professional skills and attitudes, veterinary surgeons are expected to be knowledgeable about an increasing range of subjects. Year One competencies represent the skills, knowledge and attitudes expected of a graduate after one year in practice. This is supported through a Professional Development Phase (PDP), which aims to provide a structure for graduates to reflect on their progress and plan their future professional development.

#### 3.7.3.7 New curricular subjects

Acknowledging the growing demand for veterinarians with expertise in wildlife diseases and for the care of animals in conservation programmes, Kirkwood (1994) called for the introduction of zoological medicine in veterinary education, either in the undergraduate curriculum in the form of lectures or a final year elective, or at postgraduate level. It was also suggested that a more thorough undergraduate training in laboratory animal science could be incorporated into existing curricula through the provision of notes, tape-slide programmes and interactive videos as well as electives (Stewart 1995).

### 3.7.4 Educational technologies in undergraduate teaching

There was a different view of the role of educational technologies in teaching, seen now as an effective means of complementing good traditional teaching, rather than as a cheap alternative to lectures (Michell 1991). Through the RCVS Charter Education Trust (CET), funds became available to develop technology for teaching in the UK veterinary schools (Lucke 1994). The CET also funded projects on innovating teaching methods, EMS and CPD. Through this scheme, funding was available to establish networks and computer-based training programs (Lucke 1995).

#### 3.7.4.1 The CLIVE Project

The CLIVE project (Computer-aided Learning In Veterinary Education) originated in 1993 as a Teaching and Learning Technology Programme (TLTP) project. The necessary infrastructure for courseware development on a national scale had already been identified by the Universities Funding Council's Information Systems Committee, suggesting a national coordinating body responsible for design, delivery and pedagogic standards (Darby 1992). The outcome was TLTP, a government-funded initiative “to make teaching and learning more productive and efficient by harnessing modern technologies”, launched in February 1992. Over thirty five million pounds were invested in TLTP in the first two stages, with a further £3.5M per annum provided for stage III projects. TLTP built on the foundations laid by the Computers in Training Initiative (CTI) established in 1984, which was considered to have borne the brunt of initial resistance to IT-based learning (Gardner 1996). The CTI Centre for Medicine (CTICM) provided support for CLIVE through dissemination and awareness activities.

With Edinburgh as the lead CLIVE site, and the support of the Heads of Schools, four courseware designers were appointed (in Edinburgh, Glasgow, Liverpool and London) and local executive committee members were appointed from all schools of veterinary medicine in the UK (Bristol, Cambridge, Edinburgh, Glasgow, Liverpool and London). Use was made of existing expertise in Bristol and Cambridge. The original aim was to make Computer-Aided Learning (CAL) an established and expanding feature of veterinary education in all the sub-disciplines of veterinary science in the UK.

This collaborative effort resulted in the production and use of a plethora of computer-aided learning (CAL) packages across various subjects for undergraduate veterinary education (Holmes and Nicholls 1996; Dale, McConnell *et al.* 2005). Similar consortia were set up in Australia (ALIVE) and North America (CONVINCE) with a similar remit to share teaching expertise via CAL packages.

### 3.7.4.2 Multimedia for undergraduate education

Outwith the CLIVE project, multimedia packages (computer-based learning programs that include more than one medium) were developed across a range of veterinary subjects to supplement traditional teaching, and as a delivery system for new curricular subjects, such as epidemiology (Alessandrini, Morelli *et al.* 1997). A multimedia program in veterinary nutrition was developed for use across a number of veterinary schools, where it was observed to include self-paced individualized learning, training in problem-solving skills, wide unification for teaching of nutrition, and wide exposure to clinical scenarios than would be possible during clinical rotations (Dascanio, Shires *et al.* 1997). Multimedia was regarded as particularly suitable for veterinary education because the highly visual nature of clinical material allowed for the inclusion of video clips (Longstaffe 1993)

## 3.7.5 Raising standards

### 3.7.5.1 Assessment

It was argued that changes in teaching would require different approaches to assessment (Armour 1990). Biggs (2003) called for the constructive alignment of curriculum objectives, teaching methods, assessment procedures and educational climate to best foster students' intellectual development. In an attempt to make clinical assessment more objective in the UK, the Objective Structured Clinical Examination (OSCE) – first used successfully in the medical field (Harden, Stevenson *et al.* 1975) – was introduced into veterinary medicine (Davis, Ponnamperuma *et al.* 2006).

### 3.7.5.2 Student selection

A broadening of selection criteria – including aptitude tests – was called for, given that students were being selected for the duration of their professional life and not just for five years of undergraduate activity (Michell 1990b). Aptitude tests were one of a number of quantitative approaches investigated, to determine whether it was possible to predict university performance from secondary school grades. A task force appointed by the Canadian Veterinary Medical Association argued for increased emphasis on students' aptitudes and personality traits, rather than academic ability (Guernsey, Doig *et al.* 1998). In the UK, Selborne argued for more students with an interest in research to be enrolled (Anon 2003). This was tackled by Liverpool veterinary school through offering an intercalated degree to which students committed themselves from the outset, with the school recruiting specifically for individuals motivated by research (Anon 1999b).

The widening participation agenda was highlighted in veterinary medicine, with a call for role models for students from non-traditional backgrounds (Anon 2006a), although there was scepticism about the potential for widening participation with changes to student tuition fees likely to increase student debt (Anon 2006b).

### 3.7.5.3 Standard setting and quality assurance

The rise in standard-setting was not exclusive to the UK. As a result of the Pew National Veterinary Education Program (PNVEP), schools in the United States were critically examining their own performance and goals. The system in place in Europe to evaluate veterinary schools was described by Betts (1991a), specifically the role of the Advisory Committee on Veterinary Training (ACVT) that recommended a system of guided self-evaluation, documented in a self-evaluation report, coupled with site visits by international experts. This period saw the introduction of veterinary school 'league tables' in Canada

(Tyler 1994). In the UK, while welcoming league tables based on objective data, the Deans of the veterinary schools questioned the methods by which *The Times* and *The Guardian* newspapers had compiled their tables (Duffus, Jeffcott *et al.* 2001).

#### 3.7.5.4 Scholarship of teaching

In a move to increase standards in education, the scholarship of teaching came under scrutiny, with a teacher appraisal scheme being introduced in Liverpool (Faull, Taylor *et al.* 1992). Universities were called upon to pay attention to the need for good teaching skills in response to the introduction of student fees (Anon 1999d). As methods of teaching and learning diversified, so it would be necessary to have knowledge of how learning takes place, and how assessment can be harnessed to drive appropriate learning.

Defining characteristics of a good teacher would remain the same though, with enthusiasm for the subject being considered paramount (DeRoth 1990). Other successful attributes included the importance of keeping in touch with research developments in the taught subject, selecting appropriate material rather than giving students an overwhelming amount of wearying information, emphasising clinical relevance, and conveying information in a clear, concise manner using audiovisual aids appropriately (Euzeby 1996).

### 3.7.6 Continuing Professional Development (CPD)

A joint RCVS/BVA review (Anon 1994a) underlined the importance of CPD in maintaining competence, learning new skills and knowledge, and retaining public confidence. The report distinguished between structured CPD such as courses, semi-structured CPD such as distance learning packages, and unstructured CPD such as reading journals. The Scottish company VETCPD was commended for its role in providing and coordinating CPD in Scotland, serving as a positive model for centralised organisation of CPD.

In Australia, the profession was urged to undertake continuing education and re-training out of a moral commitment to clients and the community rather than it becoming mandatory (Denney 2000).

In the UK, CPD was considered to be a national and European priority (Michell 1991), although until fairly recently there had been no accepted national framework for monitoring CPD (Lanyon 1996). In trying to tackle the problem, the RCVS introduced a new records card system for recording CPD (Anon 1997b); however, a survey of new British graduates revealed that the majority had taken less than the recommended five days in the preceding year (Routly, Taylor *et al.* 2002).

Towards the end of this period of study, the structure of CPD in the UK had been revised, with the removal of the old certificate/diploma courses and an emphasis on modularised CPD, supporting personalised, flexible continuing education. Although regarded by the profession as being mandatory, the enforcement of CPD as a statutory requirement would not be possible until a new Veterinary Surgeons Act emerged.

#### 3.7.6.1 Educational technologies for distance learning

Live transmissions via the LIVE-NET interactive optical fibre network allowed for the delivery of distance learning packages and live interactive transmissions between the RVC and Europe (Betts 1991b). Seen originally as cheap alternatives to lectures, new technologies were seen as complementing good traditional teaching (Michell 1991). Distance-learning multimedia for continuing education appeared as a new method of delivery for lifelong learning (Hare 1993; Povey and Stowe 1993), and was seen as a suitable alternative to face to face CPD (Davies 1997). Materials to support independent continued learning included CDROMs, CD-Interactive (CD-I) and Internet-based learning (Povey 1997). However, there was uncertainty about the extent to which distance learning could contribute to the 35 hours a year required by the RCVS (Anon 1997b)

### 3.7.7 Support for dissemination of best practice in veterinary education

Government-funded initiatives were put in place to support the best use of technology in higher education in the 1990s, continuing through to the current time. The Learning and Teaching Support Network for Medicine, Dentistry and Veterinary Medicine (LTSN-01 (Learning and Teaching Support Network for Medicine; Dentistry and Veterinary Medicine)) was the successor to the Computers for Teaching Initiative Centre for Medicine (CTICM), providing support through 24 subject centres, but with an extended remit to support innovation in teaching and learning on a broader scale, through funding projects and raising awareness of best practice. The Higher Education Academy Subject Centre for Medicine, Dentistry and Veterinary Medicine replaced LTSN-01, when the Higher Education Academy became the overarching umbrella organisation in 2005, enveloping the Institute for Learning and Teaching in Higher Education (ILTHE) and LTSN.

### 3.7.8 Summing up 1990-2006

The 1990s through the early 2000s saw the beginnings of a paradigm shift from teacher-centred, didactic instruction in compartmentalized subjects, to a learner-centred, integrated approach involving clinically relevant problem-solving, a process that owed its origins to curricular development and learning theories of the 1960s. This was complemented by increasingly formalised EMS where students were able to set their own learning objectives. Outcome-based education was matched with assessment methods that tested higher order thinking, with an increased emphasis on the demonstration of measurable clinical skills. Personalised learning became possible through elective choices, also enabled by technology through access to personal computers, computer-aided learning and the internet. These technologies also facilitated access to resources for lifelong learning, an increasingly important theme during this era, closely linked with widening participation.

# 4 Developing and refining the procedures

It was the intention of this study that individual perspectives on learning and teaching, gleaned from interviews and focus groups, would be recorded, coded and analysed to complement the general quantitative picture of teaching and learning practices over time, obtained first using a questionnaire disseminated to alumni, staff and students, and a demographic survey of student intake over time. This chapter documents the evolution of the materials and methods.

## 4.1 Overview of procedures

The table below shows the chronological order in which the materials and methods were refined.

| Date | Questionnaire | Student focus groups | Interviews with staff |
|---|---|---|---|
| August and November 2002 | | | Exploratory interviews with current staff |
| February and March 2003 | | Exploratory meeting with 1st, 2nd, 3rd and 4th year student representatives | |
| | | Pilot focus groups with 1st, 2nd and 3rd year students | |
| May 2004 | Pre-pilot with current lecturing staff and local practitioners | | |
| June 2004 | Pilot with local practitioners and alumni | | |
| June 2004 | Pilot with undergraduate students | | |
| April and May 2005 | | (Interim) focus groups with 4th and 5th year students | |
| The evolved materials and methods are described in Chapter 5. | | | |

**Table 4-1: Chronological overview of refinement and development of procedures**

## *4.2 Development and refinement of the questionnaire*

### 4.2.1 Design of questionnaire

This survey incorporated a modified version of the LTDI 'Resource questionnaire' (Shaw 1998). It was designed with the intention of establishing what educational methods and technologies were available to participants; what technologies have been used over time; and how alumni, staff and students rate these technologies retrospectively in relation to their undergraduate training and from their current perspective. Respondents were also encouraged to provide a reason for their ratings, where appropriate, and to list the subjects in which these methods or technologies were used well.

It was considered important that the questionnaire be designed to elicit maximum information from participants without overburdening them. The questionnaire had to be concise, easy to fill in, objective, and incur no costs to the respondents other than their time.

### 4.2.2 Piloting of questionnaire

The importance of piloting a questionnaire before implementing a large-scale survey is strongly advocated (Oppenheim 1992; Robson 2002). This permits a gradual process of refinement which not only takes into account question wording but also the general aim of the questionnaire, as well as layout and the order of questions. Issues such as how to maximise the response rate, and also thinking ahead as to how the data will be analysed, are also considered to be important.

Consequently, the questionnaire was pre-piloted and piloted in May and June 2004, with a sample of lecturing staff, local practitioners, alumni, and undergraduate students. The pre-pilot and pilot questionnaires are included as Appendices B1, B2 and B3.

#### 4.2.2.1 Pre-pilot study with lecturing staff and local practitioners

The pre-pilot form included the following components:

- Part 1: Consent form;
- Part 2: Resource questionnaire asking participants to recall the use of educational methods in their undergraduate veterinary training;
- Part 3: Resource questionnaire asking participants to rate educational methods from their current perspective;

- Part 4: Asking participants for information about themselves e.g. gender, year of graduation, age at admission to the veterinary course, cultural affiliation;
- Part 5: Asking participants for feedback on the pilot study itself.

In part 2, respondents were asked to tick technologies that were available and those that were used; rate them; give a reason for the rating; and list courses where good use was made of the methods. A representative extract of this part of the questionnaire is shown in Figure 4-1.

| **Resources** | **Tick if available** | **Tick if used** | **Not at all useful** | **Not very useful** | **Useful** | **Very useful** | **Extremely useful** | **Reason for answer** | **Courses where particularly good use of the technology was made** |
|---|---|---|---|---|---|---|---|---|---|
| **w) PowerPoint presentations** | | | | | | | | | |

**Figure 4-1: Format of the resource questionnaire, for the pre-pilot study with lecturing staff and local practitioners**

Part 3 was similar in design except that participants were not asked to list courses, and resources were considered from a postgraduate, rather than an undergraduate, point of view.

The complete questionnaire is reproduced as Appendix B1.

The questionnaire was initially piloted with two members of lecturing staff and a fellow PhD student who also worked as a practitioner in a local practice with strong links to the Faculty of Veterinary Medicine. This person also offered to pilot the questionnaire with three of her colleagues in veterinary practice, and to do a ‘think aloud’ session with them. Of the six participants, two were Glasgow graduates.

The questionnaire had been designed in colour, with the idea of making Part 3 distinct from Part 2, to emphasise a shift in perspective. However, the respondents in the pre-pilot study received their questionnaires as email attachments, and five of the respondents printed them out on their own monochrome laser printers.

No incentives were offered to the pre-pilot study participants, but respondents were each given a small gift afterwards as a token of appreciation.

#### 4.2.2.1.1 Pre-pilot outcomes

What emerged quite clearly from the pre-piloting with colleagues was that:

- If a technology was not used or available, or if respondents were not sure if a technology was used or available, instructions on how to record this were not clear. For example, some respondents put a cross in the relevant boxes, whilst others left the boxes blank. More commonly, respondents put a cross in some boxes and left others blank. The following feedback was gleaned from the think aloud session:

  *"Not sure how to use N/A – do I put N/A or leave blank i.e. it tells me to tick if available."*

  *"When I'm not sure of my memory, I'm probably going to guess but some people, I think, will just leave a blank."*

- Respondents were not sure if they were allowed to make comments about a technology that was not in use, e.g.

  *"I want to say we didn't have these – Liverpool did and I wish we had, I'd like to make that comment."*

- The respondents were unfamiliar with some of the methods and technologies. *"What are these?*", and *"Not sure what they are"* appeared frequently throughout the forms. In relation to MS PowerPoint presentations, one participant said *"A powerpoint to me is a socket (Explain what this is).*"

- Cadaver surgery, peer discussion, self-directed learning and extra-mural studies were suggested as additional methods that could be added to the form.

#### 4.2.2.1.2 Changes to the questionnaire in response to feedback

The questionnaire was modified in the light of this feedback for the pilot phase (with local practitioners and alumni).

Instructions were made more explicit. For example, in terms of participants' current perspective, they were encouraged to consider how they would use these methods in their current role as a teacher, practitioner or other postgraduate roles. A 'Guidelines' box was included, drawing respondents' attention to how they were expected to record data in each of the main columns. The resource questionnaire grid was made more attractive, using shading to make it easier for participants to fill in. Rather than placing a tick in a single box for availability or use, participants were asked to tick 'Yes', 'No' or 'Not sure'. The revised format of the grid is shown in Figure 4-2.

| Resources | Tick if Available | | Tick if Used | | This method/technology was … | | | | | Reason for answer | Courses where particularly good use of this method/ technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | | |
| 7) Electronic slides (on teacher's computer, projected in class using data projector) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |

**Figure 4-2: Format of the resource questionnaire for the pilot study with local practitioners and alumni**

The order of methods and technologies listed were also modified. Initially for the pre-pilot study, methods had been listed in a random order, but for the pilot study methods were grouped according to their function. For example, lectures, acetates, lantern slides, 35mm slides and electronic slides (PowerPoint) etc. were grouped under the theme of 'Lecture (plenary) based methods and projection technologies'. Within each theme technologies were chronologically sequenced. This approach is advocated by Verma and Mallick (1999):

> *"Organize the questionnaire into a logical sequence, so that related items are grouped together. Use headings to tell the respondent what each group of questions is about, or what their purpose is."*

The pre-pilot study also revealed that alumni would not be likely to know their RCVS membership number offhand. For the subsequent pilot phase respondents were asked instead for their year of graduation along with their name to identify them as individuals.

The consent form in the pre-pilot questionnaire was considered to be too verbose and phrased inappropriately. A simpler and more concise version was used for the pilot phase onwards.

Another modification to the form, for the piloting phase, included making the front page of the questionnaire more visually appealing to respondents. A colour university logo replaced the monochrome one, the title of the questionnaire given a contrasting background, and a star with the text 'Win £25 book token' added to try to increase the response rate.

With regards to suggested additions to the form, cadaver surgery was not added as a separate item but ‘Practical classes’ was changed to ‘Practical classes (laboratories including cadaver dissection and surgery)’. Self-directed learning was not included as a separate item but textbooks, notes, handouts and programmed learning etc. were grouped under the theme of ‘Directed self-study methods and technologies’. EMS was not added as a separate item, but ‘One-to-one tutorials’ was revised to become ‘One-to-one tutorials (including ‘seeing practice’ or EMS)’. Discussion with peers was not included in the subsequent pilot phase but was later added in the ‘live questionnaire’ as ‘Peer assisted learning (studying with classmates)’.

#### 4.2.2.2 Pilot study with local practitioners and alumni

The revised questionnaire was piloted with two other veterinary surgeons in the same local practice, and subsequently distributed to a sample of alumni. The questionnaire is reproduced as Appendix B2.

Twenty two UK-based alumni were approached through either mail or email (or both), representing less than 1% of the 2630 living Glasgow veterinary graduates registered with the RCVS, of which 2376 were based in the UK. These 22 people were chosen either because they were known to the author through work or because one of the supervisors suggested that they would be likely to complete the questionnaire, as they were known to have an interest in veterinary education and a strong affection for their *alma mater*.

Alumni were offered the chance to complete a paper-based form, which was mailed to them with a stamped addressed envelope enclosed; or a web-based form, shown in Figure 4-3. The intention of offering participants a choice of form was to encourage people to use the format they were most comfortable with, and to make the questionnaire more accessible.

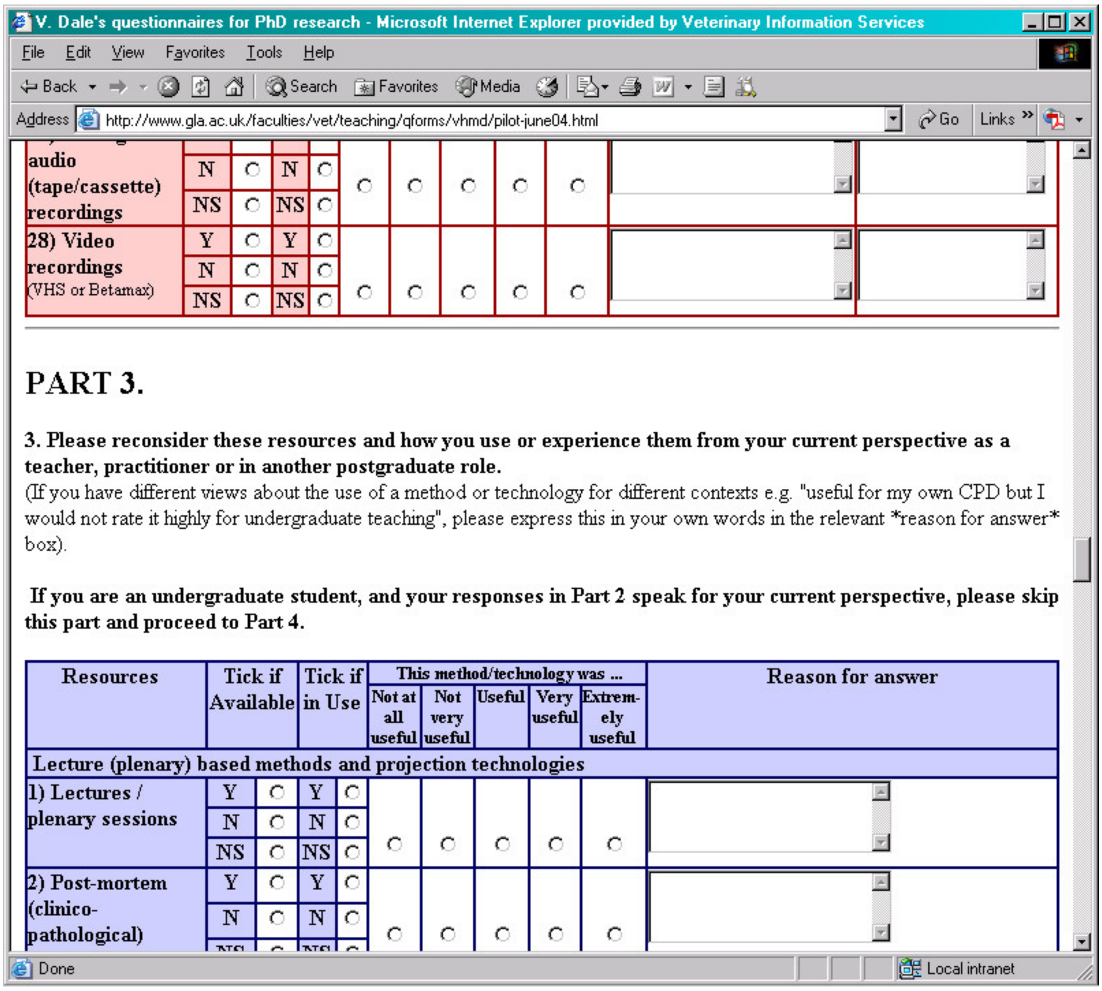


**Figure 4-3: Screenshot of online pilot survey. The 'colour scheme' of the questionnaire was reproduced, to emphasise the difference between Part 2 and Part 3.**

A prize draw for three £25 book tokens was offered as an incentive to alumni. The two practitioners who took part in the pilot study were not offered an incentive but, like their colleagues, were given a small gift afterwards.

#### 4.2.2.2.1 Pilot outcomes

Fifteen alumni responded (68%), of which three were web form submissions, the other 12 being paper-based forms.

The improved instructions in this version meant that there was less confusion over what respondents were expected to do – each section of the form was completed as expected with ticks in the appropriate boxes and few missing values, but a few problematic issues arose:

- One practitioner noted that the introduction to Part 3 was ambiguous, and one alumnus skipped this section because they felt their answers would have been the same as for Part 2.

- One respondent had a dual cultural affiliation (having grown up in two separate continents).
- One respondent rated methods and technologies in relation to how useful they perceived them to be, not from actual experience.
- An additional respondent said that she had submitted data using the web form, but it was never received.
- The 'haptic cow' was suggested as an additional method that could be included on the form. This is a virtual reality device, placed within a fibre-glass model of a cow's back end, designed to simulate rectal palpation of the uterus and ovaries through touch-sensitive feedback (Baillie, Mellor *et al.* 2005).

##### 4.2.2.2.2 Changes to the questionnaire in response to feedback

To make the point clearer that Parts 2 and 3 had a different emphasis, the wording was changed in the introduction to Part 3, for the live survey with all alumni (Appendix B4). (Part 3 was not included in the pilot phase with students as they only had undergraduate experience and were not qualified to comment from a postgraduate perspective.)

After discussion with one of the project supervisors, it was agreed that dual cultural affiliation could be coded differently at the data entry and analysis phase.

The issue of how a respondent *perceives* the value of a technology in relation to their *experience* of a technology is a difficult issue to address. There would either have to be an assumption that users who had not experienced a technology still had something valid to say about their potential use, or the results could be regarded as 'missing data'.

The web form was not considered a reliable means of returning data, with responses going astray possibly due to an error in the Perl script processing the form data on the University's central web server, and/or the author's email system detecting responses as 'junk email' and automatically deleting them. The web form was omitted for the subsequent phases of the study.

The haptic cow was not added as it was not considered a mainstream technology and its use was still fairly specialised at the time of this study.

#### 4.2.2.3 Pilot study with undergraduate students

The questionnaire used in the pilot phase with undergraduate students is reproduced as Appendix B3. This was handed to 20 students undertaking small animal and equine clinical rotations at the end of their fourth year of study. As an incentive, three £15 book tokens were offered, to be allocated by a prize draw.

#### 4.2.2.3.1 Pilot outcomes

A response rate of 50% was observed, with three students having responded immediately, and a further seven responses 'trickling in' over the following two to three weeks. The three students who replied promptly were rewarded with the book tokens, with other respondents each receiving £5 as a token of thanks for completing the survey.

One issue arising from the study that deserves a mention is that one respondent ticked two or more boxes in the five point Likert scale used for rating a method. Such responses must be excluded from the analysis and considered 'missing data'. Averaging the responses is not appropriate, as respondents for example may have ticked one box for some uses of an educational method and another box for a different use of the method. Also, Likert scales represent ordinal (categorical) data with no assumption of equal intervals between the categories (Cohen, Manion *et al.* 2000).

One respondent commented that they did not know what lantern slides, 35mm slides, laserdisc and cine films were and suggested that pictures of the resources would help. This sentiment was echoed by another student. It was considered that adding pictures would have lengthened the questionnaire which would have resulted in increased costs. More crucially however, a longer questionnaire would deter participants from completing the form.

As the study has a 'broad chronological window', it was anticipated that respondents would not be familiar with technologies that had gone into disuse. One other student respondent noted that they had used lantern slides but not 35mm slides, but it was recognised that the rating she gave must have been for the 35mm slides, and not lantern slides which are no longer available.

Other methods / resources suggested for inclusion on the form included farm visits.

#### 4.2.2.3.2 Changes to the questionnaire in response to feedback

The 'Not sure' option for availability and use was included in the first pilot phase as a means of recording participants' uncertainty about unfamiliar technologies. It was decided that this would suffice without having to add lengthier descriptions of technologies.

Farm visits were not added to the form as it was designed to get feedback on a broad sample of educational methods and technologies. It was not designed to be an exhaustive list.

The final ('live') questionnaire appears as Appendix B4.

### 4.2.3 Data handling

#### 4.2.3.1 Manual data entry versus computer-readable forms

The decision was taken at the time, with the agreement of one of the supervisors, not to design the questionnaire as a computer-readable form (for example, using Cardiff TeleFORM software) because it was anticipated that this would not lead to significant time savings, especially since the questionnaires included open-ended components requiring comments to be typed in any case. This type of data entry can also incur inaccuracies, for example in relation to 'crossed out' boxes versus 'checked' boxes.

Questionnaire data from the pilot studies with alumni and current students was entered into an Excel workbook, with rows of data representing individual responses (or cases), and columns representing different questionnaire items (or variables). Because there were so many variables, due to the exhaustive length of the questionnaire, it was impossible to include all variables within the number of the available columns in Excel, therefore a decision was made to separate quantitative (closed) responses from qualitative (open-ended) responses. This had implications for how the data were entered – for each questionnaire, first the quantitative responses were entered on one spreadsheet within the workbook, then the qualitative responses were entered onto another spreadsheet.

#### 4.2.3.2 Data coding

Having already used SPSS 11.5 for Windows to analyse data for other unrelated studies, particularly using Likert scale (ordinal) questionnaire data, the data were 'coded' with subsequent analysis in mind. The coding scheme for the pilot studies is detailed in Appendix D1, and can be summarised in Figure 4-4. The majority of the variables were ordinal or nominal, with some scale variables. This had implications for the types of statistical tests that could be performed. Siegel and Castellan (1988) was used as the definitive guide as to which non-parametric tests were considered appropriate for different types of data.

- **For availability and use of a method/technology:**
  0=No; 1=Yes; 2=Not sure; 9=Missing
- **For rating of a method/technology:**
  1=Not at all useful; 2=Not very useful; 3=Useful; 4=Very useful; 5=Extremely useful; 9=Missing
- **For current role:**
  1=Undergraduate student; 2=Postgraduate student;
  3=University teacher; 4=Practitioner; 5=Retired university teacher; 6=Retired practitioner; 7=Other; 9=Missing
- **Year of study (applicable to students only):**
  1=First year; 2=Second year; 3=Third year; 4=Fourth year;
  5=Fifth year
- **Era (based on year of graduation):**
  1=pre-Weipers; 2=Weipers; 3=post-Weipers; 4=information; 9=Missing
- **Gender:**
  1=Male; 2=Female; 9=Missing
- **Culture:**
  1=Asia; 2=Africa; 3=Australasia; 4=Europe; 5=North America; 6=UK and Eire; 7=South America; 8=Dual affiliation; 0=Other; 9=Missing
- **Legibility of form:**
  0=No, 1=Yes, 9=Missing
- **Clarity of language used:**
  0=Ambiguous, 1=Clear, 9=Missing
- The other variables such as years of admittance and graduation, or currently study year, were numerical (scale) and were not coded.

**Figure 4-4: Summary of the coding system used for pilot questionnaire responses**

### 4.2.4 Pilot data analysis

Results from the pilot studies with alumni and students cannot be considered conclusive, because of the limited number of respondents; however, it was thought necessary to carry out some analysis, to guide which types of analyses would be suitable for the main study. SPSS 11.5 for Windows was used to analyse the quantitative data.

Summary statistics were obtained, specifically medians and inter-quartile ranges for technology ratings. Bar charts were assembled for availability and use of technologies.

Specific statistical tests were considered appropriate to determine significant differences in the availability, use and rating of methods/technologies between different groups of respondents. These attempted to answer the following questions:

- **Is there a significant difference in the perceived usefulness of different methods between alumni and students?**
  – requiring nonparametric tests for two independent samples
  (Mann-Whitney U test)

- **Is there a significant difference in the perceived usefulness of different methods between alumni of different eras?**
  – requiring nonparametric tests for *k* independent samples
  (Kruskal-Wallis one-way analysis of variance)

- **Is there a significant difference in the perceived usefulness of alumni's post-graduate experience compared with their undergraduate experience (on reflection)?**
  – requiring nonparametric tests for two related samples
  (Wilcoxon Signed Ranks test)

Other grouping variables considered potentially worth exploring included role (in relation to alumni), gender, cultural affiliation and age at admission (in relation to current students).

#### 4.2.4.1 Results of the pilot analysis

Analysis of the pilot data showed that alumni took between 10 and 60 minutes to complete the form, while students spent between 10 and 25 minutes recording their responses into their cut down version of the questionnaire.

All respondents rated the form as legible, with 88% of respondents rating the language as clear rather than ambiguous.

Bar charts illustrating representative results from the pilot study are shown in Appendix D2.

##### 4.2.4.1.1 Alumni versus students' rating of technologies

Table 4-2 through to Table 4-6 shows the results of the Mann-Whitney comparison between alumni and students' rating of lecture-based methods and technologies; small-group tutorial methods and technologies; directed self-study methods and technologies; practical, hands-on methods and technologies; and miscellaneous audiovisual aids.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | Alumni | 100 | 100 | 4 | 4 | 5 | P=0.361 NS |
| | Student | 100 | 100 | 4 | 4 | 5 | |
| **Post-mortems** | Alumni | 100 | 100 | 4 | 4 | 5 | P=0.231 NS |
| | Student | 100 | 100 | 4 | 5 | 5 | |
| **Blackboard** | Alumni | 93.3 | 93.3 | 2 | 3 | 3 | P=0.314 NS |
| | Student | 60 | 30 | 3 | 3 | 4 | |
| **Lantern slides** | Alumni | 6.7 | 6.7 | 4 | 4 | 4 | - |
| | Student | 0 | 0 | - | - | - | |
| **Acetates** | Alumni | 93.3 | 93.3 | 2.75 | 3 | 3 | P=0.418 NS |
| | Student | 100 | 100 | 3 | 3 | 3 | |
| **35mm slides** | Alumni | 93.3 | 93.3 | 3 | 4 | 4 | P=0.043* |
| | Student | 80 | 70 | 3 | 3 | 3 | |
| **Electronic slides** | Alumni | 20 | 20 | 4 | 4.5 | 5 | P=0.423 NS |
| | Student | 100 | 100 | 3 | 4 | 5 | |

**Table 4-2: Perceived availability, use and rating of lecture-based methods and technologies, comparing alumni with student responses in the pilot survey**

| Method / Technology | Role | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Mann-Whitney U (2-tailed) |
|---|---|---|---|---|---|---|---|
| **One-to-one tutorials** | Alumni | 73.3 | 73.3 | 5 | 5 | 5 | P=0.884 NS |
| | Student | 90 | 90 | 5 | 5 | 5 | |
| **Group tutorials** | Alumni | 86.7 | 86.7 | 4 | 5 | 5 | P=0.675 NS |
| | Student | 90 | 90 | 4 | 4 | 5 | |
| **Flipcharts / White-board** | Alumni | 46.7 | 40 | 3 | 3 | 4 | P=0.924 NS |
| | Student | 60 | 50 | 3 | 3 | 4.5 | |
| **Laser-disc** | Alumni | 0 | 0 | - | - | - | - |
| | Student | 10 | 10 | 3 | 4 | 4 | |

**Table 4-3: Perceived availability, use and rating of small group tutorial methods and technologies, comparing alumni with student responses in the pilot survey**

| Method / Technology | Role | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Mann-Whitney U (2-tailed) |
|---|---|---|---|---|---|---|---|
| **Textbooks** | Alumni | 100 | 100 | 3 | 4 | 5 | P=0.724 NS |
| | Student | 100 | 100 | 3.5 | 4 | 5 | |
| **Student notes** | Alumni | 73.3 | 73.3 | 4 | 4 | 5 | P=0.966 NS |
| | Student | 100 | 100 | 4 | 4 | 5 | |
| **Handouts** | Alumni | 73.3 | 73.3 | 3.25 | 4 | 4.75 | P=0.176 NS |
| | Student | 100 | 100 | 4 | 4.5 | 5 | |
| **Journals** | Alumni | 73.3 | 66.7 | 3 | 3 | 4 | P=0.842 NS |
| | Student | 100 | 80 | 3 | 3 | 4 | |
| **Programmed learning** | Alumni | 0 | 0 | - | - | - | - |
| | Student | 20 | 20 | 3.5 | 4 | 4 | |
| **Computer-aided learning** | Alumni | 20 | 20 | 2 | 3 | 4 | P=0.375 NS |
| | Student | 100 | 100 | 3 | 4 | 4 | |
| **Internet** | Alumni | 0 | 0 | 4 | 4 | 4 | P=0.343 NS |
| | Student | 80 | 60 | 2.5 | 3 | 4 | |

**Table 4-4: Perceived availability, use and rating of directed self-study methods and technologies, comparing alumni with student responses in the pilot survey**

| Method / Technology | Role | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Mann-Whitney U (2-tailed) |
|---|---|---|---|---|---|---|---|
| **Practical classes** | Alumni | 100 | 100 | 4 | 4 | 5 | 0.264NS |
| | Student | 100 | 100 | 4 | 5 | 5 | |
| **Hands-on clinical training** | Alumni | 93.3 | 93.3 | 4 | 5 | 5 | 0.344NS |
| | Student | 100 | 100 | 3.75 | 5 | 5 | |
| **Posters** | Alumni | 40 | 40 | 1.75 | 2 | 2.25 | 0.125NS |
| | Student | 60 | 50 | 2 | 3 | 3 | |
| **Models** | Alumni | 66.7 | 66.7 | 3 | 3.5 | 4 | 0.328NS |
| | Student | 100 | 100 | 3 | 4 | 4.75 | |
| **Specimens** | Alumni | 93.3 | 86.7 | 2.25 | 3 | 3 | 0.049* |
| | Student | 100 | 100 | 3 | 4 | 4.5 | |

**Table 4-5: Perceived availability, use and rating of practical methods and technologies, comparing alumni with student responses in the pilot survey**

| Method / Technology | Role | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Mann-Whitney U (2-tailed) |
|---|---|---|---|---|---|---|---|
| **CCTV** | Alumni | 0 | 0 | 4 | 4 | 4 | 0.317$^{NS}$ |
| | Student | 10 | 0 | 1 | 1 | 1.5 | |
| **Cine film** | Alumni | 33.3 | 33.3 | 2 | 2 | 4 | 0.101$^{NS}$ |
| | Student | 10 | 10 | 1 | 1 | 1.5 | |
| **Educational TV** | Alumni | 6.7 | 6.7 | 4 | 4 | 4 | 0.102$^{NS}$ |
| | Student | 20 | 20 | 1.75 | 2.5 | 3 | |
| **Audio recordings** | Alumni | 20 | 20 | 3 | 3 | 4 | 0.114$^{NS}$ |
| | Student | 30 | 30 | 4 | 4 | 4 | |
| **Video recordings** | Alumni | 53.3 | 53.3 | 3 | 4 | 5 | 0.221$^{NS}$ |
| | Student | 90 | 90 | 3 | 3.5 | 4 | |

**Table 4-6: Perceived availability, use and rating of miscellaneous audiovisual aids, comparing alumni with student responses in the pilot survey**

### Pilot outcomes (comparison of alumni with students)

In most cases, use mirrors availability. There were only two significant differences ($P<0.05$) found between alumni and students, related to the rating of 35mm slides ($P=0.043$) and preserved specimens ($P=0.049$). That significant differences between groups were few may have been a result of the low number of participants, or the fact that the alumni were from different eras and therefore when grouped together, their views on the usefulness of different technologies could not be easily distinguished from undergraduates. That alumni rated 35mm significantly higher than current students is not surprising since it has been superseded by the use of PowerPoint, the main lecturing technology for current students. Current students rated preserved specimens higher than alumni.

#### 4.2.4.1.2 Differences in perceived usefulness of technologies across different eras

Table 4-7 through to Table 4-11 shows the results of the Kruskal-Wallis comparison between alumni ratings from different eras, in relation to lecture-based methods and technologies; small-group tutorial methods and technologies; directed self-study methods and technologies; practical classes, hands-on methods and technologies; and miscellaneous audiovisual aids.

### Note about small sample numbers

For small sample numbers, a relaxed level of significance of 0.1 is recommended to allow for the possibility of a Type II error (Cohen, Manion *et al.* 2000). Results significant at this level but where $P>0.05$ have been marked with the "◆" symbol.

| Method / Technology | Era | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | Weipers | 100 | 100 | 4 | 4 | 5 | 0.447 NS |
| | Post-Weipers | 100 | 100 | 3 | 3.5 | 4.75 | |
| | Information | 100 | 100 | 3.5 | 4 | 4.5 | |
| **Post-mortems** | Weipers | 100 | 100 | 3 | 4.5 | 5 | 0.958 NS |
| | Post-Weipers | 100 | 100 | 3.25 | 4.5 | 5 | |
| | Information | 100 | 100 | 4 | 4 | 5 | |
| **Blackboard** | Weipers | 100 | 100 | 2.5 | 3 | 4 | 0.449 NS |
| | Post-Weipers | 75 | 75 | 2 | 3 | 3 | |
| | Information | 100 | 100 | 2 | 2 | 3.5 | |
| **Lantern slides** | Weipers | 16.7 | 16.7 | 4 | 4 | 4 | - |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 0 | 0 | - | - | - | |
| **Acetates** | Weipers | 83.3 | 83.3 | 2.5 | 3 | 3 | 0.084 NS ◆ |
| | Post-Weipers | 100 | 100 | 3 | 3.5 | 4 | |
| | Information | 100 | 100 | 2 | 3 | 3 | |
| **35mm slides** | Weipers | 83.3 | 83.3 | 2.5 | 4 | 4.5 | 0.847 NS |
| | Post-Weipers | 100 | 100 | 3.25 | 4 | 4.75 | |
| | Information | 100 | 100 | 3 | 3.5 | 4.75 | |
| **Electronic slides** | Weipers | 0 | 0 | - | - | - | - |
| | Post-Weipers | 25 | 25 | - | - | - | |
| | Information | 40 | 40 | 4 | 4.5 | 5 | |

**Table 4-7: Perceived availability, use and rating of lecture-based methods and technologies, comparing alumni responses from different eras in the pilot survey**

| Method / Technology | Era | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Kruskal-Wallis |
|---|---|---|---|---|---|---|---|
| **One-to-one tutorials** | Weipers | 66.7 | 66.7 | 4.25 | 5 | 5 | 0.417 NS |
| | Post-Weipers | 50 | 50 | 5 | 5 | 5 | |
| | Information | 100 | 100 | 5 | 5 | 5 | |
| **Group tutorials** | Weipers | 83.3 | 83.3 | 3 | 5 | 5 | 0.841 NS |
| | Post-Weipers | 75 | 75 | 4 | 4 | 5 | |
| | Information | 100 | 100 | 4 | 5 | 5 | |
| **Flipcharts / White-board** | Weipers | 0 | 0 | - | - | - | 0.547 NS |
| | Post-Weipers | 75 | 50 | 3 | 3.5 | 4 | |
| | Information | 80 | 80 | 2.5 | 3 | 4 | |
| **Laser-disc** | Weipers | 0 | 0 | - | - | - | - |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 0 | 0 | - | - | - | |

**Table 4-8: Perceived availability, use and rating of small group tutorial methods and technologies, comparing alumni responses from different eras in the pilot survey**

| Method / Technology | Era | Availability (%) | Use (%) | Q1 | Median | Q3 | Kruskal-Wallis |
|---|---|---|---|---|---|---|---|
| **Textbooks** | Weipers | 100 | 100 | 4 | 4 | 4.25 | 0.726 NS |
| | Post-Weipers | 100 | 100 | 3.25 | 4 | 4.75 | |
| | Information | 100 | 100 | 3 | 3 | 5 | |
| **Student notes** | Weipers | 33.3 | 33.3 | 3 | 4 | 4 | 0.153 NS |
| | Post-Weipers | 100 | 100 | 4.25 | 5 | 5 | |
| | Information | 100 | 100 | 3.5 | 4 | 5 | |
| **Handouts** | Weipers | 33.3 | 33.3 | 4 | 4 | 4 | 0.026* |
| | Post-Weipers | 100 | 100 | 4.25 | 5 | 5 | |
| | Information | 100 | 100 | 2 | 3 | 4 | |
| **Journals** | Weipers | 50 | 50 | 3 | 3 | 3 | 0.292 NS |
| | Post-Weipers | 75 | 75 | 3 | 4 | 4 | |
| | Information | 100 | 80 | 2.25 | 3 | 3.75 | |
| **Programmed learning** | Weipers | 0 | 0 | - | - | - | - |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 0 | 0 | - | - | - | |
| **Computer-aided learning** | Weipers | 0 | 0 | - | - | - | 0.317 NS |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 60 | 60 | 2 | 2 | 4 | |
| **Internet** | Weipers | 0 | 0 | - | - | - | - |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 0 | 0 | - | - | - | |

**Table 4-9: Perceived availability, use and rating of directed self-study methods and technologies, comparing alumni responses from different eras in the pilot survey**

| Method / Technology | Era | Availability (%) | Use (%) | Q1 | Median | Q3 | Kruskal-Wallis |
|---|---|---|---|---|---|---|---|
| **Practical classes** | Weipers | 100 | 100 | 3.75 | 4 | 5 | 0.695 NS |
| | Post-Weipers | 100 | 100 | 3.5 | 5 | 5 | |
| | Information | 100 | 100 | 3.5 | 4 | 5 | |
| **Hands-on clinical training** | Weipers | 83.3 | 83.3 | 4.75 | 5 | 5 | 0.699 NS |
| | Post-Weipers | 100 | 100 | 4.25 | 5 | 5 | |
| | Information | 100 | 100 | 4 | 5 | 5 | |
| **Posters** | Weipers | 33.3 | 33.3 | 2 | 2.5 | 3 | 0.353 NS |
| | Post-Weipers | 25 | 25 | 2 | 2 | 2 | |
| | Information | 60 | 60 | 1 | 2 | 2 | |
| **Models** | Weipers | 66.7 | 66.7 | 3.25 | 4 | 4 | 0.407 NS |
| | Post-Weipers | 50 | 50 | 3 | 3.5 | 4 | |
| | Information | 80 | 80 | 3 | 3 | 3.75 | |
| **Specimens** | Weipers | 100 | 100 | 3 | 3 | 3.5 | 0.035* |
| | Post-Weipers | 75 | 75 | 3 | 3 | 3 | |
| | Information | 100 | 80 | 2 | 2 | 2.75 | |

**Table 4-10: Perceived availability, use and rating of practical methods and technologies, comparing alumni responses from different eras in the pilot survey**

| Method / Technology | Era | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Kruskal-Wallis |
|---|---|---|---|---|---|---|---|
| **CCTV** | Weipers | 0 | 0 | - | - | - | - |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 0 | 0 | - | - | - | |
| **Cine film** | Weipers | 50 | 50 | 2 | 2 | 3.5 | 0.313 $^{NS}$ |
| | Post-Weipers | 25 | 25 | 4 | 4 | 4 | |
| | Information | 20 | 20 | 2 | 2 | 2 | |
| **Educational TV** | Weipers | 0 | 0 | 4 | 4 | 4 | 1.000 $^{NS}$ |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 20 | 20 | 4 | 4 | 4 | |
| **Audio recordings** | Weipers | 33.3 | 33.3 | 3 | 3 | 3 | 0.157 $^{NS}$ |
| | Post-Weipers | 0 | 0 | - | - | - | |
| | Information | 20 | 20 | 4 | 4 | 4 | |
| **Video recordings** | Weipers | 16.7 | 16.7 | 5 | 5 | 5 | 0.382 $^{NS}$ |
| | Post-Weipers | 50 | 50 | 4 | 4.5 | 5 | |
| | Information | 100 | 100 | 2.25 | 3.5 | 4.75 | |

**Table 4-11: Perceived availability, use and rating of miscellaneous audiovisual aids, comparing alumni responses from different eras in the pilot survey**

### Pilot outcomes (alumni, different eras compared)

Only two significant differences were found (where $P<0.05$) when different eras were compared, relating to alumni ratings of handouts ($P=0.026$) and specimens ($P=0.035$). At the relaxed alpha level of 0.1, an additional significant difference related to alumni ratings of acetates ($P=0.084$).

The Mann-Whitney U test was performed on individual pairs of data to determine where these differences lay. The Bonferroni correction requires that at an alpha level of 0.05 is divided by the number of hypotheses being tested i.e. reduced to 0.05/2 ($\alpha$ 0.025); similarly, a relaxed alpha level of 0.1 is reduced to 0.1/2 ($\alpha$ 0.05). There was no significant difference between the Weipers and post-Weipers alumni ratings of handouts ($p=0.066$) but there was a significant difference between the post-Weipers and Information era ratings of handouts ($P=0.022$), where they were rated significantly higher in the post-Weipers era. With regards to specimens, it looks from the medians as though these were rated more highly in the Weipers and post-Weipers eras than the Information era. However, there was no difference between the Weipers and post-Weipers era ratings ($P=0.439$) or between the post-Weipers and Information era ratings ($P=0.066$) in the pairwise tests. Regarding acetates, there was no significant difference between the Weipers and post-Weipers era ratings (P=0.079) or between the post-Weipers and Information era ratings (p=0.058) in the pairwise tests.

#### 4.2.4.1.3 Alumni's postgraduate experience compared with their undergraduate experience on reflection

Table 4-12 through to Table 4-16 shows the results of the Wilcoxon Signed Ranks test, comparing alumni's undergraduate ratings with their postgraduate ratings of lecture-based methods and technologies; small-group tutorial methods and technologies; directed self-study methods and technologies; practical, hands-on methods and technologies; and miscellaneous audiovisual aids. As in the previous analyses, to allow for the possibility of a Type II error, results shown to be significant at the relaxed level of 0.1 are indicated with the "◆" symbol.

| Method / Technology | UG/PG | Avail-ability (%) | Use (%) | Rating | | | Wilcoxon signed ranks test (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | UG | 100 | 100 | 4 | 4 | 5 | 0.234 NS |
| | PG | 93.3 | 86.7 | 3 | 3.5 | 5 | |
| **Post-mortems** | UG | 100 | 100 | 4 | 4 | 5 | 0.480 NS |
| | PG | 73.3 | 66.7 | 3 | 4.5 | 5 | |
| **Blackboard** | UG | 93.3 | 93.3 | 2 | 3 | 3.5 | 0.317 NS |
| | PG | 46.7 | 33.3 | 2.25 | 3 | 4.5 | |
| **Lantern slides** | UG | 6.7 | 6.7 | - | - | - | - |
| | PG | 0 | 0 | - | - | - | |
| **Acetates** | UG | 93.3 | 93.3 | 2.75 | 3 | 3 | 0.083 NS ◆ |
| | PG | 80 | 60 | 2.5 | 3 | 3 | |
| **35mm slides** | UG | 93.3 | 93.3 | 3 | 4 | 4.5 | 0.157 NS |
| | PG | 60 | 33.3 | 3 | 3 | 5 | |
| **Electronic slides** | UG | 20 | 20 | 3 | 4.5 | 4.5 | - |
| | PG | 86.7 | 73.3 | 4 | 5 | 5 | |

**Table 4-12: Perceived availability, use and rating of lecture-based methods and technologies, and comparison of alumni's undergraduate and postgraduate responses in the pilot survey**

| Method / Technology | UG/PG | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Wilcoxon signed ranks test (2-tailed) |
|---|---|---|---|---|---|---|---|
| **One-to-one tutorials** | UG | 73.3 | 73.3 | 5 | 5 | 5 | 0.317 NS |
| | PG | 60 | 46.7 | 4.5 | 5 | 5 | |
| **Group tutorials** | UG | 86.7 | 86.7 | 4 | 5 | 5 | 0.783 NS |
| | PG | 80 | 73.3 | 4 | 5 | 5 | |
| **Flipcharts / White-board** | UG | 46.7 | 40 | 3 | 3 | 4 | 0.157 NS |
| | PG | 73.3 | 53.3 | 3 | 3 | 4 | |
| **Laser-disc** | UG | 0 | 0 | - | - | - | - |
| | PG | 13.3 | 13.3 | 2.25 | 4 | 4.5 | |

**Table 4-13: Perceived availability, use and rating of small group tutorial methods, and comparison of alumni's undergraduate and postgraduate responses in the pilot survey**

| Method / Technology | UG/PG | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Wilcoxon signed ranks test (2-tailed) |
|---|---|---|---|---|---|---|---|
| **Textbooks** | UG | 100 | 100 | 3 | 4 | 5 | 1.000 NS |
| | PG | 86.7 | 80 | 4 | 4 | 5 | |
| **Student notes** | UG | 73.3 | 73.3 | 4 | 4 | 5 | 0.564 NS |
| | PG | 66.7 | 60 | 3.75 | 4 | 5 | |
| **Handouts** | UG | 73.3 | 73.3 | 3.25 | 4 | 4.75 | 0.180 NS |
| | PG | 66.7 | 60 | 3 | 4 | 4 | |
| **Journals** | UG | 73.3 | 66.7 | 3 | 3 | 4 | 0.066 NS ◆ |
| | PG | 86.7 | 66.7 | 3 | 4 | 5 | |
| **Programmed learning** | UG | 0 | 0 | - | - | - | - |
| | PG | 0 | 0 | - | - | - | |
| **Computer-aided learning** | UG | 20 | 20 | 2 | 3 | 4 | 0.180 NS |
| | PG | 66.7 | 40 | 4 | 5 | 5 | |
| **Internet** | UG | 0 | 0 | - | - | - | - |
| | PG | 73.3 | 46.7 | 3 | 4 | 5 | |

**Table 4-14: Perceived availability, use and rating of directed self-study methods, and comparison of alumni's undergraduate and postgraduate responses in the pilot survey**

| Method / Technology | UG/PG | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Wilcoxon signed ranks test (2-tailed) |
|---|---|---|---|---|---|---|---|
| **Practical classes** | UG | 100 | 100 | 4 | 4 | 5 | 0.317 NS |
| | PG | 86.7 | 80 | 4 | 4 | 5 | |
| **Hands-on clinical training** | UG | 93.3 | 93.3 | 4 | 5 | 5 | 0.102 NS |
| | PG | 80 | 66.7 | 4 | 5 | 5 | |
| **Posters** | UG | 40 | 40 | 1.75 | 2 | 2.25 | 0.317 NS |
| | PG | 73.3 | 46.7 | 2 | 2 | 3 | |
| **Models** | UG | 66.7 | 66.7 | 3 | 3.5 | 4 | 1.000 NS |
| | PG | 53.3 | 33.3 | 2 | 3.5 | 5 | |
| **Specimens** | UG | 93.3 | 86.7 | 2.25 | 3 | 3 | 0.157 NS |
| | PG | 66.7 | 46.7 | 2.25 | 3 | 3 | |

**Table 4-15: Perceived availability, use and rating of practical methods and technologies, and comparison of alumni's undergraduate and postgraduate responses in the pilot survey**

| Method / Technology | UG/PG | Avail-ability (%) | Use (%) | Q1 | Med-ian | Q3 | Wilcoxon signed ranks test (2-tailed) |
|---|---|---|---|---|---|---|---|
| **CCTV** | UG | 0 | 0 | - | - | - | - |
| | PG | 26.7 | 20 | 3.5 | 4 | 5 | |
| **Cine film** | UG | 33.3 | 33.3 | 2 | 2 | 4 | 1.000 NS |
| | PG | 6.7 | 6.7 | - | - | - | |
| **Educational TV** | UG | 6.7 | 6.7 | - | - | - | - |
| | PG | 40 | 6.7 | 3 | 3 | 4 | |
| **Audio recordings** | UG | 20 | 20 | 3 | 3 | 4 | 0.317 NS |
| | PG | 46.7 | 40 | 2.25 | 3 | 3 | |
| **Video recordings** | UG | 53.3 | 53.3 | 3 | 4 | 5 | 0.157 NS |
| | PG | 86.7 | 60 | 3 | 3.5 | 5 | |

**Table 4-16: Perceived availability, use and rating of miscellaneous audiovisual aids, and comparison of alumni's undergraduate and postgraduate responses in the pilot survey**

### Pilot outcomes (alumni, undergraduate and postgraduate compared)

None of the paired samples were shown to be significantly different at a standard alpha level of 0.05, compared using the Wilcoxon Signed Ranks test. However at the relaxed alpha level of 0.1, significant differences were found in relation to acetates and journals. The medians for acetates were the same (3), but differed for journals, indicating that on average, these were perceived to be more useful at a postgraduate level. Although shown not to be statistically significant, the medians were different between undergraduate and postgraduate ratings of 35mm slides and CAL, where 35mm slides were rated higher at the undergraduate level, and CAL was rated higher at the postgraduate level. Due to the small sample sizes, the results must be interpreted with caution.

#### 4.2.4.1.4 General conclusions of the pilot questionnaire analyses

It was anticipated from the outset that no firm conclusions could be drawn from the pilot analyses due to the small sample sizes. However, the data gathered served to confirm the types of analyses that could be undertaken with the 'live' questionnaire results, and provided methodological rigour to the study.

## *4.3 Development and refinement of the teacher interviews*

### 4.3.1 Informal data-gathering meetings

Informal meetings were held initially, with members of University staff and external researchers, who had expertise and/or interest in the following domains of study:

- University of Glasgow archives
- history of medicine in the UK
- history of higher education in the UK
- history of veterinary education in the UK
- recent research in veterinary education, with a European-wide focus on curriculum development
- experience of supporting different audio-visual technologies within the University of Glasgow over time.

Handwritten notes were made during the meetings, and written summaries were generated from these.

#### 4.3.1.1 Outcomes of informal meetings

These meetings were useful in mapping out areas of initial enquiry, and identifying potential sources of further information, such as relevant journals as well as useful contacts.

### 4.3.2 Pilot interviews with current staff

Pilot interviews were held with four members of teaching staff between August and November 2002, in an effort to become familiar with the setup of a typical face-to-face interview, audio-recorded with the interviewee's consent.

These interviews contributed relevant information about veterinary education between 1949 and the present, and therefore the data that emerged were not considered exclusively 'pilot' material.

#### 4.3.2.1 Sampling

It was felt important to speak to staff with a diverse range of interests and different levels of teaching experience. Therefore, purposive sampling was considered appropriate, and interviews were conducted with senior members of staff with a long association with the Faculty, as well with as a newer member of staff engaged in innovative curricular development.

#### 4.3.2.2 Recording

Handwritten notes were made during the interviews. Summary notes were then typed up and a transcript later produced from the audio-recording on minidisk.

#### 4.3.2.3 Analysis

Major themes were identified manually through reviewing the summaries of the interviews and by subsequent theoretical coding of the transcripts. This formed part of the main qualitative study therefore the findings are described in Chapter 6.

#### 4.3.2.4 Pilot outcomes

The initial discussions provided:

- Extensive historical accounts of the history of the Faculty, with particular reference to veterinary pathology and microbiology
- A detailed overview of audio-visual developments within the Faculty
- A thorough account of one staff member's experience of participation in a Europe-wide collaborative project to standardise the teaching of clinical pathology to veterinary undergraduates

This provided a framework from which to carry out further interviews.

## *4.4 Development and refinement of student focus groups*

### 4.4.1 Design of the student focus groups – preparatory meetings with class representatives

As preparation for the student focus groups, informal meetings were first held with class year representatives in February and March 2003, specifically:

- a focus group discussion in February 2003 with representatives from 1st, 2nd and 3rd year
- a meeting in March 2003 with the 4th year representative

#### 4.4.1.1 Recording

The main recording method was handwritten notes made during the focus groups ('field notes'), which were typed up as a written summary immediately after each meeting. These provided a useful overview of the meetings and served to identify the main themes for discussion in the subsequent pilot focus groups.

#### 4.4.1.2 Emerging topics of discussion

Key topics emerging from these meetings included the use of computer-aided learning (CAL) programs, access to online learning resources on site and from home, electronic communications from staff, use of PowerPoint slides and student notes, development of library skills, clinical relevance in preclinical courses, interactivity in lectures, transparency of the examination process and use of examinations to promote learning, and the need for improved course documentation and composite timetables.

Specific findings – based on student feedback – suggested that:

- Computer-aided learning (CAL) programs:
    - serve a useful role for revision, especially self-assessment CAL
    - need to be integrated into the timetable, with relevant resources recommended to students by staff (for example at the end of a lecture)
    - are best used when there is contact with the lecturer to ask questions / discuss content (in a blended learning context)
    - are not an acceptable replacement for didactic lectures (at least to most students)
- Access to and competition for IT facilities on site can affect use of learning resources – and more students wanted access to online resources from home
- Students requested access to PowerPoint lecture notes in advance of lectures to save unnecessary note-taking. Printed lecture notes served as a major focus for learning and revision
- Opportunities to develop library skills were not presented often enough to students in the first three years of the course

- Unavailability or ‘hogging’ of library textbooks was a source of frustration to students
- More emphasis on clinical relevance was requested for preclinical courses
- Students felt that the level of transparency about examination content was not consistent across all courses and could be addressed through changes to the course information documents
- A feedback session after each examination was suggested, to turn examinations into opportunities for learning
- Questions posed by the lecturer at the end of a lecture were appreciated
- Electronic communication from staff in relation to timetables changes etc. varied between courses
- Students requested composite timetables

These findings served to create the framework for informal discussion within the subsequent focus groups.

#### 4.4.1.3 Sampling of students for pilot focus groups

In addition to identifying topics for discussion, the class representatives’ help was sought in assembling a representative group of between 7-10 students from each year to make up the pilot focus groups – for example in relation to gender, mature students versus school leavers, and UK versus overseas students.

#### 4.4.1.4 Ethical considerations

Formal ethics approval for this part of the study (consultation with class representatives) was not sought. However, formal ethics approval was sought from the Faculty of Education Ethics Committee for subsequent focus groups.

### 4.4.2 Piloting of student focus groups

Focus groups were first piloted in February and March 2003, specifically with 1$^{st}$, 2$^{nd}$ and 3$^{rd}$ year students. The purposes behind the focus groups pilots, which typically lasted one hour, were:

- to gain experience of the focus group discussion format, using the minidisk recorder for the first time and dealing with issues of consent, while managing a discussion amongst a group of students

- to gain insight into students' use of – and attitudes towards – available learning resources
- to assess the types of 'data' that would emerge, and how to analyse it

#### 4.4.2.1 Incentives

Tea/coffee and cakes were provided as an incentive to students to attend the focus group meetings, but it proved difficult to arrange focus group meetings with 4$^{th}$ and final year students, because of their heavy workload and clinical commitments, so these were postponed for a future occasion.

#### 4.4.2.2 Recording

The focus groups were audio-recorded, with the participants' verbal consent. During the interview, 'field notes' were made, which were immediately written up into a typed summary after the event, allowing a quick overview of the main themes. Subsequently, the focus groups were transcribed.

#### 4.4.2.3 Pilot outcomes

As the meetings with class representatives had identified the main topics for discussion during the focus groups, many of the same concerns were raised. One thing it may be useful to point out, is that focus groups are typically used for quality assessment in the Faculty, therefore students view these meetings as an opportunity to make suggestions for improvements to the course, and identify problematic issues, rather than highlighting aspects of the course with which they are satisfied.

On reflection, the pilot discussions were conducted at an early stage of the project, and students should probably have been given a more in-depth introduction to the purpose of the meetings in relation to the PhD, rather than being asked to comment generally on their experiences of learning and teaching.

**Emerging themes**
Topics of discussion included students requesting:

- access to online learning resources (specifically CAL programs) from home
- improved course documentation and composite timetables
- greater transparency of examination marking schemes

- increased awareness of career opportunities, and access to an extra-mural studies database
- use of CAL in a supplementary fashion to teach basic concepts, with CAL being made available for additional subjects (including some practical replacements)
- access to lecturers' PowerPoint files in advance of lectures
- access to adequate IT facilities

Quotes that help illustrate relevant – and diverse – themes of discussion are as follows:

- Students preference for lecturers' use of PowerPoint, and request for standardisation of technologies for information dissemination in lectures:

  *"Its nice to see PDF forms or even PowerPoint presentations of notes that people present in class, but I think in the last couple of weeks in physiology it's all just scribbled onto the [board] and then erased … I'm not actually that good at writing out notes and listening at the same time, I normally just listen and then go home so it's better for a lot of people I'm sure, to have something with them even before they show up to class or when you get to class so that when you go home you can say 'Well these were the major points' and then supplement that with textbooks or whatever."*

  (1st year student)

- Students' requirements for PowerPoint files in advance of the lectures:

  *"I think it's good that the things for lectures are up in time for us to print them out so you can actually have them for when we're in the lectures, because last year they tended to be up quite a while afterwards and we didn't really use them."*

  (2nd year student)

- Requirement for examination transparency and improved course documentation:

  *"I'm still confused by how the grading scale works, the course documentation doesn't really ... I guess it's different for me because I'm just used to a different system, but still I'm not aware, that when the year is over, do I get a letter grade or just a number grade?"*

  (1st year student)

- Lack of awareness of CAL programs:

  *"It would be kind of nice if the professors could say at the end of a lecture 'Hey, if any of you guys aren't understanding this, why don't you try looking at these [CAL programs] and maybe that'll help, and if you've got questions come and talk to me'."*

  (1st year student)

- Suggestions for replacing practical classes with CAL:

  *"There was one practical we had, the ELISA practical, and it just – we were there for over two hours and all we did was pipette a few things you know, if you got to do that, and that was it really. And if that had been on a CAL package it would have taken half an hour, been a lot less expensive, it was such a waste of time."*

  (2nd year student)

- Request for access to electronic learning resources (CAL) from home:

  *"I think it's really handy but it would be really helpful if we could access it from home, because I'm only at the vet school when I'm out here for lectures and quite often there's things I would want to be able to get access to at other times but I can't get out to the vet school because it's two hours away."*

  (1st year student)

- Competition for access to IT facilities:

  *"The only reason I don't do CAL things … in my case is because it's so busy in there that you can't concentrate."*

  (2nd year student)

- Request for a single, up-to-date, composite timetable:

  *"They're so confusing. We've got four different ones. You get one at the beginning of the term which tends to not be right and you get to about half way through the term and then, sometimes you don't know which timetable lectures are coming off of, because there's one on the wall on a noticeboard usually, and there's ones that are on the server, and you've got a printed copy."*

  (1st year student)

- Need for access to an EMS database with student review of sites to identify good practices:

  *"I think for the EMS it might be a good idea to have places where students have been before, because I think there's a book in the library but it's not kept very up to date, even from GUVMA. But maybe if they could have some sort of database where they've gone for EMS and made some comments like if they were good or not."*

  (1st year student)

Many of these quotes – illustrating students' demands for PowerPoint presentations in advance of lectures, wanting to know what exactly will be covered in examinations, and wanting timetables condensed for them – are illustrative of a surface, dependent learning approach (Marton and Säljö 1976)

**Focus group rules**

It was observed during the focus group piloting that it is sometimes difficult to force students to make their point sequentially and in full, rather than interactively, for example:

> *"I know he's just one of those people who like to write on the overhead what he's saying, which is fine, but if he could give us a piece of paper …"*
>
> *"… just outlining the …"*
>
> *"He gave us diagrams, didn't he?"*
>
> *"But even those, they're so muddled up."*
>
> *"He goes into so much detail that just a basic outline of what he's talking about would be nice."*

This highlighted the requirement for the facilitator to lay down the rules for discussion at the start of the focus group; mainly that only one student speaks at any one time, and is given the opportunity to make their point in full.

### 4.4.3 Interim student focus groups

Focus groups were subsequently held in April and May 2005, specifically with 4th and 5th year students (some of whom had already participated in the first pilot exercise). The main purposes behind these meetings were:

- to present to students the results – for their year – of the 'live' questionnaire study distributed to students
- to encourage students to reflect on these results, elaborating on specific questionnaire items when prompted.

Specific questions were prepared for the 4th year focus group, based on reflection on the questionnaire data. These were deliberately open-ended to stimulate discussion.

- Do the results surprise you, or are they what you would have expected?
- Practicals – these were obviously well received; do you have any more comments to make on these? Why are they so useful?

- Printed notes – how would you respond to the argument that these could be perceived as spoon-feeding?
- Electronic slides – generally were well received but described as sometimes 'too quick' – why, and what underlying problem is present?
- Lectures – rated as variable quality – elaborate on what differentiates good from bad teachers
- Models – what better use could be made of these?
- Textbooks – why have some subjects better recommended textbooks than others? Ideally, how should they be used?
- Internet – generally considered not really useful – why?
  How could we make better use of this resource, or should we be?
- Journals – Would you make more use of them in other subject areas? Under what circumstances? When should you be introduced to scientific literature?
- Posters – anatomy and animal breeds (main use). How/where else could they be used? Would producing your own as a project for any subjects be useful?
- CAL – generally not popular. How should we be using this medium?
- Do any of these technologies promote integration of subject knowledge, or could they be used in this way?

Open-ended questions were also prepared for fifth year students, based on their questionnaire data.

- Expand on the importance of hands-on training – what does it let you do that other methods do not deliver?
- Post-mortem demonstrations – what added benefits do they offer, and how should they ideally be constructed?
- Notes – why are they so useful? Why not use journals more, for example?
- Individual tutorials – why are some tutors better than others?
- How could EMS be improved? How does EMS complement your practical training in the curriculum?
- CAL – how should it ideally be used? What packages are useful and why? Why are others less useful?

- Internet – how could you make best use of this resource?
  Should training be given in its use?

- Video – how could we improve its use? Is there much call for DVDs yet?

- Posters – throughout the course, how are they best used?

### 4.4.3.1 Interim focus group outcomes

Students at both focus group meetings were not surprised by the results presented from the questionnaire, and elaborated on possible reasons for the ratings of different methods and technologies. Unfortunately, time did not permit all of the questions to be answered, but the focus group allowed students the opportunity to describe in their own words how the use of various educational methods and technologies impacted on their learning.

#### 4.4.3.1.1 Fourth year interim focus group findings

The major findings from fourth year students were:

- Good teachers were identified as ones that seemed keen to teach:

  *"In third year, the staff seemed really keen to teach, especially in Pathology. Their main goal was to get students through the course and impart wisdom."*

  *[About one SA clinician] "He is a great lecturer – he is very approachable, he's keen, and he talks to the audience."*

- Interactive lecturing was also appreciated:

  *"He questions you sometimes, to get you thinking. Because it's so easy just to sit in a lecture, if they bring that element in, it can help you think more."*

  *"The problem with lectures is you just sit there and say nothing, whereas if it's interactive, even if someone's teaching you something and asking you questions, that would be better."*

- With regards to the media used, the blackboard was seen to have an advantage over PowerPoint in that allowed learning to be student-paced, and was also seen to be interactive:

  *"Using the blackboard makes a lecture much more interactive.*
  *The lecturer is forced to slow down because he goes at your speed.*
  *If he's drawing a diagram, it might get ridiculously complicated, but he's drawing it at your speed and you can copy it. And just the act of drawing it with him helps you understand it. And you can take notes,*
  *and it's not a massive battle like it is with PowerPoint."*

- PowerPoint, inappropriately used, was seen not to benefit student learning:

  *"It's terrible when lecturers just read word for word what they've got on their slides. They might as well not be there."*

  *"You're so busy writing down the 45th line that they've got written on their slide that you've ignored everything they've said to you."*

- Post-mortem demonstrations had also largely been replaced with PowerPoint, which was negatively perceived:

  *"Post-mortems nowadays are just done using PowerPoints. There's no real animal there. Now we tend to sleep like we do in lectures. But in the post-mortems we do ourselves, it's hands-on clinical learning – they're fantastic."*

  *"Rather than having the PMs already done you could do it in front of the class, so it's more interesting because you're thinking 'It could be this, it could be that'."*

- The need for clinical relevance from the early years was highlighted:

  *"A few clinical examples in lectures make a huge difference. Even in first year anatomy where you learn all about the bones of the leg, if you just put a couple of examples from fourth year orthopaedics – nothing too complicated, but something that makes you realise why you're there, something veterinary – you'd be really interested and probably learn it really well."*

  *"The biggest struggle in the first two years is not knowing why on earth you need to know any of the stuff you're being taught."*

  *"Some of the courses, like microbiology and pharmacology, aren't really stuff we're going to use in practice. The stuff we're really going to use out of these specific topics we're going to be taught again in final year, so there's no point reading around those. You just have to learn the stuff that they want you to learn from the exam and that's it."*

- There was a strong feeling that motivation for learning was primarily exam-oriented:

  *"It's not what university's supposed to be about, but it is what vet school's about. It's just going from one exam to the next. The whole process is exam-driven."*

- The impact of this extrinsic motivation on students' learning appears to be short-term, with information quickly forgotten:

  *"I really think everything I learned in third year has escaped my brain. I could look at great books of a million and one viruses and what they look like in every situation and what their core proteins are, and really, what's going to happen is someone's going to bring in a dog, and hopefully I'll*

*recognise one or two signs and I'll give them tablet A and it will get better. I don't need to know what a glucose receptor looks like."*

- Problem-based learning was seen as a way to facilitate self-directed learning:

  *"Going back to the PBL, I think it's a really good idea – not to do the whole course like that – but it does make you look stuff up for yourself and try and find stuff out for yourself, especially now we're doing clinical work. Perhaps in the earlier years, it might help when you're learning the muscles of the leg to have an orthopaedic problem, even if it's only one a month."*

- Participants agreed that it would be preferable to find information out for themselves through reading textbooks and journals, but the current curriculum prevented them doing so:

  *"Notes are terrible. You parrot read something. You know nothing around the subject. You don't know any other ideas that other people might have because you've only got this one person's take on something. I much prefer to read a book than my notes."*

  *"I agree, I think I'd remember a lot better from textbooks and journals, however we spend so much time in lectures."*

  *"We have to be spoon-fed because the course is so intensive. We don't have time to read books or journals. It's not a 'real university' this place – it's a factory producing vets."*

The students' feedback would suggest that their learning is primarily driven by examinations. The use of didactic lectures and printed lecture notes enables spoon-feeding, required because students are overloaded with factual information that is not perceived to be clinically relevant. This appears to be made possible through the use of modern projection technologies that do little to stimulate or aid retention and transfer.

#### 4.4.3.1.2 Final year interim focus group findings

The major findings from final year students were:

- Students highlighted the importance of practising clinical skills from earlier in the course:

  *"The [practicals] we had last year, which were all working up to the OSCEs. In practice you always get passed an ophthalmoscope. Half the time you don't even know how to use it. So at least having done that, I can go into practice knowing how to use it now. So even putting things like that into third year, and things like lameness workups for horses, even the whole general clinical exam. I know in third year they've started bringing in how to do a clinical examination of the horse, but it just involves [the lecturer] standing up in front of the [class], not necessarily even with a horse. It needs to get people going with their stethoscopes, go and listen to a horse's heart, listen to lung sounds and gut sounds, so that when you're*

*out in practice you know how to do it. And get the suturing practicals into third year, because that's when you start your clinical EMS, and I certainly had to get taught how to do suturing in my practice, and it's something that needs to be done in the first term of the third year."*

- EMS was not seen as the best place to learn these skills initially:

  *"You can't rely on people getting things done in EMS, because lots of the places you go to just assume that you know how to do the basics."*

- Models for learning palpation skills were also seen to aid with clinical skills development:

  *"The haptic cow is brilliant."*

  *"It would be quite nice to have a horse one for colic, and if you possibly could at all, simulate impaction. I know it's always going to feel different in the real thing, because the haptic cow doesn't feel anything like a normal cow, but it's just to know what you're feeling. And you can say 'Oh, I'm supposed to be feeling this', and [the teacher] can tell you where you are."*

- Journals related to clinical practice were perceived to be more useful to students than scientific journals:

  *"Some of them are so specific and more detailed than we want.*
  *'In Practice' to me is brilliant. I get that at home. I'd use that as learning, instead of notes, for exams and things as well. But other journals – unless it's a review article – they're just not that helpful."*

- Computer-aided learning programs that focused on clinical problems were perceived to be more relevant than ones that covered basic concepts:

  *"The case ones, where you're presented with a cat and you've got to say what could be wrong with it, and therefore how do you treat it, that's good."*

  *"Some of them are very basic but you've got to work your way through it and it does take a while. Lots of people wouldn't get to the end of it because they'd end up getting bored."*

- Problem-solving tutorials also supported case-based learning:

  *"The last two or three years' practical classes, and a lot of the tutorials we did last year, that were on case-based problem solving kind of tutorials. They were quite good, just to work through cases and things. And we've had quite a few of them this year as well."*

- Like the fourth year students, the final year students highlighted the importance of making preclinical subjects relevant:

> *"Anatomy was very good, the way that you had lectures, and you went straight in after the lectures to do dissection, and then you also have live animals that you can do things with, that was done very well."*

> *"[The lecturer] was quite good at that. In his anatomy lectures, he'd be talking about the femur or something and go 'So therefore, when you're doing pinning of the femoral fracture, this is why you've got to know this and that landmark'."*

The major outcome of this focus group was the final year students' emphasis on the need to practice clinical skills as preparation for their career as a veterinary surgeon. They appreciated methods and technologies that supported them in this – such as the haptic cow, student notes organised by presenting signs, and CAL packages and tutorials based on clinical cases. Preclinical teaching was valued where there was obvious clinical relevance.

### 4.4.4 Subsequent refinement of the focus group methodology

Results of the pilot and interim meetings were interpreted as indicating that the focus group methodology was already honed to give the maximum information required, to provide individual perspectives on students' learning.

#### 4.4.4.1 Sampling

One crucial factor in the organisation of the focus groups for the 'real' study was a decision to email random students to ask them to attend the focus group, at the request of the Associate Dean for Learning and Teaching. Previously, some class representatives had been extremely helpful in assembling groups of students for focus group meetings, whilst there were a few who did not reply to email messages requesting their help, making organisation of the meetings more difficult.

#### 4.4.4.2 Incentives

Another small issue that emerged, from listening to the audio-recordings, was the preference for providing food outside of the meeting, so that students were less distracted by food during the meetings, and so that they, and the recordings, were more audible.

## *4.5 Development and refinement of the methods used to interrogate archived evidence*

### 4.5.1 Inventory of archive materials

Three physically separate stores of archived material were identified:

- Archive Services at the main campus of the University of Glasgow
- The Faculty Office store
- The James Herriot Library

The contents of the three stores had already been inventoried (Hunter 2004). While the materials retained at Archive Services had been appropriately stored and catalogued within section DC144, the material kept within the Faculty Office and the James Herriot Library was not initially amenable to further study because much of it was physically inaccessible and in an unsuitable environment for long-term storage. Between late 2003 and early 2006, a team from Archive Services, led by Mrs. Moira Rankin, transferred the remaining records to Archive Services, where they were sorted and given accession numbers.

### 4.5.2 Identification of relevant archive materials

The following records were identified as particularly relevant to the study:

- Student enrolment records
- University calendars
- Course syllabus documents
- Board of Studies minutes

#### 4.5.2.1 Student enrolment records

These provided a source of information about students enrolled on the veterinary undergraduate programme since 1919. Not all students who enrolled graduated from Glasgow, as some students transferred to other colleges or withdrew from the course. The information was interrogated to measure the changing gender balance over time towards a predominantly female body of students, and permitted identification of students' age at admission, and in most cases, their recorded nationality and their parent or guardian's occupation.

#### 4.5.2.2 University calendars

These provided a list of the different subjects within the BVMS degree since 1949, and a record of which subjects were assessed in formal examinations and when. Educational resources relevant to each subject e.g. textbooks, were also listed.

#### 4.5.2.3 Course syllabus documents

These were only available for selected years but showed in detail the components of the subjects comprising the BVMS degree, providing an independent check of the information in the University calendars.

#### 4.5.2.4 Board of Studies Minutes

These provided evidence of major and minor changes to the undergraduate veterinary course.

## *4.6 Use of NVivo to analyse qualitative data*

It was realised after the pilot studies that the qualitative evidence would need to be analysed and presented in a structured, objective fashion. It was recognised that isolated quotes from interviews for example, could not be used to provide sufficient ‘evidence’ for a particular argument. QSR NVivo was therefore chosen as a suitable software package, to store, link and analyse documents and concepts arising from the following sources of information:

- questionnaire responses to open-ended questions
- interviews with current and former staff
- focus groups with students

NVivo can be described as an electronic system for importing, creating and coding qualitative documents, such as interview transcripts. The basic unit within NVivo is the ‘node’, which is a container for categories and coding (Richards 1999). Nodes normally include excerpts of transcript (or open text responses to a questionnaire) that the user codes as representative of one or more categories. The categories can also be thought of as ‘repeating ideas’ (Auerbach and Silverstein 2003). They may be left unorganised as ‘free nodes’, or organised hierarchically as ‘tree nodes’. As coding progresses, the user also creates ‘memo’ documents, into which they record their thinking about creation and organisation of nodes, which form a kind of research diary or audit trail. Ideally, the qualitative researcher should oscillate between data-gathering, coding and memo-making, with the ultimate aim of generating theory to explain patterns in the qualitative data.

Such data can be coded from the ‘bottom-up’. Auerbach and Silverstein (2003) describe this as a six-step process:

1. Explicitly state research concerns and conceptual framework in research journal
2. Select all relevant text for analysis by coding within a free node
3. Record repeating ideas by grouping together related passages of relevant text.
4. Organise themes by grouping repeating ideas into coherent categories
5. Develop theoretical constructs by grouping themes into units consistent with your theoretical framework
6. Create a theoretical construct by retelling the participants' stories in terms of the theoretical constructs

This is consistent with a 'grounded theory' approach (Strauss and Corbin 1998; Glaser and Strauss 1999). Bringer, Johnston *et al.* (2004) noted that grounded theory is generally intended for the development of a substantive theory, not a grand theory that one would expect to be generalisable. This is particularly true for case studies, such as this investigation into methods and technologies in veterinary education at Glasgow.

# 5 Materials and Methods

## 5.1 Overview of materials and methods

The table below shows a chronological overview of the different parts of the data-gathering and analysis phase.

| Date | Questionnaire | Student focus groups | Interviews with staff |
|---|---|---|---|
| July 2004 | 'Live' study with alumni | | |
| January 2005 | 'Live' study with lecturing staff | | |
| | 'Live' study with $3^{rd}$, $4^{th}$ and $5^{th}$ year students | | |
| April 2005 | 'Live' study with $1^{st}$ and $2^{nd}$ year students | | |
| August 2005 to November 2005 | | | Interviews with former members of staff |
| April 2006 | | Focus groups with $1^{st}$, $2^{nd}$, $3^{rd}$, $4^{th}$ and $5^{th}$ year students | |
| June and July 2006 | | | Interviews with former members of staff |
| November and December 2006 | | | Class observations and interviews with current lecturing staff |

**Table 5-1: Chronological overview of the materials and methods used**

## 5.2 'Live' questionnaire survey with alumni, staff and students

### 5.2.1 Issues in designing the final questionnaire

#### 5.2.1.1 Ethical considerations

Participants needed to be assured of confidentiality. The plain language statement that accompanied the questionnaire served to inform participants about the purpose of the research, and to outline the data collection methods used. The statement, approved by the Faculty of Education's ethics committee along with the questionnaire, assured participants that they reserved the right not to participate in the study, or to withdraw their data at any time; and that data would be held in accordance with the 1998 Data Protection Act.

#### 5.2.1.2 Objectivity of questionnaires

Robson (2002) wrote that questionnaires are a straightforward approach to the study of attitudes and beliefs, and that generalisable, standardised data can be collected, with postal questionnaires being an easy way to gather lots of information about a population in a short period of time. On the other hand, he noted that data is subject to the respondents' characteristics such as memory, experience and motivation, and their need to report their experiences in a 'positive' light. For this study, it was accepted that there would be some temporal bias in the data collected, since alumni were asked to describe their undergraduate experiences from memory.

#### 5.2.1.3 Sampling and types of errors

Some of the errors which creep into surveys are a result of inappropriate sampling techniques. Dillman (2000) cited four possible causes of error in questionnaire surveys, two of which are related to sampling:

- *sampling error*, which is the result of surveying only part of the population so that the results cannot be considered representative. In this study, sampling errors were possible at the questionnaire piloting phase, where a small number of people were asked to participate (less than 1% of RCVS registered Glasgow alumni).

- *coverage error*, which can occur if all members of the population do not have an equal chance of being selected. For the 'live' study, questionnaires were sent to all graduates registered with the RCVS. However there are a number of graduates no longer registered, principally retired veterinary surgeons, people who have left the profession for family commitments, and those who have chosen an alternative career path, who were not invited to participate.

Another type of error relates to the design of the questionnaire:

- *measurement error*, that can result from unclear question wording leading to inaccurate answer. For example, it is assumed that people who said they have used a technology and rated it are familiar with that technology and have not confused it with a similar educational method e.g. lantern and 35mm slides.

Another type of error arises when particular groups decline to participate in a survey, which would mean their views were not being represented:

- *nonresponse error*, which occurs if the non-respondents represent a particular group of people.

Typically, a questionnaire should have internal and external validity and reliability, that is to say that it should measure what it aims to measure, and that it is repeatable.

### 5.2.1.4 Ways of boosting response rates

Robson (2002) noted that although postal surveys can be used to gather large amounts of data in a relatively short time, at low cost, they typically have low response rates. Steps were taken to minimise this risk.

#### 5.2.1.4.1 Handwritten signature and personalised salutation

The use of handwritten, personalised salutations is encouraged, along with handwritten signatures (Verma and Mallick 1999; Dillman 2000). Because of the large number of people selected for this study (2630 alumni, 500 students and 50 staff), the introductory letter incorporated an electronic scanned signature. Salutations were personalised for alumni and staff, the latter being handwritten, but as the questionnaires were handed out to students 'en masse' at lectures it was felt that a handwritten 'Dear Student' would be most appropriate.

#### 5.2.1.4.2 Colour of paper

A bright colour of paper ('buttercup yellow') was selected, with the idea that the questionnaire would 'stand out' from the respondent's other papers e.g. on a desk, so that they would be less likely to put it to one side and forget about it (Booth 2003). Studies have been carried on the preferred paper colour for questionnaires, but none have proved conclusive (Mandal, Eaden *et al.* 2000; Booth 2003; Newby, Watson *et al.* 2003).

#### 5.2.1.4.3 Return envelopes

Freepost return envelopes were included with the questionnaires sent to UK-based alumni only, as a means of reducing the cost for respondents to encourage them to mail the completed questionnaires back.

#### 5.2.1.4.4 Incentives

Through offering incentives (book tokens or www.amazon.co.uk e-vouchers) to participants at the piloting stages, and to undergraduate students asked to complete the 'live' questionnaire, the author's experience was that incentives did not make a difference to the response rate, and that people who were interested in the survey would complete it, with or without an incentive. It was decided therefore, that for the 'live' survey with alumni, and with teachers, no incentives would be offered.

### 5.2.2 Distribution to alumni, staff and students

#### 5.2.2.1 Alumni

The ‘live’ questionnaire (Appendix B4) was disseminated in July 2004 to all living Glasgow graduates registered with the RCVS, along with a freepost envelope (UK only) and a copy of the University of Glasgow Veterinary Faculty Newsletter. This publication is sent to graduates working in the UK and overseas in various sectors of the profession. This represents 100% of Glasgow graduates registered with the RCVS, but excludes graduates no longer registered with the RCVS, which typically would include retired veterinary surgeons and female graduates who may have given up veterinary work to raise a family, and graduates who have changed careers. Of the 2630 questionnaires, 2376 were mailed to UK-based graduates (90.3%) and 254 to graduates living overseas (9.7%).

The questionnaire was also made available online, to make access and submission easier for the participants, and also to help to reduce postage costs for overseas alumni. As an alternative to a web form, which was used (with variable success) in the pilot phase with alumni, an electronic version of the questionnaire was made available for download from a website created by the author for this purpose (see Figure 5-1). Clickable check boxes and type-in fields were added to an otherwise ‘protected’ MS Word document, which could be downloaded from a website set up for this purpose, completed offline, and emailed back to the author.


**Figure 5-1: Screenshot of survey website, with instructions, email contact, and a link to the questionnaire.**

### 5.2.2.2 Lecturing staff

A complete list of teaching staff (Lecturers, Senior Lecturers, University Teachers and Professors engaged in teaching) in the Faculty was previously unavailable. Therefore the first task was to compile such a list, sourcing data from all of the 2004-5 course information documents. A number of lecturing staff were also alumni, and some would have received a copy of the questionnaire already. However since there was a fairly low response rate from the alumni questionnaire distribution, it was decided to give all academic members of staff a copy of the questionnaire, with the exception of staff alumni who had returned a form previously.

Fifty members of lecturing staff from different disciplines within the Faculty were given a copy of the questionnaire in January 2005.

### 5.2.2.3 Undergraduate students

A decision was made to give the questionnaire to students in 3$^{rd}$, 4$^{th}$ and final years earlier on in the academic session than to the 1$^{st}$ and 2$^{nd}$ year students. This was so that preclinical students, who received the questionnaire in the third term, would have sufficient opportunity to become familiar with educational methods and technologies. This was especially the case for first year students. In contrast, students in paraclinical, and clinical years especially, had a heavy workload and it was considered fairer to distribute the forms earlier in the session so as not to interfere with professional examinations. Also, these students already had experienced most of the technologies and methods mentioned in the questionnaire.

The questionnaire was therefore distributed to 88 fourth year students and 102 third year students in January 2005, at the start of a lecture. Students were asked to complete the forms, and instructed that the forms would be collected a week later.

Ninety four final year students were emailed about the questionnaire and asked to pick up a paper copy, or fill in the electronic questionnaire. Because final year students were all on different rotations, it was not possible to address them all on one specific occasion.

One hundred and thirteen first year students, and 116 second year students were given a copy of the questionnaire, during lectures, in April 2005. Again these were collected from them in another lecture just over a week later.

To try to improve the response rate of each year, students were sent email reminders, and asked in person, during subsequent lectures, to fill in the questionnaires, as the results would be of great importance to the Faculty in terms of improving the effective use of different learning and teaching methods.

### 5.2.3 Manual entry and coding of the data

An outcome of the pilot exercise, an Excel spreadsheet file was designed in advance of data entry, with each row representing an individual response, and each column representing the data variables for each questionnaire item. For each distribution of the survey (i.e. to alumni, students and teachers), quantitative data was entered on one spreadsheet with qualitative data entered onto another spreadsheet.

The coding scheme for the actual study is detailed in Appendix D3, and is summarised as follows:

- **For availability and use of a method/technology:**
  0=No; 1=Yes; 2=Not sure; 9=Missing
- **For rating of a method /technology:**
  1=Not at all useful; 2=Not very useful; 3=Useful; 4=Very useful; 5=Extremely useful; 9=Missing
- **For current role:**
  1=Undergraduate student; 2=Postgraduate student;
  3= Practitioner; 4= Retired practitioner; 5= University teacher;
  6= Retired university teacher; 7=Other; 9=Missing
- **School of graduation:**
  1=Glasgow; 2=Other vet school; 3=Non-vet school; 4=Missing
- **Subjects taught (by teachers and retired teachers):**
  1=Preclinical; 2=Paraclinical; 3=Clinical; 4=Across subjects; 9=Missing
- **Year of study (applicable to students only):**
  1=First year; 2=Second year; 3=Third year; 4=Fourth year;
  5=Fifth year
- **Era (based on year of graduation):**
  1=pre-Weipers; 2=Weipers; 3=post-Weipers; 4=information; 9=Missing
- **Gender:**
  1=Male; 2=Female; 9=Missing
- **Culture:**
  1=Asia; 2=Africa; 3=Australasia; 4=Europe; 5=North America; 6=UK and Eire; 7=South America; 8=Dual affiliation; 0=Other; 9=Missing

**Figure 5-2: Summary of the coding system used for questionnaire responses**

The other variables such as years of admittance and graduation were numerical (scale) and therefore did not need coding

### 5.2.4 Data analysis of quantitative data in SPSS

Specific statistical tests were considered appropriate to determine significant differences in the availability, use and rating of methods/technologies between different groups of respondents. These attempted to answer the following questions:

- **Is there a significant difference in the perceived usefulness of different methods between alumni of different eras?**
  – requiring nonparametric tests for *k* independent samples
  (Kruskal-Wallis one-way analysis of variance)

- **Is there a significant difference in the perceived usefulness of different methods between students of different years?**
  – requiring nonparametric tests for *k* independent samples
  (Kruskal-Wallis one-way analysis of variance)

- **Is there a significant difference in the perceived usefulness of different methods between veterinary teachers and non-veterinary teachers?**
  – requiring nonparametric tests for two independent samples
  (Mann-Whitney U test)

- **Is there a significant difference in the perceived usefulness of different methods between current teachers and students?**
  – requiring nonparametric tests for two independent samples
  (Mann-Whitney U test)

Non-parametric statistical analyses were conducted as prescribed by Siegel and Castellan (1988).

### 5.2.4.1 Descriptive statistics and bar charts

SPSS 11.5 for Windows was used to analyse the quantitative results. Descriptive statistics (frequencies, medians, quartiles) were sought first (selecting 'Analyse' → 'Descriptive statistics' → 'Explore' from the menu bar. Regarding missing data, cases were excluded pairwise. Bar charts were also created to get a visual representation of distributions (selecting 'Graphs' → 'Bar').

### 5.2.4.2 Weighting of cases in SPSS

In SPSS, cases were weighted so that 'non-counting' categories would be displayed on bar charts and in frequency tables. All cases were weighted with a value of 1.0 except for a small number of 'fake' cases, which were given a weighting of 0.00001.

### 5.2.4.3 Nonparametric tests – two independent samples

To compare Likert scale ratings between two independent groups, the Mann-Whitney U test was used (selecting 'Analyse' → 'Nonparametric tests' → '2 independent samples'). For the comparison of current teachers ratings versus current students ratings, the grouping variable used was [Role: 1=Undergraduate; 5=Teacher].

#### 5.2.4.4 Nonparametric tests – *k* independent samples

The Kruskal-Wallis Analysis of Variance was used when there were more than two independent groups to be compared (e.g. different years of students, or different 'eras' of alumni (selecting 'Analyse' → 'Nonparametric tests' → 'k independent samples'). The 'test variable list' included the Likert scale ratings of the technologies.

For the comparison of different years of students' ratings, the grouping variable used was [Student year: 1=First year; 2=Second year; 3=Third year; 4=Fourth year; 5=Fifth year]. For the comparison of different 'eras' of alumni's ratings of the technologies, the grouping variable used was [Era: 1=Pre-Weipers; 2=Weipers; 3=Post-Weipers; 4=Information].

The Kruskal-Wallis ANOVA only tests for significant differences between the independent groups; it does not determine the nature of the difference. To identify how the groups' responses differed, the Mann-Whitney U test was performed between all relevant pairs, with the Bonferroni correction applied, where a standard P value of 0.05 is divided by the number of hypotheses being tested.

### 5.2.5 Analysis of the open text questionnaire responses

#### 5.2.5.1 Reformatting of data

Text responses were copied from the Excel spreadsheets to individual rich text format (.rtf) files for each respondent and imported into NVivo.

#### 5.2.5.2 Section coding

Automatic coding was carried out based on the question numbers, so that responses to the same question from different respondents were grouped together automatically. This formed the basis for coding as described in section 5.3.1.5.

## *5.3 Interviews and focus groups*

The results of the analyses of data from the quantitative survey (presented in section 6.1.3) were used to inform the following stage of data gathering. A qualitative study (narrative inquiry) of the experiences of Glasgow students, alumni, and current and former staff was conducted to gain an insight into individual perspectives on the use of these methods and technologies, and as a means of revealing some of the catalysts for educational innovation within the discipline.

### 5.3.1 Interviews with former members of teaching staff

Interviews with former members of staff were undertaken to generate an understanding of teaching and learning practices at Buccleuch Street and Garscube between 1949 and recent years.

#### 5.3.1.1 Sampling and selection

Figure 5-3 illustrates the former lecturers and long-standing members of staff selected for the interviews, showing each lecturer's period of service in the Faculty. The figure also includes the three longstanding members of staff who participated in the pilot interviews.

Six former Deans, still living, were selected because of their insight into educational technologies from a higher management perspective. All the former Deans except for William Weipers (deceased) were asked to participate, and their period of Deanship is indicated by denser shading in the table.

An additional thirteen former members of staff were included, representing staff who taught across the three periods of study, and in various subjects throughout the undergraduate curriculum. These people were considered to have been influential in educational innovation, by a long-serving member of senior Faculty staff. The student yearbooks were also consulted, with a view to identifying key teaching staff across different subjects over time.

The graphs shows a timeline along one axis, divided into three periods – the 'Weipers era', the 'Post-Weipers era' and the 'Information era'. Each column represents a single former member of teaching staff. The shaded areas represent each teacher's period of service at the Faculty.

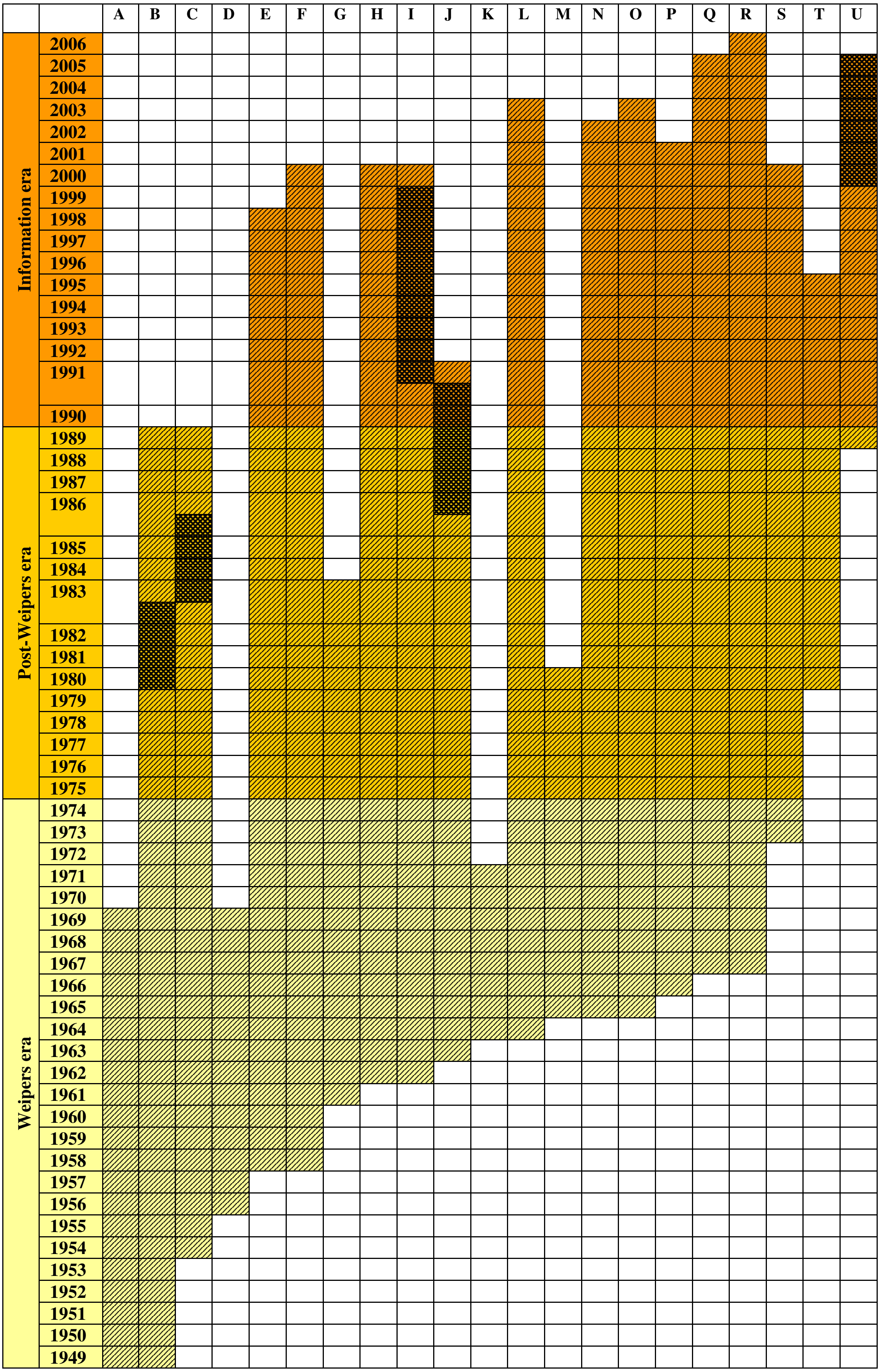


**Figure 5-3: Length of service of selected representative former staff, colour-coded for era**
Denser cross-shading indicates time spent as a Dean. One former Dean declined to participate in the study and therefore is not indicated on the chart.

#### 5.3.1.2 Incentives

Former staff were offered lunch as a small expression of thanks for taking the time to meet and recall their experiences of teaching undergraduates.

#### 5.3.1.3 The interview pro-forma

The interview pro-forma is shown in Appendix E. It was designed to elicit the following information:

As a teacher:

- Which methods and technologies did you find useful?
- Were they easy to use, and were you given training?
- Did you experience any problems with the methods technically, or pedagogically in terms of facilitating student learning?
- Were you responsible for introducing any new methods or technologies, and what impact did this have on the curriculum?

Reflecting on your days as an undergraduate student:

- What methods were available, and which ones helped you to learn most effectively?
- What subjects did these methods work well/less well in?
- How has your undergraduate experience influenced the way you taught subsequently?

This was not distributed to former staff in advance as it was felt to be too prescriptive, and might limit their feedback to pre-defined themes, rather than gathering information considered to be important from their perspective. (Although, on hindsight, this would have been an advantage in terms of standardising the questions asked of each participant, and more generalisable findings would have emerged).

#### 5.3.1.4 Recording techniques

With the interviewees' written permission, the interviews were recorded using a portable minidisk recorder. Conversations were later transcribed, and interviewees given a copy of their own interview transcript, to review and identify any incorrect or contentious information to be corrected or deleted.

### 5.3.1.5 Analysis

Transcripts were imported into NVivo for subsequent coding and analysis (beginning with version 2.0, later migrating to version 7.0).

Text was coded under major themes (categories) in the first instance.. Within these, sub-categories were identified, that were found to parallel the major areas of enquiry, as identified in the introduction in Chapter 1, and expanded on in the literature review in Chapter 3. The sub-categories were the focus of further study, resulting in the creation of a third level of coding, representing the characteristics (usually advantages and disadvantages) of different methods/technologies, and forming the basis for the development of theory about veterinary teaching and learning.

Flick (1998) described three phases of theoretical coding in qualitative analysis:

- Open coding (identification of individual concepts or categories).
- Axial coding (refinement of categories and clarification of the relationships between them).
- Selective coding (continuation of axial coding at a higher level of abstraction).

In this study, open coding generated the level 1 and 2 codes listed in Appendix H. These were coded originally as ‘free nodes’ within NVivo. Organisation of the codes (into ‘tree nodes’ within NVivo) was made possible through axial coding, that resulted in a hierarchical structure of parent and child nodes. As analysis progressed, certain nodes were discarded as irrelevant to the main research questions of the thesis. Selective coding is best exemplified by the level 3 codes, which represent the ‘characteristics’ of level 2 nodes. At this level, it becomes possible to start to generate theoretical constructs about the role of methods and technologies in veterinary education.

An example screenshot in Figure 5-4 (rotated so that detail can be seen) shows the hierarchical organisation of nodes in relation to video. The original transcript is shown, and to the right of it (at the top of the page), ‘coding stripes’ have been displayed. These enable the user to review coding in progress, and visually help to organise and link nodes at the axial and selective coding phases. The text coded at the ‘accessibility issues’ node has been highlighted.

Although it was anticipated that a ‘bottom-up’ coding or ‘grounded theory’ approach would be appropriate to aid in the generation of theory from qualitative data, in reality the analysis incorporated a combination of ‘bottom-up’ and ‘top-down’ approaches. At an early stage of analysis, major themes were evident, as identified in the earlier literature review, therefore to create these in NVivo a 'top-down' approach was used. Within the major categories and sub-categories, a 'bottom-up' approach was used to generate the level 3 nodes.

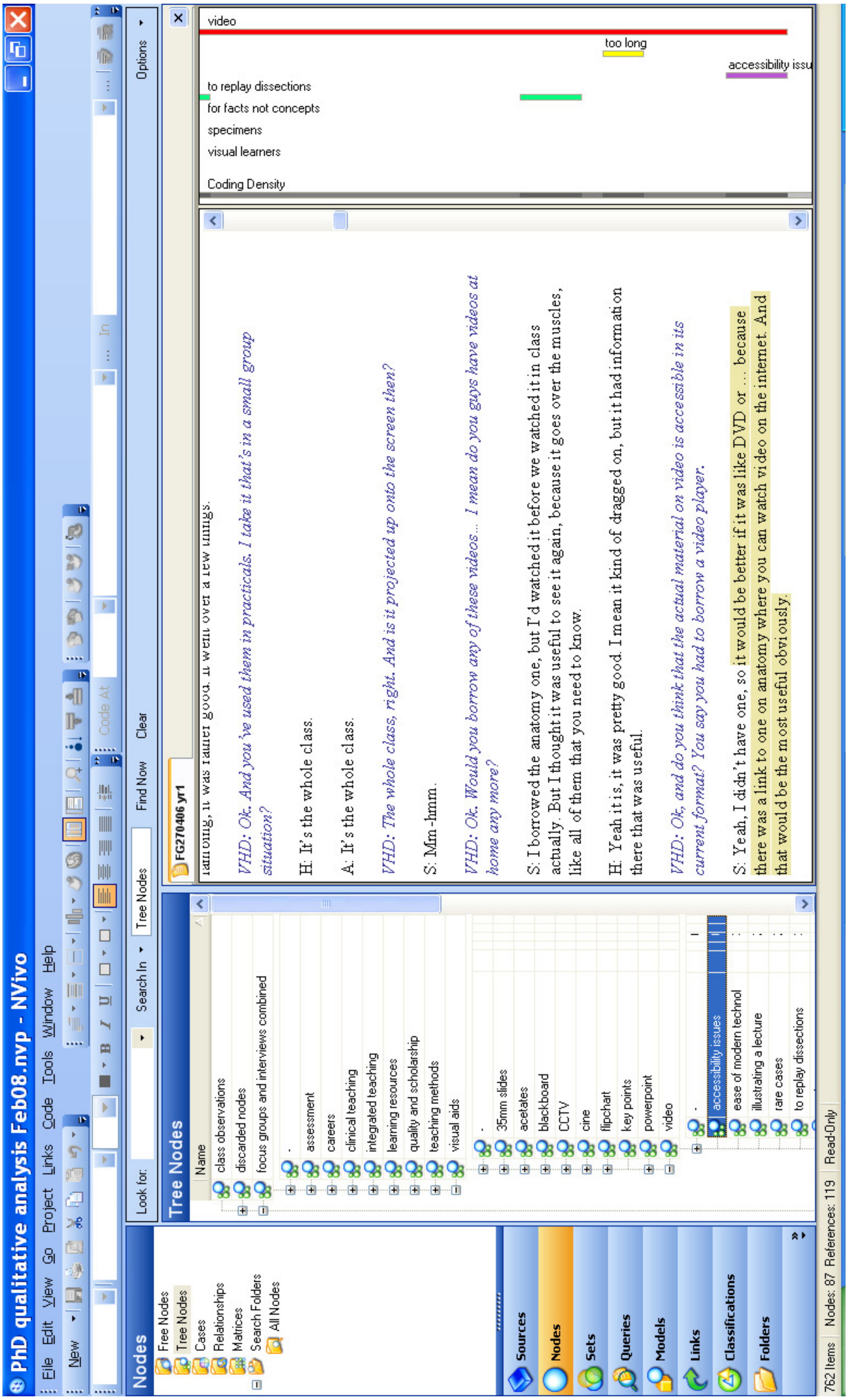


**Figure 5-4: Screenshot from NVivo, showing nodes generated from a focus group transcript, with coding stripes displayed**

#### 5.3.1.6 Ethical considerations

Permission to carry out this work was granted by the Faculty of Education Ethics Committee. Informed written consent was obtained from the participants. One retired member of staff was interviewed in the presence of their spouse due to poor health.

### 5.3.2 Focus groups with current students

#### 5.3.2.1 Sampling and selection

Five students were randomly selected from each of the first four student years, to participate in the study. A group of final year students were identified, from within the same rotation group, who would be available on the same day. Five one-hour meetings were scheduled for times when the students did not have any classes, and were emailed asking them to attend, at the request of the principle investigator (the author) and the Associate Dean for Learning and Teaching (Prof. Sullivan).

Each focus group lasted approximately one hour, and all focus groups were held on the same day to try to ensure consistency of themes of discussion from different year viewpoints.

#### 5.3.2.2 Recording techniques and ethical considerations

Permission to carry out this work was granted by the Faculty of Education Ethics Committee. Focus groups were audio-recorded with students' written consent. Forms were created in advance for students to sign and date.

#### 5.3.2.3 Incentives

Coffee and biscuits were provided at the start of the meeting, and students were given a lunch voucher each after the meeting, to use that day or the following day.

#### 5.3.2.4 Themes of discussion (investigation)

The results of the resource questionnaire, particularly the median rating for a range of methods and technologies and the accompanying qualitative comments, were used as the primary basis for discussion. A number of methods/technologies were selected for each focus group, from those rated as 'Not at all useful' (1) to those rated as 'Extremely useful' (5). Additional questions were identified for possible discussion with students, based on the outcomes of the pilot and interim focus groups.

#### 5.3.2.4.1 First year students

The following questions were identified for possible discussion with first year students:

- Relevance and importance of different teaching methods – practical classes (5), EMS and one-to-one tutorials (5), post-mortems (5), student notes (5), lectures (4), the internet (4), models (4), CAL (4), textbooks (4), video (3), peer tutoring (3), posters (3), group tutorials (3) and the blackboard (2).

- Expectations of the course at admission – were they realistic, from your first year's experience?

- Are you still focused on a practice career? Has the course been relevant so far in that respect?

- Choosing a veterinary school – do the particular teaching methods at an individual school inform your choice?

- Opinion on traditional didactic course versus problem-based course using case-based learning from day one (e.g. Nottingham)

- How do you perceive your learning to be driven (e.g. is it driven by examinations)?

- Some professors are regarded as 'better' than others – what makes a good teacher?

- About your own learning needs – does the course cater for individual learning styles?

- Are you adequately supported in terms of skill development – have you made use of the Student Learning Service?

- Anatomy posters in laboratory received a low rating – could these be made more relevant/accessible/useful?

- Not using internet much – why? Do you need to be taught how to filter information? Are staff not making use of it?

- Post-mortems permit 3D visualisation – do you have any experience of 3D computer reconstructions e.g. from CT scans? Would they help you, if available online?

- Is the course stressful? Do you have to balance it with part-time work?

- Is student debt a concern to you?

- What about value for money in terms of quality of teaching?

#### 5.3.2.4.2 Second year students

The following questions were identified for possible discussion with second year students:

- Relevance and importance of different teaching methods – PowerPoint (5), practical classes (5), student notes (4), textbooks (4), the internet (4), acetates (3), peer learning (3), journals (3), group tutorials (3) and CAL (3).
- Lecturers can 'fly through' slides – are you expected to learn too much information?
- Is all this information relevant to a career in practice?
- Anatomy practicals – in previous focus groups these were related to 'real life cases' – what is the importance of this?
- How could better use be made of CAL and/or the internet?
- Acetates are regarded as useful for following the lecturer's real-time drawing in the class – how does this aid your understanding?
- Peer learning – some students feel that they work better alone – is group learning not important to a career in practice?
- Journals – students have asked who has the time to use them – what would be your views on increasing the amount of self-directed learning in the course to replace lectures? Do you feel that you get rewarded for self-directed learning?
- Describe your own learning style – is this supported?
- Have you made use of the Student Learning Service?
- Would you be prepared at this point to make a choice about specialising e.g. in small animals versus horses or food animals?
- Is the vet course relevant to a research career? Should we be producing researchers as well as clinicians? Are any of you likely to pursue an intercalated option?

#### 5.3.2.4.3 Third year students

The following questions were identified for possible discussion with third year students:

- Relevance and importance of different teaching methods – EMS and one-to-one tutorials (5), hands-on clinical training (5), handouts (5), post-mortems (4), student notes (4), group tutorials (4), textbooks (4), video (3), CAL (2) and journals (2).
- What about integration of subjects on a paraclinical level – do any of the teaching methods facilitate this?

- What are your views on a research career, based on your experience of the course so far? Is the school doing enough to promote veterinary research as a career option?

- Students have said that EMS experience ‘depends on the practice/practitioner’ – tell me more. Does the school have enough of an input into what happens during EMS?

- You have not ‘seen’ an animal in 3$^{rd}$ year yet – is this important?

- Handouts and notes were highly rated – would you agree you are being spoon-fed? Does this matter?

- Using journals for library project – regarded by students as not mandatory and they ‘have to sift through unnecessary material’ – but should you not be able to conduct article reviews by now?

- Professional skills development – have you experienced enough of it to date? Have you used the Student Learning Service? Are you comfortable carrying out library database searches?

#### 5.3.2.4.4 Fourth year students

The following questions were identified for possible discussion with fourth year students:

- Relevance and importance of different teaching methods – practical classes (5), student notes (5), PowerPoint (4), lectures (4), models (4), textbooks (3), the internet (3), journals (3), posters (3) and CAL (2).

- Attitudes towards undergraduate tracking, and the concept of omni-potential vs. omnicompetence.

- How does the course cater for diverse student learning styles?

- The perceived reward for independent / collaborative learning assignments in comparison to traditional examinations.

- The role of EMS and the value of the on-site hospital – the benefits and limitations of primary versus referral cases.

- Acetates are still heavily used – what role do they play?

- What additional benefits can be gained from tutorials?

- To what extent is the curriculum targeted at day 1 competences?

- Do you feel that the course prepares you for other career options? Should it?

#### 5.3.2.4.5 Final year students

The following questions were identified for possible discussion with final year students:

- Relevance and importance of different teaching methods – hands-on clinical training (5), practicals (4), post-mortems (4), student notes (4), EMS/one-to-one tutorials (4), group tutorials (4), CAL (3), the internet (3), video (3) and posters (3).
- Attitudes towards undergraduate tracking, and the concept of omni-potential vs. omnicompetence.
- The role of EMS and the value of the on-site hospital – the benefits and limitations of primary versus referral cases.
- To what extent is the curriculum targeted at day 1 competences?
- How does the course cater for diverse student learning styles?
- The worst and best bits of the whole five year course.
- How would you describe veterinary undergraduate teaching at Glasgow?
- How important is European and AVMA accreditation in terms of its influence on your learning and subsequent career choice?
- What are your views on lifelong learning?

#### 5.3.2.4.6 Overarching themes

Some of the questions asked of final year students were identical to those asked of fourth year students because of the overall clinical relevance. Because of this, and the fact that each focus group threw up items for discussion in subsequent ones that day, there was a certain amount of overlap in terms of the topics of discussion.

Therefore the major themes across the different year groups comprised:

- Ideas about specialisation before and after graduation.
- Experience of the course generally and the amount of information students are required to learn.
- What drives students' learning i.e. is it examinations?
  Views on continual assessment as opposed to examinations.
- Quality of teaching and learning; attributes of a good teacher; accommodation of students' learning styles.
- Use of different lecturing technologies e.g. the blackboard, acetates, PowerPoint.
- Use of e-Learning tools, specifically CAL, Moodle, the internet and podcasting.
- Ideas on structuring/organisation of course; potential to bring clinical teaching into earlier years.

- Impact of AVMA accreditation on choice of University and subsequent career decisions.
- Instruction in Day One clinical skills e.g. suturing.
- Experience of independent learning exercises such as Self-Directed Learning Assignment (SDLA) and Collaborative Learning Assignment (CLA).
- Student notes and the concept of spoon-feeding.

#### 5.3.2.5 Analysis

As with the interview transcripts, focus group transcripts were imported into NVivo, and theoretical coding was carried out in the same way as described in section 5.3.1.5. In the early stages of coding, interview nodes were kept separate from focus groups nodes, but as the themes of discussion were comparable, it made sense to amalgamate the nodes from the interviews and focus groups, to move towards generating an overall narrative account of participants' experiences and views about various methods and technologies and other relevant aspects of veterinary education, such as integrated teaching.

### 5.3.3 Class observations

#### 5.3.3.1 Purpose of the observations

Class observations were conducted in October and November 2006. These served two purposes:

- Gaining an insight into different teaching methods, to assess student engagement and interaction with the lecturer, each other, and learning resources.
- To generate areas for discussion in the subsequent interviews with current staff.

#### 5.3.3.2 Sampling

As a way of sampling the range of classes conducted within the Faculty, to gain a 'first hand' impression of teaching and learning in action, a blueprint was drawn up. The idea for this stemmed from the blueprinting of stations for Objective Clinical Structured Examinations (Davis, Ponnamperuma *et al.* 2006). In OSCE blueprinting, a matrix is constructed in the planning of this form of assessment, with a list of skills types on one axis (clinical, communication) and a list of subjects or '–ologies' along the other axis. These areas are then sampled, with each station represented by a cross, which is then mapped to RCVS Day 1 core competencies.

The same protocol was used for sampling classes to observe, however the list of skills types on the left axis was replaced by the ‘class type’ (the term being used loosely as a significant proportion of veterinary teaching takes place outside the classroom. The grid is shown in Figure 5-5.

| **Class type** | **Preclinical** | | | | **Paraclinical** | | | | **Clinical** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Anatomy** | **Animal husbandry** | **Biomolecular sciences** | **Physiology** | **Microbiology** | **Pathology** | **Parasitology** | **Pharmacology** | **Companion Animal Sciences** | **Combined Integrated Course** | **Small animal Clinical Studies** | **Large Animal Clinical Studies** |
| **Lecture** | X | | | | | | | | X | | | |
| **Dissection practical** | X | | | | | | | | | | | |
| **Laboratory practical** | | | | | X | | | | | | | |
| **Field trip (farm)** | | X | | | | | | | | | | |
| **Clinico-pathological conference** | | | | | | X | | | | | | X |
| **Seminar** | | | | | | | | | | | X | |
| **Role play** | | | | | | | | | | X | | |
| **Online learning** | X | X | X | X | X | X | X | X | X | X | X | X |

**Figure 5-5: Blueprint for sampling teaching methods for direct observation**

### 5.3.3.3 Recording techniques

‘Field notes’ and photographs (taken without a flash) were the main means of recording data from the class observations. For a more in-depth study, video-recording would have been used. However the purpose of these observation exercises was simply to gain an overall impression and to generate themes for discussion in the subsequent interviews with current staff. It was also considered important not to be intrusive in order to avoid changing the dynamics of the class, although the opportunity was taken where possible to ask students their impressions of the class and their thinking about their learning outcomes.

The field notes were typed up immediately after each class. Direct observations were recorded (in black text), with reflective comments (in blue italicised text), and illustrative photographs were included to emphasise particular points.

#### 5.3.3.4 Analysis

A PDF version of each report was emailed to the lecturer(s) concerned, for additional comments and reflection. An RTF version of each report was also imported into NVivo as it was anticipated that – like the focus groups and interviews – the reports could also be theoretically coded.

### 5.3.4 Interviews with current members of teaching staff

#### 5.3.4.1 Purpose of the interviews

Some of these interviews were with staff whose teaching had been observed, therefore discussion was based around the teaching observations. In addition, the majority of interviewed staff had also completed a questionnaire, so the interview served to draw out more information about individuals' questionnaire responses.

#### 5.3.4.2 Sampling

Lecturers were sampled across the BVMS curriculum, to gain an impression of learning and teaching in different subject areas within the preclinical, paraclinical and clinical levels of the course.

#### 5.3.4.3 The interview pro-forma/style

In addition to the classroom observations, and reflection on the questionnaire submitted previously by interviewees, information about the lecturers' teaching was obtained from recent quality assurance forms completed by students. This served to highlight aspects of each lecturer's teaching practice that students commended, as well as aspects that students were more critical of. Discussion was tailored to aspects of each individual's teaching style, but there was overlap between the interviews in terms of the topics discussed. These included for example, views on omnicompetence versus undergraduate specialisation, favoured use of visual aids and learning resources, and the placing of the interviewee's taught subject within the overall BVMS degree. Other themes of discussion included teacher training activities and views on increased subject integration.

#### 5.3.4.4 Recording techniques

The interviews were recorded, with the interviewees' written consent, using a minidisk, with files converted to digital files for later transcription in full.

#### 5.3.4.5 Analysis

The transcripts were analysed using NVivo, as was done for the student focus group transcripts and the transcripts emerging from the interviews with former staff. As before, major themes (categories) and sub-categories were identified (through open and axial coding). Level 3 codes were developed through selective coding, as a basis for developing a conceptual framework about veterinary learning and teaching methods.

#### 5.3.4.6 Ethical considerations

Permission to carry out this work was granted by the Faculty of Education Ethics Committee. Informed written consent was obtained from the participants.

## *5.4 Demographic study of archived student enrolments*

### 5.4.1 Sources

Enrolment records were taken from the following sources:

- 'Buccleuch Street Records, 1945-1958' (accn. 2890/1 or /4)
- 'Graduates in Veterinary Medicine, 1954-1966' (accn. 2890/4)
- 'Graduates in Veterinary Medicine 1967-1975' (accn. 2890/4)
- 'Graduate Book, July 1972 to 1980' (accn. 2890/4)
- Individual record cards - withdrawals/transfers/exclusions entering course 1962-1975 and duplicates of 'Graduates in Veterinary Medicine 1967-1975' (accn. 2890/26)
- Individual record cards for 1978-1985 graduates (accn. 2890/8)
- Individual record cards for 1986-1995 graduates (accn. 2890/17)
- Individual record cards for 1996-1998 graduates (accn. 2890/16)
- Individual record cards for 1999 graduates (accn. 2890/9)
- Individual record cards for recent graduates and currently enrolled students kept within the Faculty Teaching Unit.

### 5.4.2 Student wastage

Not all students who enrolled graduated from Glasgow. Some transferred to other veterinary colleges or other faculties within the University. Others were prevented from continuing due to unsatisfactory performance. State grants were typically withdrawn in the latter situations. Other students withdrew from the course for personal reasons. These records were typically marked as ‘student wastage’, and also included Erasmus students enrolled during the 1990s.

### 5.4.3 Demographic factors

The following were recorded in an Excel spreadsheet:

- Anonymous identifier (linked elsewhere to a password-protected file with the participants’ identities, necessary to check for duplicate records)
- Date of admission
- Date of graduation
- Date and country of birth
- Nationality
- Parent’s/guardian’s occupation (where available)

### 5.4.4 Age at admission

Where the age of the student was included, this was recorded, otherwise age at admission was calculated by deducting the birth date from the date of admission.

### 5.4.5 Era of enrolment

The ‘era of enrolment’ (Weipers, Post-Weipers or Information) was based on the year of entry.

### 5.4.6 Nationality

Nationality was recorded as appeared on the student record, but in cases of ambiguity e.g. joint nationality, country of birth was used as the definitive guide to nationality. When the student’s nationality was recorded as British (as opposed to Scottish, Welsh etc.), nationality was recorded as British (unspecified). British students born overseas were recorded as British (overseas).

### 5.4.7 Parent's/guardian's occupation

For historical reasons, the parent's/guardian's occupation was recorded as the father's/male guardian's occupation, however the mother's/female's occupation was recorded where the father/male guardian was deceased or omitted.

### 5.4.8 Coding

The coding system for the student records data is shown in Appendix F.

# 6 Results

## 6.1 The questionnaire

### 6.1.1 Response rate

#### 6.1.1.1 Alumni

Completed questionnaires were collected from Capital Communications on a weekly basis approximately two weeks after the questionnaire had been distributed with the Faculty newsletter. The questionnaire returns dropped by about 50% each week – for example 120 forms were returned in the first week, followed by 59 forms in the second week, and 33 forms in the third week.

Of the 2630 questionnaires mailed to alumni (2376 UK and Ireland; 254 overseas), 322 forms were returned, representing an overall response rate of 12.5%. Nineteen forms were also returned to sender – with the newsletter – as the participants' mailing address was out of date.

Of the 322 responses, ten had to be discarded because they had no identification (the consent form was missing), therefore participants could not be approached to supply the consent form. Another two forms were returned without the consent form signed, these were returned to the participants for signing but again they did not supply the signed consent form. (A handful of other participants who had not signed the consent form were asked to complete it, either through mail or email, and did so.)

Eight alumni returned their questionnaires blank. In one instance this was because the participant assumed that their return would be too late for the study. One form was returned because the alumnus had participated in the pilot study, and felt their answers would be the same. In the other six instances, these were early graduates (1940s, early 1950s) who stated on the form or in an accompanying letter that they could not recall their use of educational technologies, or felt that their memories of learning veterinary medicine would not be helpful to the study.

This meant the valid number of questionnaire returns was 302, or 11.5% of the original mailing list. Of these, 272 were returned as paper-based forms, and 30 were returned online. Table 6-1 shows how the responses were divided across the different 'eras', also comparing responses from UK and Ireland versus overseas graduates.

| *Era* | *Region* | *No. forms mailed* | *No. valid returns* | *Response rate (%)* | *Total. no. forms mailed* | *Total no. valid returns* | *Overall response rate (%)* | *% of total returns* |
|---|---|---|---|---|---|---|---|---|
| **Pre-Weipers** (pre-1949) | UK | 71 | 11 | 15.5% | 76 | 13 | 17.1% | 4.3% |
| | O/seas | 5 | 2 | 40% | | | | |
| **Weipers** (1949-1974) | UK | 624 | 85 | 13.6% | 720 | 94 | 13.1% | 31.1% |
| | O/seas | 96 | 9 | 9.4% | | | | |
| **Post-Weipers** (1975-1989) | UK | 756 | 79 | 10.4% | 813 | 84 | 10.3% | 27.8% |
| | O/seas | 57 | 5 | 8.8% | | | | |
| **Information** (1990-) | UK | 925 | 96 | 10.4% | 1021 | 111 | 10.9% | 36.8% |
| | O/seas | 96 | 5 | 5.2% | | | | |
| **Total** | | 2630 | 302 | 11.5% | 2630 | 302 | 11.5% | 100% |

**Table 6-1: Alumni response rates for the questionnaire, showing comparison of different eras and respondents' location (UK/Ireland or overseas)**

Not surprisingly (because of the smaller class sizes and fewer living graduates), there were few returns from the earliest era, so results from the analyses of data from this group of respondents should be interpreted with caution. However, in terms of the percentage return, the best overall response is from this era, possibly indicating early graduates' greater interest in the study and/or increased time available to complete the questionnaire during retirement. Returns from the following three eras each constitute about a third of the total number of responses, but only represent a response rate of between approximately 10-13% from those invited to participate, so again caution needs to be advised about the interpretation of results. Returns from UK respondents, across the eras, are generally higher than from overseas respondents – probably due to the fact that a stamped-addressed envelope was included for UK returns. The exception to this rule is the pre-Weipers overseas graduates, representing a disproportionate response (40%), probably due to the very small sample (5).

A number of the retired alumni completed part 2 but omitted part 3, as they were no longer engaged in veterinary activities. Part 3 was also omitted by a number of recent graduates as their current views of the usefulness of educational methods and technologies had not changed since their recent undergraduate study.

#### 6.1.1.2 Current students

Forms were returned from 122 of 513 students, representing an overall response rate of 23.8%. Response rates for individual student years are shown in Table 6-2:

| *Year* | *No. of responses* | *No. distributed* | *Response rate (%)* |
|---|---|---|---|
| **1st** | 16 | 113 | 14.2% |
| **2nd** | 31 | 116 | 26.7% |
| **3rd** | 19 | 102 | 18.6% |
| **4th** | 38 | 88 | 43.2% |
| **5th** | 18 | 94 | 19.1% |

**Table 6-2: Student response rates for the questionnaire, comparison of different years**

The 2nd year responses are in line with the average response rate, whilst responses from 1st 3rd and 5th year students are under-represented. Responses from 4th year students are over-represented. Possible reasons for this may be because:

- they were the first to receive their questionnaire – and therefore would not have experienced 'questionnaire burnout';
- they received their questionnaires well in advance of examinations and were therefore not yet engaged in heavy revision.

Again, caution is advised over the interpretation of results, as the response rates were generally below the accepted minimum. Citing Goudy (1976), Lydeard (1991) noted that biases are usually eliminated when response rates reach 70% , although response rates above 50% are generally thought to be acceptable for self-administered questionnaires (Reisbig, Hafen *et al.* 2007).

#### 6.1.1.3 Teachers

Fifty members of lecturing staff were each handed a copy of the paper-based questionnaire in person or through the internal mail, after an email message alerting teachers' attention to the questionnaire in advance. Thirty six staff members completed the questionnaire, a response rate of 72%.

It was not possible to divide staff according to their main areas of teaching, because of elements of horizontal and vertical integration in the course, and staff involvement in different years of the course. However it was possible to separate veterinary teachers from non-veterinary teachers, thereby identifying those teachers with responsibility for some clinical teaching (veterinary surgeons) versus non-clinicians (biomedical scientists).

| ***Profession*** | ***Gender*** | | ***Total no. responses*** | ***Overall response rate*** | ***% of total returns*** |
|---|---|---|---|---|---|
| **Veterinary surgeon** | Male | 12 | 21 | 42% | 58.3% |
| | Female | 9 | | | |
| **Non-veterinary scientist** | Male | 9 | 15 | 30% | 41.7% |
| | Female | 6 | | | |

**Table 6-3: Teacher response rates across the two groups of staff**

Twenty one respondents were male, and fifteen were female. The veterinary teacher responses outnumbered the non-veterinary teacher responses, in number and percentage response rate. The higher response from veterinary teachers may reflect a difference in the perceived importance of the questionnaire, or perhaps non-veterinary teachers felt that the questionnaire was less applicable to them, since part 2 asked them to define their undergraduate experience of educational methods and technologies as part of a larger study focused specifically on veterinary education.

### 6.1.2 Assumptions about incomplete responses

Rather than completing both fields about use and availability of a method or technology, some respondents have only checked a response for one field or another. For example, they may have ticked that it was used and rated it, or they have ticked that a technology was available and rated it.

In ‘cleaning’ the data to minimise ‘missing data’, the following assumptions were made:

- If a technology has been used, one must assume that it was available.
- If a technology was not available, one must assume it could not have been used.

However:

- If a technology was not used, one cannot assume that it was not available.
- If a technology was available, one cannot assume that it was used, even when a rating has been provided.

### 6.1.3 Data analysis

A recognised limitation of 5-point Likert scales is that they constitute a relatively small number of response categories, often resulting in data with a low total score variability. Cohen, Manion *et al.* (2000) noted that most respondents prefer not to choose the two extreme poles of the scale, and therefore suggested the use of a 1-7 scale as opposed to a 1-5 scale, thereby realistically presenting participants with five choices as opposed to three. Masters (1974) showed that in situations where low total score variability is achieved with a small number of response categories, reliability can be increased through increasing the number of categories employed. The majority of studies using Likert-type items published in the Journal of Agricultural Education in volumes 27 through 32 used a 1-7 scale (Clason and Dormody 1994). In this study, because of the low scope for variation in responses to a 1-5 Likert scale (compared with a larger scale), differences between the different groups in the ratings of methods/technologies are not dramatically different in the tables displaying medians and quartiles. Differences between the groups of study are more evident on the bar charts, therefore some of these have been included in the main text of the thesis. All bar charts showing availability, use and ratings of methods and technologies are included as Appendix G. These are displayed separately for (i) alumni from different eras (ii) different student years and (iii) veterinary and non-veterinary teachers. Missing values are not displayed so that bars represent valid percentages rather than actual percentages. Groups are not represented on bar charts where the methods or technologies were only used by a minority of respondents (less than 10%), or where confusion exists over their use. In the case of current students these include out-dated technologies such as cine films or audio-cassette recordings, whilst for earlier alumni, these would include more recently implemented methods and technologies such as computer-aided learning or the internet.

#### 6.1.3.1 Alumni (undergraduate experience)

##### 6.1.3.1.1 Caution regarding responses from the pre-Weipers era

Responses from the pre-Weipers period should be considered with some reservation, as these constitute only 4.3% of the total number of responses and are most susceptible to chronological bias in that this group of participants have had to reflect furthest back in time. Depicted on bar charts, this group of responses commonly stands apart from the distribution of responses from the Weipers period onwards.

##### 6.1.3.1.2 Note regarding viable categories

Categories are shown on the bar charts only for those eras in which use of a technology is greater than 10%. Where there were only two viable categories, the Mann-Whitney U test was used instead of the Kruskal-Wallis ANOVA to look for significant differences, the latter being reserved for tests with more than two independent samples.

#### 6.1.3.1.3 Lecture (plenary) based methods and technologies

The perceived availability and use of the lecture-based methods and technologies by alumni of different eras, and the median rating and first and third quartiles, are shown in Table 6-4.

Generally, use mirrors availability for all lecture-based methods and projection technologies, indicating that use was made of available methods by alumni (as undergraduates), and their teachers.

Lectures have continued to be the most heavily used method since pre-Weipers times. Post-mortem demonstrations have also been used by the majority of alumni since the pre-Weipers era, but became ubiquitously used in the Weipers period onwards. A similar pattern emerged for the blackboard, although its availability and use decreased in the Information era. Lantern slides appear to have been widely available and used in the Weipers period, succeeded in the post-Weipers era by the use of acetates and 35mm slides, the latter two types of resources continuing into the Information era, when electronic slide availability and use became widespread.

With regards to the usefulness of these methods, a normal distribution curve of responses for most methods indicates a range of experiences by alumni as undergraduates, however the majority of alumni experiences were positive. Alumni experiences of lectures, post-mortem demonstrations, 35mm slides and electronic slides were almost exclusively positive, whilst a minority of alumni rated the blackboard, lantern slides and acetates as not useful to their learning.

| Method / Technology | Era | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | Pre-Weipers | 100 | 100 | 4 | 4 | 4 | P=0.749 NS |
| | Weipers | 93.6 | 90.4 | 3 | 4 | 5 | |
| | Post-Weipers | 100 | 100 | 4 | 4 | 4 | |
| | Information | 100 | 100 | 4 | 4 | 5 | |
| **Post-mortems** | Pre-Weipers | 69.2 | 61.5 | 3 | 3 | 4 | P=0.002** |
| | Weipers | 92.6 | 88.3 | 4 | 4 | 5 | |
| | Post-Weipers | 96.4 | 95.2 | 4 | 5 | 5 | |
| | Information | 100 | 100 | 4 | 4 | 5 | |
| **Black-board** | Pre-Weipers | 76.9 | 76.9 | 3 | 3 | 4 | P=0.075 NS |
| | Weipers | 89.4 | 85.1 | 3 | 3 | 4 | |
| | Post-Weipers | 89.3 | 82.1 | 3 | 3 | 4 | |
| | Information | 74.8 | 63.1 | 3 | 3 | 3 | |
| **Lantern slides** | Pre-Weipers | 7.7 | 7.7 | - | - | - | - |
| | Weipers | 48.9 | 43.6 | 3 | 3 | 4 | |
| | Post-Weipers | 4.8 | 4.8 | - | - | - | |
| | Information | 3.6 | 2.7 | - | - | - | |
| **Acetates** | Pre-Weipers | 7.7 | 7.7 | - | - | - | P=0.062 NS |
| | Weipers | 47.9 | 45.7 | 3 | 3 | 4 | |
| | Post-Weipers | 95.2 | 95.2 | 3 | 3 | 3 | |
| | Information | 98.2 | 97.3 | 3 | 3 | 3.25 | |
| **35mm slides** | Pre-Weipers | 0 | 0 | - | - | - | P=0.389 NS |
| | Weipers | 56.4 | 53.2 | 3.25 | 4 | 4 | |
| | Post-Weipers | 91.7 | 91.7 | 3 | 4 | 5 | |
| | Information | 85.6 | 83.8 | 3 | 4 | 4 | |
| **Electronic slides** | Pre-Weipers | 7.7 | 7.7 | - | - | - | - |
| | Weipers | 3.2 | 1.1 | - | - | - | |
| | Post-Weipers | 1.2 | 1.2 | - | - | - | |
| | Information | 70.3 | 69.4 | 3 | 4 | 4 | |

**Table 6-4: Perceived availability, use and rating of lecture-based methods and technologies by alumni from different eras**

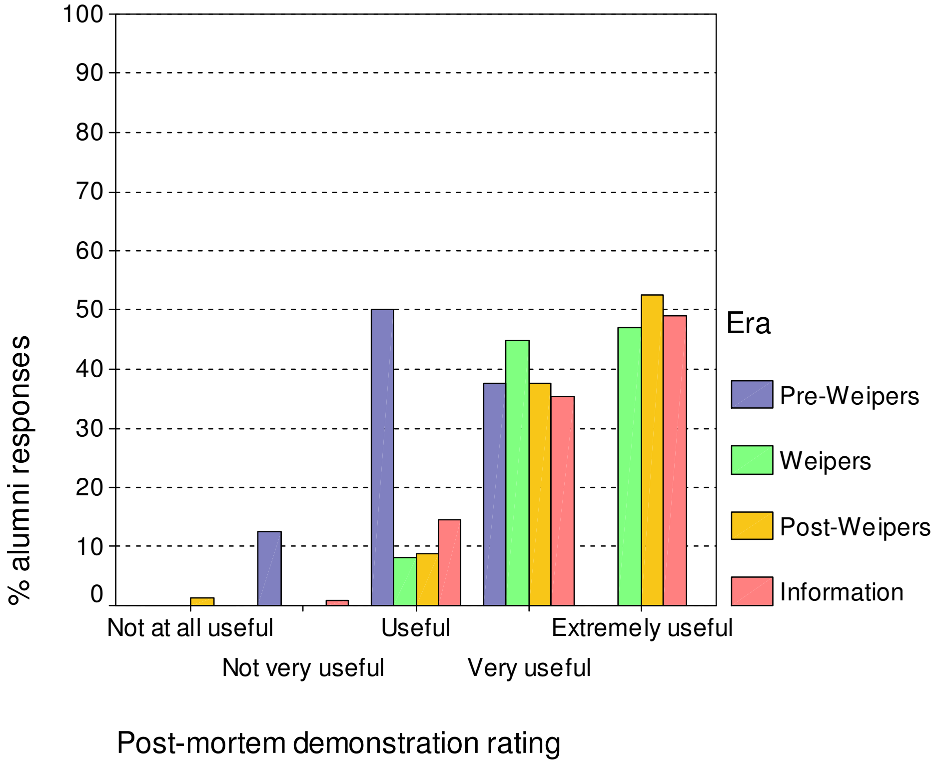


**Figure 6-1: Usefulness of post-mortem demonstrations as perceived by different alumni groups**

Figure 6-1 shows that the distribution of responses from the Weipers, post-Weipers and Information eras are comparable, with the pre-Weipers era set apart, indicating a lower overall rating from this era.

Table 6-5 lists the reasons for alumni ratings of lecture-based methods and technologies, and courses where these were used to good effect. Asterisks represent topics or lecturers that were not actually 'courses', but which made an impact on students to the extent that they listed them as such.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Lectures** | ☑ Standard / main method of teaching<br>☑ Efficient for large student numbers<br>☑ Lecturer emphasised relevant information; provided evidence-based information from practice; could enthuse & motivate learners; provided structure / direction / focus / key points<br>☑ 'Best' way to learn<br>☑ 'Got me through exams'<br>☑ Exposed to most recent information / research<br>☑ Good for theory<br>☑ Access to visual images<br>☑ Accompaniment to student notes<br>☑ Remembered information better if heard before read<br>☑ Face to fact contact; focus for discussion & interaction<br>*However*<br>☒ Quality variable dependent on lecturer – some lectures soporific, boring, led to daydreaming | 'All subjects' / 'Most subjects' / 'Preclinical subjects'<br>Anatomy, Bacteriology, Embryology, Farm animal medicine, Histopathology, Parasitology, Pathology, Pharmacology, Physiology, Small animal medicine, Surgery & reproduction |
| **Post-mortems** | ☑ Broad range of case examples (although random) followed from admission to post-mortem<br>☑ Fostered multidisciplinary subject integration (especially between pathology and medicine)<br>☑ Well run / presented / debated<br>☑ Visualisation of clinical conditions and underlying pathology aided memorisation<br>☑ Interesting / stimulating / memorable<br>☑ Practical / hands on<br>☑ Complemented lectures; provided 'in the flesh' examples of theory<br>*However*<br>☒ Too many students led to poor visibility | Anatomy, Bacteriology, Large animal medicine, Meat inspection, Pathology, (Small animal medicine to a lesser extent), Veterinary public health |
| **Blackboard & chalk** | ☑ Standard method of teaching (Weipers era)<br>☑ Allowed time for note-taking (but slow for some)<br>☑ Useful for diagrams / flowcharts / illustrations of dynamic processes<br>☑ Used for headings, lists, key points<br>☑ Interactive when used in discussion<br>☑ Allowed for spontaneous and step-wise explanations | 'Most subjects' (Weipers era)<br>**Anatomy** (in particular), Animal Husbandry Embryology, Histology, Physiology, Microbiology, |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| | *However*<br>☒ Sometimes difficult to see; or lacked visual impact / boring / dry; dependent on lecturer ability | Surgery |
| **Lantern slides** | ☑ Interesting<br>*However*<br>☒ Limited use (Weipers era)<br>☒ Monochrome | Embryology, Histology, Histopathology, Parasitology, Pathology, Medicine Microbiology |
| **Acetates** | ☑ Like blackboard but more colours ('prettier')<br>☑ Good freehand illustration generated greater class involvement<br>☑ Useful in discussion (best in small groups)<br>☑ Pre-prepared acetates saved lecturer's time<br>*However*<br>☒ Sometimes difficult to see (often too much text on one sheet or handwriting illegible)<br>☒ Quality dependent on skill of lecturer<br>☒ Could be soporific | 'Most subjects'<br>Anatomy, Histology, Medicine, Pathology, Pharmacology (calculations) Physiology, Surgery |
| **35mm slides** | ☑ 'Essential'<br>☑ High quality colour images projected for the first time<br>☑ Pictures of 'real' animals<br>☑ Illustrations of clinical cases not likely to see otherwise, and pathological material<br>☑ Provided clarity / understanding / aide memoire<br>*However*<br>☒ Prone to technical glitches<br>☒ Soporific<br>☒ Dependent on skill of lecturer | Anatomy, Histology, Histopathology, Medicine, Microbiology, **Ophthalmology*** (in particular), Parasitology, **Pathology** (in particular), Surgery |
| **Electronic slides (PowerPoint)** | ☑ Good quality images and text<br>☑ Handout precluded need for note-taking<br>☑ Photos and video useful for visualisation<br>*However*<br>☒ Usefulness dependent on lecturer's skills (especially technical ability)<br>☒ Often overused<br>☒ Too much information presented too quickly | 'All subjects' (Information era)<br>Anatomy, Guest lecturers*, Medicine, Pathology, Surgery |

**Table 6-5: Lecture-based methods – alumni reasons for rating and courses where used to good effect**

#### 6.1.3.1.4 Small group tutorial methods and technologies

The perceived availability and use of the small group methods and technologies by alumni of different eras, and the median rating and first and third quartiles, are shown in Table 6-6.

| Method / Technology | Alumni era | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Peer-assisted learning** | Pre-Weipers | 53.8 | 46.2 | 3 | 3 | 4 | P=0.069 NS |
| | Weipers | 61.7 | 61.7 | 3 | 4 | 4 | |
| | Post-Weipers | 64.3 | 58.3 | 3 | 3 | 4 | |
| | Information | 82 | 75.7 | 3 | 3 | 4 | |
| **One-to-one tutorials** | Pre-Weipers | 38.5 | 30.8 | 4 | 5 | 5 | P=0.302 NS |
| | Weipers | 67 | 67 | 4 | 4 | 5 | |
| | Post-Weipers | 89.3 | 89.3 | 4 | 5 | 5 | |
| | Information | 92.8 | 91 | 4 | 5 | 5 | |
| **Group tutorials** | Pre-Weipers | 23.1 | 23.1 | 3 | 4 | 4 | P=0.738 NS |
| | Weipers | 71.3 | 71.3 | 3 | 4 | 5 | |
| | Post-Weipers | 95.2 | 94 | 3 | 4 | 5 | |
| | Information | 100 | 100 | 3.75 | 4 | 4 | |
| **Flipcharts / Whiteboard** | Pre-Weipers | 0 | 0 | - | - | - | P=0.414 NS |
| | Weipers | 20.2 | 18.1 | 3 | 3 | 3 | |
| | Post-Weipers | 58.3 | 54.8 | 3 | 3 | 4 | |
| | Information | 87.4 | 86.5 | 3 | 3 | 4 | |

**Table 6-6: Perceived availability, use and rating of small group tutorial methods and technologies by alumni from different eras**

As with lecture-based methods, use generally mirrors availability for all small group tutorial methods and technologies.

Peer-assisted learning was available and used in the pre-Weipers, Weipers and post-Weipers eras but its use escalated in the Information era. The use of one-to-one tutorials and group tutorials increased successively with each consecutive era. Flipcharts were not available to students of the pre-Weipers period, but their use increased over time since their introduction in the Weipers era.

While a minority of alumni appear to have had reservations about the value of peer-assisted learning, group tutorials and flipcharts, alumni experiences were generally positive, those of one-to-one tutorials including EMS exclusively so.

Table 6-7 lists the reasons for alumni ratings of small group tutorial methods and technologies, and courses where these were used to good effect. As before, asterisks represent topics or lecturers that were not actually 'courses', but which made an impact on students to the extent that they listed them as such.

| **Method / technology** | **Reasons for rating** | **Courses where used to good effect** |
|---|---|---|
| **Peer-assisted learning** | ☑ 'We learned from each other'<br>☑ Informal / relaxed;<br>Easier to ask questions of peers [than teachers]<br>☑ Good for revision<br>☑ Stimulating / motivating<br>*However*<br>☒ Dependent on who was in the group<br>(could be competitive or dominated by one or two individuals) | Anatomy,<br>Animal husbandry,<br>Clinical years,<br>Medicine,<br>Pathology,<br>Practical classes,<br>Surgery |
| **One-to-one tutorials (inc. EMS)** | ☑ EMS essential for development of practical and communication ('job') skills<br>☑ 'Hands' on<br>*However*<br>☒ Dependent on tutor | Medicine,<br>**Seeing practice / EMS** (in particular)<br>Some clinical rotations,<br>Surgery |
| **Group tutorials** | ☑ Opportunity for informal discussion and questions<br>☑ Reinforced / consolidated learning<br>☑ More tutor contact time<br>☑ Encouraged participation of all students<br>*However*<br>☒ Quiet / shy students sometimes overshadowed by more confident students | Anatomy,<br>Animal husbandry,<br>Biochemistry,<br>**Clinical subjects**<br>(in particular),<br>Medicine,<br>Pathology,<br>Pharmacology,<br>Physiology,<br>Reproduction,<br>Surgery |
| **Flipcharts / Whiteboards** | ☑ Good for brainstorming and bullet points<br>☑ Diagrams for explanations and answering questions<br>☑ Used in same way as the blackboard<br>*However*<br>☒ Messy<br>☒ Time-consuming to flip through pages<br>☒ Limited to small groups only | Anatomy,<br>Communication skills*,<br>**Farm animal medicine**<br>(in particular),<br>Parasitology,<br>Surgery |

**Table 6-7: Small group tutorial methods – alumni reasons for rating and courses where used to good effect**

#### 6.1.3.1.5 Directed self study methods and technologies

The perceived availability and use of the directed self-study methods and technologies by alumni of different eras, and the median rating and first and third quartiles, are shown in Table 6-8.

| Method / Technology | Alumni era | Availability (%) | Use (%) | Q1 | Median | Q3 | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| **Textbooks** | Pre-Weipers | 92.3 | 84.6 | 4 | 5 | 5 | P=0.287 NS |
| | Weipers | 100 | 100 | 3 | 4 | 5 | |
| | Post-Weipers | 100 | 100 | 3 | 4 | 4.25 | |
| | Information | 100 | 99.1 | 3 | 4 | 5 | |
| **Student notes** | Pre-Weipers | 30.8 | 23.1 | 3.25 | 4 | 4 | P=0.046* |
| | Weipers | 56.4 | 54.3 | 4 | 4 | 5 | |
| | Post-Weipers | 97.6 | 97.6 | 4 | 5 | 5 | |
| | Information | 100 | 100 | 4 | 5 | 5 | |
| **Handouts** | Pre-Weipers | 15.4 | 15.4 | 4 | 4 | 4 | P=0.017* |
| | Weipers | 63.8 | 61.7 | 4 | 4 | 5 | |
| | Post-Weipers | 94 | 92.9 | 3 | 4 | 5 | |
| | Information | 97.3 | 97.3 | 3 | 4 | 4 | |
| **Journals** | Pre-Weipers | 46.2 | 38.5 | 2.5 | 4 | 4.5 | P=0.005** |
| | Weipers | 68.1 | 63.8 | 3 | 3 | 4 | |
| | Post-Weipers | 86.9 | 83.3 | 3 | 3 | 4 | |
| | Information | 93.7 | 85.6 | 3 | 3 | 3.25 | |
| **Tape-slide programmes** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 3.2 | 1.1 | - | - | - | |
| | Post-Weipers | 45.2 | 33.3 | 2 | 3 | 4 | |
| | Information | 8.1 | 6.3 | - | - | - | |
| **Computer-aided learning** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 1.1 | 1.1 | - | - | - | |
| | Post-Weipers | 1.2 | 0 | - | - | - | |
| | Information | 69.4 | 64 | 2 | 3 | 4 | |
| **Internet** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 1.1 | 1.1 | - | - | - | |
| | Post-Weipers | 1.2 | 0 | - | - | - | |
| | Information | 44.1 | 29.7 | 3 | 3 | 4 | |

**Table 6-8: Perceived availability, use and rating of directed self study methods and technologies by alumni from different eras**

As with previously discussed methods and technologies, use generally mirrors availability for directed self-study methods and technologies.

Like lectures, textbooks were ubiquitously used from the pre-Weipers era onwards. Printed student notes and handouts, introduced in the pre-Weipers period, increased in use over the Weipers era, becoming ubiquitously used in the post-Weipers and Information eras. Journal use also increased over time since their introduction in the pre-Weipers era. Tape-slide programmes were used by a third of alumni in the post-Weipers era, their use replaced by computer-aided learning programmes in the Information era. Internet use was limited to the Information era, when about a third of the alumni from this era made use of it.

As before, a wide range of ratings reflect different alumni experiences of these methods. Whilst a minority of alumni rated textbooks, journals, tape-slide programmes and computer-aided learning programmes as not useful, the majority of alumni rated most methods positively, and student notes exclusively so (as can be seen in Figure Figure 6-2).

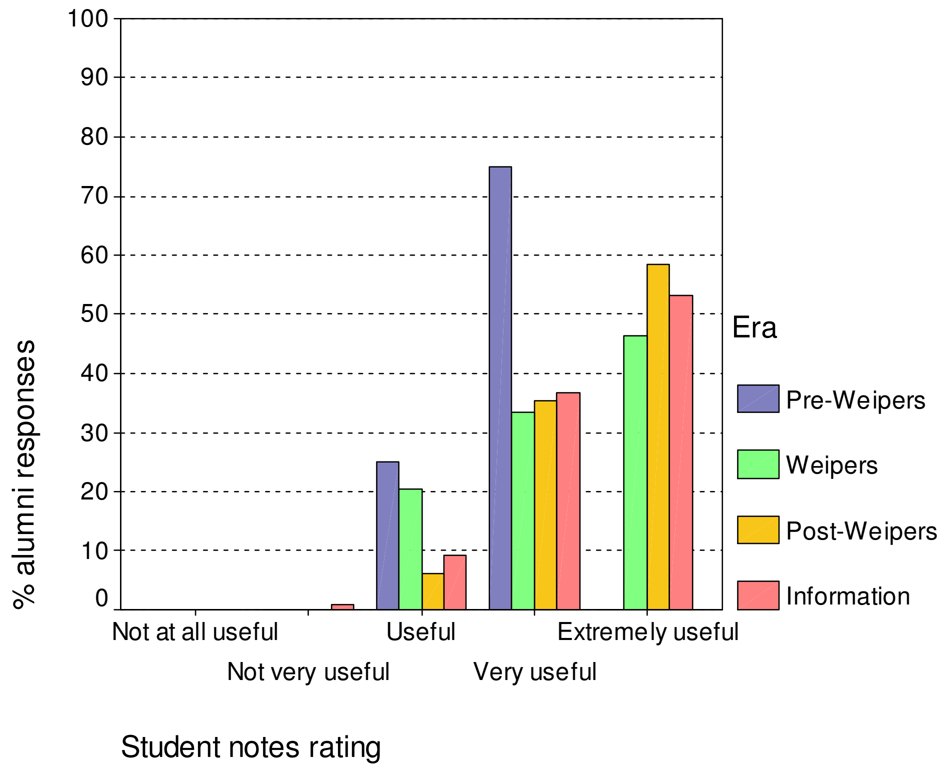


**Figure 6-2: Usefulness of printed student notes as perceived by different alumni groups**

Table 6-9 lists the reasons for alumni ratings of directed self-study methods and technologies, and courses where these were used to good effect.

| **Method / technology** | **Reasons for rating** | **Courses where used to good effect** |
|---|---|---|
| **Textbooks** | ☑ Mainly for reference / additional information<br>☑ Clarification of information in lectures / course notes<br>☑ Main source of private study for some<br>☑ Can use at own pace<br>*However*<br>☒ Expensive<br>☒ Sometimes conflicting information<br>☒ Often too much detail<br>☒ Limited range (Weipers era) | 'All subjects' / 'Throughout the course'<br>Anatomy (*Sisson*), Biochemistry, Histology, Histopathology, Medicine (*Blood & Henderson*), Microbiology, Parasitology, Pathology, Physiology (*Vander*), Surgery |
| **Student notes** | ☑ 'Learn and pass' – all examinable material<br>☑ Closely related to lectures, could read beforehand<br>☑ 'Takeaway' resource to use at own pace<br>☑ Concise summary of course<br>☑ Precluded need for note-taking so promoted concentration in lectures<br>☑ Could annotate notes<br>*However*<br>☒ Became outdated unless regularly updated | 'All subjects' / 'Throughout the course'<br>Anatomy, Animal husbandry, Ophthalmology*, Physiology, Parasitology, Pathology, Microbiology, Pharmacology, Reproduction, Small and large animal medicine, Surgery |
| **Handouts** | ☑ Supplement to lectures / printed notes<br>☑ Could annotate during lectures<br>☑ Saved having to draw diagrams in class<br>☑ Ensured student attendance at lectures<br>*However*<br>☒ Varied in quality<br>☒ Individual pieces of paper easily misfiled / lost | 'All subjects' / 'Throughout course'<br>Anaesthesia, Anatomy, Animal husbandry, Histology, Large and small animal medicine, Microbiology, Physiology, Pathology, Parasitology (life cycles), Pharmacology, Surgery |
| **Journals** | ☑ Up to date; informative<br>☑ Expands / broadens knowledge<br>☑ Useful when directed to a specific article<br>☑ Review articles useful for Medicine & Surgery<br>*However*<br>☒ Not enough time to read them<br>☒ Often too detailed for undergraduates | 'All subjects'<br>Animal husbandry, Medicine, Clinical subjects (*In Practice*, *Veterinary Record*), Reproduction, Surgery |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Tape-slide programmes** | ☑ Useful for revision<br>☑ Could use at own pace<br>*However*<br>☒ Hard to concentrate<br>☒ A bit boring | **Anatomy**<br>(in particular)<br>Histology / Embryology, Microbiology, Ophthalmology, Pathology |
| **Computer-aided learning** | ☑ Good for self-directed learning; can work at own pace<br>☑ Better for revision than learning; serves as a reinforcement tool<br>☑ Useful for self-tests; assessment is 'non-judgemental'<br>☑ Not a substitute for lectures / tutorials<br>*However*<br>☒ Variable quality<br>☒ Can be slow<br>☒ Limited access to computers<br>☒ 'Don't like looking at computer-screen for long periods' | Anatomy<br>Histology / Embryology,<br>Farm animal medicine,<br>Pathology,<br>Small animal medicine (anaesthesia, cardiology, diagnostic imaging),<br>Veterinary Public Health |
| **Internet** | ☑ 'Not yet invented' / 'In its infancy' for many respondents<br>☑ Useful for researching projects<br>☑ Access to latest data<br>*However*<br>☒ Often slow (computers and internet connection)<br>☒ Difficult to sift through lots of irrelevant material | Medicine,<br>Pathology, Veterinary Public Health |

**Table 6-9: Directed self-study methods – alumni reasons for rating and courses where used to good effect**

#### 6.1.3.1.6 Practical ('Hands-on' training) – preclinical, paraclinical and clinical

The perceived availability and use of the practical methods and technologies by alumni of different eras, and the median rating and first and third quartiles, are shown in Table 6-10.

| Method / Technology | Alumni era | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Practicals** | Pre-Weipers | 100 | 100 | 3 | 4 | 4.25 | P=0.207$^{NS}$ |
| | Weipers | 100 | 100 | 4 | 4 | 5 | |
| | Post-Weipers | 100 | 100 | 4 | 4 | 5 | |
| | Information | 100 | 100 | 4 | 5 | 5 | |
| **Hands-on clinical training** | Pre-Weipers | 46.2 | 46.2 | 2.5 | 3 | 4 | P=0.001** |
| | Weipers | 89.4 | 89.4 | 4 | 5 | 5 | |
| | Post-Weipers | 100 | 100 | 4 | 5 | 5 | |
| | Information | 100 | 100 | 4 | 5 | 5 | |
| **Posters** | Pre-Weipers | 15.4 | 0 | - | - | - | P=0.094$^{NS}$ |
| | Weipers | 33 | 31.9 | 2 | 3 | 3 | |
| | Post-Weipers | 63.1 | 58.3 | 2 | 3 | 3 | |
| | Information | 72.1 | 57.7 | 2 | 3 | 3 | |
| **Models** | Pre-Weipers | 30.8 | 23.1 | 3 | 3 | 3 | P=0.219$^{NS}$ |
| | Weipers | 39.4 | 38.3 | 3 | 4 | 4 | |
| | Post-Weipers | 73.8 | 70.2 | 3 | 3 | 4 | |
| | Information | 83.8 | 79.3 | 3 | 3 | 4 | |
| **Preserved specimens** | Pre-Weipers | 69.2 | 69.2 | 2.5 | 3 | 3.5 | P=0.331$^{NS}$ |
| | Weipers | 88.3 | 86.2 | 3 | 3 | 4 | |
| | Post-Weipers | 96.4 | 91.7 | 2.5 | 3 | 4 | |
| | Information | 88.3 | 82 | 2 | 3 | 4 | |

**Table 6-10: Perceived availability, use and rating of practical methods and technologies by alumni from different eras**

Use of practical (hands-on) training methods generally mirrors availability.

Like lectures and textbooks, practical classes were ubiquitously used and available throughout the four eras of study. Hands-on clinical training, used by about half of pre-Weipers alumni, were ubiquitously used in the following three eras. Posters became increasingly available over time, although noticeable usage did not begin until the Weipers era. The use of models (including skeletons) increased over time from the pre-Weipers era, whilst preserved specimens were heavily used throughout the four eras.

In general (with the exception of posters), the methods were generally rated positively, with practical classes exclusively so. Hands-on clinical training was rated negatively by about 20% of pre-Weipers alumni, but was almost exclusively positively rated by alumni from the following three eras, as can be seen in Figure 6-3.

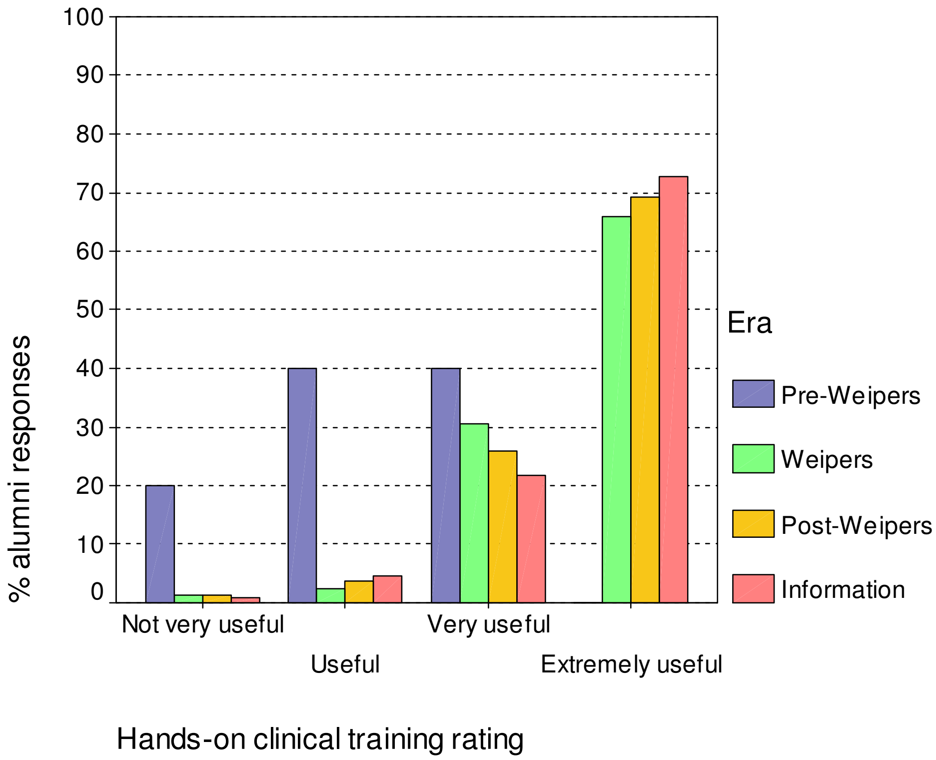


**Figure 6-3: Usefulness of hands-on clinical training as perceived by alumni from different eras**

Table 6-11 lists the reasons for alumni ratings of practical methods and technologies, and courses where these were used to good effect.

| **Method / technology** | **Reasons for rating** | **Courses where used to good effect** |
|---|---|---|
| **Practicals** | ☑ Essential 'hands on'<br>☑ Fun<br>☑ Engaged multiple senses (sight, smell, sound)<br>☑ Development of motor and observation skills<br>☑ Visualisation enhanced understanding<br>☑ Reinforced lectures / consolidated theory<br>*However*<br>☒ Variable usefulness<br>☒ Inadequate number of demonstrators | **Anatomy** (in particular), Biochemistry, Clinical studies, Histology / Embryology, Meat inspection Medicine, Parasitology, **Pathology** (in particular), Physiology, **Surgery** (in particular) |
| **Hands-on clinical training** | ☑ 'No substitute for the real thing'<br>☑ 'Highlight' of the course<br>☑ Essential / vital | Anatomy (topography), Animal husbandry, Clinical subjects in fourth and final year, |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| | ☑ Reinforced book learning / consolidated theory<br>☑ Development of animal handling skills<br>☑ Relevant to future job as a veterinary surgeon<br>*However*<br>☒ 'Not enough of it' | EMS / seeing practice, Farm and small animal **medicine** (in particular), **Surgery** (in particular), Reproduction (pregnancy diagnosis) |
| **Posters** | ☑ Useful for learning breeds<br>☑ Quick reference tool<br>☑ Diagrams useful<br>*However*,<br>☒ Limited application<br>☒ Did not attract attention / 'Boring' / 'Couldn't be bothered to stand reading' | **Anatomy** (in particular), **Animal husbandry** (in particular), Microbiology (bacteriology) |
| **Models** | ☑ Next best alternative to 'real thing'<br>☑ 3D visualisation of structures<br>☑ Showed skeletal relationships<br>*However*<br>☒ Not always realistic<br>☒ Limited use | **Anatomy** (in particular), Animal husbandry, Physiology, Reproduction (bovine obstetrics; including haptic simulator), **Surgery** (orthopaedics in particular) |
| **Preserved specimens** | ☑ Examples of rare conditions / anomalies not otherwise seen<br>☑ 3D visualisation<br>☑ Reference for students' own dissections<br>*However*<br>☒ Different appearance and texture from fresh specimens<br>☒ Offensive smell / gruesome / grim<br>☒ Limited application | **Anatomy** (in particular), Embryology, Parasitology, Reproduction, **Surgery** (in particular) |

**Table 6-11: Practical methods – alumni reasons for rating and courses where used to good effect**

#### 6.1.3.1.7 Audiovisual aids

The perceived availability and use of the miscellaneous audiovisual technologies by alumni of different eras, and the median rating and first and third quartiles, are shown in Table 6-12.

| Method / Technology | Alumni era | Availability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Median | Q3 | |
| **Closed-Circuit Television** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 5.3 | 5.3 | - | - | - | |
| | Post-Weipers | 7.1 | 3.6 | - | - | - | |
| | Information | 7.2 | 2.7 | - | - | - | |
| **Cine film** | Pre-Weipers | 0 | 0 | - | - | - | $P=0.488^{NS}$ |
| | Weipers | 46.8 | 42.6 | 3 | 3 | 4 | |
| | Post-Weipers | 50 | 47.6 | 3 | 3 | 4 | |
| | Information | 9.9 | 9 | - | - | - | |
| **Educational TV** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 5.3 | 5.3 | - | - | - | |
| | Post-Weipers | 8.3 | 2.4 | - | - | - | |
| | Information | 11.7 | 8.1 | - | - | - | |
| **Audio recordings** | Pre-Weipers | 0 | 0 | - | - | - | - |
| | Weipers | 6.4 | 4.3 | - | - | - | |
| | Post-Weipers | 23.8 | 11.9 | 2 | 2 | 3 | |
| | Information | 13.5 | 5.4 | - | - | - | |
| **Video recordings** | Pre-Weipers | 0 | 0 | - | - | - | $P=0.605^{NS}$ |
| | Weipers | 8.5 | 7.4 | - | - | - | |
| | Post-Weipers | 36.9 | 34.5 | 3 | 3 | 4 | |
| | Information | 81.1 | 73 | 3 | 3 | 4 | |

**Table 6-12: Perceived availability, use and rating of miscellaneous audiovisual technologies by alumni from different eras**

Again, use generally mirrors availability of miscellaneous audiovisual aids. Closed-circuit television and educational television were experienced by a small minority of alumni from the Weipers era onwards. Cine film was used by half of the Weipers alumni and half of the post-Weipers alumni, replaced with video tape recordings, which came into use in the post-Weipers era and proliferated in the Information era. Audio tape recordings were available and used from the Weipers era onwards, most heavily used in the post-Weipers era but still only by a minority of alumni. There was a negative skew in the rating of audio recordings by post-Weipers alumni. The ratings for CCTV and educational TV have not been displayed due to their scarce use. A normal distribution of responses for cine film ratings indicate a range of positive and negative experiences in the Weipers and post-Weipers era, the majority being positive. Video tape recordings were rated almost exclusively positively from their introduction in the post-Weipers period.

Table 6-13 lists the reasons for alumni ratings of miscellaneous audiovisual methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Closed-Circuit Television** | ☑ Used in physiology to reduce number of laboratory practical animals<br>☒ Very limited use<br>☒ Poor visibility of surgery demonstrations | Anatomy, Embryology, Histology |
| **Cine film** | ☑ Memorable<br>☑ Demonstration of locomotion / gait<br>☑ Animal behaviour demonstrations<br>☑ Visual imagery of exotic / rare diseases<br>☑ Demonstration of surgical techniques<br>*However*<br>☒ Variable quality<br>☒ Generally no sound | Medicine (neurology; rabies), Parasitology, Surgery (bovine obstetric surgery in particular; equine lameness) |
| **Educational TV** | Very limited use | ("James Herriot?") |
| **Audio recordings** | ☑ Self-study aid<br>☑ 'In car' learning<br>☑ Commercial product promotion<br>*However*<br>☒ Lacks visual stimulus<br>☒ Not interactive<br>☒ Very limited application | Cardiology* (auscultation of heart sounds) |
| **Video recordings** | ☑ Demonstration of gait; abnormal behaviour; surgical techniques; and rare cases<br>☑ Good view of laboratory demonstrations<br>☑ Self-study aid<br>*However*<br>☒ Much information irrelevant<br>☒ Variable quality<br>☒ Limited access | Medicine (neurology), Surgery (orthopaedics, anaesthesia, equine lameness) |

**Table 6-13: Miscellaneous audiovisual technologies – alumni reasons for rating and courses where used to good effect**

### 6.1.3.2 Current students

#### 6.1.3.2.1 Lecture (plenary) based methods and technologies

The perceived availability and use of the lecture-based methods and technologies by different student years, and the median rating and first and third quartiles, are shown in Table 6-14.

| Method / Technology | Year | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | 1 | 100 | 100 | 4 | 4 | 5 | P=0.904[NS] |
| | 2 | 100 | 100 | 3 | 4 | 4.25 | |
| | 3 | 100 | 100 | 4 | 4 | 5 | |
| | 4 | 100 | 100 | 3 | 4 | 5 | |
| | 5 | 94.4 | 94.4 | 3 | 4 | 4.25 | |
| **Post mortems** | 1 | 50 | 50 | 4 | 5 | 5 | P=0.024* |
| | 2 | 51.6 | 35.5 | 4 | 4 | 4 | |
| | 3 | 89.5 | 89.5 | 4 | 4 | 5 | |
| | 4 | 100 | 100 | 3 | 4 | 4 | |
| | 5 | 94.4 | 94.4 | 3 | 4 | 4 | |
| **Blackboard** | 1 | 87.5 | 87.5 | 2 | 2 | 3 | P=0.005** |
| | 2 | 93.5 | 93.5 | 3 | 3 | 4 | |
| | 3 | 94.7 | 89.5 | 2 | 3 | 3 | |
| | 4 | 89.5 | 65.8 | 2 | 3 | 4 | |
| | 5 | 66.7 | 55.6 | 2 | 2 | 3 | |
| **Lantern slides** | 1 | 0 | 0 | - | - | - | - |
| | 2 | 3.2 | 3.2 | - | - | - | |
| | 3 | 5.3 | 0 | - | - | - | |
| | 4 | 0 | 0 | - | - | - | |
| | 5 | 0 | 0 | - | - | - | |
| **Acetates** | 1 | 100 | 100 | 3 | 3 | 3 | P=0.025* |
| | 2 | 100 | 96.8 | 3 | 3 | 4 | |
| | 3 | 100 | 100 | 2 | 3 | 3 | |
| | 4 | 100 | 92.1 | 3 | 3 | 3 | |
| | 5 | 100 | 100 | 3 | 3 | 3 | |
| **35mm slides** | 1 | 12.5 | 6.2 | - | - | - | P=0.014* |
| | 2 | 90.3 | 90.3 | 3 | 3 | 4 | |
| | 3 | 63.2 | 63.2 | 2 | 3 | 3 | |
| | 4 | 86.8 | 86.8 | 3 | 3 | 3 | |
| | 5 | 77.8 | 72.2 | 2.5 | 3 | 3.5 | |
| **Electronic slides** | 1 | 93.7 | 93.7 | 4 | 5 | 5 | P=0.025* |
| | 2 | 96.8 | 93.5 | 4 | 5 | 5 | |
| | 3 | 94.7 | 94.7 | 4 | 5 | 5 | |
| | 4 | 84.2 | 78.9 | 4 | 4 | 5 | |
| | 5 | 100 | 100 | 3.75 | 4 | 4 | |

**Table 6-14: Perceived availability, use and rating of lecture-based methods and technologies by different student years**

For each technology, use generally mirrors availability, indicating that students used the technologies available to them and their teachers.

Lectures, acetates and electronic slides were considered to be available to all student years, and were used to support teaching throughout the BVMS course.

The increasing availability of post-mortem demonstrations from one year to the next reflects increased exposure to the students of this type of teaching, particularly from 3rd year onwards, where post-mortem demonstrations constitute a main component of gross pathology teaching, and were the hallmark of clinico-pathological integration from 4th year onwards.

The ratings of the methods and technologies differ – with lectures, electronic slides and post-mortem demonstrations generally rated more highly than older projection technologies such as blackboards or acetates which remain in use. Blackboard use appears to decline after 2nd year, when it was most heavily used by preclinical teachers in anatomy and physiology.

There existed some confusion about the use of lantern and 35mm slides by students, highlighting their unfamiliarity with either projection method.

Table 6-15 lists the reasons for student ratings of lecture-based methods and technologies, and courses where these were used to good effect.

| **Method / technology** | **Reasons for rating** | **Courses where used to good effect** |
|---|---|---|
| **Lectures** | ☑ Necessary<br>☑ 'All we need to know'<br>☑ Concisely summarises main points<br>☑ Pictures / videos helpful<br>☑ Good to have PowerPoint handout in advance<br>*However*<br>☒ Quality variable – dependent on lecturer<br>☒ Unnecessary repetition due to lack of communication between lecturers<br>☒ Sometimes too much detail | 'All subjects'<br>Anatomy, Animal husbandry, Biomolecular sciences, Fourth year clinical subjects (CAS, CIC), Parasitology, Pathology, Physiology, Virology |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Post-mortems** | ☑ 'Hands on'; practical<br>☑ 3D visualisation of diseases; understanding of disease processes<br>☑ Good quality images<br>☑ Consolidates learning from lectures<br>☑ Can follow cases from admission to post-mortem<br>*However*<br>☒ Not frequent enough | **Anatomy** (in particular), Final clinical year, Fourth year combined integrated course (CIC), **Pathology** (in particular), Veterinary public health |
| **Blackboard & chalk** | ☑ Good to follow drawing / see incremental build up of diagrams<br>☑ Slows lecturer down to students' pace<br>☑ Useful for spelling, formulae<br>*However*<br>☒ Difficult to read (handwriting)<br>☒ Lectures unstructured (if primarily used method) | **Anatomy** (in particular), Biomolecular sciences (e.g. Krebs cycle), Pharmacology, Physiology |
| **Lantern slides** | Not used | None |
| **Acetates** | ☑ As blackboard, can follow drawing of diagrams<br>☑ Information can be added spontaneously by lecturer<br>☑ OK if written at pace students can keep up with, and if projector focused, optimal lighting in room<br>☑ Technically simple<br>*However*<br>☒ Often too fast for students to copy<br>☒ Illegible handwriting<br>☒ Poor visibility from back of class<br>☒ 'Not as good as PowerPoint' | **Anatomy** (in particular), Animal husbandry, Biomolecular sciences, **Physiology** (in particular) |
| **35mm slides** | ☑ 'Nice' photographs / illustrations, particularly of disease / lesions<br>*However*<br>☒ Variable quality (some old, scratched)<br>☒ Cannot refer back (as with PowerPoint)<br>☒ Prone to overuse by 'trigger happy' lecturers<br>☒ Technical glitches frustrating<br>☒ Text slides not clear | **Anatomy** (in particular), Fourth year clinical subjects (CAS, CIC), Histology, Pathology |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Electronic slides (PowerPoint)** | ☑ Clear, detailed images; clear text<br>☑ Good use of colour<br>☑ Multimedia capabilities<br>☑ Can print handouts in advance; enabling students to listen in lectures<br>☑ Available online for revision or if missed class<br>☑ Bullet points focus attention<br>*However*<br>☒ Lecturers tend to go too fast through slides<br>☒ Technical glitches have delayed lecture | 'All subjects'<br>**Anatomy** (in particular), Animal husbandry, Biomolecular sciences, Fourth year clinical subjects (CAS, CIC), Parasitology, **Pathology** (in particular), Physiology |

**Table 6-15: Lecture-based methods – student reasons for rating and courses where used to good effect**

#### 6.1.3.2.2 Small group tutorial methods and technologies

The perceived availability and use of the small group tutorial methods and technologies by different student years, and the median rating and first and third quartiles, are shown in Table 6-16.

| Method / Technology | Year | Avail-ability (%) | Used by (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Peer-assisted learning** | 1 | 75 | 62.5 | 2.25 | 4 | 4 | $P=0.726^{NS}$ |
| | 2 | 90.3 | 87.1 | 3 | 3 | 4 | |
| | 3 | 73.7 | 68.4 | 2 | 4 | 4.25 | |
| | 4 | 81.6 | 71.1 | 2.25 | 3 | 4 | |
| | 5 | 88.9 | 77.8 | 2 | 3 | 4 | |
| **One-to-one tutorials** | 1 | 93.7 | 93.7 | 4 | 5 | 5 | $P=0.122^{NS}$ |
| | 2 | 80.6 | 77.4 | 4 | 4.5 | 5 | |
| | 3 | 84.2 | 84.2 | 4 | 5 | 5 | |
| | 4 | 94.7 | 94.7 | 4 | 5 | 5 | |
| | 5 | 94.4 | 88.9 | 4 | 4 | 5 | |
| **Group tutorials** | 1 | 93.7 | 93.7 | 2.75 | 3.50 | 4 | P=0.024* |
| | 2 | 90.3 | 90.3 | 3 | 3 | 4 | |
| | 3 | 94.7 | 89.5 | 3 | 4 | 4 | |
| | 4 | 97.4 | 92.1 | 3 | 4 | 5 | |
| | 5 | 100 | 100 | 3.5 | 4 | 5 | |
| **Flipcharts / Whiteboard** | 1 | 81.2 | 81.2 | 2.75 | 3 | 3 | $P=0.372^{NS}$ |
| | 2 | 77.4 | 67.7 | 3 | 3 | 4 | |
| | 3 | 100 | 94.7 | 3 | 3 | 3.5 | |
| | 4 | 97.4 | 89.5 | 3 | 3 | 4 | |
| | 5 | 66.7 | 66.7 | 3 | 3 | 3.75 | |

**Table 6-16: Perceived availability, use and rating of small group tutorial methods and technologies by different student years**

As with lecture-based methods, use of small-group tutorial methods mirrors availability.

Peer-assisted learning, one-to-one tutorials, group tutorials and flipcharts were used by the majority of students in each year. It is clear from the wide-range of responses regarding usefulness that not all students considered themselves to have benefited from peer-assisted learning, and this type of learning has yet to be formalised within the curriculum. While one-to-one tutorials (incorporating EMS) were highly valued, and group tutorials were generally considered to be very useful, there were a minority of students who did not find group tutorials to be very useful. Flipcharts were rated as generally useful, but less so than the tutorials, perhaps indicating that it is the social interaction between teachers and students, and between students, that is valued rather than the medium through which ideas are translated.

Table 6-17 lists the reasons for student ratings of small group methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Peer-assisted learning** | ☑ Discussion of problems and ideas; peers provide simple explanations; talking aids memory<br>☑ Development of teamwork skills<br>*However*<br>☒ Dependent on the group – variable input<br>☒ Students often 'prefer to study alone' | Biomolecular sciences,<br>Fourth year companion animal course (CAS),<br>Pharmacology,<br>Physiology |
| **One-to-one tutorials (inc. EMS)** | ☑ Practical application of theory<br>☑ 'Hands on' experience<br>☑ Opportunity to ask questions<br>☑ Remember cases seen in practice | **Animal husbandry** (in particular),<br>**EMS** (in particular),<br>Haptic cow,<br>final year |
| **Group tutorials** | ☑ Useful if students and tutor prepared beforehand<br>☑ Possible to ask questions in informal / relaxed atmosphere<br>☑ Reinforces learning from lectures<br>☑ Discussion aids memory<br>*However*<br>☒ Postgraduate tutors sometimes lacking appropriate expertise / knowledge (evident in Biomolecular sciences) | **Biomolecular sciences** (in particular),<br>Final year farm animal track,<br>Fourth year clinical subjects (CAS, CIC),<br>Microbiology,<br>**Parasitology** (in particular),<br>Physiology |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Flipcharts / Whiteboards** | ☑ For summarising, explaining answers, and drawing diagrams<br>☑ Brainstorming in tutorials<br>☑ More for small groups but also used in lectures<br>☑ Like Blackboard but clearer to read<br>*However*<br>☒ Flipcharts not eco-friendly | Anatomy, Biomolecular sciences, Final year, Fourth year clinical subjects (CAS, CIC), Parasitology, Physiology |

**Table 6-17: Small group methods – student reasons for rating and courses where used to good effect**

#### 6.1.3.2.3 Directed self study methods and technologies

The perceived availability and use of the directed self study methods and technologies by different student years, and the median rating and first and third quartiles, are shown in Table 6-18.

As for lecture-based and small group tutorial methods, use of directed self-study methods mirrors availability, with the exception of journals which only used by a minority of students in the first three years. Technologies available to all years of students included textbooks, student notes, handouts and computer-aided learning, and these were all rated highly by the majority of students, with the exception of computer-aided learning, which only a minority found very useful.

Internet availability and use also increased throughout the course, although surprisingly a significant proportion of students claimed not to have made use of it, or were unsure whether they had used it. Journals and the Internet were generally not considered to be as useful as textbooks, student notes and handouts, which supported a more didactic method of self-learning (directed-self learning as opposed to self-directed learning).

As with lantern and 35mm slides, there existed confusion about the use of tape-slide programmes, another out-dated technology.

| Method / Technology | Year | Avail-ability (%) | Used by (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Textbooks** | 1 | 100 | 93.7 | 3 | 4 | 5 | P=0.026* |
| | 2 | 100 | 96.8 | 3 | 4 | 5 | |
| | 3 | 94.7 | 94.7 | 3 | 4 | 5 | |
| | 4 | 100 | 97.4 | 3 | 3 | 4 | |
| | 5 | 100 | 100 | 4 | 4 | 5 | |
| **Student notes** | 1 | 100 | 100 | 4 | 5 | 5 | P=0.692 NS |
| | 2 | 96.8 | 93.5 | 4 | 4 | 5 | |
| | 3 | 100 | 100 | 4 | 4 | 5 | |
| | 4 | 100 | 100 | 4 | 5 | 5 | |
| | 5 | 100 | 100 | 4 | 4 | 5 | |
| **Handouts** | 1 | 100 | 87.5 | 3.25 | 4.50 | 5 | P=0.242 NS |
| | 2 | 100 | 93.5 | 4 | 4 | 5 | |
| | 3 | 100 | 100 | 4 | 5 | 5 | |
| | 4 | 94.7 | 94.7 | 4 | 5 | 5 | |
| | 5 | 100 | 100 | 3 | 4 | 5 | |
| **Journals** | 1 | 50 | 25 | 3 | 3.50 | 4 | P=0.011* |
| | 2 | 64.5 | 32.3 | 2.25 | 3 | 3 | |
| | 3 | 89.5 | 42.1 | 1.75 | 2 | 3 | |
| | 4 | 100 | 76.3 | 2 | 3 | 3 | |
| | 5 | 100 | 94.4 | 3 | 3 | 4 | |
| **Tape-slide programmes** | 1 | 0 | 0 | - | - | - | - |
| | 2 | 12.9 | 9.7 | - | - | - | |
| | 3 | 0 | 0 | - | - | - | |
| | 4 | 2.6 | 0 | - | - | - | |
| | 5 | 5.6 | 0 | - | - | - | |
| **Computer-aided learning** | 1 | 100 | 100 | 3 | 4 | 5 | P<0.0001*** |
| | 2 | 100 | 93.5 | 2 | 3 | 4 | |
| | 3 | 100 | 100 | 2 | 2 | 3 | |
| | 4 | 100 | 89.5 | 2 | 2 | 3 | |
| | 5 | 100 | 94.4 | 3 | 3 | 3 | |
| **Internet** | 1 | 68.7 | 68.7 | 3 | 4 | 5 | P=0.024* |
| | 2 | 77.4 | 67.7 | 3 | 4 | 4 | |
| | 3 | 78.9 | 68.4 | 3 | 3 | 4.5 | |
| | 4 | 86.8 | 63.2 | 3 | 3 | 3 | |
| | 5 | 77.8 | 77.8 | 2.5 | 3 | 4 | |

**Table 6-18: Perceived availability, use and rating of directed self study methods and technologies by different student years**

Table 6-19 lists the reasons for student ratings of directed self-study methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Textbooks** | ☑ Clarifies / consolidates notes taken in lectures<br>☑ Additional information – 'reading around the subject'<br>☑ 'Different viewpoints'<br>☑ Can use at own pace<br>☑ Reference use mainly<br>☑ Pictures and diagrams useful<br>*However*<br>☒ Too much information<br>☒ Variable quality<br>☒ Expensive | 'All subjects'<br>**Anatomy** (in particular e.g. colour atlas), Biomolecular sciences, Fourth year companion animal course (CAS), Microbiology (bacteriology), Pharmacology, **Physiology** (in particular) |
| **Student notes** | ☑ 'Essential'<br>☑ Contains 'everything we need'; all examinable material collated in a single source<br>☑ More concise than textbooks<br>☑ Can study at own pace<br>☑ Precludes note-taking in lectures, therefore can listen more effectively during lecture<br>☑ Can annotate (using colour)<br>*However*<br>☒ Variable quality; sometimes poorly written, poorly organised or out of date | 'All courses'<br>**Anatomy** (in particular), **Animal husbandry** (in particular), Fourth year farm animal course (CIC), Microbiology, **Pathology** (in particular), Physiology |
| **Handouts** | ☑ Precludes need for drawing diagrams or hurried note-taking in lectures – can concentrate on speaker's explanations<br>☑ Highlights/summarises key points<br>☑ Easy / good revision aid<br>*However*<br>☒ Variable quality / availability<br>☒ Easily misplaced<br>☒ Can lead to 'laziness' in lectures | 'All subjects'<br>**Anatomy** (in particular), Animal husbandry **Biomolecular sciences** (in particular), **Fourth year farm animal course** (CIC, in particular), **Microbiology** (in particular), **Parasitology** (in particular), **Pharmacology** (in particular), **Physiology** (in particular) |

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Journals** | ☑ Useful for projects / specific cases<br>☑ Access to up to date information<br>☑ Review articles good<br>*However*<br>☒ Can be too detailed for undergraduate level leading to 'information overload';<br>☒ 'Not enough time' | Anatomy, **Biomolecular sciences** (in particular), Final year clinical studies, **Fourth year companion animal course** (CAS, in particular), **Pharmacology** (in particular) |
| **Tape-slide programmes** | Not used. | None. |
| **Computer-aided learning** | ☑ Good for revision / self-assessment / visualisation<br>☑ Can work at own pace<br>*However*<br>☒ Use requires motivation<br>☒ Often too long / boring / detailed<br>☒ Students adverse to 'reading from a screen'<br>☒ 'Not a substitute for proper teaching or practical experience'<br>☒ Often based on experiments rather than examinable facts<br>☒ Computer room too cold to work in or distracting | Anatomy, Animal husbandry, **Biomolecular sciences** (in particular), Fourth year companion animal course (anaesthesia, CAS, **radiography**), Pathology, **Pharmacology** (in particular), Physiology |
| **Internet** | ☑ Useful for research projects<br>☑ Lecture notes online<br>☑ Good pictures / diagrams<br>*However*<br>☒ Reliability of information is variable<br>☒ Not enough time / takes too long to find information | Anatomy, **Biomolecular sciences**, Fourth year CIC, Parasitology, Pharmacology |

**Table 6-19: Directed self-study methods – student reasons for rating and courses where used to good effect**

##### 6.1.3.2.4 Practical ('Hands-on' training) – preclinical, paraclinical and clinical

The perceived availability and use of the practical methods and technologies by different student years, and the median rating and first and third quartiles, are shown in Table 6-20.

As with the previously described technologies, use of practical training methods mirrors availability.

| Method / Technology | Year | Avail-ability (%) | Use (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Practicals** | 1 | 100 | 100 | 4.25 | 5 | 5 | $P=0.107^{NS}$ |
| | 2 | 96.8 | 93.5 | 4 | 5 | 5 | |
| | 3 | 100 | 100 | 4 | 4 | 5 | |
| | 4 | 100 | 100 | 4 | 5 | 5 | |
| | 5 | 100 | 100 | 4 | 4 | 5 | |
| **Hands-on clinical training** | 1 | 56.2 | 56.2 | 3 | 4 | 5 | $P=0.073^{NS}$ |
| | 2 | 87.1 | 83.9 | 4 | 4 | 5 | |
| | 3 | 78.9 | 78.9 | 4 | 5 | 5 | |
| | 4 | 94.7 | 92.1 | 4 | 5 | 5 | |
| | 5 | 100 | 100 | 4 | 5 | 5 | |
| **Posters** | 1 | 68.7 | 50 | 2 | 3 | 3 | $P=0.877^{NS}$ |
| | 2 | 77.4 | 51.6 | 2 | 3 | 3 | |
| | 3 | 73.7 | 52.6 | 2 | 2 | 3 | |
| | 4 | 76.3 | 42.1 | 2 | 3 | 3 | |
| | 5 | 83.3 | 61.1 | 2 | 3 | 3 | |
| **Models** | 1 | 68.7 | 68.7 | 3 | 4 | 4 | $P=0.481^{NS}$ |
| | 2 | 87.1 | 87.1 | 3 | 3.5 | 4.25 | |
| | 4 | 68.4 | 63.2 | 3 | 4 | 4 | |
| | 3 | 84.2 | 73.7 | 3 | 3.5 | 4 | |
| | 5 | 89.9 | 89.9 | 3 | 3 | 4 | |
| **Preserved specimens** | 1 | 87.5 | 87.5 | 3 | 4 | 4 | P<0.0001*** |
| | 2 | 93.5 | 90.3 | 3.25 | 4 | 5 | |
| | 3 | 100 | 94.7 | 3 | 3 | 4 | |
| | 4 | 94.7 | 84.2 | 3 | 3 | 4 | |
| | 5 | 100 | 94.4 | 2 | 3 | 3 | |

**Table 6-20: Perceived availability, use and rating of practical methods and technologies by different student years**

Practical classes were used by students in all years of the BVMS course, whilst use of hands-on clinical training increased throughout the course, through exposure to live animals during animal husbandry, EMS and as part of clinical rotations. Preserved specimens were used by the majority of students throughout the course, as were models, the latter being most heavily used in the 2nd and final years.

Practical classes and hands-on clinical training were rated highly, with models and specimens still regarded as useful but generally less so.

Posters were used but were generally considered to have limited usefulness.

Table 6-21 lists the reasons for student ratings of practical methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **Practicals** | ☑ Essential ‘hands on’<br>☑ Puts theory into practice / Reinforces lecture notes<br>☑ 3D visualisation promotes understanding<br>☑ Practice aids learning / remembering<br>☑ Development of surgical skills / preparation for job<br>*However*<br>☒ Overcrowding in big classes | **Anatomy** (in particular), Biomolecular Sciences, Fourth year clinical subjects (CAS, CIC) Histology, **Microbiology** (in particular), **Pathology** (in particular), Parasitology, Physiology, Veterinary Public Health |
| **Hands-on clinical training** | ☑ Access to live animals<br>☑ Development of animal handling skills<br>☑ Practical experience<br>☑ No substitute for ‘the real thing’<br>☑ Relevant to future job as veterinary surgeon<br>*However*<br>☒ Not enough, especially in preclinical years<br>☒ Inadequate staff supervision | **Anatomy** in particular), **Animal husbandry** (in particular), EMS, Final year clinical rotations, Fourth year clinical subjects (CAS, CIC) |
| **Posters** | ☑ For reference during practical classes<br>☑ Pictures & diagrams useful<br>☑ Good for sheep / cattle breeds<br>*However*<br>☒ Difficult to take notes in larger group of students<br>☒ Background / ‘Often walk past’ / ignore | **Anatomy** (in particular), Animal husbandry |
| **Models** | ☑ 3D visualisation of structures e.g. blood vessels<br>☑ Topography (bony landmarks); skeletal relationships | **Anatomy** (in particular), Haptic cow* |
| **Preserved specimens** | ☑ Comparison for one’s own dissection<br>☑ Useful if structures labelled / colour-coded<br>☑ Consolidates theoretical knowledge<br>☑ Access to rare / abnormal conditions<br>*However*<br>☒ Restricted access in large classes<br>☒ Cannot always handle / manipulate specimens<br>☒ Unnatural appearance / tissues not fresh | **Anatomy** (in particular), Embryology, Parasitology, Pathology |

**Table 6-21: Practical methods – student reasons for rating and courses where used to good effect**

#### 6.1.3.2.5 Audiovisual aids

The perceived availability and use of the miscellaneous audiovisual technologies by different student years, and the median rating and first and third quartiles, are shown in Table 6-22.

| Method / Technology | Year | Avail-ability (%) | Used by (%) | Rating | | | Kruskal-Wallis ANOVA |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| Closed-circuit television (CCTV) | 1 | 6.2 | 6.2 | - | - | - | - |
| | 2 | 12.9 | 9.7 | - | - | - | |
| | 3 | 10.5 | 5.3 | - | - | - | |
| | 4 | 15.8 | 10.5 | - | - | - | |
| | 5 | 16.7 | 5.6 | - | - | - | |
| Cine film | 1 | 12.5 | 12.5 | 4 | 4 | 4 | - |
| | 2 | 22.6 | 16.1 | 2.75 | 3 | 3.25 | |
| | 3 | 15.8 | 15.8 | 2 | 3 | 5 | |
| | 4 | 18.4 | 18.4 | 4 | 4 | 5 | |
| | 5 | 5.6 | 5.6 | - | - | - | |
| Educational TV broadcasts | 1 | 18.7 | 18.7 | 3 | 4 | 5 | - |
| | 2 | 12.9 | 12.9 | 2 | 2.5 | 3.25 | |
| | 3 | 10.5 | 10.5 | 2 | 2.5 | 3 | |
| | 4 | 10.5 | 10.5 | 2.25 | 3.5 | 4.75 | |
| | 5 | 5.6 | 0 | - | - | - | |
| Audio recordings | 1 | 6.2 | 0 | - | - | - | - |
| | 2 | 3.2 | 3.2 | - | - | - | |
| | 3 | 5.3 | 0 | - | - | - | |
| | 4 | 5.3 | 2.6 | - | - | - | |
| | 5 | 22.2 | 11.1 | 3 | 3.5 | 4 | |
| Video recordings | 1 | 87.5 | 75 | 3 | 3 | 4 | P=0.019* |
| | 2 | 93.5 | 83.9 | 3 | 3 | 4 | |
| | 3 | 94.7 | 89.5 | 3 | 3 | 3 | |
| | 4 | 89.5 | 84.2 | 3 | 4 | 4 | |
| | 5 | 88.9 | 88.9 | 2 | 3 | 3 | |

**Table 6-22: Perceived availability, use and rating of miscellaneous audiovisual technologies by different student years**

As with previously described technologies use mirrors availability.

With the exception of video-recordings, the majority of audio- or visual- 'press to play' technologies (cine, broadcast television, audio-recordings) were not used by the majority of students. Lack of familiarity with these media was the reason why a number of students were not sure if they have used them. Use of audio-recordings increased in the final year (by students listening to clinical auscultation sounds for example), where they were on average rated as useful. Video-recordings were used by the majority of students and generally rated as useful.

Table 6-23 lists the reasons for student ratings of miscellaneous audiovisual methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating | Courses where used to good effect |
|---|---|---|
| **CCTV** | ☑ Lecturer can demonstrate to large classes<br>*However*<br>☒ Rarely used | Anatomy,<br>Animal husbandry<br>Communication skills*,<br>Fourth year CIC (foaling),<br>**Histology** (in particular),<br>Physiology |
| **Cine film** | ☑ As an introduction to practical classes<br>☑ Demonstration of clinical signs and abnormalities<br>*However*<br>☒ Dated | Anatomy,<br>Animal husbandry,<br>Fourth year clinical subjects (CAS, CIC),<br>Pathology |
| **Educational TV** | Not used<br>[Students confused this with cine / videos] | None |
| **Audio recordings** | ☑ Gut sounds / heart sounds | Cardiology*,<br>Fourth year clinical subjects (CAS, CIC) |
| **Video recordings** | ☑ 'Easier' than listening lecture<br>☑ Moving images e.g. gait<br>☑ Access to rare clinical cases<br>☑ Demonstration of surgical procedures<br>☑ Self-study aid<br>*However*<br>☒ Films often dated<br>☒ Technology out-dated (digital formats preferred) | **Anatomy** (in particular),<br>Animal husbandry,<br>Fourth year clinical subjects (CAS, CIC e.g. hoof trimming, cat spey),<br>Pharmacology |

**Table 6-23: Miscellaneous audiovisual technologies – student reasons for rating and courses where used to good effect**

#### 6.1.3.3 Lecturing staff

Lecturing staff had been asked to indicate their subject in the questionnaire, with the intention that comparisons could be made between different groups of staff e.g. preclinical versus clinical. This proved not to be possible because of the amount of teaching carried out by individuals in different parts of the veterinary course. However, it was possible to carry out comparisons of ratings by veterinary surgeons with those of non-veterinary scientists and other animal health professionals.

#### 6.1.3.3.1 Lecture (plenary) based methods and technologies

The perceived availability and use of the lecture-based methods and technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-24.

| Method / Technology | Vet or Non-Vet | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | Vet | 100 | 95.2 | 4 | 4 | 5 | P=0.822$^{NS}$ |
| | Non-vet | 100 | 100 | 4 | 4 | 5 | |
| **Post-mortems** | Vet | 85.7 | 76.2 | 4 | 4 | 5 | P=0.960$^{NS}$ |
| | Non-vet | 40 | 13.3 | 1.75 | 4.5 | 5 | |
| **Blackboard** | Vet | 76.2 | 47.6 | 2.25 | 3 | 3 | P=0.776$^{NS}$ |
| | Non-vet | 66.7 | 33.3 | 2 | 3 | 4.25 | |
| **Lantern slides** | Vet | 0 | 0 | - | - | - | P=0.346$^{NS}$ |
| | Non-vet | 6.7 | 0 | - | - | - | |
| **Acetates** | Vet | 90.5 | 61.9 | 3 | 3 | 3 | P=0.117$^{NS}$ |
| | Non-vet | 73.3 | 60 | 3 | 3 | 4.25 | |
| **35mm slides** | Vet | 95.2 | 61.9 | 3 | 4 | 4 | P=0.018* |
| | Non-vet | 66.7 | 20 | 3 | 3 | 3 | |
| **Electronic slides** | Vet | 95.2 | 95.2 | 4.5 | 5 | 5 | P=0.079$^{NS}$ |
| | Non-vet | 100 | 93.3 | 4 | 4 | 5 | |

**Table 6-24: Perceived availability, use and rating of lecture-based methods and technologies by lecturing staff (comparing veterinary teachers with non-veterinary scientists)**

As for alumni of all eras, and current students, lectures were ubiquitously used by veterinary and non-veterinary teachers, all of whom rated this teaching method positively. A similar pattern of use emerges for electronic slides, also rated highly by both groups of teachers.

Post-mortem demonstrations were considered to be available to most veterinary staff and some non-veterinary scientists, however they were used almost exclusively by veterinary teachers. Their usefulness was positively skewed for veterinary teachers, whilst a quarter of non-veterinary scientists provided a negative rating, indicating a lesser relevance for many non-veterinary scientists.

Lantern slides were largely redundant, although a very small proportion of veterinary staff perceived them still to be available.

Blackboards, acetates and 35mm slides were perceived to be widely available but were only used by a proportion of veterinary and non-veterinary teachers. However a significant number of teachers continued to use these methods – approximately half of veterinary teachers and a third of non-veterinary scientists used the blackboard; two thirds of veterinary teachers and non-veterinary scientists used acetates; and two thirds of veterinary teachers used 35mm slides, compared to a fifth of non-veterinary scientists. The responses to ratings of these three methods appear as a normal distribution, indicating a range in terms of the usefulness as perceived by teachers, the majority indicating that these methods have value.

Table 6-25 lists the reasons for lecturer ratings of lecture-based methods and technologies.

| **Method / technology** | **Reasons for rating** |
|---|---|
| **Lectures** | ☑ Traditional method still the mainstay of teaching<br>☑ Rapid / efficient delivery of factual information to large student numbers<br>☑ Opportunity to answer students’ questions<br>☑ Provides summary / outline / guidance / key points / the ‘basics’ |
| **Post-mortems** | ☑ Correlation of pathology and clinical data<br>☑ Demonstration of pathological material<br>*However*<br>☒ Usefulness dependent on commonality of condition<br>☒ Timetabling logistics<br>☒ Not relevant to all courses / lecturers |
| **Blackboard & chalk** | ☑ Slow paced; avoids ‘information overload’<br>☑ Can answer questions; give spontaneous explanations<br>☑ Useful for illustrations (providing lecturer can draw)<br>*However*<br>☒ Considered to be ‘out-dated’<br>☒ Few in existence |

| Method / technology | Reasons for rating |
|---|---|
| **Lantern slides** | Not used. |
| **Acetates** | ☑ Can construct diagrams during lecture<br>☑ Flexible method<br>☑ As with blackboard but advantage of facing the class<br>☑ Best used for tutorials / seminars<br>*However*<br>☒ Superseded by PowerPoint |
| **35mm slides** | ☑ Demonstration of illustrative material<br>☑ Useful when not all images digitised<br>*However*<br>☒ Superseded by PowerPoint<br>☒ Technically laborious to create |
| **Electronic slides (PowerPoint)** | ☑ The 'best' / standard method<br>☑ Easy to update; Ease of labelling<br>☑ Can distribute to students via web / as handouts<br>☑ Can build up complicated principles in step-wise fashion<br>☑ Combination of text, images and video<br>*However*<br>☒ Can be too detailed, presenting superficial information |

**Table 6-25: Lecture-based methods – lecturer reasons for rating**

#### 6.1.3.3.2 Small group tutorial methods and technologies

The perceived availability and use of the small group methods and technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-26.

Use broadly mirrors availability of small group tutorial methods in both groups of staff, although flipcharts were not used to the extent that they were perceived to be available in either group. Use of one-to-one tutorials (including EMS) was much higher in veterinary teachers.

Use of peer-assisted learning was markedly greater by veterinary teachers than non-veterinary scientists, also true of group tutorials and flipcharts. Both groups of staff rated one-to-one tutorials and group tutorials exclusively positively, whilst a small proportion of non-veterinary scientists did not find peer-assisted learning useful, and a small proportion of both groups of staff did not find flipcharts useful.

| Method / Technology | Vet or Non-Vet | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Median | Q3 | |
| **Peer-assisted learning** | Vet | 76.2 | 76.2 | 3 | 4 | 4 | P=0.642$^{NS}$ |
| | Non-vet | 60 | 46.7 | 3 | 4 | 4 | |
| **One-to-one tutorials inc. EMS** | Vet | 66.7 | 66.7 | 4 | 5 | 5 | P=0.011* |
| | Non-vet | 26.7 | 13.3 | 3 | 3 | 4 | |
| **Group tutorials** | Vet | 90.5 | 90.5 | 4 | 4 | 5 | P=0.011* |
| | Non-vet | 73.3 | 66.7 | 3 | 3.5 | 4.25 | |
| **Flipcharts / White-boards** | Vet | 95.2 | 61.9 | 3 | 3 | 4 | P=0.146$^{NS}$ |
| | Non-vet | 60 | 40 | 2 | 3 | 3 | |

**Table 6-26: Perceived availability, use and rating of small group tutorial methods and technologies by lecturing staff (comparing veterinary teachers with non-veterinary scientists)**

Table 6-27 lists the reasons for lecturer ratings of small group methods and technologies.

| Method / technology | Reasons for rating |
|---|---|
| **Peer-assisted learning** | ☑ To facilitate development of team working and critical analysis skills<br>☑ Used for group work (Self-Directed Learning Assessment in Biomolecular Sciences, Pharmacology library project, Fourth year CAS (collaborative learning assignment), final year tutorials)<br>*However*<br>☒ Usefulness depends on group dynamics<br>☒ Not a substitute for staff contact |
| **One-to-one tutorials (inc. EMS)** | ☑ 'Best way' to teach clinical work, useful in rotations<br>☑ Can assess students' knowledge and skills<br>*However*<br>☒ Lack of time<br>☒ Tutorials groups generally too big for one-to-one |
| **Group tutorials** | ☑ More relaxed way to teach<br>☑ Opportunity for students to ask questions<br>☑ Can build on lectures<br>*However*<br>☒ Depends on motivation / input of students<br>☒ Group sizes too big (12-20) |

| Method / technology | Reasons for rating |
|---|---|
| **Flipcharts / Whiteboards** | ☑ Good for summarising main points<br>☑ Mainly for promoting discussion in tutorials<br>*However*<br>☒ Number of lecturers 'prefer other methods' (acetates, PowerPoint) |

**Table 6-27: Small group methods – lecturer reasons for rating**

### 6.1.3.3.3 Directed self study methods and technologies

The perceived availability and use of the directed self study methods and technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-28.

| Method / Technology | Vet or Non-Vet | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Textbooks** | Vet | 100 | 100 | 3 | 4 | 4 | P=0.380$^{NS}$ |
| | Non-vet | 93.3 | 93.3 | 3.5 | 4 | 4 | |
| **Printed notes** | Vet | 95.2 | 85.7 | 3 | 4 | 4 | P=0.716$^{NS}$ |
| | Non-vet | 80 | 73.3 | 3 | 4 | 5 | |
| **Handouts** | Vet | 95.2 | 85.7 | 3 | 4 | 4 | P=0.454$^{NS}$ |
| | Non-vet | 93.3 | 93.3 | 3 | 4 | 5 | |
| **Journals** | Vet | 95.2 | 85.7 | 3 | 3 | 4.25 | P=0.616$^{NS}$ |
| | Non-vet | 80 | 46.7 | 3 | 3 | 4 | |
| **Tape-slide programmes** | Vet | 9.5 | 4.8 | - | 6.1.3.3. | - | - |
| | Non-vet | 6.7 | 0 | - | - | - | |
| **Computer-aided learning** | Vet | 76.2 | 71.4 | 3 | 4 | 4 | P=0.599$^{NS}$ |
| | Non-vet | 73.3 | 60 | 3 | 4 | 4 | |
| **Internet** | Vet | 81 | 71.4 | 3 | 3 | 4 | P=0.243$^{NS}$ |
| | Non-vet | 86.7 | 53.3 | 3 | 4 | 4 | |

**Table 6-28: Perceived availability, use and rating of directed self-learning methods and technologies by lecturing staff (comparing veterinary teachers with non-veterinary scientists)**

Use mirrors availability of most directed self-study methods, although journals were not used to the extent that they were perceived to be available, particularly by non-veterinary scientists, also true of computer-aided learning and the Internet. For these technologies use was greater among veterinary teachers than non-veterinary scientists. Journals and computer-aided learning were generally perceived to be comparably useful to both groups of staff, and the Internet appeared somewhat more useful to non-veterinary scientists although the difference was not statistically significant. Textbooks were ubiquitously used by veterinary teachers and non-veterinary scientists and were almost exclusively positively rated, with the exception of a small minority of veterinary staff. A similar pattern of almost widespread use was observed for handouts and student notes, generally rated positively, with a small minority of both groups of staff having perceived them to be less useful. Tape-slide programmes appeared to be largely redundant, and a very small proportion of staff claimed not to be sure if they were still available or used.

Table 6-29 lists the reasons for lecturer ratings of directed self-study methods and technologies.

| Method / technology | Reasons for rating |
|---|---|
| **Textbooks** | ☑ Can direct student to further reading / provide page references to supplement information from lectures<br>☑ Good to make students look up information themselves<br>☑ Some excellent / authoritative sources<br>*However*<br>☒ Sometimes dated<br>☒ Not suitable for all subject areas |
| **Student notes** | ☑ Core standard for examination purposes<br>☑ Essential in absence of good textbook<br>☑ Reduces need for student note-taking<br>*However*<br>☒ Students can become 'lazy' / over-reliant on notes<br>☒ Time-consuming to update |
| **Handouts** | ☑ PowerPoint handouts enable students to listen in lectures<br>☑ Good for tutorials and practical instructions<br>☑ Illustrative material, to save students' drawing<br>*However*:<br>☒ 'Spoon-feeding'<br>☒ Danger of student over-reliance |

| Method / technology | Reasons for rating |
|---|---|
| **Journals** | ☑ Good for specific topics / projects<br>☑ Teaches students how to interpret results and critically analyse primary sources<br>☑ Journal club format works well in final year<br>*However*<br>☒ Generally too specialised for undergraduates |
| **Tape-slide programmes** | ☒ Outdated; superseded by digital media |
| **Computer-aided learning** | ☑ Allows students to work at own pace<br>☑ Consolidates information from lectures / practicals<br>☑ Students motivated if CAL is concise and interactive<br>☑ For Multiple Choice Questions (MCQs)<br>*However*<br>☒ Lack of staff time to develop these<br>☒ Not a replacement for staff/student contact |
| **Internet** | ☑ Used for library projects and references accompanying lectures<br>*However*<br>☒ Websites are of varying quality (reliability)<br>☒ Students do not have time to look at sites<br>☒ Many staff not experienced using it in their teaching |

**Table 6-29: Directed self-study methods – lecturer reasons for rating**

#### 6.1.3.3.4 Practical ('Hands-on' training) – preclinical, paraclinical and clinical

The perceived availability and use of the practical methods and technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-30.

Use largely mirrors availability of practical classes, hands-on clinical training and models. Poster use was markedly less than availability for both groups of staff, and not all veterinary teachers, who perceived them to be available, used specimens in their teaching. There were no significant differences between the veterinary and non-veterinary lecturers' ratings of the methods' usefulness, although the medians and inter-quartile ranges would suggest that practical classes and hands-on clinical training were perceived as more useful among veterinary teachers, while specimens and models appear to have been more highly valued by the minority of non-veterinary teachers who used them.

| Method / Technology | Vet or Non-Vet | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Practical classes** | Vet | 85.7 | 76.2 | 4 | 5 | 5 | P=0.518[NS] |
| | Non-vet | 66.7 | 60 | 4 | 4 | 5 | |
| **Hands-on clinical training** | Vet | 85.7 | 85.7 | 5 | 5 | 5 | P=0.367[NS] |
| | Non-vet | 26.7 | 20 | 3.5 | 4.5 | 5 | |
| **Posters** | Vet | 76.2 | 42.9 | 2 | 3 | 3 | P=0.205[NS] |
| | Non-vet | 33.3 | 20 | 3 | 3 | 5 | |
| **Models** | Vet | 57.1 | 57.1 | 2.75 | 3 | 4 | P=0.181[NS] |
| | Non-vet | 20 | 20 | 3.5 | 4 | 4 | |
| **Specimens** | Vet | 66.7 | 47.6 | 3 | 3 | 4 | P=0.119[NS] |
| | Non-vet | 26.7 | 26.7 | 4 | 4 | 5 | |

**Table 6-30: Perceived availability, use and rating of practical methods and technologies by lecturing staff (comparing veterinary teachers with non-veterinary scientists).**

Table 6-31 lists the reasons for lecturer ratings of practical methods and technologies, and courses where these were used to good effect.

| Method / technology | Reasons for rating |
|---|---|
| **Practicals** | ☑ Essential ‘hands on’ training for a practical profession<br>☑ Only way to learn some skills e.g. dissection, ultrasound<br>☑ Helps memory retention<br>*However*<br>☒ Shortage of time / staff / resources impacts on usefulness |
| **Hands-on clinical training** | ☑ Access to real animals essential for practical profession<br>*However*<br>☒ Reduced staff and increased student numbers impact on usefulness<br>☒ Referral cases less relevant to first opinion practice<br>☒ Not relevant for all courses / lecturers |
| **Posters** | ☑ For reference during practicals / in clinics<br>☑ Revision aid |
| **Models** | ☑ Useful for where there is no other demonstration material<br>☑ Skeletal models useful for radiographic anatomy<br>☑ Simulators for skills learning<br>*However*<br>☒ Not relevant for all courses / lecturers |

| Method / technology | Reasons for rating |
|---|---|
| **Preserved specimens** | ☑ Illustrative<br>☑ Reusable<br>☑ Aids understanding of clinical anatomy<br>*However*<br>☒ Not as good as fresh material / distorted by fixation<br>☒ Not relevant for all courses / lecturers |

**Table 6-31: Practical methods – lecturer reasons for rating**

#### 6.1.3.3.5 Audiovisual aids

The perceived availability and use of the miscellaneous audiovisual technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-32.

| Method / Technology | Vet or Non-Vet | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **CCTV** | Vet | 38.1 | 14.3 | 1.25 | 3 | 4 | - |
| | Non-vet | 6.7 | 0 | - | - | - | |
| **Cine** | Vet | 4.8 | 4.8 | 1 | 3 | 3 | - |
| | Non-vet | 0 | 0 | - | - | - | |
| **Educational television broadcasts** | Vet | 9.5 | 9.5 | 3 | 3 | 3 | - |
| | Non-vet | 6.7 | 0 | - | - | - | |
| **Audio recordings** | Vet | 19 | 9.5 | 1.5 | 2 | 3 | - |
| | Non-vet | 6.7 | 0 | - | - | - | |
| **Video recordings** | Vet | 81 | 76.2 | 3 | 4 | 5 | $P=0.970^{NS}$ |
| | Non-vet | 46.7 | 40 | 3 | 4 | 5 | |

**Table 6-32: Perceived availability, use and rating of miscellaneous audiovisual technologies by lecturing staff (comparing veterinary teachers with non-veterinary scientists).**

The only technology used to any great extent by both veterinary teachers and non-veterinary scientists appears to have been video recordings, which were generally rated as useful by both cohorts, with no significant difference between them. Veterinary teachers made more use of video than non-veterinary scientists. A small proportion of veterinary teachers used CCTV, cine, educational TV and audio, and the median values would suggest that while CCTV, cine and educational TV were perceived to have some usefulness, audio was generally not regarded as useful.

Table 6-33 lists the reasons for lecturer ratings of miscellaneous audiovisual technologies.

| Method / technology | Reasons for rating |
|---|---|
| **CCTV** | ☑ Future use likely with increasing student numbers<br>*However*<br>☒ Needs careful handling of questions<br>☒ 'Not as good as being in same room' |
| **Cine film** | ☑ Useful where live animal demonstration not available before video<br>*However*<br>☒ Outdated |
| **Educational TV** | Not used. |
| **Audio recordings** | ☑ BSAVA lectures available in this format<br>*However*<br>☒ Analogue format largely outdated |
| **Video recordings** | ☑ Reinforces learning<br>☑ Demonstration of techniques<br>☑ Dynamic images (neurology, lameness)<br>*However*<br>☒ Largely superseded by digital formats<br>☒ Boring if too long |

**Table 6-33: Miscellaneous audiovisual technologies – lecturer reasons for rating**

### 6.1.3.4 Comparison of current teachers and students perceptions

#### 6.1.3.4.1 Lecture (plenary) based methods and technologies

The perceived availability and use of the lecture-based methods and technologies by current students and their teachers, and the median rating and first and third quartiles, are shown for comparison in Table 6-34.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Lectures** | Students | 99.2 | 99.2 | 3 | 4 | 5 | P=0.044* |
| | Teachers | 100 | 97.2 | 4 | 4 | 5 | |
| **Post-mortems** | Students | 78.7 | 74.6 | 3 | 4 | 5 | P=0.137[NS] |
| | Teachers | 66.7 | 50 | 4 | 4 | 5 | |
| **Blackboard** | Students | 87.7 | 77.9 | 2 | 3 | 3 | P=0.411 [NS] |
| | Teachers | 72.2 | 41.7 | 2 | 3 | 3.25 | |
| **Lantern slides** | Students | 1.6 | 0.8 | 1 | 2 | 3 | - |
| | Teachers | 2.8 | 0 | 1 | 1.5 | 2.75 | |
| **Acetates** | Students | 100 | 96.7 | 3 | 3 | 3 | P=0.714 [NS] |
| | Teachers | 83.3 | 61.1 | 3 | 3 | 3 | |
| **35mm slides** | Students | 73 | 71.3 | 3 | 3 | 3 | P=0.096 [NS] |
| | Teachers | 83.3 | 44.4 | 3 | 3 | 4 | |
| **Electronic slides** | Students | 92.6 | 90.2 | 4 | 4 | 5 | P=0.014* |
| | Teachers | 97.2 | 94.4 | 4 | 5 | 5 | |

**Table 6-34: Comparison of current students and teachers perceptions of availability, use and rating of lecture-based methods and technologies**

Lectures were ubiquitously available and used by students and teachers. On average, both groups rated lectures as very useful, but there was a significantly more positive trend in the teacher ratings. A similar pattern emerged for electronic slides (PowerPoint), with teachers again providing a significantly higher rating than students. Post-mortems were considered to be very useful by both groups, with more students having experienced their use, compared to teachers. The blackboard, acetates and 35mm slides were rated as having some usefulness by students and teachers. Use was greater among students than teachers, again reflecting that not all teachers made use of these media. The low perceived availability and use of lantern slides reflects their obsolescence.

#### 6.1.3.4.2 Small group tutorial methods and technologies

The perceived availability and use of the small group methods and technologies by current students and their teachers, and the median rating and first and third quartiles, are shown in Table 6-35.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Median | Q3 | |
| **Peer-assisted learning** | Students | 82.8 | 74.6 | 2 | 3 | 4 | P=0.018* |
| | Teachers | 69.4 | 63.9 | 3 | 4 | 4 | |
| **One-to-one tutorials inc. EMS** | Students | 89.3 | 87.7 | 4 | 5 | 5 | P=0.325 $^{NS}$ |
| | Teachers | 50 | 44.4 | 3.5 | 5 | 5 | |
| **Group tutorials** | Students | 95.1 | 92.6 | 3 | 4 | 4 | P=0.013* |
| | Teachers | 83.3 | 80.6 | 4 | 4 | 5 | |
| **Flipcharts / White-boards** | Students | 86.1 | 80.3 | 3 | 3 | 4 | P=0.876 $^{NS}$ |
| | Teachers | 80.6 | 52.8 | 3 | 3 | 4 | |

**Table 6-35: Comparison of current students and teachers perceptions of availability, use and rating of small group tutorial methods and technologies**

For small group tutorial methods, use generally mirrors availability, with the notable exception of flipcharts and whiteboards, which were not used by teachers to the extent that they were perceived to be available.

Teachers rated peer-assisted learning significantly more useful than the students did, while group tutorials also showed a significantly more positive trend among teachers than students. There was no difference in the ratings of one to one tutorials and flipcharts / whiteboards, with the latter having some usefulness, and one to one tutorials including EMS perceived to be the most valuable of all the small group tutorial methods and technologies.

#### 6.1.3.4.3 Directed self study methods and technologies

The perceived availability and use of the directed self study methods and technologies by current students and their teachers, and the median rating and first and third quartiles, are shown in Table 6-36.

Use generally mirrors availability for all directed self-study methods and technologies, with the notable exception of journals, and the use of internet by teachers. Journal use was markedly lower than availability for both groups. The most useful resource appears to have been printed notes, given a significantly higher rating by students than staff. Textbooks and handouts were rated on average as very useful by both groups. Computer-aided learning was rated significantly higher by teachers than by students. The perceived use and availability of tape-slide programmes was minimal, reflecting the fact that they are an out-dated technology.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Textbooks** | Students | 99.2 | 96.7 | 3 | 4 | 5 | P=0.617 NS |
| | Teachers | 97.2 | 97.2 | 3 | 4 | 4 | |
| **Printed notes** | Students | 99.2 | 98.4 | 4 | 5 | 5 | P=0.001** |
| | Teachers | 88.9 | 80.6 | 3 | 4 | 5 | |
| **Handouts** | Students | 98.4 | 95.9 | 4 | 4 | 5 | P=0.036* |
| | Teachers | 94.4 | 88.9 | 3 | 4 | 5 | |
| **Journals** | Students | 82.8 | 55.7 | 2 | 3 | 3 | P=0.019* |
| | Teachers | 88.9 | 69.4 | 3 | 3 | 4 | |
| **Tape-slide programmes** | Students | 4.9 | 2.5 | 1 | 3 | 3 | - |
| | Teachers | 8.3 | 2.8 | 1 | 2.5 | 3 | |
| **Computer-aided learning** | Students | 100 | 94.3 | 2 | 3 | 3 | P<0.001*** |
| | Teachers | 75 | 66.7 | 3 | 4 | 4 | |
| **Internet** | Students | 79.5 | 68 | 3 | 3 | 4 | P=0.620 NS |
| | Teachers | 83.3 | 63.9 | 3 | 3 | 4 | |

**Table 6-36: Comparison of current students and teachers perceptions of availability, use and rating of directed self-learning methods and technologies**

#### 6.1.3.4.4 Practical ('Hands-on' training) – preclinical, paraclinical and clinical

The perceived availability and use of the practical methods and technologies by the two groups of lecturing staff, and the median rating and first and third quartiles, are shown in Table 6-37.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **Practical classes** | Students | 99.2 | 98.4 | 4 | 5 | 5 | P=0.710 NS |
| | Teachers | 77.8 | 69.4 | 4 | 5 | 5 | |
| **Hands-on clinical training** | Students | 86.1 | 84.4 | 4 | 5 | 5 | P=0.080 NS |
| | Teachers | 61.1 | 58.3 | 5 | 5 | 5 | |
| **Posters** | Students | 76.2 | 50 | 2 | 3 | 3 | P=0.109 NS |
| | Teachers | 58.3 | 33.3 | 2 | 3 | 3 | |
| **Models** | Students | 81.1 | 77 | 3 | 4 | 4 | P=0.198 NS |
| | Teachers | 41.7 | 41.7 | 3 | 3 | 4 | |
| **Specimens** | Students | 95.1 | 89.3 | 3 | 3 | 4 | P=0.429 NS |
| | Teachers | 50 | 38.9 | 3 | 4 | 4 | |

**Table 6-37: Comparison of current students and teachers perceptions of availability, use and rating of practical methods and technologies**

Use of practical methods and technologies broadly mirrors availability, with the notable exception of posters, which were only used by a half of students and a third of teachers. For all of these technologies and methods, availability and use was higher in students than teachers, reflecting the fact that not all teachers would have made use of them, particularly those with clinical relevance. Practical classes and hands-on training were perceived by both groups to have the most usefulness, while posters generally were regarded as the least useful by students and teachers.

#### 6.1.3.4.5 Audiovisual aids

The perceived availability and use of the miscellaneous audiovisual technologies by the current students and their teachers, and the median rating and first and third quartiles, are shown in Table 6-38.

| Method / Technology | Role | Avail-ability (%) | Use (%) | Rating | | | Mann-Whitney U (2-tailed sig.) |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Med-ian | Q3 | |
| **CCTV** | Students | 13.1 | 8.2 | - | - | - | - |
| | Teachers | 25 | 8.3 | - | - | - | |
| **Cine** | Students | 16.4 | 14.8 | 3 | 4 | 4 | - |
| | Teachers | 2.8 | 2.8 | - | - | - | |
| **Educational television broadcasts** | Students | 11.5 | 10.7 | 2 | 3 | 4 | - |
| | Teachers | 8.3 | 0 | - | - | - | |
| **Audio recordings** | Students | 7.4 | 3.3 | - | - | - | - |
| | Teachers | 13.9 | 0 | 1.75 | 2.5 | 3 | |
| **Video recordings** | Students | 91 | 84.4 | 3 | 3 | 4 | P=0.002** |
| | Teachers | 66.7 | 61.1 | 3 | 4 | 5 | |

**Table 6-38: Comparison of current teachers and students perceptions of availability, use and rating of miscellaneous audiovisual technologies**

Of the miscellaneous audio-visual aids, only video recordings were used by the majority of teachers and students, and were rated significantly higher by teachers. Cine had also been used by the minority of students who perceived it to be available, and considered it to be very useful.

## 6.2 *Class observations*

From the perspective of an educationalist who is not a content expert in any of the subjects being taught, the class observations served to highlight, above all, the importance of effective communication in the classroom. In particular, it was observed that the different types of class teaching enabled different types of dialogue between teachers and students, and between students and their peers. Although anecdotal in description, this section describes some of the observations that were subsequently discussed in the interviews with current teachers.

### 6.2.1 Lecturers providing structure

Most classes had an obvious structure, with signposting provided by the lecturer(s). Taking the lecture as an example, teachers outlined a plan for the session, sometimes in the form of learning objectives. This was followed by the main part of the class, generally involving the transmission of information. There was then an opportunity for students to clarify their understanding through asking questions, before the session was closed with a brief summary.

### 6.2.2 Interaction and discussion

Some classes allowed for a greater degree of interaction and discussion than others. For example, some questions were asked by a few students in lectures, but for the most part the lectures represented a one-way transmission of information from the lecturer to the audience. In the observed tutorial, each student in the small group was asked a question in turn, and there was the option for group discussion.

**Figure 6-4: Fourth year students listening and making notes in a tutorial on small animal history-taking ©VHMD**

In the practical classes, teachers went round individual groups of students, clarifying that students were clear about the objectives of the class, and asking / answering questions relating to the material being studied.

**Figure 6-5: Anatomy lecturer with a group of first year students in an anatomy practical ©VHMD**

**Figure 6-6: Microbiology teacher with a group of third year students in a practical on bacterial identification ©VHMD**

### 6.2.3 General principles

In one lecture, the teacher emphasised the importance of students understanding the general principles, rather than committing minor details to memory:

> *"It's more important to have an overview of the subject than a detailed knowledge of all the structures."*
>
> (Anatomy teacher)

### 6.2.4 Clinical relevance in preclinical classes

What was obvious to an observer was the frequent reference to the clinical implications of preclinical principles. For example, three examples of clinical relevance in an anatomy lecture on the forelimb were provided by the lecturer:

- significant bleeding arising as a result of nicking a particular blood vessel during surgery;
- taking a blood sample from the cephalic vein;
- awareness of the possibility of injection of *Euthatal* outside of the vein causing the animal unnecessary pain.

Radiographs were also made available in the accompanying anatomy practical class to demonstrate clinical relevance.

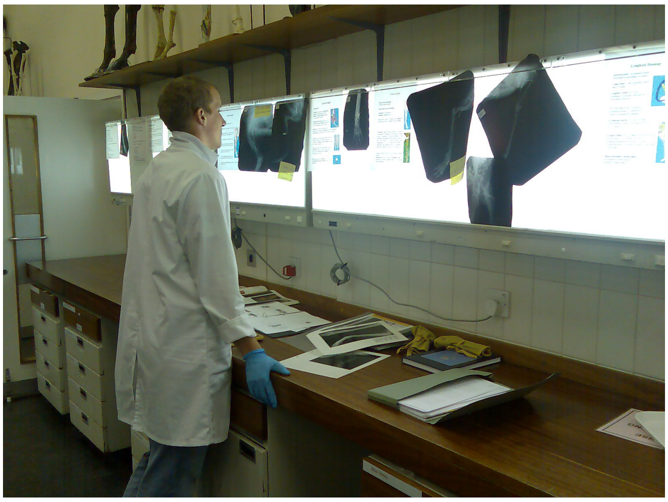

**Figure 6-7: First year student viewing radiographs in anatomy dissection practical ©VHMD**

Clinical relevance was also highlighted in the animal husbandry class on the farm, when the lecturer posed students a clinical problem to the students, while they were observing young calves in their pens:

> *"If you were in charge of looking after a calf, how would you manage it?*
>
> *Colostrum – why is this important?*
>
> *'What would you do if the calf hadn't suckled?*
>
> *The calf is now 24 hours old … what next?*
>
> (Husbandry teacher)

**Figure 6-8: Second year husbandry class on calving at the farm ©VHMD**

### 6.2.5 Making examination process transparent

At some of the classes observed, teachers took five minutes at the start of the class to outline the structure of the forthcoming examination(s), taking questions from students about the assessments. Some teachers made explicit use of the fact that assessment drives the students learning to guide their efforts to relevant practical skills:

> *"You have to get to grips with these things because these are the things that will come up in a practical exam"*
>
> (Husbandry teacher)

### 6.2.6 Use of a variety of teaching resources

Students were observed in lectures and practical classes using a mix of learning resources, used interchangeably. For example, in a husbandry practical class on silage, students switched between the lecturer to ask questions, the display of historical teaching materials, the hay bales and the bags of silage.

**Figure 6-9: Second year students in animal husbandry class on silage in discussion with lecturer and reviewing teaching materials ©VHMD**

In the anatomy practical class, students alternated between their own dissections, animals already dissected with pins highlighting topographical landmarks, textbooks, printed notes, skeletal limbs, each other and the lecturers, after watching a video in preparation for their own dissections.

**Figure 6-10: First year students watch a video before beginning dissection ©VHMD**

Use of the live animal was also observed. Live dogs were used in the anatomy forelimb practical as a way of students relating their anatomical knowledge to the real animal. A live animal was used also in a practical class on neurological reflexes, giving students the opportunity to practice reflex testing. An additional benefit of the live animal perceived by the lecturer was to keep students alert and interested through moving around and interacting with the animal in addition to each other, their teacher and referring to their handouts.

**Figure 6-11: Fourth year students in small animal practical class on reflexes in the live animal ©VHMD**

### 6.2.7 Hands-on, experiential learning

Another anecdotal observation of the practical classes in particular were that they were very hands-on, allowing the development of practical skills to complement theoretical knowledge. In the microbiology class for example, students worked in pairs or threes, and followed a set of printed instructions to allow them to identify bacteria.

**Figure 6-12: Third year students in microbiology practical on bacterial identification ©VHMD**

Students were encouraged to handle gross specimens on the fourth year small group teaching for public health, whilst in the final year large animal class, students were encouraged to clinically examine cows that they had been assigned under the ‘Adopt a cow’ exercise.

**Figure 6-13: Fourth year students in veterinary public health class examining and handling gross specimens ©VHMD**

**Figure 6-14: On farm teaching for final year students on farm animal track ©VHMD**

## *6.3 Student focus groups and teacher interviews*

The results from the student focus groups and interviews with former and current teachers have been merged to allow the reader to gain an overview of the roles of educational methods and technologies used over time, from different perspectives.

The major themes (categories) of discussion that emerged from the focus groups and interviews, with sub-categories, are listed in full in Appendix H.

Quotes are included here as a way of ‘telling the participants’ stories’ and help to illustrate their individual perceptions and experiences. Headings in the text represent the sub-categories or concepts identified. For anonymity, all lecturers, senior lecturers, professors and senior management officials have been referred to as ‘teachers’. (‘Former’ teachers moved on to other professional positions, whilst ‘retired’ teachers worked at the veterinary school until their retirement.)

### 6.3.1 Teaching methods

#### 6.3.1.1 Lectures

Lectures were perceived to be an efficient way to disseminate information to students, particularly to draw their attention to key points. Other cited benefits included the ability of lecturers to enthuse students and provide clinical relevance, as well as the potential for interactivity through questions. Both students and teachers felt that attendance was required for meaningful learning.

##### 6.3.1.1.1 Efficiency of didactic teaching

One of the most common sentiments expressed by teachers was the fact that lectures – didactic teaching – were efficient, in terms of transmitting a lot of information to a large audience in a short time:

> *"The reason that didactic teaching still works is it's a highly efficient way of a) delivering information to students, b) exposing a role model to students, and c) addressing in an immediate sense [any] feedback students may have … People talk about didactic teaching as being, you know, almost like it is archaic. It's not. It has evolved with the time. We make use of different delivery systems within didactic teaching, so to say didactic teaching is out-dated would actually be a mistake."*
>
> (Teacher)

> *"If you think about it, giving a lecture to 120 students must be the most efficient way of presenting information to them, because you can give a lecture, and you can tick it off the list."*
>
> (Teacher)

##### 6.3.1.1.2 A guide to important points

As well as being efficient in terms of transmitting facts, the purpose of a lecture was perceived by lecturers to be an opportunity to guide students through the curriculum:

> *"A lecture is not to deliver all the facts, a lecture is to highlight the points that you think are going to be difficult for students to grasp and to understand."*
>
> (Retired teacher)

> *"The lecturer should be giving a framework of what's important and what isn't important and whether issues need explaining conceptually"*
>
> (Teacher)

#### 6.3.1.1.3 Attendance

Students felt that they had to attend lectures in order to clarify their student notes:

> *"If you just print off the notes and don't go to the lectures, parts of your notes with abbreviations and stuff won't be explained, so going to the lecture so that I can understand the notes [laughs] may be one of the reasons why I'd go, because a lot of the notes assume a bit of knowledge."*
>
> *"When I come to revise, I'm very aware of lectures that I have been to and lectures that I haven't been to, and the ones that I have been to I find it a lot easier to make sense of that information.*
>
> (4th year students)

This was something that staff also recognised:

> *"I still think the lecture – if it's done well – is still one of the most useful things possible for the students, I really do. I know for myself, when I was an undergraduate, if I didn't go to a lecture, it would maybe take me two hours, even though I'd got someone else's notes, to try and get that information and understand it myself properly, you know, for a decent lecturer, so I think they're incredibly valuable, if they're done right."*
>
> (Teacher)

#### 6.3.1.1.4 Inspiring and enthusing students

The lecture was also considered to be an opportunity to enthuse students:

> *"[It is important] to keep the students involved and enthusiastic if you can, because it's important to keep their enthusiasm up, because it's a tough course as you know."*
>
> (Retired teacher)

This ability to inspire students was made possible by what one teacher referred to as "the power of oratory", based on good communication:

> *"Teaching is a lot about communication, and a lot about understanding the pace at which people can acquire information and learn facts, and that's where … the good teacher inspires, the good teacher delivers, and the good teacher understands. And it's understanding your audience …Some of the best lectures I have ever been in never had a single audiovisual adjunct. The power of oratory, the ability to inspire, is not dependent on aids frankly."*
>
> (Teacher)

#### 6.3.1.1.5 Clinical relevance

The lecture also gave staff the opportunity to highlight to students the practical relevance of theory:

> *So for instance, if we go along with pharmacology, if you were going to talk about the mechanism of action for a drug, you're going to say why they need to know that, because it's the clinical scenario that they're going to put that use into, whereas if you just read the textbook then it's very much 'This drug operates in this mechanism', so you try and engage the students by showing them the relevance of it.*

(Teacher)

#### 6.3.1.1.6 Interactive

Face to face contact during a lecture was also considered beneficial in terms of giving students the opportunity to clarify their understanding:

> *" I think it can be interactive, that's another important advantage of it, so that the students who don't understand what's going on can ask the questions, if you make the environment appropriate that they can ask the questions."*

(Teacher)

### 6.3.1.2 Practical classes

Practical classes were perceived by students and teachers as an opportunity to apply theoretical knowledge in practice, and (particularly in anatomy) to visualise gross structures while developing psychomotor skills. Students were given hands-on access to a diverse collection of materials, and encouraged to work independently, with the potential for interaction with teachers and fellow students. However, resource issues were observed to impact on the number of staff available to supervise practical training.

#### 6.3.1.2.1 Application of knowledge:

The main purpose of a practical class was identified as allowing students to apply their theoretical knowledge, derived from the lecture and student notes, consolidated through hands on experience:

> *"It's good how we have the lecture in the morning followed by a practical on what we just had in the lecture. It sort of reinforced it, and then you could take your lecture in and compare what you saw."*

($1^{st}$ year student)

> *"I think it helps them just apply the knowledge rather than to just know things, to actually apply it and see it work, and then sometimes it just makes so much sense it all clicks into place and they say 'Ok, I see that now, that makes sense'. It's fun! And it works, the whole of locomotion*

*works. It's a mechanical problem and it's a mechanical solution, and it works."*

(Teacher)

This system was perceived to improve memory:

*"You hear about it in the lecture but then you actually have to go and find it yourself – the muscle or whatever. That kind of helps too – you remember it better."*

(1st year student)

When asked about what might be their idea of an ideal day at veterinary school, one student responded:

*"I really like the way you would do say, a lecture then a practical. So if you had to do a full day you could have a lecture and practical for one class and then a lecture and a practical for another class. Fridays are good, because that's how anatomy is run, but it's all day anatomy. So if you could do say, anatomy in the morning and then biomolec[ular science] in the afternoon."*

(1st year student)

This suggests that for the preclinical years at least, the traditional system of a lecture accompanied by a practical class was considered by teachers and students to be beneficial in consolidating knowledge.

#### 6.3.1.2.2 Visualisation of structures

Many practical classes allow students to handle and visualise gross specimens. Interestingly, students often appear to visualise structures in two-dimensions, and for this reason, anatomy colouring books were suggested as a potentially useful learning resource:

*"A lot of their learning in the practical funnily enough is two-dimensional … At the class yesterday they were looking at the position of the heart within the chest cavity, and they had taken the lungs out, and when you look inside the chest cavity there's the heart, and there are the blood vessels. But the blood vessels are two-dimensional – that's all they're seeing, I mean they're seeing a heart here and blood vessels, just the same as a diagram, and they won't dig any deeper, not unless you tell them 'Look, you've got to go behind there and see another structure'. But when they first look at it it's two dimensional, and that's what they want initially, because it orientates them and you can tell them 'Behind this structure that you've just looked at is something else. Go and have a look, see if you can work out what it is. So I think two-dimensional colouring books would be useful for a lot of students."*

(Teacher)

#### 6.3.1.2.3 Psychomotor skills

Dissection classes were perceived to be the point in the course where students first learned how to handle surgical instruments:

> *"I think practical classes are absolutely essential, I think the students should dissect. You can use all sort of aids – experimental aids, phantoms, you name it – you can use them all, that's fine, but nothing compares to dissecting and sorting the tissue out, going through it yourself. Apart from which it gives you skills, practical skills."*

(Retired teacher)

#### 6.3.1.2.4 Access to materials

One of the major benefits of practical classes was perceived to be access to material that students would not otherwise have access to:

> *"You wouldn't be able to get hold of that material yourself. You can look in books and stuff, but you'd never be able to find yourself a dead dog or whatever, that way, so you kind of need it."*

(1st year student)

The diversity of resources available during practicals was also perceived to be beneficial:

> *"There were dissected dogs out there that had been properly done, which had coloured pins and pointed out all the different muscles. There were x-rays and there were bones, and it gave you a really … it got you to see everything, I thought they were really good."*

(1st year student)

#### 6.3.1.2.5 Interactive

Practicals were also considered to be interactive, allowing staff the opportunity to engage with students:

> *"We – in the bacteriology part of it – we don't have small group sessions at the moment, but in a sense we have the practicals which allows us to interact with the students a lot, so it gives them the opportunity to ask us questions about other things. One of the other real pluses of the practicals is that we actually get to meet the students, because obviously in lectures they can be pretty faceless, but doing the practicals, that is a big plus from it, I think. Probably from their point of view as well, because they get the opportunity to pose us questions."*

(Teacher)

#### 6.3.1.2.6 Do-it-yourself

Practical classes were also appreciated by students for the hands-on opportunity to do things themselves, something they would need to be able to do after graduation:

*"It was also good that you were in a group, you got to dissect your dog, so that way you got to do it yourself."*

(1st year student)

*"I think he's saying that eventually we'll be doing that ourselves"*

(1st year student)

#### 6.3.1.2.7 Not enough practical classes

Given the wide-ranging benefits of practical classes, students expressed a desire for more of them, particularly for the training of a profession which was regarded as a practical one:

*"I think it would be good if there was more practical stuff though, because I think for me that's really the stuff I enjoy the most. It helps me the most, so the more the better, really."*

(1st year student)

*"I thought there would be more practicals. I mean it's a practical job. You don't feel you know very much, like you think of it as being a practical course, but we spend so much time just looking at writing on paper. You know when you graduate you're not going to still be working at a desk.*

(3rd year student)

#### 6.3.1.2.8 Resource issues

However, it was clear from speaking to staff that they were only just managing to run some of the practical classes in place, with a limited number of staff, a restriction on the availability of gross specimens, and increasing student numbers:

*[The students are] always saying "We want more help in the practical classes, we want more demonstrators", and with the best will in the world, if there are four people, which there are sometimes four people in an anatomy practical and sometimes not that, sometimes three, but we've seen even two, going round that class, I mean you can't speak to everybody. You're dashing from table to table as the hands go up, and people come across the room and more or less grab you. There's lots of people don't get their questions answered, and I think that's a great shame.*

(Retired teacher)

*"Certainly there was no problem getting material when I was an undergraduate … I think that has become more difficult of recent years, partly if you think of the number of students – I was in a class of 35 – but the number of students has increased markedly over the years, and to provide that number of students with fresh material has become much more difficult and also has become much more expensive."*

(Retired teacher)

### 6.3.1.3 Peer-assisted learning

Two types of peer-assisted learning (PAL) were identified. Formal PAL was instigated in order to cope with too few staff in large group practical classes, and as a means of developing confidence and teaching skills in peer tutors. In this, and informal PAL, students were perceived to benefit from information being explained to them from a fellow student's perspective.

#### 6.3.1.3.1 Formal peer-assisted learning

Peer-assisted learning has been used to provide a solution to the problem of the low teacher-student ratio in practical classes:

> *" It was good because if it had been a lecturer or a couple of lecturers there was no way they would have got round the groups and covered us as well because there was quite a few of the fifth years ... It's like three lecturers between the whole class. At times it would be really tough trying to get hold of a lecturer."*

(1st year student)

Peer-teaching was also considered beneficial to the students:

> *"It would be good if you could do more of the final years teaching younger students. We did it to anatomy students in first year which was good, that we didn't get in first year. We taught them suturing and stuff, and I found I learnt a lot from it."*

(5th year student)

> *"We had the fifth years out doing a second year class the other day, and they love it. Like they say 'No, no, no' they don't want to do it, but I would say if you spoke to those students they all really enjoyed it. And that's the same if they then feel that they've passed some information on to second years, they go 'We do know something'.*

(Teacher)

Peer-learning was also facilitated in groupwork assignments:

> *I think it's really nice to have that mix, you know, and some people have done degrees in pharmacology and if you can't get a concept from a lecturer you might be able to get it from a student, because they are a student and they're more where your head is. And it's nice to have that.*

(3rd year student)

#### 6.3.1.3.2 Informal peer-assisted learning

Informal discussions with friends and housemates provided another valuable method of learning that provided insight into the longer term relevance of what students were learning:

> *"I stay with a fourth year and a fifth year presently, and like last term just before the exams I was trying to study renal anatomy and I couldn't really get it. And then I asked her and she explained like everything to me in like 15 minutes, and I was ready for the exam. And in the exam I actually feel more confident with renal than other topics, so yeah, it does help a lot … And I think at the same time it also brings it into perspective because they will tell you which things are more important in the later years."*

(2nd year student)

### 6.3.1.4 Tutorials

Tutorials were viewed by students and teachers as an opportunity for students to clarify their understanding, and as a forum for valuable discussion. However, the benefits were reduced in larger group sizes, and there was a danger of tutorials turning into 'mini-lectures', if staff were inexperienced or if students did not prepare or participate.

#### 6.3.1.4.1 Valuable discussion

Tutorials were viewed by students as a valuable forum for small group discussion when lecturers used the sessions effectively to make students think:

> *"The best discussions are when they talk around the subject, rather than just answering the questions straight. They talk around it, and put it into context.*

(1st year student)

> *"Some of them covered the material in a condensed form, like revision notes, and some of them said 'Ok, well let's try and take the information that you've learnt and think about it from a different way', which I think is much more useful."*

(3rd year student)

#### 6.3.1.4.2 Not a mini-lecture

It was recognised that valuable discussion would only arise where the tutorial was not treated as a mini-lecture:

*"We interact with students and get them talking, and try and make it a conversation rather than a lecture. That's the idea, and it does tend to work. You get variation between groups but by in large they tend to be reasonably interactive, and the students are always very positive about it."*

(Teacher)

There was a perceived danger with tutorials that inexperienced tutors would sometimes use them to disseminate factual information, rather than encouraging the students to think and contribute to a discussion:

*"I'm not really sure what we're supposed to achieve. They just read answers out and that's it. Half the time they aren't actually people who are lecturers in that subject, or they're from a different area and they're just reading out an answer sheet. That doesn't benefit us in the slightest. We need to have the option to ask the questions."*

(2nd year student)

*"I've found that the most effective tutorials for me now are, well firstly I need to be very knowledgeable about the subject, and I think that can be a problem where, because of the limited number of staff, we do use tutors that don't perhaps have the same knowledge as the person that's taught the subject. But the biggest challenge with the tutorials is getting the students to do the work … Some students still don't answer anything and I don't like doing it – but there are times when you just have to point at a student and say 'Ok, what's the answer?', or you just go round the class … Whether they like it or not, I don't know, but I think they learn more that way. And they do the work and it's not a mini-lecture, it's not about me standing up and going through the answers with them."*

(Teacher)

#### 6.3.1.4.3 To check understanding

Tutorials were perceived to have an increasingly important role in the clinical years of the course, for checking understanding:

*"That's where you really get into the nuts and bolts of everything. You're sort of testing yourself, but if you don't understand it, it's a really good opportunity to sort of say you don't understand it and even though you're in really small groups of four or something, there's other people that won't understand it as well."*

(5th year student)

#### 6.3.1.4.4 Group size

Group size was perceived to be a crucial factor in enabling effective discussion, with large groups considered to be intimidating for some students:

*"Like our tutorial groups at the minute, they're way too big."*

(1st year student)

*"I think a lot of people are afraid to ask questions in their groups, and it's a lot easier to be interactive when it's a smaller group."*

(3rd year student)

*"In group tutorials you always have people who don't want to speak up, you know, so even if they don't understand, they still won't speak up, even if they don't know the answer they still won't speak up, so perhaps in group tutorials there's the people who … prefer an individual tutorial where they can express themselves."*

(5th year student)

### 6.3.1.5 Self-directed learning

Although not all students feel comfortable in a small group, recent attempts to reshape the curriculum have placed a growing emphasis on groupwork, to facilitate the development of professional skills that students require for the workplace. Examples include the first year biomolecular sciences self-directed learning assignment (SDLA), the pharmacology library project in third year, and the companion animal collaborative learning assignment (CLA) in fourth year.

The major themes to come out of the discussions on self-directed learning were the benefits to students of being engaged in cutting edge research, and the opportunity to develop teamwork, presentation and information-retrieval skills. Students were disinclined to engage with SDL when they felt that their efforts were not rewarded or when the work was not perceived to be clinically relevant. To change the overall educational paradigm from a teacher-centred to a student-centred approach, it was suggested that SDL be introduced earlier in the course.

#### 6.3.1.5.1 Cutting edge research

First year students appreciated the opportunity to be involved in projects that exposed them to new research:

*"[My project] was on the sheep ovine pulmonary thing. I really liked it. Our guy was really good at explaining things to us so we had the basic knowledge and then did all the journal searches and stuff ourselves, so I thought it was really helpful for me … It was kind of neat that you were reading papers that people were just writing and you were making a hypothesis about something they don't know either."*

(1st year student)

However there was a perception among fourth and final year students that they were being used to pursue the research interests of the lecturer, rather than the projects being student-centred:

> *"What was even more obvious to some of us was that lecturers were basically just using us to do something they didn't have time to do."*

(4th year student)

> *"I think [for] the CLA we ended up doing maybe what the lecturers themselves were interested in, not what would benefit us, which would be the purpose of the whole thing really."*

(5th year student)

**6.3.1.5.2 Clinical relevance**

Self-directed learning was perceived to be beneficial where there was obvious clinical relevance:

> *"I think questions which had the basic knowledge and then you got to see clinical cases out of it. That gave you a sort of motivation to be a vet."*

(1st year student)

Project work that was geared towards clinical problem-solving was prized by clinical students above projects with an emphasis on basic research:

> *There's some of them that were useful, like radiographs, I can see why people … they'll be pro's interpreting mega-oesophagus in a radiograph, or whatever. I was in the MRSA [project group], and we spent ages trawling through files and everything, and you just thought 'This is why we're doing it – it's for the vet school rather than for us' sort of thing.*

(4th year student)

**6.3.1.5.3 Teamwork**

The self-directed learning assignments were also perceived to be about developing teamwork skills:

> *"I think the aim of it is to get us to work in a group."*

(4th year student)

This was something the students felt at odds with:

> *"I think every year of vet school we've had a group-ish project to do, every second term in every year, and if you can't work as a group by the time you're in fourth year, I think you're in trouble."*

(4th year student)

> *"Vets and groupwork didn't always go as smoothly as people would have wanted it to, but that's more the fault of the students themselves rather than the nature of the assessment."*

(5th year student)

Teachers also acknowledged this difficulty:

> *"I don't think it's worked so well in trying to get them to work as a team, because some of them in the group do work as a team but others just hang on to the rest of the group."*

(Teacher)

Although first year students acknowledged the benefit of sharing findings with other groups:

> *"Each group had to do a presentation and then you got to see what each person did and you got to learn a wee bit from each of the presentations."*

(1st year student)

#### 6.3.1.5.4 Presentation skills

This also benefited the individuals who gave the presentations on behalf of their group:

> *"They just did their presentations last week and the week before, and their presentations are better than some of the presentations that our staff would do. Really clear presentations, clear slides and well presented, you know, we've got some real public speakers."*

(Teacher)

#### 6.3.1.5.5 Information-retrieval skills

Another key skill students were expected to develop as a result of these exercises was information-retrieval, in light of the fact that students could not be expected to know everything about all species:

> *"The main benefit is that the students have learned how to acquire relevant information, and of course they've learned a lot about particular subjects. Not all the students cover the same topics so they're all learning different things, but they've learned a mechanism by which they know how to access peer-reviewed information."*

(Teacher)

#### 6.3.1.5.6 Earlier introduction in course

However, it was suggested that professional skills such as information retrieval (developed in the context of self-directed and collaborative learning assignments) needed to be introduced from earlier on in the course:

*"I think it's important that in the pharmacology [library project] you have to look for papers yourself, because I think searching for papers and finding them is a skill. So I don't think it would help for the vet school to spoon-feed them to you in any way, but just to get you into the habit of doing it on a smaller scale from earlier on."*

(3rd year student)

An earlier introduction to independent learning approaches would change the mindset of newly admitted students, it was suggested:

*"I think the biggest problem we have with that is that third year's too late. The students come from school [knowing] that the information's going to be given to them; that they're going to learn it, and then they're going to regurgitate it. And first and second year can reinforce that to a great extent, so that by the time they get to third year it's very hard to get them to do what we want them to do … And even though they get the biomolecular SDLA, it's not enough to change the mindset. We need to hit them right at the beginning, like the first couple of weeks should be just them learning stuff on their own. Because if you did that, you'll have changed how they think they should be getting the information. But we get them in and we give them lectures for the first term, I think the SDLA isn't until the second term, and so by that time they think 'Oh well, how we're going to be taught is exactly the same as at school. It's going to be given to us'."*

(Teacher)

There was also a perception among final year students that increased self-directed learning would receive a favourable response from students if it was introduced earlier in the course and used more frequently:

*"I think it would work if it was brought in from first year, you know, 'This is the way it's done', instead of one course per year being like that, where you're used to sitting in a lecture, reading the board and writing it back down, to then for say, pharmacology, to have to go off and learn it yourself. I think if the whole course then just became directed learning, 'You just find this bit out, come back and tell everybody about it', it would work."*

(5th year student)

Although it was noted that this approach would require adequate support from staff in terms of structure and feedback:

*"As long as they give you, you know, not necessarily get rid of all lectures and everything, but as long as you've got enough time, a day a week or whatever, to do all that work that you've got to do, and then when you come to go through it, there's enough staff members and things to go through it in small groups."*

(5th year student)

#### 6.3.1.5.7 Perceived lack of reward

Under the current system, students generally did not feel adequately recompensed for their efforts:

> *"If I knew that the 20% would actually make a difference then I wouldn't have minded, but now, having found out that it doesn't make a shred of difference, I actually feel a bit angry that we put … our group – I am not saying any other group worked less hard – but we worked so hard. Our project took up so much time, just going round different members of staff and interviewing them and stuff. It's a bit disheartening."*
>
> (4th year student)

The CLA was an attempt to introduce independent learning on a small scale. At the other end of the spectrum, problem-based learning in many medical schools has been introduced as a wholesale solution to bring clinical relevance into earlier years and to promote subject integration.

### 6.3.1.6 Problem-based learning

Students and teachers expressed strongly opposing views about the suggestion of a fully problem-based curriculum. With their knowledge of the medical school curriculum from friends and relatives, students felt that PBL might give them more motivation to learn, because of its 'real world relevance' and the opportunity for deep learning. They, like the staff, recognised the resource implications that a fully PBL curriculum would entail, but in addition, teachers expressed significant concerns about potential gaps in the curriculum, as well as students not receiving a thorough grounding in the preclinical and paraclinical subjects before studying clinical aspects.

#### 6.3.1.6.1 Intrinsic motivation to learn

Problem/case based learning was viewed by students as a way to intrinsically motivate students to undertake more meaningful learning than the traditional approach:

> *"I think first of all it would keep more students in focus, because most of them are just waiting 'til the class exam before they study, and some just wait for the final exam and don't even bother to study for class exams."*
>
> (2nd year student)

*"I think [PBL] would make us better students, because I think at the moment there is a tendency – I have a tendency – to not work and just do the minimum to kind of scrape by until four weeks before the exams and then kill yourself, and move to the library and just live there. And the reality of the situation is you can actually get through the course doing that."*

(3rd year student)

#### 6.3.1.6.2 Real world relevance

PBL was also considered by students to emulate veterinary practice, in contrast with traditional didactic teaching and rote learning:

*"When you're given a case scenario, it makes it more real. Because that's what happens when you're doing EMS at the vets; I can remember a lot of cases I've seen – it makes it more real to you, and when you're working as a vet, that's how your mind works, rather than sitting in a lecture."*

(4th year student)

*"It's quite demoralizing as well. You're just sitting there – particularly in third year – and you're just rote learning all these life cycles and things like that, and you just start to think 'What is the point? How is this ever going to be relevant?'"*

(5th year student)

#### 6.3.1.6.3 PBL in Medicine

Students made frequent reference to the fact that the medical students at Glasgow had a PBL curriculum, which they considered to be a more effective learning method:

*"Given the choice between the course that we're doing at the moment and doing problem-based learning, I'd definitely choose problem-based learning."*

*"Mm hmm, I think it would make us better vets actually."*

(3rd year students)

*"I haven't done a degree before, so I can only base [my opinion] on what I've experienced here, which seems to be reasonably logical, but like [student] says, your sister's doing the medical degree, and it's a completely different way, it seems easier to assimilate the information that way then, it seems silly that we're doing it this way."*

(4th year student)

#### 6.3.1.6.4 Engaging the brain

PBL was viewed as a more effective learning method than lectures, in terms of making students think more deeply:

*"They could actually just get rid of the lectures completely and give us big textbooks with nice, pretty slides to look at, you'd just go away and they say 'Right, by the end of this week you should have done that'.*
*I mean that's all you do in lectures at the moment, you just sit there and get information, go home and learn it. It just seems …"*

*"It seems strange. And it's using your memory. My memory is awful!*
*If you engage your brain more, you learn it better and you understand it, rather than just going 'This is gram-positive, this is anaerobic'."*

(3rd year students)

#### 6.3.1.6.5 Practicalities

However students did appreciate that the PBL approach was a resource-intensive one that could not be implemented in its entirety:

*"I appreciate that you're never going to be able to teach the whole course like that. There's just so much volume. But it does help more, even if they just wanted to teach really important areas and give us case studies, that would be really helpful."*

(4th year student)

This was something that staff had also pointed out:

*"It's hugely expensive."*

(Teacher)

#### 6.3.1.6.6 Rejection of wholesale PBL

Although firmly behind the concept of vertical integration, all retired and former members of staff, and some current staff, were opposed to the idea of problem-based learning implemented to the same extent as that employed within the Faculty of Medicine:

*"I think unless you know your basic sciences, it's very difficult – how can you understand pathological changes and the changes in disease if you're not aware of the physiology, biochemistry and pathology of course … I'm very keen on bringing clinical information back down the course and using clinicians, but using them as icing on the cake, rather than the core."*

(Retired teacher)

*"You can't become a surgeon if you don't know anatomy. You can't become a pathologist if you don't know histology. End of story.*
*But to denigrate it as has been done over the years, to me is very short-sighted. I can quote Sir James Black – Nobel prize winner – who said that he was appalled at the idea of not teaching anatomy. To him it was the basic subject, which is absolutely necessary."*

(Retired teacher)

*"The problem-based learning at the medical school is not getting a good response from the clinicians, you know, comments like 'I wouldn't let a Glasgow doctor treat me' from clinicians who teach on the course, I think is indicating that there are difficulties with a fully problem-based system. So I don't think we should be going that way, or fully self-directed which is effectively what that is."*

(Teacher)

#### 6.3.1.6.7 Gaps in knowledge

Part of the concern related to the perception that graduates of a fully problem-based curriculum had substantial gaps in their knowledge:

*"What students want, in my experience, is to know that they have covered the topics. And I think in problem-based learning there is serendipity as to what walks through the door and how you then do your learning. You see this in many different generations. Why are taught Masters so popular? Because people feel that if they go and do the taught Masters they're getting the structured knowledge and therefore they understand it, ticked the box."*

(Teacher)

*"The good students in fact were ok, or the enthusiastic ones, but quite a lot of students left the course with huge gaps in their knowledge."*

(Retired teacher, talking about training at a different university)

### 6.3.1.7 Post-mortem demonstrations

Post-mortem demonstrations were appreciated by students for their role in fostering subject integration, three-dimensional visualisation of structures and as an aid to revision.

#### 6.3.1.7.1 Subject integration

The post-mortem demonstration was perceived as a means of promoting horizontal and vertical subject-integration:

*"I think they're quite good because it's not just pathology, it's a lot of parasitology, and you have to think of … it integrates all the classes better, so you're not seeing things … you know, when you're in one class learning one thing, and it's maybe hard to put them all together, whereas in pathology it's much more integrated."*

*"I think it's the most important of all the practical courses we do. It's the only thing that draws everything together. You see bacteria, you see everything, and you do constantly revise the anatomy."*

(3rd year students)

This was partly due to the fact that pathology staff had a good overview of the course as a whole:

*"He knows enough things about parasitology as he does about pathology. He seems to be a parasitologist, a bacteriologist and a pathologist all in one, so that helps as well."*

(3rd year student)

#### 6.3.1.7.2 Revision aid

Post-mortems also assisted students with revision:

*"You don't just see it on a slide in the lecture, you do get to see the whole 3D, and it's repetition of what you've seen. I mean, in the lectures they're throwing so much at you and skipping going through so many slides that you concentrate on one thing and then all of a sudden you're on something else. I suppose it's revision in a way"*

(3rd year student)

#### 6.3.1.7.3 Three-dimensional visualisation

Post-mortem dissections, when conducted by students, were considered beneficial to learning because they permitted a three-dimensional view of gross pathological structures:

*"Just being able to see something in 3D. It helps you to remember things so much better."*

(3rd year student)

However, visibility in the post-mortem demonstrations was poor and it was suggested that modern technology could be used to improve this:

*"People would scramble to get to the front, because you can't see at the back, so it would have been great if they had an overhead camera sort of thing."*

(3rd year student)

### 6.3.1.8 Précis of discussions on teaching methods

Lectures were perceived by teachers as being an efficient way to disseminate theory to a large number of students, who relied on this form of teaching as an essential guide to the material in their lecture notes. Lectures also gave staff the chance to enthuse students, with the possibility for interaction if questions were asked. The theoretical knowledge from lectures was reinforced in practical classes, which gave students the opportunity to develop psychomotor skills and access a diverse range of materials that they would otherwise not have access to. One problem with practical classes identified by staff and students was the low teacher–student ratio, which required in some cases the use of formal peer teaching, that peer tutors benefited from in that it helped build their confidence about their own knowledge and skills. Tutorials – when run effectively and with an optimal number of students – were viewed by teachers and students as an opportunity for valuable discussion, allowing for clarification of students' understanding, something that could not be easily done in a lecture. Recent attempts to implement SDL assignments allowed students to be involved at the cutting edge of research, as well as developing information retrieval and teamwork skills. However, students put forward the argument that they were not being adequately recompensed for their efforts that were perceived to be directly benefiting the tutors rather than the students. Problem-based learning was suggested by students as an alternative way of learning that they perceived was working well in the medical school. In contrast, most teachers were reluctant to go down the fully problem-based route, arguing that this resulted in gaps in students' knowledge. Post-mortem demonstrations were viewed by students as a way to promote subject integration, and like practical classes, promoted three-dimensional visualisation when conducted by students themselves, whilst post-mortem demonstrations conducted by teachers in front of an entire class required the use of appropriate visual aids.

### 6.3.2 Visual aids

Visual aids were used mainly in lecture-style teaching, as an accompaniment to the spoken word.

#### 6.3.2.1 Key points

Students and teachers felt that visual aids used in lectures should only cover the key points, which the lecturer would then elaborate on:

> *"I don't like it when they've got too much text on there, because you don't tend to pay attention. If it's just key points it's better and then you can make your notes to go with it."*
>
> *'Reading off the slides is totally boring.'*
>
> (2nd year students)
>
> *"There's a tendency for people to have a good slide archive or whatever, you know, doing it nicely, but they find themselves so often I think reading what's on the slides, whereas I think you should put the slide on the wall, point out two or three points, and then go on to the next slide. But there's this tendency to sort of read it out, which is crazy."*
>
> (Retired teacher)

#### 6.3.2.2 Blackboard

The blackboard provided an interesting solution to this problem:

> *"I find that it's a bit more interesting if it's blackboard, just because it's not PowerPoint. Because PowerPoints can get a bit boring – they're just reading it and you already know what's coming. So the blackboard was interesting that way sometimes. But different people do it differently and some do it better than others."*

(1st year student)

#### 6.3.2.2.1 Student-paced

A clear advantage of the blackboard was the opportunity to write, speak and draw at a speed that students could keep up with:

> *"I used to love the blackboard; I really did. I think because it allows you to take the students with you, and you're all working at the same speed, and that was a great advantage, I think. And also it kept things relatively simple. Again it comes back to this idea about getting across very basic information. And I could draw a diagram, and I could develop it, and as I was developing it of course I was going at the same speed as the students."*

(Retired teacher)

Current students still perceived the blackboard to be useful for copying lecturers' diagrams:

> *[The blackboard is beneficial] for things like drawing diagrams, to go along with printed notes.*

(1st year student)

Although one student did not recognise the importance of this skill, preferring newer technologies that eliminated the need for this:

> *"There are pen-like mice that they can get so you can actually draw on PowerPoint itself, so … they can just do it on the spot. And then the students will have printed off the notes, can just [electronically] copy the same thing and don't have to draw the diagram as well."*

(2nd year student)

This particular student considered the use of older visual aids such as blackboards and acetates to be "a step backwards", having previously studied at a hi-tech secondary school.

### 6.3.2.3 35mm slides

None of the students commented on the use of 35mm slides, because of their very limited use, with most lecturers having gone over to PowerPoint and/or still using the overhead projector. However, it is clear from interviews with former and current teachers that they played a major role in teaching and the presentation of research findings in the Weipers, post-Weipers and early Information eras. Slick slide presentations looked professional and added clinical interest, although they restricted the lecturer to the order of the slides in the slide magazine/carousel, and there was the opportunity for poor communication if the teacher looked at their slides rather than the audience, which contributed to the soporific environment created by dimmed lighting.

#### 6.3.2.3.1 Impact of good slides

One former teacher paid tribute to the Faculty photographer, Allan May, for his role in producing 35mm slides:

> *"He has been responsible for promotions and Deanships and whatever around the world, and I relied upon him to an enormous degree. And the standard of work and the beautiful pictures he came up with, not just slides – they were simple, slides of tables and whatever – but some of the pictures he took for us were fantastic …He was an enormous benefit to us, you know? We were always being complimented about our slides."*
>
> (Retired teacher)

#### 6.3.2.3.2 Clinical interest

Staff who used 35mm slides in their teaching referred to the fact that photographic images could be used for clinical interest in the preclinical years:

> *"The idea of that was to give the students who were in the first couple of years – where they were pretty much stuck doing academic stuff, and anatomy and physiology and things tend to be very academic in those years – some sort of feeling for what they actually wanted to do. So they actually saw some real, live animals, put their anatomy into practice."*
>
> (Retired teacher)

#### 6.3.2.3.3 Diazos

Diazo slides represented a major advance in that they were the first form of projected text slides to be available:

> *"Kodak brought out different types of films and advanced onto Diazos which were blue – blue background, white lettering. Blue was the favourite colour. They had greens and reds but they weren't really very good … [They appeared in the] late 60s, early 70s. I think they came into America first, because a lot of people who had gone to the States to give lectures and things came back raving about this new colour slide system, and it took off."*
>
> (Retired photographer)

The new slides were perceived to contribute to the high standard of teaching at that time:

> *"I would say the major thing in keeping the standard of teaching high were the meetings that were held at Scarborough under AVTRW ...*

> *and you would use the best possible slides, the best possible material you could get. You'd have blue and white slides, your slides would all be of high standard. And that rubbed off in the technique that you would use in teaching."*

(Teacher)

The Diazo was not without its limitations however:

> *"The only problem with it was it tended to fade after a while. If someone was giving a long lecture, and left a slide in to talk to it, the heat of the lamp sometimes caused the film to melt."*

(Retired photographer)

#### 6.3.2.3.4 Soporific

The other problem with 35mm slides was that their use produced a soporific effect on the audience, because it required that the lights be turned off:

> *"I spent many happy hours as a student sound asleep in front of 2 by 2 slides, and I think it's generally acknowledged that many people drop off with 2 by 2's."*

(Retired teacher)

#### 6.3.2.3.5 Inflexible

Another difficulty with the use of 35mm slides, either in a magazine or carousel, was that it made the lecture inflexible:

> *"With 2 by 2's you're entrapped, you're on a progression, you lack versatility."*

(Former teacher)

#### 6.3.2.3.6 Potential for poor communication

There was also the potential with 35mm slides for lecturers to poorly communicate with their students:

> *"You'll find most lecturers stare at their own slides, they haven't been trained even to look at the audience."*

(Former teacher)

### 6.3.2.4 Acetates

Acetates were the media used with the overhead projector, first used in the Faculty in the Department of Anatomy. They afforded the opportunity for teachers to write and draw on acetates in real time (either on separate sheets or on a roll of acetate), in a brightly lit room while facing the audience. They were however, subject to technical drawbacks.

#### 6.3.2.4.1 The overhead projector revolution

The use of acetates with the overhead projector (OHP) helped overcome many of the difficulties experienced with 35mm slides:

> *"This was the first time that the lights could be kept on; the lecturer faced the audience, and could think and talk laterally. As a topic evolved, you could change, you could add, you could draw arrows, you could highlight, and if you could see the point wasn't going over with students you whipped another overhead out which took you in a slightly other direction, another way of explaining the same point, which you can't do with 2 by 2's."*

(Former teacher)

Keeping the lights on was not the only way of keeping students awake. One former teacher used this modality as a way to engage students throughout the lecture through talking them through annotated diagrams:

> *"I gave students photocopies of my basic diagrams from my overheads, and they could add notes and annotations to the basic plan, the basic diagram, as I went along. So that way they had to stay awake and listen to what I was saying."*

(Former teacher)

#### 6.3.2.4.2 Diagrams

Acetates were still perceived to have a value, in terms of lecturers' highlighting diagrammatic structures in lectures:

> *"We're getting lectures at the moment where we have a booklet with all the information in it, but then the lecturer's going over it on acetate, mainly highlighting diagrams and stuff, and that's ok."*

(1st year students)

#### 6.3.2.4.3 Quick to produce

Their practical use was also highlighted by a current teacher:

> *"Acetates were quite good before the days of PowerPoint in that you could prepare stuff in a reasonable sort of way and alter it reasonably quickly … I would still use acetates in practical classes … just to give them the introduction to what they were going to do."*

(Teacher)

Current students also use acetates in summarising clinical tutorials, because they are quick to produce:

*"It's actually the students who are using them. So they've had a morning and they've done something, and then they have to report back to the rest of the class. It's a hell of a lot quicker, you can just scribble that down, and it happens and it works."*

(Teacher)

Otherwise, acetates were perceived as having few benefits:

*"I don't think they're as bad as the blackboard, they don't seem to skip about so much in the acetates, but I still prefer printed notes to acetates probably."*

(1st year student)

*"Things like the acetates and blackboard. We don't use them at all. I don't know why they'd even be rated as vaguely useful."*

(5th year student)

#### 6.3.2.4.4 Practical drawbacks

Current teachers, who had been taught using acetates, also cited their shortcomings:

*"They were just difficult to read, and they were always squint, and I just hated it when they moved the bit of paper down the acetate. And then they'd fall off, and they'd shuffle through, rummage to the next one and it would slide off, and they'd put it back on, and it was just so … You could never read what they wrote, because they were always writing at a funny angle … Also from a lecturing point of view, I have used acetates before, they get out of sync, you know? And they stick together, you can't get the thing off, or they float off, or you find that it's all blurred at one corner, so using them I found [to be] a nightmare."*

(Teacher)

### 6.3.2.5 PowerPoint

Originally used to design text slides and graphics on computer, PowerPoint represented a technical advance over 35mm Diazo slides. However, in their electronic form, PowerPoint presentations were perceived to make learning 'too easy' through the availability of automatically generated handouts, as well as being ineffective due to the mass of information that students could be bombarded with in a lecture.

#### 6.3.2.5.1 For designing 35mm slides

PowerPoint was first used for designing text and image slides on computer, which could then be printed on 35mm film and mounted in a 2 by 2 slide:

*"PowerPoint certainly made a difference, because we switched, not from doing the PowerPoint actually, to processing the colour slides, which meant that we were processing more film than we would have normally.*

*We used to shoot everything on Kodachrome and send it away, which took about ten days sometimes, there was always a time delay, and then we switched over to Ektachrome and with the advent of small laboratory processors, similar to that one. It made processing a lot easier, because it's all automatic."*

(Retired photographer)

#### 6.3.2.5.2 Providing structure

Once it began to be used in its electronic form, PowerPoint was viewed as a major resource, in terms of structuring the lecture. In contrast, lecturers who used the blackboard as their primary mode of instruction were interpreted as being unstructured, which made students feel insecure about whether they had been taught the essential core material.

> *"One thing that would be quite troublesome for a lot of lecturers is some of them don't have PowerPoint slides to go with [the lecture] so they just talk about whatever comes to their mind. I'm not saying that they're not good lecturers because some of them are really good lecturers and they're like totally interesting, but the thing is, you feel that there is less of a structure, and you are rather scared at the same time that you will be missing out some stuff that you might actually be learning otherwise."*

(2nd year student)

Current staff also felt that it had brought an element of structure to their teaching:

> *"If I was organised like that I would score better, because I've got the experience of the technique of working with the audience, and if I have the discipline, which the other things brings to me, I should be better. So it's always nice to know that after thirty five years you can actually get better."*

(Teacher)

#### 6.3.2.5.3 Makes learning too easy

One perceived difficulty with PowerPoint was that it spoon-fed students:

> *"My impression is that they're trying to make it too easy. They assimilate [information for the student] rather than [them] having to sit down and try and slog at it and put a bit of effort into it."*

(Former teacher)

> *"I think [students] lose a lot, because they become very reliant."*

(Retired teacher)

#### 6.3.2.5.4 Too quick

It was also recognised that teachers could give too much information too quickly to students using PowerPoint:

*"The difficulty with PowerPoints is that people flash up a slide – this is why students want copies of all these things, isn't it? Because you flash something up, say a few words about it and you go on to the next one. And I would find it very confusing as a student because you just get things coming up and up and up. And if I was a student I'd think 'Why do I bother going to lectures really, because all the information's there. Why should I go and sit there for an hour and be bombarded with all this stuff – not really follow it, because it's going too quickly – I'd stay home and read up on my PowerPoint notes or whatever."*

(Teacher)

### 6.3.2.6 Flipchart

The flipchart's main advantages were the fact that it was portable and could be used as a discussion tool:

*"Well the old teaching units, out the back, there were no facilities really sensibly to set up any sort of projection equipment, and it was often very useful just to have a flipchart there … It wasn't suitable for you to leave it there, so you had to keep bringing it back … flipcharts and whiteboards were really useful for discussing stuff."*

(Former teacher)

### 6.3.2.7 Closed-Circuit Television (CCTV)

Students had no experience of CCTV, but former and current teachers recall it being used in a limited capacity. It was considered to have two main benefits:

*"The basic principle of using TV [was] both (a) to record a technique for demonstration purposes and (b) to record a procedure which would otherwise be difficult to show students."*

(Former Media Services director)

#### 6.3.2.7.1 Limited use

The CCTV network was used mainly for teaching histology:

*"In the early 80s we got the television microscope connection in the teaching lab where you could literally go over the slide that the student was going to examine in the practical class, and you could show them that."*

(Retired teacher)

Its use does not appear to have made an impact in relation to clinical subjects, despite being linked to surgical suites:

*"There was an extensive cable network installed at Garscube linking lecture theatres, operating rooms, labs etc. However I cannot recall it ever being used to any significant extent, certainly not in the clinical departments. I think that it is possible that Anatomy and possibly Pathology made some use of the system."*

(Retired teacher)

It was perceived that CCTV use was limited because of the rigid timetabling of programmes and the difficulty engaging the audience.

#### 6.3.2.7.2 Rigid timetabling

Because CCTV broadcasts happened in real time, classes had to be scheduled accordingly:

*"Cable systems were always cumbersome with all the disadvantages of broadcasting – the teacher has to timetable him/herself to the system – whereas with VHS it is entirely under his/her control."*

(Former Media Services director)

#### 6.3.2.7.3 Unable to engage audience

Another criticism of CCTV, that remains a problem of video-conferencing, was that it subtracted from the value of face to face teaching, in terms of the speaker's connection with their audience:

*"I've seen things at conferences and things that were done on CCTV and I've seen stuff that's been recorded off teaching courses and things, and I feel you just lose that intimacy almost with your audience. You could be on the television, it could be anything, you might not even know them."*

(Former teacher)

### 6.3.2.8 Cine

Cine film was the precursor to video, available in 16mm and 32mm formats. Because it relied on a dedicated projector, its use was restricted to lectures and small groups rather than individual use. Technically it was impractical and films were generally of poor quality, however it did provide students with access to rare cases, and cine films showcasing novel surgical techniques received accolades.

#### 6.3.2.8.1 Award-winning pioneers

Some of the cine films created at Glasgow were award winning, because they served to illustrate pioneering medicine and surgery techniques:

*"We used to do a lot of cine filming, and we won one or two awards for our films … We did one for Mrs [Flora] Lindsay, that won an award somewhere in Australia, and a bone-pinning technique film for Jimmy Campbell."*

(Retired photographer)

*"We used to do a lot of cine work for Gordon Baker … endoscopy work, literally hundreds of feet of film."*

(Retired photographer)

*"Gordon was pioneering – along with others – the various scopes that they were using to view nasal passages, larynx, the respiratory passages and so on, you know the naso-laryngoscope and the scopes that we use to look into the lungs."*

(Former teacher)

#### 6.3.2.8.2 Rare cases

Where cine also added value to teaching was in providing students with access to rare cases:

*"We had a very, very good library of pictures of distemper, in all its stages, both in terms of clinical condition and the pathology, and films were made in the 1960s of dogs with the neurological signs of distemper. These were actually shown during the lecture course on distemper. As time went on, distemper became a very, very rare disease indeed. Through the late 80s, every year, [we] would ask the students in fourth year how many of them had seen a case of distemper, and perhaps one student out of eighty might have seen it, so it was more important at that stage to have stuff on film and in pictures, than to show people live cases, because the live cases just weren't there."*

(Former teacher)

#### 6.3.2.8.3 Impractical

Despite their usefulness in showcasing ground-breaking techniques, and providing access to rare and historic material, cine was prone to practical difficulties, in terms of filming and processing:

*"I got involved in trying to produce a number of cine films for teaching purposes, and I can tell you they were an absolute bloody nuisance! They really were. They were very awkward to produce because what you wanted on the cine film was a kind of continuum of how things went, and to do that on actual cases was not at all easy, it was very difficult."*

(Retired teacher)

*"I tried once or twice to develop cine films – 100 ft. – because Robin Lee had a processing tank, so we used to try and process our own films, but it became very messy. And stringing a 100 ft. film from one end of the room to the other to try and dry it [laughs] …"*

(Retired photographer)

#### 6.3.2.8.4 Poor quality

Another unappealing factor was the poor image quality of cine, despite the useful content:

*"It was potentially good content but the quality was poor."*

(Former teacher)

*They were just amateur films and it was pretty dated technology. A lot of it was pre-video, and it was just appalling, sort of grainy images, it was a bit like Laurel and Hardy films."*

(Retired teacher)

### 6.3.2.9 Video

Video was considered to be useful because of the possibility of recording rare cases, and for illustrating the lecture and replaying dissections. However, video cassettes tended to be too long to hold students' attention, and with the decline of the VCR they are rapidly becoming obsolete.

#### 6.3.2.9.1 Rare cases

Like cine, video recordings of rare and historic cases were useful in teaching:

*"We got a film of the first BSE case. That's actually a video. That's actually quite good. We didn't know it was BSE then."*

(Former teacher)

#### 6.3.2.9.2 Ease of modern technology

The quality and ease of use of video cameras meant that teachers were able to produce useful films:

*"The ones that we made in the departments ourselves, ok they're pretty amateurish I suppose, but there were good things in them, and they were mostly quite short."*

(Retired teacher)

*"I think a good video can be a hand-made one, by ourselves. If they see people that they recognise, and it's not perfect, I think they would be inclined to watch and go 'Oh that's so-and-so', or 'That's a student that was there two years ago' … just something else that gets their brain ticking."*

(Teacher)

#### 6.3.2.9.3 Illustrating a lecture

One current teacher described his lectures as being "video-rich", which helped to keep students engaged:

*"All my lectures tend to be video rich … A lot of them will be quite short, or a lot of them will be part of the same case. Instead of having one clip of the whole case you divide the case into 5 or 6 different clips showing different things, so you can have a chance to talk a while, then show the video, then talk about it, introduce the next thing … I think it keeps the students awake, it keeps them interested, and I think it's easier to see something ... a lot of [neurology] is very difficult to describe. You can say 'Well this dog has narcolepsy, it's falling asleep', you know they may just drift off, but if they see a dog physically falling asleep on a video then it sticks in their mind a little bit. You know, [the dog is] walking along and then it suddenly falls fast asleep, it's a little bit more stimulating."*

(Teacher)

#### 6.3.2.9.4 To replay dissections

A number of dissection videos had been made in the Department of Anatomy and were still considered by current students to be useful:

*"I borrowed the anatomy one, but I'd watched it before we watched it in class actually. But I thought it was useful to see it again, because it goes over the muscles, like all of them that you need to know."*

(1st year student)

#### 6.3.2.9.5 Accessibility issues

A major problem with VHS tapes was the fact that they were an out-dated technology:

*"They're really old!"*

(1st year student)

But the main problem with video appears to be that in its original format it was not accessible to many students:

*"I was trying to borrow videos from the library, and they have got 20 minute videos of dissections of anatomies, and basically I asked for everything on the anatomy of the ox, and then she gave me nine video tapes [laughs] in one big bag, and then I happily carried it home, only to*

*realize when I got home that my VCR doesn't play PAL but it only plays NTSC."*

(2nd year student)

#### 6.3.2.9.6 Too long

The other problem with VHS tapes, particularly professionally produced ones, was that they tended to be unnecessarily long:

*"[The video] kind of dragged on, but it had information there that was useful."*

(1st year student)

*"The commercial ones of course are particularly good, although some of them were a bit long, you had to cut out bits and so on."*

(Former teacher)

### 6.3.2.10 Précis of discussions on visual aids

In terms of still images, the blackboard was the first visual aid to be used in teaching, and had the benefit of being student-paced in that students could keep up with teachers' drawings in real time. This was superseded by 35mm slides that allowed high quality photographic images to be projected for the first time, and which provided clinical interest in the preclinical years. A perceived drawback of 35mm slides however, was the soporific environment required for their viewing, with the lights out and the teacher generally facing away from their audience. The overhead projector presented a suitable alternative to 35mm slides, in that the lights could be left on and the teacher faced the audience. The first acetates were hand-written, with different pen colours used to differentiate structures and help annotate diagrams. However, like the blackboard, acetates were problematic in that not all lecturers' handwriting was legible. Acetates, like 35mm slides, were subsequently designed using PowerPoint software, which did allow for readability, although these were labour-intensive to create. Teachers and students recognised the importance of visual aids as a means of highlighting key points, rather than the speaker reading directly from the slides, which generally resulted in a dull presentation. The tendency to bombard students with information in slides was viewed as something that the advent of PowerPoint facilitated, which also allowed for the automatic creation of handouts. Although PowerPoint was advocated as a preferable method for creating a structured presentation, it was perceived by some teachers as making learning 'too easy'.

In terms of moving images, the CCTV network appears to have been underused at Glasgow, with cine used instead for the demonstration of rare cases and ground-breaking operative techniques. Labour intensive and technically difficult to produce, cine films were superseded by analogue video, as a means of providing access to clinical material as well as narrated dissections and operations. Digital video formats are slowly replacing VHS tapes, with analogue video cassettes regarded as an inaccessible technology by current students.

### 6.3.3 Learning resources

The previous sections describe the use of audio-visual aids used mainly in lectures. This section describes the learning resources available to individual students, sometimes in a class situation but mostly for independent study.

#### 6.3.3.1 Student notes

The earliest printed notes were bacteriology notes prepared by Professor of Pathology John Emslie, from the late 1940s. This set a precedent that was followed with pathology notes and eventually the entire course, diminishing in the 2000s when the printed bound notes were gradually replaced by electronic documents uploaded to the Virtual Learning Environment (VLE).

Student notes were considered by staff and students to be an ‘essential’ resource, providing a course outline and more relevant and up to date information than that available in textbooks. However, there was some concern among staff about students’ dependency on what were essentially collective bundles of pre-digested factual information, regurgitated on examination.

##### 6.3.3.1.1 Essential

Student notes prepared by teachers were viewed as essential by most students, given the large amount of information students were required to learn:

> *“If someone just gives you a lecture without the notes like we have had, if you miss something, or if you misunderstand something the first time round, then you’ve no fallback.”*
>
> (1st year student)

> *“It’s critical information, it’s a resource you can go back to at your own time and look at.”*
>
> (3rd year student)

Student notes to accompany the lectures were viewed as an essential backup resource that included all the core information required for passing examinations, although printed notes had been superseded by electronic equivalents on Moodle in recent years:

> *"I think it's a bit of a worry now that they're not getting notes, or whatever the controversy is around that, because it was nice to always think, you know, you've got a massive pile of notes or whatever but you think 'Well, if I learn all that, I'll pass', whereas thinking 'Well there's stuff on the computer' and it's like 'Do I need to go and find this bit? And 'Do I need to find that bit?', whereas if you're given it all at the start of the year, it's just like 'Right'."*

(5th year student)

Teachers who are also alumni stressed the vital role that student notes had played in their own education:

> *"They're critically important. It all depends on how much importance people put on learning provision. If you provide student notes, then the students will assume that is all they have to know. I'm being perfectly frank, for years 1 to 4 here I did not open a textbook. Everything I got, I expected would be provided to me, either in lectures or in lecture notes. There you go. And I was not alone in that. I mean the ideal of spending money on textbooks or going to the library was almost unheard of."*

(Teacher)

#### 6.3.3.1.2 Tailored to the local course

Printed notes were seen, from the outset, to compensate for the fact that many textbooks in the Weipers and post-Weipers eras were North American and therefore less pertinent to the local context:

> *"If students aren't going to get notes pertaining to the local course then I think they're going to have a difficult time of it. They're going to end up learning North American veterinary medicine."*

(Retired teacher)

#### 6.3.3.1.3 The 'best' textbook

Even today, students who relied on student notes felt that they constituted the 'best' type of textbook:

> *"Coming back to cost, it's the best textbook available, because it's written by the staff that are on the course, so rather than staff turning up and saying 'There's no good textbooks. There's three that are quite good. This is good for that, this is good for that, that is good for that and you can't afford to buy them all, and there aren't enough copies in the library'."*

(3rd year student)

#### 6.3.3.1.4 Reduced note-taking

Another benefit of the notes was that they eliminated or reduced the need to take notes in lectures. However, some students found it difficult to break the note-taking habit:

> *"I was always trying to get students in fourth year in these combined lectures to give up taking notes. It would have been far better if they'd just listened and then gone back to the printed notes, but they wanted to … you'd see them there, you'd tell them not to. You'd go in when you've got maximum power on your side, when they didn't know you, right at the first lecture, and you'd rant and rave and tell them not to take any notes from now on, and all this sort of thing, but within a week they'd all be trying to take it down."*
>
> (Retired teacher)

Printed notes also included diagrams, which saved students from having to draw diagrams, even though this had been cited as a benefit of the blackboard:

> *"I think the diagrams help them, because they aren't all great artists, some of the scribbles they might manage, it's better to have diagrams there and they can use them."*
>
> (Former teacher)

#### 6.3.3.1.5 Up to date information

Student notes were viewed as preferable to textbooks in terms of giving students the most up to date information:

> *"Students always want the up to the minute information, and in a lot of disciplines I think, by the time a book gets to be published and distributed it's out of date."*
>
> (Retired teacher)

However student notes also needed to be reviewed, with new editions being released as necessary.

> *"I was aghast one day … I didn't realize how bad these notes had become, and how dated … So I did the whole thing … I was taking the first notes and I was making a better job of that, and then I was going back to the people who gave the lectures, and getting them to … it was a huge job … it must have taken me three years to do it … I think every ten years you've really got to throw the old ones away."*
>
> (Retired teacher)

There was a perceived danger among staff that with the move to disassembled electronic notes that there would be poorer quality control:

> *"People had to put down the current state of knowledge, not knowledge that was 20 years out of date, and that's why the lecture notes were updated once a year. The problem that we now have that we don't have any formal mechanism for ensuring that people update their notes, year in, year out."*

(Teacher)

#### 6.3.3.1.6 Providing a course outline

The notes were also appreciated in terms of providing a structure:

> *"If we didn't get the notes we'd need a structure to know all the different things that we need to learn, and it would take a while to research everything I think, because you'd need to look in a variety of different books."*

(1st year student)

> *"If students don't want to read the book, which always gives you extra, or look at any other books, books that aren't particularly used, then the notes will give them guide as to what they should try to know."*

(Retired teacher)

#### 6.3.3.1.7 For factual information

One teacher emphasised that notes were useful when students had to learn factual information, but less so for explaining concepts:

> *"It depends on what you're trying to teach them. If you have an understanding-based course, then sometimes it's more important to help them understand the principles and then they can work everything around that, and therefore they don't need to have printed notes. If it's a very fact-based course then it's more important that they have the information. Physiology is very much an understanding sort of course, that if you can understand the principles you can work everything out, and therefore I don't think it's as reliant on them having words to work from."*

(Teacher)

#### 6.3.3.1.8 Spoon-feeding

In response to the suggestion that student notes could be construed as spoon-feeding material, most students were not dissuaded from using them:

> *"I don't think it is, because you still have to sit down and learn it."*

> *"And it might be spoon-feeding but at the end of the day if you learn it, and you know it, that's the point, isn't it?"*

(1st year students)

Although one student commented that she would prefer not to be spoon-fed:

> *"I don't think we should just be handed everything on a plate …
> I find it easier to have the key points from the PowerPoint and listen to the lectures, and then if I don't understand something then go to a textbook and read round it or speak to the lecturer."*

(2nd year student)

### 6.3.3.2 Textbooks

The limitations of textbooks have largely been illustrated by quotes in the previous section; they were perceived to be expensive, were not tailored to a specific course, and became quickly out-dated. Textbooks were also perceived by students to be of varying usefulness for different subjects:

> *"It depends on the textbook for me, because some are really like, 'There's no point', but others are really good."*
>
> *"Like Miller's dissection of the dog, it's a really, really brilliant."*
>
> *"I was going to say, it's excellent."*
>
> *"But other things, are just, I don't know, not as effective."*

(1st year students)

### 6.3.3.3 Posters

Posters were perceived to have limited usefulness.

#### 6.3.3.3.1 Animal breeds

Students felt that the main use of posters was for reference purposes in relation to animal breeds:

> *"I think posters are good for the sheep breeds, and there's horse breed ones. Maybe if they did it for dogs and cats that would be quite good because I'm not very good on my dogs and my cats."*

(1st year student)

#### 6.3.3.3.2 Wallpaper

However, students felt it 'easy to walk past' posters without taking any information from them:

> *"I'm really, really bad at just walking past them, because it's on my wall and I've maybe looked at it and taken information in maybe three times in last year."*

(1st year student)

### 6.3.3.4 Models and specimens

Models and preserved specimens were considered useful throughout the veterinary course, appealing in particular to visual learners. Fresh specimens were regarded as preferable to embalmed specimens.

#### 6.3.3.4.1 Embalmed specimens

The pathology museum at Buccleuch Street contained a number of embalmed specimens in jars ('pots'), until the merging of the two pathology departments. Pots were considered to have a value in terms of students being able to visualise uncommon conditions:

> *"There's a place for everything, isn't there? Because obviously those things in jars often – some of them may be the uncommon things that you'll probably not see otherwise – and after all, if you've got a bit of liver or a full liver in a jar, you can turn the jar round, can't you?"*

(Former teacher)

The anatomy department also had its own museum when the school first relocated to Garscube, although skeletons and preserved specimens were not considered to be of paramount importance:

> *"Anatomy had a museum. We had a considerable archive of specimens and bony specimens and prepared specimens, some of them mounted …*
> *I think you've still got to have a collection of archived material, particularly bone specimens, that sort of thing. But I don't necessarily see them being on a display on shelves so that people walk around, because I don't think people gain a lot from that."*

(Retired teacher)

#### 6.3.3.4.2 Fresh specimens

Despite the curiosity value of embalmed specimens, staff at Glasgow worked hard to ensure that students had access to fresh specimens as much as possible:

> *"I do think that the courses that are run at Glasgow, the courses run over the years that I've been involved in, have been good courses …*
> *We put a huge amount of effort into it, got fresh materials and so on, which a lot of the other schools don't do now … Here in some ways it's a bit more ad hoc, but I think it works, the system works."*

(Retired teacher)

#### 6.3.3.4.3 Relevance throughout course

One final year student expressed surprise that models and specimens received a relatively low overall rating in the student questionnaire, given their continued relevance throughout the course:

*"I would say I was surprised that specimens is so low there. I take it this goes right back to anatomy and through the whole course? Well in anatomy you need the specimens to learn in anatomy, then in pathology you need it for getting through that, and public health, you know, your final stations will be based on specimens, so I don't see [how] people said it was that low … Maybe people didn't think of that when they looked at the questionnaire, they just thought 'If I look at a leg, what do I take from it?', but if you actually think about what it's teaching you for further on, it is actually more useful than the way its rated there."*

(5th year student)

#### 6.3.3.4.4 Visual learners

Models and specimens appealed in particular to one student who regarded herself as a visual learner:

*"I'm more a visual learner, I think, and it just helps a lot to actually see something rather than a drawing on a bit of paper. So I would go and check them out and see."*

(1st year student)

### 6.3.3.5 The live animal

Although the dead animal was considered to be important in allowing students access to internal structures, teachers regarded the live animal as of paramount importance, to the extent that anatomy teaching has changed to allow a greater emphasis on the live animal. This enables students' senses to be engaged, including animal handling and three-dimensional visualisation of external structures, and allows students to relate their knowledge of anatomy to the clinical situation.

#### 6.3.3.5.1 Programmed learning

One particular novel use of the live animal in anatomy was as a type of programmed learning, by veterinary teachers in Glasgow in conjunction with Bristol, as a response to increasing student numbers:

*"What we set up was a system of a script, and we got a [live] horse and we clipped little bits on the horse and we stuck numbers on the horse, and we had an audiotape, and the audiotape – you put your earphones on and went and looked at the horse – and the audiotape would say 'Run your hand from No. 1 to No. 2, you've just run your finger over the scapular spine. If you go further ventrally you'll come to No. 3 and you're now sitting on the acroneus', and students could do that."*

(Former teacher)

#### 6.3.3.5.2 Three-dimensional visualisation

It was also suggested that the live animal was a more effective 'aide memoir' than a photograph:

> *"There's nothing worse than trying to visualise something in a 2-D picture. You get a little bit more demonstration of 3-D in a movie than you do in a still. But the live animal is what, to my mind, imprints clinical signs on the memory. A good live animal case is worth a hundred pictures."*

(Former teacher)

#### 6.3.3.5.3 Engaging multiple senses

The importance of the live animal was stressed in relation to students' using all senses when encountering a clinical case:

> *"Unless you use live animals right through the veterinary course, you're going to create graduates who don't know how to use their hands, their eyes, their noses, their ears."*

(Former teacher)

There was even a suggestion that interaction with the live animal would aid in the development of a 'sixth' sense:

> *"There are other skills which are learnt in the process which are also just as important, so that if you were looking at a live animal in an anatomy class, the restraint of the animal is important. So you are learning something about restraint, because if you want to look at the ventral surface of an animal's paw, it may be quite reluctant for you to do this, especially if it's in pain. So the idea that you don't just pick up the foot – any more than you'd just go and pick up a horse's foot without taking precautions – is this kind of development of sixth sense."*

(Former teacher)

#### 6.3.3.5.4 No substitute for the real thing

One former surgery teacher emphasised the superiority of the live animal over an image:

> *"I know you can do a lot of stuff with images. You can do a lot of stuff with presentation of photographs and things like that, but there's a real difference between doing that and having an actual animal there which you prod around and try and find the bit you want to look at."*

(Retired teacher)

#### 6.3.3.5.5 The new (living) anatomy

Given the benefits of working with the live animal, a new approach to teaching anatomy emerged at Glasgow, with the emphasis no longer on the dead animal but on the live animal:

> *"We changed from formalised, very dead specimens which had no real bearing to reality, we changed to using as much fresh material as we could, as much live animal as we could, and we also brought in the new technologies such as endoscopy, and then x-ray, radiography, ultrasound to teach anatomy. So we took it away from the embalmed unreal to what we thought was a much more clinical approach, so using new technologies we brought it forward."*

(Retired teacher)

### 6.3.3.6 Tape-slide programmes

Tape-slide programmes were first developed by teachers in the Department of Anatomy. Individual staff members took responsibility for particular systems so that production was shared. The programmes were intended to be used independently, mainly as a revision aid:

> *"The idea was to put all of the histology onto tape-slide, the basic cell and tissues, and then to do it systematically so that each system was covered by a tape-slide programme that the student could use as a revision aid at any time, and we actually had a small study room where the students could sit, and they just took out the tape-slide programme, popped it into the machine, and sat and listened to it as the slides went through. That they could do at their own pace, which we thought was the way to do it."*

(Retired teacher)

Tape-slide programmes were phased out with the introduction of the personal computer:

> *"Then of course computing came in, and that of course I'm not an expert in at all, but the idea was to put these tape-slide programmes onto computer."*

(Retired teacher)

### 6.3.3.7 Computer-aided Learning (CAL)

As mentioned in the previous section, some tape-slide programmes were digitised and converted to CAL programs, when the Faculty joined the CLIVE consortium in 1994, and a number of new programs were developed using the new media. There was a perception among teachers and students that CAL was best used to teach facts, and test factual recall, because of its limitations in simulating the complexity of face to face teaching. For this reason it was considered to be a useful adjunct rather than a replacement for face to face teaching, except in the case of wet practicals that had to be discontinued for ethical reasons.

#### 6.3.3.7.1 Teacher in a box

It was stressed by one teacher that CAL could not be regarded as a saving in terms of staff time, and that it should be designed to replicate as far as possible student–teacher interaction in terms of providing meaningful feedback:

> *"The teachers should always think of themselves as being in the computer. That I think is the key to it. You know, the teacher is actually in the computer. And so the program, or whatever it is you're making, is just an extension of yourself … … There is a myth which says that if you create computer-assisted learning you will actually reduce the time of the teacher. I don't think you do … If you simply have 'Here are the correct answers', and the student does the thing and there's the correct answer, the student after a while doesn't do it. He just looks at the correct answers and doesn't learn anything. He's got to do it, and you've got to correct it, and you've got to interact with the student. If you don't interact with the student, then the thing is of no great value at all … If you go to it from the premise that 'This is going to save me time' or 'This is going to save the institute money', it isn't going to do that, and if you believe in that then you believe in fairy tales. I mean the best teaching is still on a one to one basis, and you've got to have that input into the system."*

(Teacher)

#### 6.3.3.7.2 For facts not concepts

First year students suggested that CAL was more useful for teaching facts than for explaining more complex concepts, particularly in physiology, which students believed needed to be taught face to face:

> *"So maybe animal husbandry would be the best subject to have CAL stuff almost, because it's a lot of just learning facts rather than trying to learn a new concept like muscle contraction."*
>
> *"It's really stuff you need to be taught, because it's very conceptual."*

(1st year students)

#### 6.3.3.7.3 Self-assessment

The self-assessment features of CAL were commended by students because it allowed them to monitor their progress:

> *"The little quizzes and stuff in CAL are really useful."*
>
> *"So you can test yourself on what you have taken in."*

(1st year students)

This was also a benefit recognised by one teacher:

> *"I think it's also useful with the embedded tests – I think the tests are useful for students to review or test their own knowledge and go back and look at where they've gone wrong."*
>
> (Teacher)

However it was also recognised that CAL could only be used to ask very simple questions:

> *"Yes it's got to be a yes or no again, rather than grey! But it's hard for the computer to tell them why it's grey, so you do tend to put in things there that are yes or no, and the grey ones just don't get put in."*
>
> (Teacher)

#### 6.3.3.7.4 As an adjunct to face to face teaching

There was a strong feeling among students and teachers that CAL could not be used to replace face to face teaching, but instead served as a useful adjunct:

> *"I found it slightly unsatisfactory, in that it presented basic information, but it raised a lot of questions at the same time which were not answered. So I came away personally feeling 'Well actually, that may have done more harm than good'. But of course if students are using that, they can go to an instructor and say 'Look, we're looking at this program and we didn't understand this', or 'It didn't really go into depth in this area; can you tell us a bit more about it?' So I suppose from that point of view it's ok, but it didn't provide the complete picture."*
>
> (Teacher)

> *"I would be a little bit troubled about it becoming the mainstream way of teaching, because I think we've got students that don't really tell you when things aren't going well or they're not understanding something. Not that we pick that up in lectures either, but I think some sort of regular, face to face contact with students is important."*
>
> (Teacher)

#### 6.3.3.7.5 Laboratory replacement

Supervised use of CAL has successfully been used to replace wet laboratory practical classes, as evidenced by the replacement of some physiology practicals for ethical, practical and financial reasons:

> *"I think it would be much better if they were doing experiments, but the practicalities of the use of animals for education means that we can't justify doing that … And as student numbers increased, and the staff numbers decreased, and peoples' concerns about the use of animals increased, it was not an appropriate thing to carry on doing those practicals. The CALs that we've set up are very well received by the students, I mean they keep asking when we're going to do one for the frog one, which we haven't got round to doing. It's the engagement thing*

*again. They sit there and watch the video. Even though we stop the video and ask them a question, they're not as engaged in it as if they are doing the CAL package."*

(Teacher)

#### 6.3.3.7.6 Case-based CAL

Students in 3rd, 4th and 5th year all commented on the benefits of case-based CAL, which served to integrate subjects in a clinically relevant way, and which allowed students to practice their decision-making skills:

> *"You could do it [husbandry] as a CAL just, but when talking about a disease, talk about the husbandry factors that contribute to it, rather than talking about husbandry in isolation, which is dull boring."*

(3rd year student)

> *"I think something along the lines of a virtual visit would be really good. Your dog comes in and you've got this list of options, and due to A, B or C what's your next step, and you follow it along to the end and it says 'Actually you went wrong here, and you should have done this, your dog died of anaphylactic shock' or something like that! So you go back and try again. I think it has to be interactive. The page turning thing – I don't think works, and online discussion – I'm not sure how that would work either, but an interactive, problem-solving programme. I would find that quite intriguing anyway."*

(4th year student)

#### 6.3.3.7.7 Resource-intensive to produce

One of the perceived barriers to creating or updating CAL programs was the lack of time in senior lecturers' schedules, and the fact that CAL authoring was relatively low on their list of priorities:

> *"I think it's useful for young or new lecturers to think about how you can use technology in teaching the subjects that they're currently teaching. But it's a time thing, I'd love to do more now but I haven't got the time."*

(Teacher)

> *"It is time-consuming to make one of these programs, there's no doubt, and people have less and less time, because there are fewer people around to do what's necessary."*

(Teacher)

#### 6.3.3.7.8 Online access

Although CAL programs were available on CDROM, students felt that they would be more accessible to them if they were all available online:

> *"I have a computer at home, and I would do them if I could sit at home, but the thought of specially coming up here to do a CAL – although I suppose it's fair enough if you've got an hour's break and you're getting a bit stressed towards the exams – and I do find them quite useful when I do them, like in second year, or in third year I did some of the pathology ones and they were great. And when I do them, I think they're useful, but I don't understand why they're only available on campus."*

(4th year student)

### 6.3.3.8 Moodle

Use of the Moodle Virtual Learning Environment (VLE) in the Faculty of Veterinary Medicine started in the 2005-6 session, following a student research project in summer 2005 to migrate existing resources (PowerPoint presentations, lecture notes and past examination papers) from the student intranet. Although viewed by some participants as little more than a file distribution system that facilitates spoon-feeding, it has permitted transparency of content to staff teaching different courses, as well as acting as a repository for case material to complement the random cases that students would be exposed to in clinics.

#### 6.3.3.8.1 Online revision

In contrast to most CAL programs, Moodle offered the advantage to students that its contents were accessible online for revision:

> *"It's good that you have on the internet those notes which you can look over."*

(1st year student)

#### 6.3.3.8.2 File distribution system

There was a sense, however, in which Moodle was used mainly as a repository for factual information, rather than being used in a transformative way:

> *"I think right now Moodle is just more or less a file distribution system, there's nothing else to it. It's quite different from CAL programs."*

(2nd year student)

#### 6.3.3.8.3 Quizzes

However there appears to have been some exceptions to this rule, with physiology staff in particular using the interactive features of the system:

*"I think the physiology department is actually doing quite well with it, because they update us with lots of true and false questions for us to work on, and they are fully recognizing the system."*

(2nd year student)

The quiz facility was also viewed as useful by microbiology staff, who were able to upload questions themselves, with some effort. This ability was offset by the fact that self-tests created in Moodle were less aesthetically pleasing than CAL programs designed by a courseware designer.

*"We mastered the quiz a bit, although the one problem I find is that I do something on Moodle at one point, and the next year I try and do it and I can't remember how. It's really frustrating for myself. But we did prepare a quiz last year and it was a lot better, and it randomised the questions so each time they did it, you know, it's a new set. That was pretty good I thought. I thought it was pretty useful. But in terms of looking like the way they do it in the exam, it's still not as good or visually as nice as the [CLIVE programs].*

(Teacher)

#### 6.3.3.8.4 Variable caseloads

Storing case material on Moodle was perceived as one way to cope with the variable caseload, and providing students with access to clinical material, independent of the cases coming in during their particular rotation:

*"I think Moodle has got a particular case in clinical cases like neurology where the throughput through the clinic is very variable and maybe they won't see something one week or the other, and you can make sure they have a more balanced view of that."*

(Teacher)

#### 6.3.3.8.5 Transparency across courses

Another positive outcome of the use of Moodle has been the transparency of course material across departments, allowing teachers to identify and avoid unnecessary duplication:

*"Last week I was giving this antibiotic lecture; I knew that there was some antibiotics being taught in pharmacology at some point; I didn't know whether they'd had it already or if it was later on, so I went and checked, found out it was next term, then when I had a look at everything from last year that they'd got taught on that, so I could see how stuff I was going to teach fitted into it, and so I could then say to the students 'You're going to get a lecture about this next year' and I also contacted [my colleague] and*

*said 'Look, here's my lecture on this subject, you can use it if you want', so you can say 'They've already learnt about this' or 'We're going to follow on from this'."*

(Teacher)

#### 6.3.3.8.6 Not infallible

However, it was recognised that Moodle was not an infallible system, with electronic resources being considered more fragile than hard copy:

*"The fact is it requires a certain amount of support to make it work. When Moodle falls over, as it surely will do one day, either for 24 hours, a week, then the tried and tested methods – your lecture notes and the library – will always be there. I think that's one of the concerns that I have with the electronic learning environment."*

(Teacher)

#### 6.3.3.8.7 Spoon-feeding

Another concern was that it promoted spoon-feeding in students, by making their learning resources available from a single portal, rather than them having to locate materials themselves:

*"I think it's a superb way of putting information out for students that's accessible to them, but I just worry a little bit whether we're not in fact giving them too much and [they are] not actually going in and finding things out for themselves."*

(Teacher)

### 6.3.3.9 Internet

There was a perception that use of the internet could compound the information overload problem, particularly if students were unable to search the web effectively, or if they were unable to discern authoritative sites from less reliable ones.

#### 6.3.3.9.1 Information overload

The problem of 'too much information' was cited in relation to the use of the internet for teaching:

*"I don't think it's absolutely necessary for the student, unless the student's doing a project or something within his course. I think if they're getting lectures and possibly printed notes and they have a textbook, that that's enough. They can be snowed with information."*

(Former teacher)

#### 6.3.3.9.2 Assessing source quality

There was a sense in which first year students at least did not feel skilled in assessing the quality of the information available on the internet:

> *"Anybody could put anything on the internet, and there's quite a lot of different opinions and things like that on the internet, it's sometimes hard to believe exactly what you're reading and be confident that you're not learning rubbish."*
>
> (1st year student)

Although the SDLA had gone some way towards addressing this:

> *"Before I came here I wouldn't have realised that. But during the biomolec[ular sciences] thing we had to do, it was pointed out to watch which website you were coming off onto."*
>
> (1st year student)

#### 6.3.3.9.3 Finding useful resources

Finding useful learning resources was something that not all students felt able to do:

> *"One of my friends, she goes onto the net and finds quite a lot of quite good, interactive things, but I haven't personally used them. She speaks about them, she thinks they're quite good but I don't know where she gets them from."*
>
> (1st year student)

Although some teachers explicitly recommended websites to their students:

> *"There's a website for the National Sheep Association. This is one of the website addresses which I give to them, I say 'There's a heck of a lot of useful information on there which will enhance what I say to you, just use it', and one or two students have used it, because they've got back to me."*
>
> (Teacher)

### 6.3.3.10 Podcasting

Podcasting has recently started to provide an alternative means of personal access to video and audio recordings. Interviewed teachers were not familiar with it, but some students recognised that it had potential for providing flexible access to lectures.

#### 6.3.3.10.1 Backup to missed lectures

Not all students had MP3 players at the time of the focus groups, or were familiar with podcasting technology, but those that were viewed it potentially as a means of catching up on missed lectures:

> *"I think it's got a value, because if for any reason you miss a lecture it would be useful, but not solely, because I think the lectures are probably better."*

(1st year student)

#### 6.3.3.10.2 For revision

However podcasting, such as anatomy dissection videos or lecture recordings, were also perceived to be useful revision aids:

> *"You'd really know it was preparing you for the test. Say, the video's 40 minutes, and that 40 minutes would be good studying."*

(1st year student)

> *"For exam times, because during the lecture they explain better than in the notes."*

(2nd year student)

#### 6.3.3.10.3 Can switch on and off

The tendency to mentally 'switch off' from podcasting, versus sitting in a lecture, was viewed as a negative feature by one student:

> *"It's really easy to switch off. It's harder to switch off if someone is sitting in front of you."*

(1st year student)

But on the other hand, the technology enabled students to switch the lecture on and off to suit themselves:

> *"You can stop and start it when you want."*

(2nd year student)

### 6.3.3.11 Précis of discussions on learning resources

Student notes were regarded as the mainstay of independent learning resources over the period of study. Viewed as essential by students and most teachers, they were tailored to the BVMS courses, and precluded the need for copious note-taking, allowing students to listen in lectures. Although a recognised spoon-feeding device, printed notes were viewed as preferable to textbooks, because they distilled the knowledge from various sources that students felt they did not have the time to consult.

In terms of learning resources used in practical classes, posters appear to have been of little use other than as a reference tool. Models and specimens were valued throughout the BVMS course, with Glasgow teachers stressing the importance of fresh specimens in preference to embalmed specimens, and with an increasing emphasis placed on the live animal as a learning resource, to promote development of animal handling skills and clinical relevance.

In terms of programmed learning resources, tape-slide programmes were mainly used for visual subjects, presented in a systems-based fashion. These were superseded by CAL programmes that, like their predecessor, largely presented information in a linear way. Although largely designed to test students' knowledge of facts rather than any higher level of cognitive understanding, self-assessment CAL programmes were viewed as useful by stakeholders. Teachers and students distinguished *fact-based learning* from *concept learning*, with learning resources such as student notes and CAL being viewed as suitable for fact-based learning, unlike the teaching and assessment of higher concepts, which require the teachers' presence.

As a single portal to essential learning resources, Moodle was welcomed by students and teachers, and represents the most meaningful use of the internet to date in terms of supporting students' learning. However, staff voiced concern about spoon-feeding enabled by this technology.

## 6.3.4 Integrated teaching

### 6.3.4.1 Clinical relevance of preclinical subjects

Students expressed a clear need for clinical relevance to be introduced earlier on in the course, and this was acknowledged by current teachers. Paradoxically, retired teachers provided a number of examples of integrated teaching practice that brought clinical relevance into earlier years of the course.

#### 6.3.4.1.1 Earlier in the course

Students' desire for clinical relevance earlier in the course was strongly highlighted:

> *"I understand that you need a good founding knowledge in a healthy animal first, but it just seems like third year is quite late before introducing that more clinical stuff."*
>
> (1st year student)

#### 6.3.4.1.2 Why am I here?

Otherwise there was the danger of students thinking 'Why am I here?' in relation to their learning:

*"And halfway through third year I went 'Oh wow, I am actually going to be a vet', you know, because I'd almost forgotten why I was here."*

(3rd year student)

*"I also feel, looking back from fourth year over the past few years, I've caught myself thinking 'What on earth have we been doing for the past three years?' It just seems really pointless. And I know that in theory it's supposed to give us – like first couple of years at least – are supposed to give us a depth of knowledge, a good breadth of knowledge, but some things are just blatantly pointless."*

(4th year student)

#### 6.3.4.1.3 Clear clinical emphasis

On hindsight, one final year student felt that the clinical relevance of preclinical teaching was not strongly emphasised enough:

*"Things that are really striking how now, for example husbandry, you know, you're out doing your farm animal rounds now, and everything relates back to husbandry. You didn't think about it at the time, you know, it was just a whole load of facts and figures, you go 'Yeah, yeah, yeah, I'll learn them eventually', and it comes to this year when it is actually important that you can stand in a shed and look round and know what's wrong and how you would want to improve it, and why. So I don't think enough emphasis was placed on it when we went through."*

(5th year student)

#### 6.3.4.1.4 Maintaining student interest

It was suggested that early exposure to clinical cases, albeit at a very superficial level, would serve to keep students interested in what they were learning in the preclinical and paraclinical years:

*"For me it would just be interesting to see a clinical case now and then because it would be interesting rather than needing to learn it right then."*

(1st year student)

#### 6.3.4.1.5 Previous attempts to introduce earlier clinical relevance

What is surprising, given the student feedback on their experiences of the course, is that teachers (particularly in anatomy) have long understood that students appreciated having the clinical relevance of preclinical subjects emphasised, and went to substantial efforts to do this:

*"I think it's very important to point out to students, and I always did it in my lectures and classes, and any classes I'm in, clinical relevance of anything they're studying. They may think "Why are we looking at this?"*

*and you can tell them "You need to look at it because it's important clinically."*

(Retired teacher)

*"If you could hang anatomical facts onto a clinical peg, the students loved it and would listen. If you delivered anatomical detail for anatomical detail's sake, you lost them."*

(Retired teacher)

Discussions with retired senior members of staff revealed that the concept of vertical integration, in terms of bringing clinical relevance into the earlier years of the course, was one that Glasgow had embraced from the 1960s onwards, evidenced for example by the cooperative teaching efforts between the Departments of Anatomy and Surgery:

*"I would run a session on say, the respiratory system, the chest, so … anatomists would do the anatomy, I would actually talk about the clinical findings and what you could hear when you auscultated and things like that, and so my slides would just be really an outline of a cow probably, with an auscultatory area outlined, or spectacular pictures of disease – something to really sort of capture their imagination. And then we'd take them out to the byres with live cattle, and I'd probably use some of my final year students to help, so they got almost one-to-one listening to cattle."*

(Retired teacher)

### 6.3.4.2 Subject integration

Current students also suggested that the course subjects needed to be better integrated, horizontally and vertically. This, they perceived, would make them better learners and could be facilitated through improved communication across the departments. Two historical examples of subject integration were highlighted – one arising from research collaboration across departments, and the other brought in to address directly a need for more integrated teaching. There was no consensus among staff about how much the subjects should be integrated within a revised curriculum.

#### 6.3.4.2.1 Removing the barriers

Subject integration was advocated by students in years 3 and 4:

*"I think it would be good to remove, so it's not anatomy – physiology, remove all those barriers and teach it as a whole integrated thing. Because it's hard to see the whole picture if you're being taught in these separate, pocketed ways, so you don't realise everything does actually fit together."*

(3rd year student)

*"I think in terms of relevance the course needs to be structured completely differently. I think it needs to be an integrated sort of thing, where you're taught normal anatomy, you're taught the physiology of that system then you're taught the pathology and specific diseases and treatments."*

(4th year student)

#### 6.3.4.2.2 Lecturers working together

It was thought that this could be achieved by lecturers working together:

*"If the departments could get together and put forward a few cases, and for each case – if they were going to keep the subjects separate – talk about the husbandry implications, and just draw it all together actually physically in front of you, and have a lecturer from each department saying 'This is where my subject fits in'."*

(3rd year student)

#### 6.3.4.2.3 To facilitate effective learning

Without subject integration, there was the real danger that students would forget subjects they had been taught earlier:

*"I mean they've taught us. They've given us the facts 100%. But when you get to third year, I must know about 20%."*

(3rd year student)

#### 6.3.4.2.4 Integrated pathology/medicine

One of the earlier attempts to increase vertical integration in the course was the delivery of clinico-pathological conferences, which were considered to be a Glasgow hallmark:

*"It's always been the Glasgow philosophy to integrate as far as possible the pathology teaching and the clinical teaching."*

(Retired teacher)

The collaboration was observed to have grown out of research collaboration:

*"There was this major collaboration between departments – between Parasitology, Pathology and Medicine, and that was really as a result of research into the parasitic diseases of calves, especially lungworm … Out of that I think, grew this interdisciplinary approach to teaching, and that was the time at which what is called the Combined Integrated Course got set up, which integrated Medicine and Pathology and Parasitology."*

(Retired teacher)

One of the key features of these integrated classes was the heated debates between clinicians and pathologists:

*"We'd interrupt each other, and sometimes we'd fight with each other, and the students couldn't handle that, that there were two experts standing*

*down there, lecturing to them about fog fever, both of whom were if you like, renowned in the field, and yet they were arguing, and they had two separate views on pathogenesis or something like that.*
*I think they found it a bit startling, but I think that kept them awake."*

(Retired teacher)

The other benefit of the integrated course was a reduction in the number of lectures:

*"It cut my teaching down from a hell of a lot to something like … the cattle course was cut down from I think a couple of hundred hours to eighty, just like that."*

(Retired teacher)

The number of clinico-pathological conferences has been largely reduced over the last decade or so, due to the lesser availability of case material and fewer pathologists.
A compounding factor was an increasing emphasis on molecular research, which did not require disciplines to cooperate to the same extent, although there are examples of clinical diseases being investigated at the molecular level.

#### 6.3.4.2.5 Biomolecular sciences

The creation of the Veterinary Biomolecular Science course in the early 1990s was another attempt by staff to move forward in terms of vertical integration, designed to counter the problem that students had forgotten first year virology and immunology by the time they got to third year:

*"We developed a new Veterinary Biomolecular Sciences course … to try to integrate things a bit better. We're very conscious that when the students come into the third year … they're kind of thunderstruck for a little while, because they're faced with this huge mass of information … There's no preparedness for it. And then the surprising feature is you go look at what used to be done in the first year, they did have a course … in the first year… And when they got to the third year, many of them denied having had that course … All this time and effort was put into it, both teaching, and learning it for the purposes of an exam, and then it was just forgotten, it wasn't a seamless transition … Now we've put a lump of the microbiology into the second year… to try to get the students fired up about infectious disease …The second term then sets them up to do immunology … a very, very important subject which has never been given a proper place in the course. That's the sort of thing that should be happening all the time.*

(Retired teacher)

#### 6.3.4.2.6 Current mixed views

A number of current staff perceived there to be a need for increased vertical integration:

> *"I don't have anything to do with final year students but these are the students who are about to go out into practice where they're going to see biotechnology in action, yet how much have of that information can they recall three years later? So perhaps there is a need to streamline that and for fourth year to have a bit more of biotechnology, so it's very much at the top end of the course before they're going out into practice."*

(Teacher)

> *"I'd like to have seen that they actually would have adopted their cow earlier down the years, and then, when they came up, they then just go out and they've already seen their cow sometime in their career, and they go out and follow it up. That would be the ideal."*

(Teacher)

> *"I could see things at the moment where things really ought to be changing because the students of two years – third and fourth year – well you never see these students. The next time you see these students is when they're doing their practical exam at the end of final year. So all third year, all fourth year, they've never been up to the farm. That's not to say they haven't done farm animal things down at Garscube, but they've done nothing up here. Two years."*

(Teacher)

However other teachers warned against increased vertical integration at the expense of horizontal integration in place:

> *"If you take third year for example, at the moment, because we teach pathology, microbiology and parasitology in parallel, they're often doing an element of parasitic disease now, then they see it in pathology, and they get a related disease in microbiology … It is integrated in that sense. Now if you stretch those three subjects over three years, you lose that coherence that they've got in that area of the course."*

(Teacher)

There was also a recognised danger that individual subjects could be stretched to the extent that they ceased to become recognised specialties:

> *"If people want to go and do other careers, having a fully integrated course will disadvantage our students compared to any course which has got disciplines left within it. Because if a pharmacy company says 'Right, this person has got a pass in pharmacology', it is going to be something noticeable which they can hang on to, whereas if it just says that they had pathological sciences it could mean anything."*

(Teacher)

The other difficulty with ‘excessive’ vertical integration was the difficulty in then combining modules from different courses in trying to set up new degrees:

> *“There are other issues of integration as well which need to be thought through, with having additional courses as well. We’ve got the BSc coming in, and I know the perception or the plan as I understand it is to have that completely separate to the BVMS course, but there are issues with resource there because you’re going to run two courses.”*
>
> (Teacher)

### 6.3.4.3 Précis of discussions on integrated teaching

Former teachers stressed the efforts taken to vertically integrate undergraduate veterinary teaching, such as cooperative teaching between the Departments of Anatomy and Surgery, the integrated pathology / medicine course, and the implementation of the veterinary biomolecular sciences course. Despite these endeavours, current students failed to perceive any clinical relevance in the earlier years of the course, with comments suggesting that the first two years of the course lack any relevance to a veterinary course. Current teachers agreed that more could be done to promote vertical integration, but warned against the removal of disciplinary boundaries to the extent that individual subjects were no longer recognisable. This, they said, would disadvantage students when compared with other graduates with recognised specialties, and would it difficult in future to deliver a number of courses with transferable modules.

## 6.3.5 Clinical teaching

### 6.3.5.1 Clinical skills

Mirroring the need for clinical relevance in the course earlier on, students also requested more clinical skills training in the earlier years of the course. This, they argued, would better prepare them for EMS and OSCEs. Teachers, while welcoming recent proposals for a stronger clinical skills element in a revised curriculum, made the point that many of the skills were already being taught within the existing course.

#### 6.3.5.1.1 Earlier and regular training

The need to introduce clinical skills training earlier on, and its continuation throughout the course, was also strongly emphasised by current students:

> *“I think it’s a good idea to include things like suturing from early on, because that’s not learning about clinical cases, that’s something that you need to know and get practice on.”*
>
> (1st year student)

*"Some [medical student] friends I've had, they actually do some clinical in the first year so it's a gradual build up, because they are important skills that, rather than just putting you in fourth or fifth year, you need to build up over time so you're completely confident with them."*

(2nd year student)

*"You can't teach someone comm. skills in one thing in first year and then not touch then again until fourth year … I don't think there's any point in doing things by half."*

(3rd year student)

#### 6.3.5.1.2 **Preparation for EMS**

Early clinical skills training was viewed as a prerequisite to clinical, and even preclinical, EMS:

*"I think it would be helpful for preclinical."*

(3rd year student)

*"The vet practice that I go to, the vet's really good. He's a really good teacher, but I'm sure a lot of vets don't have the patience to slow down and show you how to suture, and you just look really stupid."*

(3rd year student)

*"I walked in and he asked me to take the temperature of the dog, and I said 'Well I've not actually done it before so I don't know if I'm doing it right or wrong'."*

(3rd year student)

#### **6.3.5.1.3 Student-led clinical skills training**

In order to gain more experience of clinical skills, students were keen to find opportunities to take responsibility for own learning:

*"Well one of the things I was going to come and say today is, is there any way, before the exam, [to] get a room booked and get all the equipment, and then I could be responsible for coming up, putting all the equipment out, and then half the class could come from 9 'til 12 and then the rest of the class could come from like 1 'til 5?"*

(4th year student)

Students also suggested running spey and weight clinics for the local community's pets, at a reduced cost, or offered charitably. These, it was argued, would allow for the development of communication skills as well as clinical skills:

*"I think something you could do is have a student-led clinic, and not a clinic where you did anything big like operations, but even if it was something like a weight clinic …People could bring their dogs in, and first*

*and second years, having done nutrition, could then talk to them about their weight. That would help communication skills, it would integrate it."*

(3rd year student)

#### 6.3.5.1.4 OSCE practice

Students were partly driven to advance their communication skills as a proactive measure in response to their concerns about passing OSCEs:

> *"If it was possible, it might also be useful to have a specimen answer sheet for each station, to say 'This is your ten point checklist for urinalysis, this is your ten point checklist for your x-ray interpretation', just a summary, because it's all very well us going round there and pottering around, but if we're not doing it right … so if there was just ten different stations, and ten answers or …"*
>
> *"Specimen answers and the points allocated, just so that we know, stuff like that, obviously not do it on a time-based thing, but just so that people can practice."*

(4th year students)

#### 6.3.5.1.5 Best use of resources

Students made suggestions for how maximum use could be made from cadavers:

> *"Yeah, as well as dissecting the dog you could do a castration on it and you could do all sorts of things. It's there."*
>
> *"And that would be better for the dog, you know, in a way, if you could use it as much as possible."*

(3rd year students)

#### 6.3.5.1.6 Existing clinical skills training

Teachers were in favour of enhanced clinical skills training, and welcomed proposals to introduce a formalised clinical skills training programme, although they did point out that there was already some clinical skills training in the preclinical years:

> *"I think the clinical skills bit that [they] are putting together – I think that's very good, and in a way a long overdue step. It was interesting – I don't know if you were in on any of those meetings – but when they drew up their list of clinical skills they thought students should be developing, and we compared it with what they're doing in first and second year, a lot of those skills were already dealt with, although they weren't identified as clinical skills, we were actually teaching them clinical skills. But that's good."*

(Teacher)

### 6.3.5.2 Clinical rotations

Students have the opportunity to develop clinical and professional skills during their clinical rotations, which teachers perceived as an opportunity for students to learn an approach to diagnosis. However, students commented on the lack of relevant clinical exposure for general veterinary practice.

#### 6.3.5.2.1 Referral practice

Fourth year students found it difficult to appreciate the relevance of companion animal referral cases:

> *"It's all the experts coming in and telling you in their referral eyes, rather than 'Right, these are the clinical signs you'll see when they come to you with the animal, and you'll refer it to us and then we'll do all these fancy ops with it'. You know, it's very much in a kind of … I don't know … introverted, specialist way that they put things across and it's not done in a practical way. Because I kept thinking 'What am I going to see when that animal comes through the door?', or if I should treat it before it gets referred. I just found it really difficult to listen."*
>
> *"In a way it's good, because you need to know what to tell the owners this is what it's going to go for and stuff, but [sighs] I don't know …"*
>
> *"You need to know of them. Because you may end up at a referral centre sometime, so it's good to know that these things exist, but we're not going to go straight into referral from here."*

(4th year student)

#### 6.3.5.2.2 Unrepresentative caseload

One former member of staff explained that another difficulty was that when animals were brought in for farm animal teaching, there was an unrepresentative caseload:

> *"To me that was a major problem in the cattle practical work, because we were buying – when I was there anyway – we were spending tens of thousands of pounds a year buying sick cattle ... There were certain diseases that we found ourselves obtaining too much of [such as] Johne's disease … So we had to try and be selective and sometimes we failed in producing something new for every student. You know, you just can't do it, because you never know what's coming in."*

(Retired teacher)

#### 6.3.5.2.3 Approach to diagnosis

To some extent this did not matter, as staff acknowledged that what they were trying to get the students to develop were their clinical reasoning skills:

*"The purpose of these things was not to give people examples of things they might see in practice, although they would see some of them in practice, but probably not commonly. The idea was to actually give them an approach to diagnosis, and the link between what you saw in the live animal and what you saw in the dead, so in fact you could end up working from first principles."*

(Former teacher)

### 6.3.5.3 Extra-mural studies

The major benefit of EMS is the opportunity for students to see first opinion practice, and common cases in the workplace, which complements the referral cases they see on rotations. Students and teachers recognised that student experiences could be variable. Although much had been done to standardise EMS, it was clear from discussions that it was difficult to impose standards on practices without losing the goodwill of practitioners.

#### 6.3.5.3.1 'Luck of the draw'

The major feedback about EMS was the variability in the quality of students' experiences:

*"It's very much luck of the draw as to whether it's good first opinion practice in terms of what you get to see and what you get to do, whether you're just standing there thinking 'I wish I was somewhere else. They don't want me here, I don't want to be here', which does happen."*

(4$^{th}$ year student)

*"There's such a wide range between what people have done on EMS, and what they haven't. I've been quite lucky, and I've done what seems to be loads of surgery compared to most other people, whereas some other people haven't done anything really."*

(5$^{th}$ year student)

This was something that teachers also appreciated, but implementing change was considered to be fraught with difficulties, not least keeping the goodwill of practitioners:

*"We already know that EMS is already so variable, what students are allowed to do and in some practices they wouldn't be let anywhere near [an animal] than others. You come to the lowest possible denominator. You can be taught by someone who's 20-30 years out of date and has never done any CPD, so the obvious thing is the standard of teaching and how current it is, and are we moving the profession forward or are we just recycling the same old out-of-date information. So I think from that point of view, if there's not auditing of it and checking then I think there's real problems. How do you audit it, do you upset all the practitioners and then lose all your EMS placements?"*

(Teacher)

#### 6.3.5.3.2 Standardised EMS

Attempts to standardise EMS experiences by other veterinary schools were not considered by some students to be successful:

> *"One of the criticisms I was hearing from when I was seeing practice, from … very experienced members of the profession … they say 'EMS used to be a pleasurable experience', they used to like having their students come in, and in addition just let the students do what they felt they would like them to do, not push them too hard and things, but now it seems they're directed, in like 'You must allow a student to do this by the end of the two weeks', 'The student must be competent in this', and it's taken away the fun of practices having students in, which I don't think is a good thing, you know, you need the goodwill of the practice to be there."*

(5th year student)

One of the other ways in which students' learning experiences can be standardised is through the use of EMS forms, but again these do not appear to have been successfully used:

> *"That sheet says that you've got to sit down with the partner at the start of the week and discuss your objectives, but no partner has time to do that, and if you're just starting on your first day, you don't want to be 'Oh I need to do this, we need to sit down'. They're just like 'We're going to a call, get in the car'."*

(5th year student)

However, it should be acknowledged that a lot of effort in recent years has gone into standardising EMS:

> *"There was absolutely no real control or guidance given to students on extra-mural studies, when I was a student or in the early days. It's only quite recently that extra-mural studies has been brought back into the schools as being an important exercise as part of the development of the student … the schools also recognised a growing importance for EMS, in terms of the clinical development of students that the schools could either not – or no longer – provide, because as you've said, there's a reduction in the number of clinical cases going through the post-mortem room, and in certain areas there's a reduction in the number of clinical cases in certain conditions, because more is being done in practice now, so fewer of these cases are coming through. So there has to be a hand in hand approach to EMS that what the school doesn't do, the students – where it's a necessity – the students get it from their practice experience. And so I think there's been an all-round requirement, both from the schools, the profession, the government, on students to perform in a more organised way in extra-mural studies."*

(Former teacher)

### 6.3.5.4 Professional skills

Clinical rotations and EMS placements were viewed as crucial for the development of professional skills. These include communication and business skills, as well as critical thinking and clinical reasoning.

#### 6.3.5.4.1 Communication skills

Students receive formal communication skills training in years 1, 4 and 5 of the course, in the form of role-play with actors. The remainder of their communication skills drive from seeing practice and clinical rotations such as their week at the PDSA:

> *"The huge emphasis is on communication skills, because they get to do the entire consult themselves, and that's something they really don't get much chance to do anywhere else."*
>
> (Teacher)

It was recognised that more could be done to improve students' communication skills:

> *"I would prefer, like a case report, instead of us always going and writing the case report as a referral to the University, I would prefer us to write a case back to the farmer. And when we do a presentation, instead of doing a presentation of all the details about a disease, I would like the students to do a presentation to the farmer – ok, the farmer's not there, but pretend that the farmer's there – to make it simpler, whereas students often want to go to the most detailed piece of information, but I want them to be able to explain this disease to that person that knows absolutely nothing about it. And I think they'll then understand the disease better, if they do it like that."*
>
> (Teacher)

#### 6.3.5.4.2 Business skills

Similarly, business skills constitute an area that has not received much attention in the curriculum, which needs to be built up:

> *"We had absolutely no tuition in the financial side of practice, running a business, personnel problems."*
>
> (Retired teacher)

> *"Business skills I think we can find somebody out there in the real world to do it for us. But selling ourselves, which sort of goes in with business skills, as a vet profession we think it's something that we shouldn't do. But we do have to do it."*
>
> (Teacher)

#### 6.3.5.4.3 Decision-making

Decision-making was another professional skill that students developed during clinical rotations:

> *"What do they find most difficult? I think it's the decision-making. I think it's going from the history and clinical exam, and then actually making a decision about what they're going to do with that case – that's the bit that they haven't had to do before, and no matter how many times you watch somebody else making that decision, actually making it yourself is quite difficult. So I think that's the key skill that they're really working on during the week."*
>
> (Teacher)

#### 6.3.5.4.4 Integration of skills

Above all else, the role of a professional is to integrate all these skills. This is something that students initially struggle with, and have the opportunity to develop through clinical rotations:

> *"I think that the big challenge that they've got at the PDSA which maybe they haven't faced so much in communication skills training is the multi-tasking. They've got to communicate with the clients, but they've also got to clinically examine the animal; they've got to think on their feet, make clinical decisions; they've got to work a computer; they've got to do some dose calculations; there's a huge amount of stuff they've got to bring together, so it means that they've got to work on their communication skills but in the context of the broader picture of consulting. So it really draws everything together."*
>
> (Teacher)

### 6.3.5.5 Competencies

Professional skills are part of the range of skills, knowledge and attitudes that graduates will be able to demonstrate on Day One. Evidence would suggest that they have yet to be firmly integrated within undergraduate training. Final year students, when asked, demonstrated a polarised view of competencies.

> *"I don't know what they are. I don't know what we're expected to be competent at, to be honest."*
>
> *"I've had a quick look at them, just as a kind of confidence booster to myself, you know, to say if I was going into practice I could intubate a dog, intubate a cat, you know, simple things like that."*
>
> (5th year students)

Staff had also not yet fully integrated the Day One competencies into their teaching:

> *"I am aware of them. Do I have a copy of them? No, I don't. I do aim the questions at clinically relevant things … rather than just regurgitating facts. But having said that, this is my concern with the whole – the whole – of the course, and even talking about the restructuring and things.*
> *I feel very much that we should work within a framework. We should be told what they need to know, and then everything should be worked back from there, so that yes although I'm aware of it, I haven't physically been given them. So I suppose what I need to do is go and actually physically look at them, to see which ones I can address, but it's not been brought to my attention, if you see what I mean."*

(Teacher)

The RCVS Day One and Year One competencies assume that the goal of veterinary education is to produce omnicompetent veterinary surgeons. However, since the publication of the Pew report that rejected the concept of omnicompetence, increasing discussion has taken place on the issue of undergraduate specialisation.

### 6.3.5.6 Omnicompetence versus undergraduate specialisation

With the exception of final year students, who were dissatisfied with their final year tracking options, feedback from students indicated that there is scope for an expanded system of electives or special study modules, to allow individuals to pursue specific interests, whilst retaining core material and the option to go into any branch of the veterinary profession. Teachers were generally opposed to the idea of specialisation before graduation to the extent that it would limit career choice.

#### 6.3.5.6.1 Core and electives

Students in the first four years perceived a value in retaining a core curriculum with an element of choice in the form of electives so that graduates would be qualified to go into any branch of veterinary medicine:

> *"So long as you can learn it all, I think it would be useful to have your options still open by the time you graduate."*

(1st year student)

> *"If you're not prepared for all of the profession then that's not good, but at the same time there should be some scope for you to pursue your interests, and focus you more for a particular profession if you've got that in mind."*

(3rd year student)

#### 6.3.5.6.2 Undergraduate tracking

A third year student suggested the inclusion of special study modules (SSMs) in the curriculum:

> *"SSMs work really well, because they're not examinable. You have to pass them, and you get to choose your own SSM."*
>
> (3rd year student)

One of the fourth year students was positive about increased tracking:

> *"I think that if it's a veterinary course then you should be trained to be veterinary practitioners, but I also think that it would be wise to have much more of a divergent system in the final couple of years, where you can streamline more."*
>
> (4th year student)

However students in the final year, on retrospect, were more negative about the current system of tracking in place:

> *"The one aspect of the course I'm really not happy about is the tracking. I'd rather it was equal all along."*
>
> *"We do feel like you [characterize] us as the farm animal [people] who aren't interested in horses at all, whereas we had to pick one of them, and if you want to do mixed practice, you want to do horses as well, but they vaguely think 'Oh, you're not interested in horses', whereas you're like 'Well, I had to pick one of them'."*
>
> (5th year students)

One innovative suggestion by a teacher was to create a 'small' farm animal track:

> *"I'd actually like to see a small animal farm track. And on that small animal farm track, I would concentrate on calving a cow, doing a Caesar, parasite control on a small hobby block, because this country has got … it's running out of farm practices, but there's lots of people with a few animals, to convince those small animal people that they can actually go and see one sheep, 'Pretend it's a dog and you'll do fine'.*
> *'If you can't calf it, do a Caesar, the owner can't either', so animal welfare, you're still going to solve the problem on the animal welfare, and discuss those things, and not go into herd performance things because they're not interested."*
>
> (Teacher)

#### 6.3.5.6.3 Resistance to part with omnicompetence

All former staff, and most current staff however, derided the concept of undergraduate specialisation to the extent that it would restrict an individual's career choices:

*"I don't think specialisation applies to the undergraduate. I think the vet who comes out at the end of the day should have an overview of all veterinary medicine, and all species. They don't have to be an expert in any of them, but they should be able to cope with routine examinations and treatments and so on. Once they're qualified and have a bit of experience they should then go on, if they wish, to specialise."*

(Retired teacher)

*"I think we should very strongly stay with omnicompetence, rather than specialising."*

(Teacher)

#### 6.3.5.7 Précis of discussions on clinical teaching

Students argued the case for earlier clinical training, not least as adequate preparation for EMS. Also driven by their concern to pass OSCEs, students demonstrated a very proactive attitude to their own training, volunteering to staff the clinical skills training laboratory, and suggesting that they practise suturing on the animals they have dissected in preclinical years. An additional suggestion was the provision of free weight or neutering clinics to the local community.

The purpose of referral cases was recognised by teachers to be providing students with an approach to diagnosis, something that students failed to recognise because the hospital rotations did not replicate first opinion practice. EMS does provide them with the opportunity to handle common cases, but teachers and students commented on the lack of standardisation in EMS, which meant that students had very variable experiences in terms of how much they were allowed to do in practice. Both rotations and EMS were viewed by teachers as an opportunity for students to develop and integrate their professional skills, although there was little evidence that the RCVS Day One competencies were being used as a framework for teaching at the time of the interviews and focus groups.

In terms of the omnicompetence versus omni-potential debate, all students and most teachers perceived the need for there to be a standardised core of material to enable graduates to pursue any branch of veterinary medicine on graduation. Students' voiced a range of opinions on the current system of undergraduate tracking in place, and one teacher advocated the creation of a 'small farm animal track', being one of the few participants to back a specialised undergraduate course. Most current teachers, and all former teachers rejected undergraduate specialisation so as not to limit students' career choice before graduation.

### 6.3.6 Careers

The concept of omnicompetence assumes that students will follow a traditional veterinary career. Some students appreciated that the course was preparing them for the possibility of careers other than veterinary practice, or at least equipping them with a skill set for mixed practice. This appears to reinforce their belief in retaining a core element of training to allow them to pursue any branch of the profession on graduation:

> *"I came to vet school thinking I was going to do farm and horses mainly, and now I want to do small animal, because that's the way it's sort of panned out. But the same thing could happen to someone who, you know, they wanted to do small animal and they really enjoyed pathology and … [chose] to go down that route."*
>
> (5th year student)

#### 6.3.6.1 Veterinary public health

The topical appearance of avian flu in the UK highlighted the importance of veterinary public health as a core discipline:

> *"I think public health is still highly important, because somebody brings in a dead bird they've found, you need to know the public health thing of bird flu now, so you can't just say 'Right, I want to do small animal practice, I'm not going to do public health', whereas if you do mixed practice, public health is right up there, it's one of the most important things you'll be doing."*
>
> (5th year student)

#### 6.3.6.2 Research

Research was still considered by some students to be peripheral to the main job of a veterinary graduate:

> *"I think you can learn that after, if you really wanted to. Because research isn't … if you're interested in something you'll research it, and it's not something you should just train people for really."*
>
> (4th year student)

Although there was recognition among students that the curriculum should serve to raise awareness of potential career alternatives:

> *"I think you've got to give people the opportunity to see what it's like."*
>
> (5th year student)

This was something that one teacher re-iterated:

> *"The students aren't aware that they're training for more than one profession at this point. When we had the guy from IBLS to talk about intercalated degrees, and in the beginning of that I said 'Have you all realised the RCVS say that we'll be over-producing vets by 2009?', and there's was this 'Huh?' gasp from the students, because they hadn't realised that. They thought that if they qualified there would be a job waiting for them. So for some of them it was a real wake-up call that they won't have a job to go to. They're still very unaware of the fact that some of them won't want to do the job when they get there. And I think sometimes – especially in the clinical years – that's never put forth to the students, because the clinicians who teach the clinical years obviously like clinical work, and they are not going to reinforce to the students that there are other things that they can do with their degrees."*

(Teacher)

### 6.3.6.3 No fully mixed practice

It was also suggested that the concept of mixed practice was a misnomer, because practices selected specifically for particular species:

> *"An advert might appear in the Veterinary Record that such-and-such a practice is looking for an assistant, and that it is a mixed practice … but the opportunities that the students get within the practice are probably to be narrowed down to either small animal or large animal, and in a bigger practice still it might be equine, small animal and large animal. So the student doesn't get the same all-round experience … that I got as a new graduate in a very mixed practice, where I was encouraged and permitted to do everything that was on the go, with all species."*

(Former teacher)

### 6.3.6.4 Specialist branches of the profession

Teachers recognised that there was an opportunity in undergraduate education to nurture students' interests in particular branches of veterinary medicine:

> *"I'm a great one for fostering interest in those students who want to go into wildlife. I think that's going to be a growth area and require a great deal of veterinary input in the years to come, given the problems that the planet faces."*

(Teacher)

### 6.3.6.5 Précis of discussions on career choice

Interviews with current and former staff highlighted a potential naivety on the students' part about the career options available to them on graduation. Research was still perceived by students as peripheral to the job of a veterinary surgeon, despite the fact that not all graduates would go into veterinary practice at graduation or remain within this branch of the profession. Students regarded veterinary public health as an essential subject for mixed practice, but did not appreciate that practices were highly selecting for particular species, something that teachers did recognise.

## 6.3.7 Quality and scholarship

An ability to nurture students' intellectual development was one of the attributes cited of a 'good teacher'. This section describes the feedback from students and teachers relating to quality and scholarship.

### 6.3.7.1 AVMA

There was a perception among students that AVMA accreditation enforced higher teaching standards:

> *"Certainly it seems to us that the standards of veterinary care in the US are very, very high, so hopefully that would be reflected in their teaching standards."*
>
> (4th year student)

### 6.3.7.2 AVTRW

The Association of Veterinary Teachers and Research Work (AVTRW) also appears – directly and indirectly – to have been influential in improving the standards of teaching. For example, high quality colour slides, used to present scientific results to the research community, crossed over into teaching:

> *"I would say the major thing in keeping the standard of teaching high were the meetings that were held at Scarborough under AVTRW …In the 70's, the Glasgow Vet School set out … to show off to the rest of the world who was like us … You would use the best possible slides, the best possible material you could get … and that rubbed off in the technique that you would use in teaching … Plus the fact that you learnt how to speak in public."*
>
> (Teacher)

AVTRW was also recognised as an opportunity for teaching and research staff to get a national overview of veterinary education in a meeting that was not solely devoted to education:

> *"For me [AVTRW] has been really useful, just understanding where veterinary education is going, because there's no other forum that I'm aware of or that I go to where I can get that information, where you have*

*people from places like the BVA or the RCVS, the people that assess our curriculum …*

*So I think it's been really useful, at least for me, to see the bigger picture of veterinary education within the UK, because I think without it I wouldn't have that knowledge. I think it is important as a teacher in a veterinary institution that's committed to teaching."*

(Teacher)

### 6.3.7.3 Attributes of a good teacher

There were many attributes of a good teacher, cited by students and teachers. Not all of them are explored in detail here, but they include good communication skills, a conscientious and hard working nature, a good knowledge base, a nurturing instinct, a good overview of the course, the ability to reflect on performance and the ability to think from a student's perspective. Teachers were also respected for being honest with students, having research expertise and/or experience of practice that they can bring into their teaching, and having an interest in the students and enthusiasm for their subject.

#### 6.3.7.3.1 Good communication and the ability to explain difficult concepts well

Students stressed the importance of teachers being able to explain difficult concepts, noting that not all teachers were able to do this well:

*"Someone that actually knows what they're talking about … they can actually answer the questions. If someone wants to ask a question they don't just say 'Look it up'. Try and answer the question. If they can't answer the question, say 'Come back to me' or 'You need to look here'. There are certain lecturers that, if you have problems with a particular point, will just repeat themselves over and over again and just treat you as if you're stupid … And there are some lecturers that are really good at that, they will take the time, but others just blank you and say 'I've explained it to you, it's in the notes'."*

(2nd year student)

Teachers also cited the importance of good communication in terms of providing understandable explanations:

*"It needs to be logical and simple. If you present stuff to them in a manner which is complicated, it complicates them. Funny that! If you make it straightforward and simple it goes down very much better."*

(Retired teacher)

*"I would hope to think that I can communicate ok. If you can communicate ok I think you can get some of the information across."*

(Teacher)

#### 6.3.7.3.2 Clinical experience and/or research expertise

The importance of being able to teach through anecdotal experience was also appreciated, particularly in the clinical years:

> *"The farm animal course was actually lectured really well, I found, particularly [lecturer], who would give us little anecdotes and say what not to do in practice, and things he'd seen. And that made it more alive, more real and more interesting."*
>
> (4th year student)

Teachers also recognised that having experience of working in clinical practice was an asset to teaching:

> *"It teaches you what's relevant and what you can ignore. I don't want to be critical, but one example would be some of the previous neurology teaching, done by non-clinicians, would concentrate on something like brain herniation for example, you know, twenty minutes on that, which I think none of the students would ever encounter in practice, or if they do the dog would be dead anyway so it's not going to matter. And so that would be an example of somebody who didn't like clinics, didn't do it and the teaching becomes what they understand from a research point of view, but not clinically appropriate. And there's also evolution of clinical management and disease understanding, so I think being involved at the coal-face, you know the front line, does keep you relevant."*
>
> (Teacher)

Research expertise was also valued:

> *It impacts on the teaching in the sense that, to give your teaching any truth, or any conviction, it doesn't matter what you are, if you are a pathologist, if you are a physiologist, if you are a clinician, you have to be able .. The student has to feel that you can 'do' the subject, … that you're not reading out page twenty-three in the book … And its one of the dangers of the current thinking in that we should be either research workers or teachers, and if you do that you'll go down the route where you will weaken the teaching because the people who teach will just be reading page twenty-three in the book, and becoming maybe very good at reproducing diagrams out of the book, but their teaching will lack any sort of veracity to it.*
>
> (Teacher)

Teachers who were regarded as specialists in their discipline were well regarded for their enthusiasm:

> *"It's nice to listen to them, because they are so enthusiastic about it."*
>
> (3rd year student)

Although there was the danger that specialists could provide too much information, which teachers and students both recognised:

> *"To an extent, but they maybe go overboard."*
>
> (3rd year student)

> *"If you're an expert in one particular field … deep down you should only tell them what somebody else in a vet school down the road would tell them. That's all you need to do, the basic stuff. But you tend – because it's your own interest – you tell them everything you can in the time available, and you want to – when it comes round to exam time – you want them to be an expert in your particular field as well … But I think we, over the years, as we went through doing it, we actually tended to abbreviate rather than extend. We got better at it, there's no doubt about that."*
>
> (Retired teacher)

**6.3.7.3.3 Friendly and approachable**

Students appreciated the efforts of staff who were approachable and willing to 'give their time':

> *"Friendly."*
>
> *"Approachable."*
>
> *"Just open to folk coming in and asking questions."*
>
> *"On soft tissue, one of the surgeons we had, if there was ten minutes between consults or if somebody was in a consult and not everybody was in, he would take you into a room and just have a quick kind of chat tutorial kind of 'A dog comes in with this, what do you want to do?' And it was really kind of informal, laid back, it was really useful, and then he cracked off and said 'Right, I've got something to do', but he'd given you ten minutes of his time, which was really beneficial for everybody that was there."*
>
> (5th year students)

This was contrasted with what had been identified by students in one of the pilot focus groups as the "surgeon complex":

> *"There are some that are very approachable, and will speak to you outwith the context of their department. They'll speak to you in a kind of sociable aspect as well, in an integrated kind of way, whereas there's other surgeons who will just walk right past you, even if you're their student and you have their case, they'll speak to somebody else about it rather than you."*
>
> (5th year student)

#### 6.3.7.3.4 Interested and enthusiastic

Students also appreciated teachers that appeared interested in their teaching:

> *"I think seeming interested in the subject and the students is a really good start."*
>
> (1st year student)

> *"Just trying to inspire students, trying to convey to them my love of the subject, if you like, and I still try and do that. And a lot of students respond to that."*
>
> (Retired teacher)

> *"If you've got an enthusiastic person standing up there you'll get enthusiastic about it, but if you've got somebody who's just going through the motions, it probably won't matter what material that person's got, you'll probably prefer to go home and just read it yourself.*
>
> (Teacher)

#### 6.3.7.3.5 Sense of humour and 'tricks'

While a sense of humour was appreciated, it was acknowledged that not all teachers could do this:

> *"I think humour would be nice but then not everyone can do that."*
>
> (2nd year student)

What emerged from talking to teachers was that they had a number of 'tricks up their sleeve' – part of their teacher's toolkit – which they could use to regain the attention of students:

> *"Don't go telling the students because they all think this is spontaneous you know, but I keep an eye on the clock when I'm lecturing, and after about fifteen twenty minutes I'll stop mid-sentence … you'd say 'The heart has four cham- Do you know I was salsa-ing the other night?' and it just breaks the flow, but it seems to work. You see their minds suddenly saying 'Well', they relax and have a laugh, and you go back and you start again, and break it up a bit like that."*
>
> (Teacher)

#### 6.3.7.3.6 Veterinary versus non-veterinary teachers

One of the interesting debates that came up in conversations was the issue of veterinary versus non-veterinary teachers. The lack of veterinary surgeons coming in to teach was lamented:

> *"It's a shame that veterinary people are not going into the preclinical subjects anymore because, with the best will in the world, people who are not veterinary qualified – there are exceptions – but perhaps aren't really aware of something that might be very important clinically."*
>
> (Retired teacher)

Comments from some non-veterinary staff highlighted the division between veterinary and non-veterinary teachers:

> *"I still think there is an issue of perceived equality amongst the staff. I think that the clinicians still think that the non-clinicians haven't got a clue what they're talking about."*
>
> (Preclinical teacher)

## 6.3.7.4 Teacher training

In order to develop attributes of a good teacher, veterinary and non-veterinary lecturers alike are required to attend training organised by the University. These were perceived to be useful but not wholly applicable in practice, and teachers in part modelled their skills on mentors.

### 6.3.7.4.1 University training programmes

A cross-disciplinary teacher training programme has been available at the University since the 1960s:

> *"There were seminars way back, probably in the early '70s. I started lecturing when I did my first lectures in 1965-66, and I hadn't had any formal training, but by the end of the '60s we were going to seminars, they got a programme going, I would say. They were instructive, you got printouts. We also did mock lectures, and we were evaluated by our peer groups, so there was peer evaluation."*
>
> (Retired teacher)

In recent years, these comparatively unstructured programmes were replaced by the New Lecturers Programme (NLP), which current teachers had mixed experiences of. In particular, teachers found it difficult to apply some of the learning theories in practice:

> *"I think overall I didn't find it particularly useful – some aspects of it I did, but I think the theory was not particularly useful. The only parts that were of benefit were the feedback sessions where somebody came out to assess your teaching. And then I was aware of the sorts of comments that were going to be raised, and it was about not being heard sufficiently well, and that I should be using the microphone, which I do all the time now. But no, overall it was quite disappointing, just because a lot of it's based on theory, which doesn't seem to be particularly relevant."*
>
> (Teacher)

> *"I found doing the new lecturer and teacher programme really useful. Some of the things are a couple of steps divorced from the things I'm doing on a day to day basis, but there is a lot more information about clinical teaching which is obviously really significant to me. And just the general theories of teaching I find interesting. It's often difficult to maybe whittle it down and actually apply it, but just having it as a framework on which to reflect on my practice is something which I found very useful."*

(Teacher)

##### 6.3.7.4.2 Support from mentors

Another important source of expertise was mentors, senior members of staff who served as role models for younger staff:

> *"I suppose I've followed [his] format quite closely, simply because I felt it worked … his way of explaining terms, for example always defining the terms, rather than just giving you the word, defining it, so that then you can start to understand it. It starts becoming like a language rather than just a series of words. So all the anatomical terms, a lot of them have derivatives, like brachio- [means] 'of the arm', so it helps learn it like a language, because not all of them did Latin or Greek. I didn't. But [he] did, so he explained all these terms to me … and [he] was very good at keeping all the clinical stuff in, so that kind of thing I've carried on, because it worked, I didn't see any need to change it."*

(Teacher)

#### 6.3.7.5 Student feedback on teaching

Student feedback is one aspect of quality assurance that is used to monitor and maintain the quality of teaching in the Faculty. This has mainly been derived from student questionnaires, supplemented in recent years by focus groups. Both students and teachers acknowledged the limitations of student questionnaires, and it was generally perceived that good teaching was not adequately rewarded.

##### 6.3.7.5.1 Quality Assurance (QA) forms

One student suggested that QA forms were not the best way to communicate difficulties with staff:

> *"I know we get the electronic forms to fill in and stuff, but the worry with that is how much attention are the lecturers actually paying to them? I think talking to them, having meetings, probably is a more effective way because they have to listen."*

(2nd year student)

Whilst it was also suggested that the QA forms did not provide an accurate representation of students' experiences:

*"To be honest, when it comes to filling those forms in … we get such a wide range of lecturers, these names come up and I think 'Well I have no idea what that lecturer was like', or what they even taught or anything. So I find them a bit of a waste of time, to be honest."*

*"Yeah, I think pretty much the same, although there's some stick in your mind, if they're dreadfully bad or really good though."*

(4th year students)

There were mixed views among teachers on the usefulness of QA forms:

*"I think it's important for them to have that forum to feed back. And things like knowing about my voice, that some students at the back still can't hear me even with a microphone, and just remembering to project the voice, or just making slides really clear … I think it's useful for guiding an individual lecturer in areas where they can improve on, but in terms of promotion I think it can become difficult because some subjects are clearly more difficult, have harder concepts than other subjects and it tends to be the harder subjects that get the lower rating."*

(Teacher)

*"Your questionnaires that the students fill out, to say what they think of something, they don't necessarily fill it out correctly. It's just human nature that we don't want to be horrible. Even if the students complain about things, they still sometimes won't actually [say so] on the form."*

(Teacher)

### 6.3.7.6 Staff rewards

There was also a suggestion among fourth year students that lecturing staff were not adequately remunerated for the effort required to deliver good teaching:

*"If you're getting paid pittance to lecture the fourth year for one term, are you actually going to bother putting time and effort into thinking 'Right, they're at this level, I'm up here. I'm going try to simplify everything I do'. That obviously takes a load of effort to prepare slides to teach us."*

(4th year student)

The lack of reward for good teaching was strongly evidenced in interviews with teachers:

*"My main feeling now about what's going on in the school is that even more than before, teaching doesn't seem to be – not just rewarded but – even regarded as something that's important, after all this is a Veterinary School, and we get more and more undergraduates in, fewer and fewer people are teaching them."*

(Retired teacher)

*"There is no direct incentive. I have been told it's not enough; if you want progression and promotion it's not enough to teach well and to teach lots."*

(Teacher)

*"I'm involved in research, and you're very aware that your promotion line is probably research-based rather than, you know what it's like, rather than clinical, whether you get five noddy points or one noddy point from the students for your teaching style or effort you put in, that's the compromise."*

(Teacher)

### 6.3.7.7 Value for money

Investment in the scholarship of teaching was very much tied in with student satisfaction, and their perception of value for money.

#### 6.3.7.7.1 Award of veterinary degree

The ultimate value for money was perceived to be the reward of a veterinary degree at the end of the course:

*"It's obviously really, really, really expensive but at the end of the day you really do want to become a vet, so it is valuable."*

(1st year overseas student)

*"You're actually paying for the degree rather than the classes."*

(3rd year student)

#### 6.3.7.7.2 Postgraduate fees

The postgraduate fees were seen as disabling to some students:

*"If I was a postgraduate there's no way I could be here, and it's the reason I didn't do a degree in between times."*

*"I only have to pay the two thousand pounds at the end of the course, which compared to postgrads – there's no difference in what we're learning. They're not getting any more than what I'm getting."*

(3rd year students)

Undergraduate students appreciated the impact of having a diverse student body on their learning, but cautioned against charging postgraduate students higher fees:

*"I think the issue of money for graduates is important, because currently within the class we have postgraduates, we have undergraduates, we have people who've taken gap years, and it's a nice mix, and I think you get a*

*richer learning experience because all those people are there. And I think if you don't change the amount of fees you charge postgraduates, you're not going to get them at the end of the day."*

(3rd year student)

#### 6.3.7.7.3 Widening participation

The issue of postgraduate fees impacted on the widening participation debate:

> *"I think that in the bid to make veterinary an accessible career to people from all backgrounds and everything like that … if you take the extreme case of someone with an under-privileged background and they didn't go to a very good school, and as a result they weren't able to get very good A-level results because the school limited them. They then went to University – they wanted to be a vet – so they went to University, they did a[n alternative] degree because they would never get into University with their A-level results, and they subsequently came to vet school, but then they haven't got any way of raising seventy thousand pounds."*

(3rd year student)

### 6.3.7.8 Précis of discussions on quality and scholarship

Since the veterinary school at Glasgow became part of the University at the beginning of the period under study, teachers have been able to participate in formal teacher training programmes. Former staff described their experiences of these, which mostly focused on communication aspects in terms of delivering effective presentations, something that the New Lecturers Programme has combined with a knowledge of learning and assessment theory, which current teachers regarded as interesting but not wholly applicable in practice. Increasing numbers of students paying tuition fees in recent years has put teaching quality under even closer scrutiny; however, student questionnaires for quality assurance purposes were not regarded by teachers as being applicable to 'high stakes' decisions such as promotions, and students questioned how much attention was being paid to their feedback by this mechanism. Former and current teachers' statements suggested that they felt unrewarded for teaching excellence, which required them to be good communicators with appropriate clinical experience and/or research expertise, as well as being approachable, interested and enthusiastic about their teaching. Ultimately, value for money was perceived by students to be the award of their degree on graduation, despite the high cost that was viewed as being especially prohibitive to postgraduate students.

### 6.3.8 Assessment

Assessment was not in itself a component subject of the thesis, but it arose in discussions with teachers and students, as an integral part of the learning process. Many forms of assessment have been developed or adapted for use veterinary education, and ultimately they all serve to drive students' learning.

#### 6.3.8.1 Examinations as a motivating factor for learning

The focus groups revealed that examinations clearly served to motivate students to learn:

> *"Exams kind of make you focus and make sure you cover everything rather than just the bits that you like better than the rest."*
>
> (1st year student)

> *"I miss having the class exams at the end of term, because that at least used to make me revise the work we'd done that term. Now I haven't, and I've got shed loads to do. So I find it motivational, but it depends what your approach to exams is."*
>
> (4th year student)

**6.3.8.1.1 Information overload**

However, there was a realisation that learning a lot of information at a superficial level for the purpose of an examination was counter-productive:

> *"I think maybe it's the amount of information that we have to deal with. Because what you should end up with is a lot of information, and we don't really fully understand it. And the exam comes and then we'll just be cramming past year papers and we hope that it will be similar to the past year papers and then pass. But after the exam you don't really know much about the topic, which could be quite a problem when you get to higher years because we have to refer back to the information we have learnt."*
>
> (2nd year student)

> *"And even a week after we've done the exams, I can't answer … I went to the vets at Easter and he asked me about viruses that we'd done literally two weeks beforehand, and I couldn't answer any of the questions."*
>
> (3rd year student)

**6.3.8.1.2 Day one**

However, by the end of final year, the ability to perform on day one of graduation was taking precedence in driving their learning:

> *"I'm actually worried about going out and working and being able to actually do things on day one than the exam itself."*

*"I was thinking the other day, it's more worrying if somebody, in a consult, just asks you random questions like 'How do I get my dog pregnant?', or something like that."*

(5th year students)

The ability to problem-solve real cases in practice was something that former teachers tried to emulate in the final examination:

*"What we had was a collection of people who were acting as examiners. Each of them had an animal there … The candidate had to ask the examiner the background history, he had to do whatever examinations necessary, he had to organise that he got particular procedures done, like x-rays, lab tests and all this sort of stuff, and he had to justify why he wanted them, he had to interpret them, he had to say what was to be done. In fact, what we were doing with stuff was exactly what they were going to do in practice … What we wanted to know was that people were in fact adequate for walking out the door."*

(Retired teacher)

Current teachers also recognised the importance of posing questions from a clinically relevant perspective:

*"Sometimes with anatomy it's difficult to keep all of them 100% clinically relevant … It's not possible in all of them, but I try and keep it that way."*

(Teacher)

### 6.3.8.2 Different types of assessment

Discussions with students and teachers revealed some of the advantages and limitations of traditional and newer forms of assessment. Ultimately, there was an expectation for assessment practices to mirror the tasks that graduates would be expected to perform on Day One.

#### 6.3.8.2.1 Traditional forms of assessment

Traditional oral examinations were viewed positively by former teachers, as an opportunity to probe students' knowledge:

*"It meant that you could guide the student to some extent, and you could show the external examiner 'they really do know this', and it helped the student in that they were being posed questions and they had to answer them, and they had an instant to do it."*

(Retired teacher)

In contrast, multiple choice questions (MCQs) were not viewed favourably by one current teacher because of the low level of cognitive processing required and the fact that students resented the potential for any subject to be examined:

> *"I think it is impossible to write good multiple choice questions … To try to get away from just regurgitation … I don't think it really tests what I want to know from them. I'd rather do my short answer questions … And the students hate them. They really hate them, because they don't know what is expected of them … They want to know what they need to deliver. They can't deal with multiple choice."*
>
> (Teacher)

#### 6.3.8.2.2 Newer forms of assessment

As a newly implemented form of assessment, the OSCEs was a topic of major discussion. The restriction of clinical procedures to a five minute window was not viewed by one participant as realistic:

> *"It didn't matter whether it was going to take her four minutes or eight minutes, the important thing was that she did it right. And I think sometimes we lose sight of that, that we're actually training people for the real world."*
>
> (Teacher)

In addition, there was a perceived disparity between how clinical tasks would be performed in practice versus how they might be performed for an OSCE:

> *"It's interesting to see them say to each other 'Shall we do it the OSCE way or shall we do it the non-OSCE way?' So I think it's really important that the OSCEs have to reflect real life rather than just some kind of ivory tower way of doing things."*
>
> (Teacher)

In contrast to the time-pressures of OSCEs, portfolios represent a method of assessment that allows students to demonstrate evidence of best practice at their leisure. These were viewed by students as a potential means of increasing standardisation of EMS:

> *"I think in theory it sounds a really good idea, because as it is our EMS is not regulated in any way, and people are learning skills at a vastly different rate, and some people are getting the chances to do things that others aren't. It just depends what practice you're in, but that way, if you've got a tick list, it will say 'Look, I've got to do this'."*
>
> *"I think if you're going to do something like that, you have to have some sort of practice accreditation scheme or something, to make sure that everybody gets the same opportunities."*
>
> (4th year students)

#### 6.3.8.3 Integrated assessment

There was a perceived need for assessment to be integrated, in the same way that teachers were trying to promote an integrated approach to teaching, and for students' knowledge of topics to be assessed more than once to promote retention:

> *"At the moment we say 'Right, you need to learn all of these subjects, and we'll teach them in parallel so that you can see how they join together, but we're going to examine you on them all individually'".*
>
> (Teacher)

> *"I don't [agree with] doing bits and pieces like, 'We've just finished the digestive system, so we'll have an exam on the digestive system, and then we'll not do the digestive system again.'*
>
> (Retired teacher)

> *"That's what worries me about going down the road of this continuous assessment, knocking off modules as you go along."*
>
> (Retired teacher)

#### 6.3.8.4 Précis of discussions on assessment

The biggest finding from the discussions with participants was the role of assessment in driving student learning. For this reason, teachers recognised that assessment methods needed to mirror the tasks students would be expected to perform in the real world, and to be as clinically relevant as possible. Types of assessment that tested lower cognitive processes such as factual recall were not regarded by teachers as being as useful as other methods that tested higher order skills. An increased amount of integrated assessment was proposed, so as to align the assessment with an integrated teaching approach, and to promote retention of information.

## *6.4 Demographic study of archived student enrolments*

A study of demographics may appear to be at odds with a discussion on educational methods and technologies. It is included here because the admission of students to the veterinary course is one of the contextual factors in the literature on veterinary education. The diversity of students in terms of gender, age, and nationality impact on the education process in terms of the diversity of teaching and learning methods required to support different types of learners, and also because learning technologies have been viewed as a means of supporting widening participation efforts.

In this section, graphs are generally presented so that chronological differences can be observed from left to right. However, because of the number of categories of some variables, some of the graphs were transposed. In these cases, chronological changes can be observed from top to bottom for each category. The timelines in most graphs are marked by decades for a detailed breakdown, but for some graphs the eras are consistent with those described elsewhere in this thesis, for consistency and simplicity.

### 6.4.1 Graduate status

Figure 6-15 shows the status of all students who enrolled on the BVMS course between 1950 and 2004. Not all of these enrolments were first year students – a number were direct entry students, and these included students enrolled on a temporary basis as part of the Erasmus programme during the late 1980s and 1990s. A small proportion of enrolled students transferred or withdrew from the course, and a minority were excluded. It is interesting to note that the proportion of students excluded has consistently fallen from about 10% to virtually nil since the 1960s. Interestingly, all (but one) of the 1950s enrolments successfully graduated. This may suggest that records were not kept of unsuccessful students as far back as the 1950s, or perhaps because veterinary surgeons were desperately needed in the post-war period, academics may not have been so keen to exclude failed students.

### 6.4.2 Age at admission

Figure 6-17 shows that the majority of graduates were admitted at ages 17, 18 and 19 (also shown in Figure 6-17). A small proportion of students gained entry at age 16 (approximately 4% in the 1970s). The oldest registered student was admitted to the course at the age of 46 during the 1960s. Approximately one third of students enrolled between 2000 and 2004 are over the age of 20. This can be attributed to the fact that, as a result of AVMA accreditation, a proportion of recently enrolled students have come from North America. These students generally possess a degree on entry to the Glasgow course, therefore are older than the traditional school-leavers that comprise the majority of entrants.

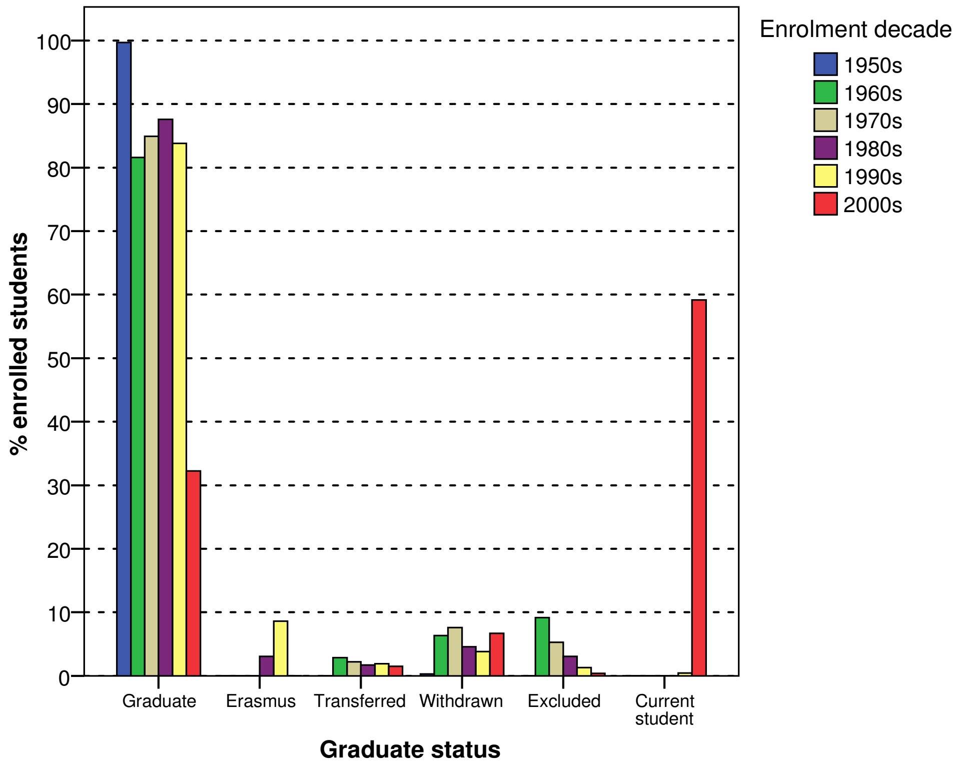


**Figure 6-15: Status of all students who enrolled between 1950 and 2004 (by decade)**

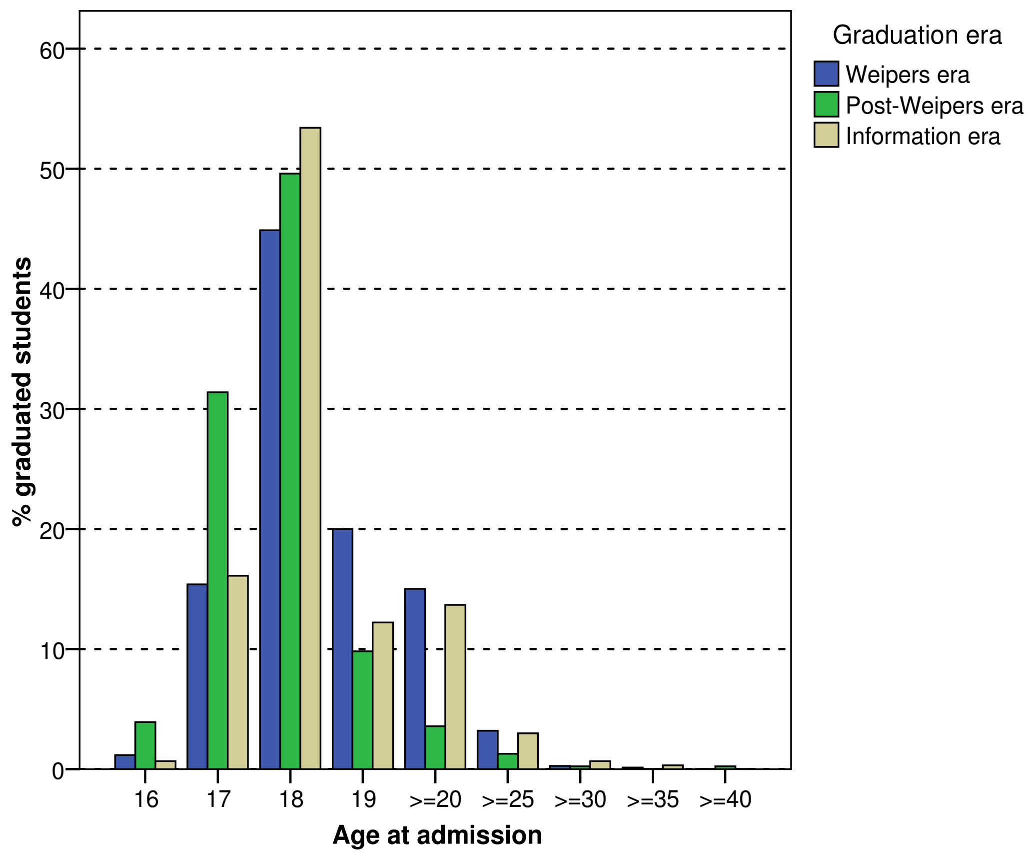


**Figure 6-16: Graduates' age at admission (by era)**

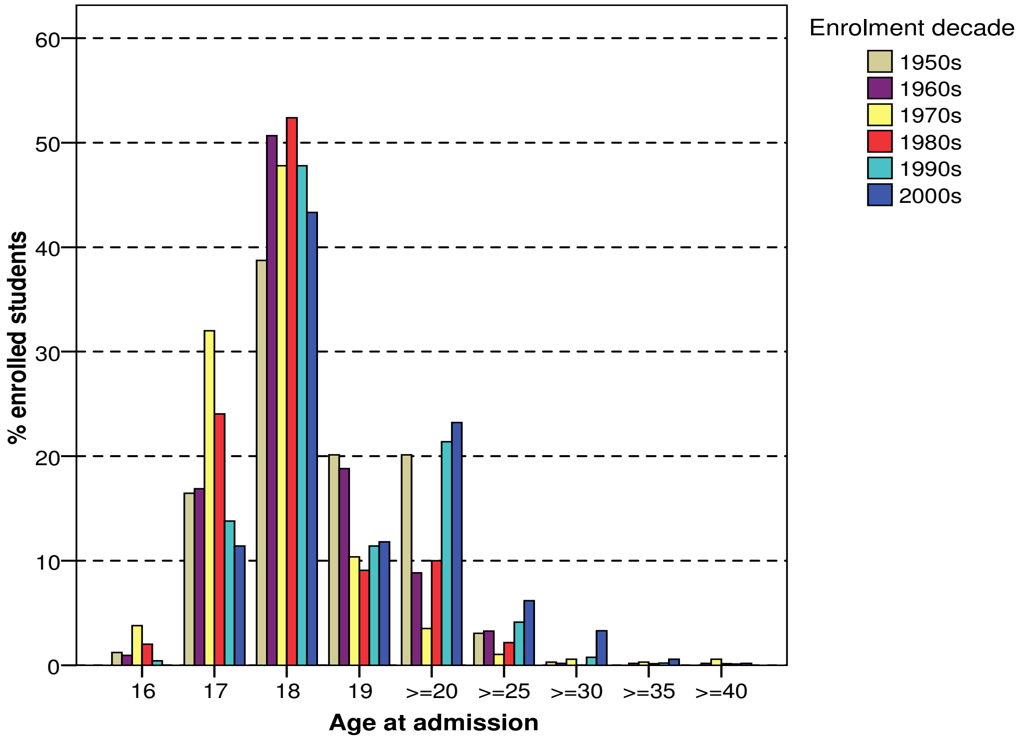


**Figure 6-17: Graduates' age at admission (by decade)**

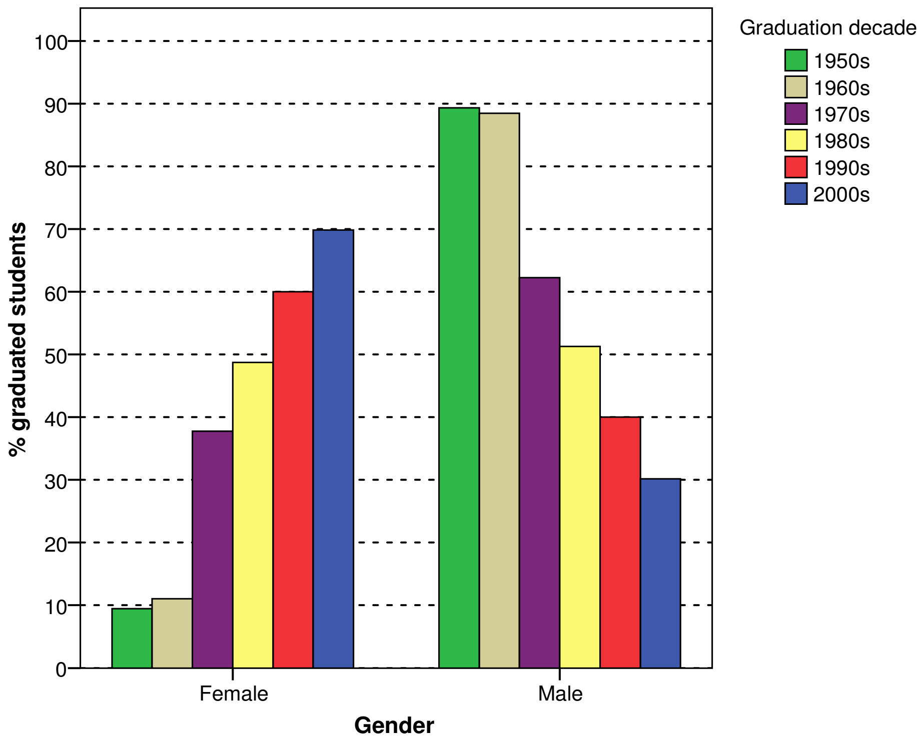


**Figure 6-18: Comparison of gender across the period of study (by decade)**

### 6.4.3 Gender

Figure 6-18 shows clearly that as the number of female graduates has increased over time, so the proportion of male graduates has decreased. The genders were approximately equal in number in the 1980s.

### 6.4.4 Recorded nationality

Because of the diversity of the student population in terms of nationality, these results are shown in tabular form rather than as graphs. Student numbers for each nationality are stated for each decade of student enrolment.

### 6.4.5 Grouped nationality

Figure 6-19 shows that the majority of students enrolled at the veterinary school in Glasgow between 1950 and 2004 were British or Irish. A number of European students were enrolled during the late 1980s and 1990s, indicating the impact of the European Erasmus student exchange programme. The number of North American students increased during the 2000s, corresponding with AVMA accreditation.
A relatively small number of students from Africa enrolled during the 1950s and 1960s, before the establishment of the veterinary schools in Africa.

### 6.4.6 British and Irish nationality

Figure 6-20 reveals that the majority of enrolled British students were Scottish (35.8%) and English (30.9%). A number of nationalities were recorded as ‘British’ in the student records, rather than a specific country, therefore these records were classified as ‘British (unspecified)’. These comprised 25.5% of the records. The fact that there were no ‘British (unspecified)’ students in the 1970s and 1980s is attributable to the more accurate record-keeping system in place at that time. ‘British (overseas)’ students were those recorded as ‘British’ but schooled overseas.

| **Nationality** | **1950s** | **1960s** | **1970s** | **1980s** | **1990s** | **2000s** |
|---|---|---|---|---|---|---|
| African | - | 2 | - | - | - | - |
| American | - | 1 | 2 | 23 | 30 | 68 |
| American / British | - | - | - | - | 1 | - |
| American / Canadian | - | - | - | - | 1 | - |
| Australian | - | - | - | 1 | 1 | - |
| Barbadian | - | - | - | - | 1 | - |
| Belgian | - | - | - | - | 14 | 1 |
| Botswana | - | - | - | - | 1 | - |
| British (unspecified) | 300 | 296 | - | - | 314 | 402 |

| Nationality | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s |
|---|---|---|---|---|---|---|
| Canadian | - | 2 | - | 3 | 10 | 10 |
| Canadian / British | - | - | - | - | 1 | 1 |
| Ceylonese | - | - | 1 | - | - | - |
| Channel islands | - | - | - | 1 | 2 | - |
| Chilean | - | - | 4 | - | - | - |
| Cuban | - | - | - | 1 | - | - |
| Czech | - | 1 | - | - | - | - |
| Danish | - | - | 1 | - | - | - |
| Danish / British | - | - | - | - | 2 | - |
| Dutch | - | - | - | - | 11 | - |
| East African | 1 | - | - | - | - | - |
| English | 1 | 58 | 160 | 185 | 152 | - |
| French | - | - | - | 2 | 9 | 2 |
| French / British | - | - | - | - | - | 1 |
| German | - | - | - | 4 | 4 | - |
| German / British | - | - | - | - | 1 | - |
| Ghanaian | 2 | 1 | - | - | - | - |
| Gold Coast | 1 | - | - | - | - | - |
| Hong Kong | - | - | - | 2 | 1 | - |
| Ibo | 1 | - | - | - | - | - |
| Indian | 1 | - | - | - | - | - |
| Iraqi | - | - | - | - | 1 | - |
| Irish | - | - | - | - | 15 | 18 |
| Israeli | - | - | 1 | 1 | - | 1 |
| Israeli / Belgian | - | - | - | - | 1 | - |
| Italian | - | - | - | - | 8 | - |
| Jamaican | - | 1 | - | - | - | 1 |
| Kenyan | - | - | 1 | - | - | - |
| Malaysian | - | 2 | - | 1 | - | 1 |
| Northern Irish | - | 15 | 26 | 40 | 39 | 5 |
| Nigerian | 4 | 6 | - | - | - | - |
| Norwegian | - | - | - | 5 | 8 | - |
| Omani | - | - | - | 1 | - | - |
| Pakistani | - | - | - | - | 1 | - |
| Peruvian | - | - | - | - | 1 | - |
| Polish | - | - | - | 1 | - | - |
| Portugese | - | - | - | - | 1 | 1 |
| Rhodesian | - | 1 | - | - | - | - |
| Russian | - | - | - | - | - | 1 |
| Scottish | 4 | 118 | 475 | 350 | 239 | - |
| Sierra Leonean | - | 1 | - | - | - | - |
| Singaporean | - | 1 | - | - | 7 | 2 |
| Singaporean / British | - | 2 | - | - | - | - |
| South African | - | - | - | - | 2 | - |
| Spanish | - | - | - | 18 | 36 | 1 |
| Swedish | - | - | - | 4 | 7 | - |
| Tanganyikan | - | 2 | - | - | - | - |
| Trinidadian | - | - | - | 5 | - | - |
| Ugandan | - | 1 | - | - | - | - |
| Welsh | 2 | 2 | 13 | 5 | 5 | - |
| West Indian | - | 1 | - | - | - | - |
| British (overseas) | 15 | 8 | - | - | 11 | 4 |

**Table 6-39: Recorded nationality of all students enrolled between 1950 and 2004**

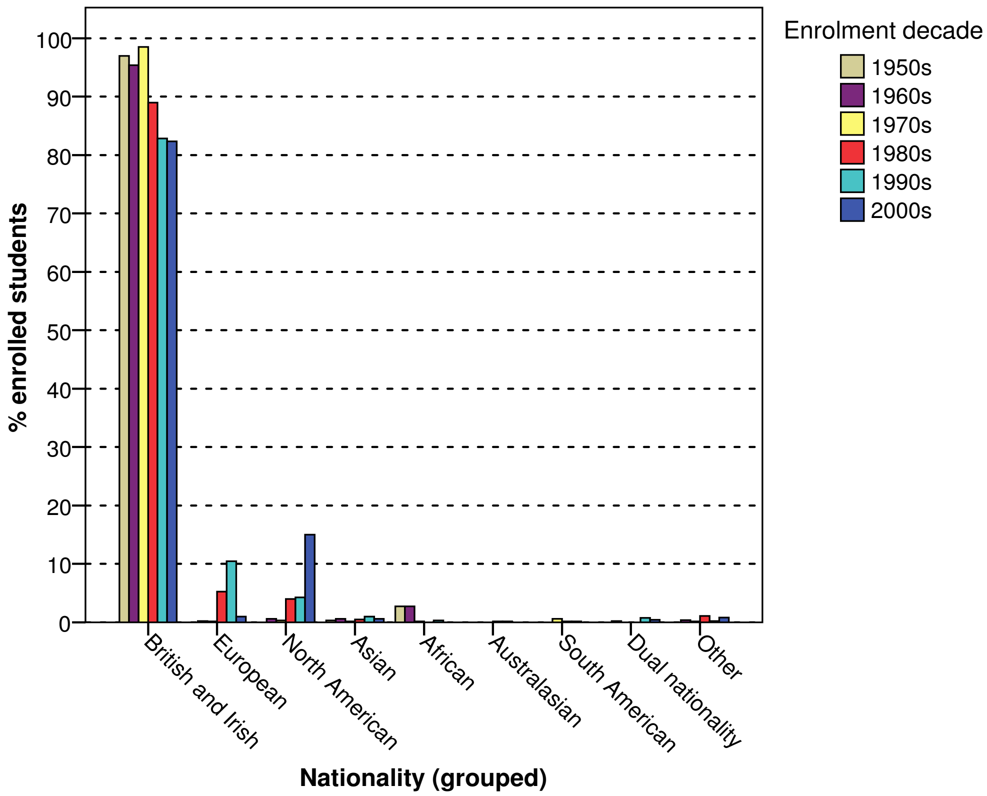


**Figure 6-19: Nationality (by region) of enrolled students from 1950 to 2004 (by decade)**

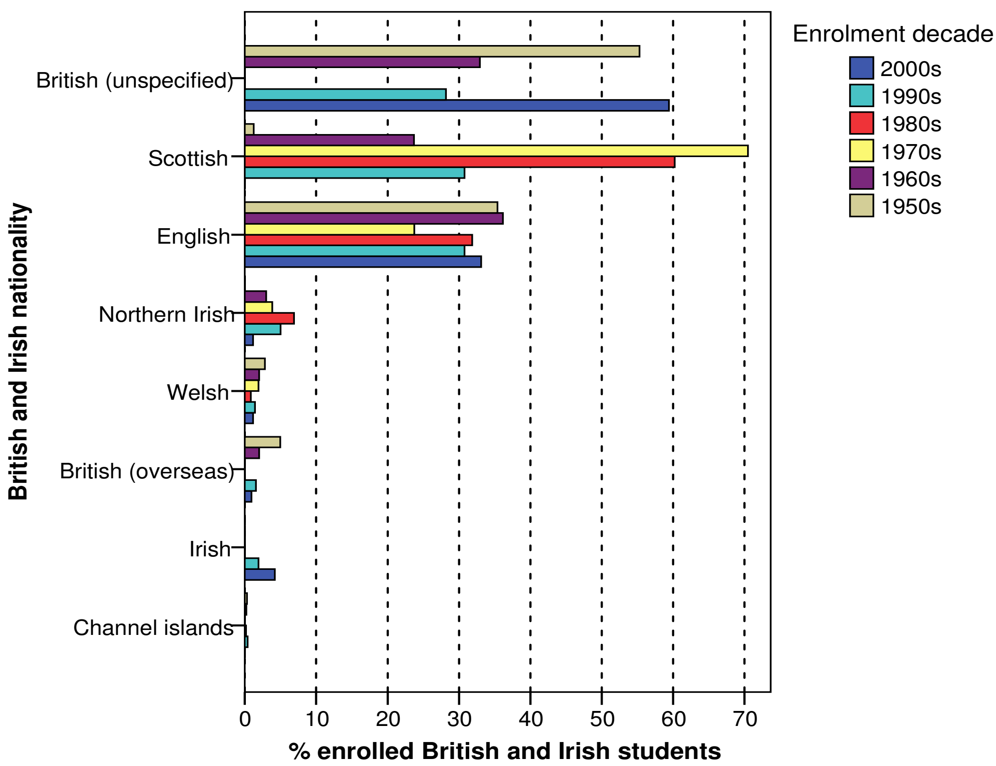


**Figure 6-20: Nationality of British and Irish enrolled students (by decade)**

### 6.4.7 Standard Occupational Classification (2000)

The Standard Occupational Classification (2000) is a government-devised socio-economic classification system. This is the second version, improved to standardise job titles at a European level. The first version, SOC (1990), was designed to replace both the Classification of Occupations 1980 (CO80) and the Classification of Occupations and Dictionary of Occupational Titles (CODOT).

The graphs provide an indication of parental occupation since 1950. Some occupations could not be categorised according to this system and therefore were classified as missing data and consequently omitted from the results.

#### 6.4.7.1 Major Groups

Figure 6-21 shows the major groupings for each era. There is comparatively little difference between the eras, with the exception of professionals (major group 2) that increased by 12.9% after the Weipers era. This group comprises the majority of parental occupations (33.4% on average), followed by managers (major group 1, 14.6%) and skilled trades (major group 5, 13.4%). Associate professionals (major group 3) comprise 6.6%, while administrative and secretarial occupations (major group 4) comprise 5.7%. The least well represented categories are plant, process and machine operatives (major group 8, 2.1%), elementary occupations (major group 9, 2%), sales and customer service occupations (major group 7, 0.9%) and personal service occupations (major group 6, 0.6%).

Together, the first five major groups account for the majority of graduates' parental occupations (94.4%). This highlights the fact that throughout the period of study, very few graduates' parents were from lower socio-economic groups.

#### 6.4.7.2 Sub-Major Groups

Graphs are included here to show the percentage composition of the first five major sub-groups, grouped by decade to better reveal temporal trends.

Figure 6-22 reveals a steady increase in the proportion of corporate managers since the 1950s, and a corresponding decrease in the proportion of agricultural and service managers.

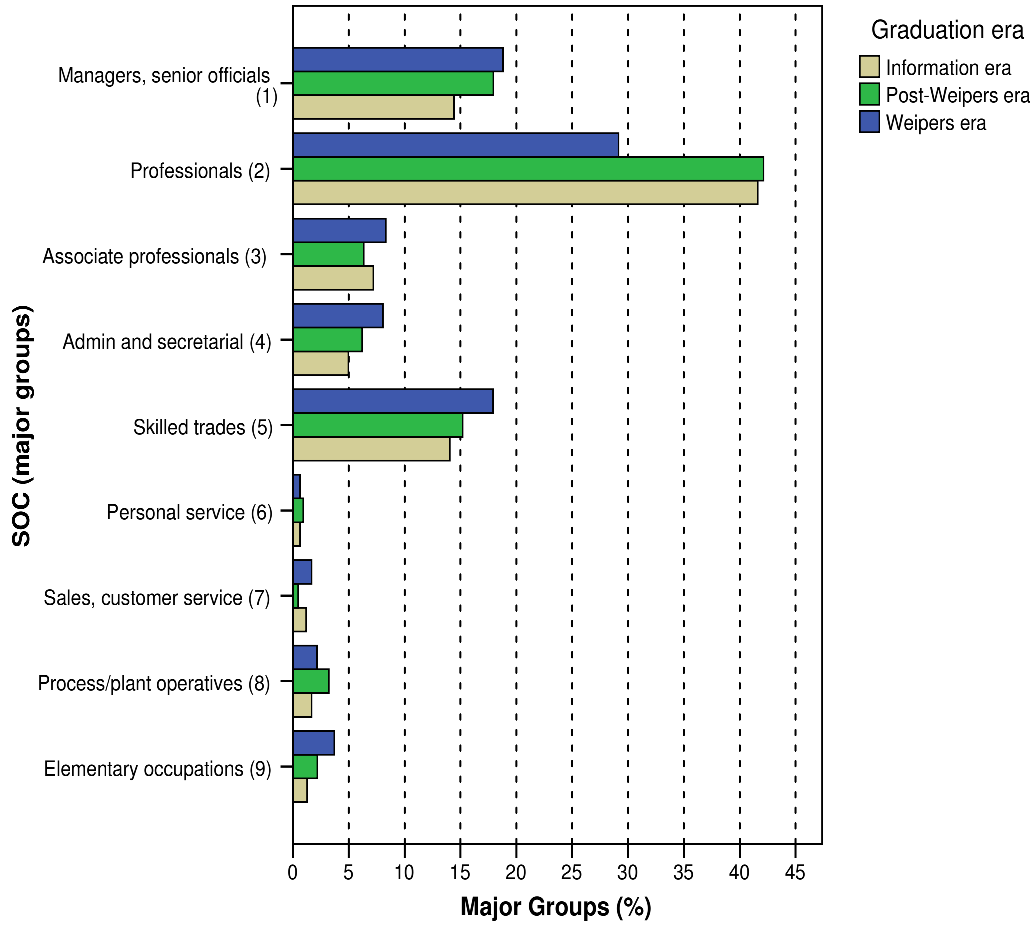


**Figure 6-21: Parental occupation: percentage of major groups for different eras**

Figure 6-23 shows a bimodal distribution for science professionals, peaking in the 1950s and again in the 1980s. A negatively skewed normal distribution characterises the health professions, peaking in the 1960s and 1970s. The number of teaching and research professionals reaches a high in the 2000s, and a bimodal distribution also typifies the business professions, at their lowest in the 1990s.

The health professionals comprise medical doctors, psychologists, pharmacists, ophthalmic opticians, dentists and veterinary surgeons, and the proportion of parental backgrounds from each unit is shown in Figure 6-25. Within this minor group, it is clear that medics and veterinary surgeons comprise the majority of the health professions. However, while the number of parents who are medical doctors increased over time, the proportion of parents who are veterinary surgeons decreased consistently with time.

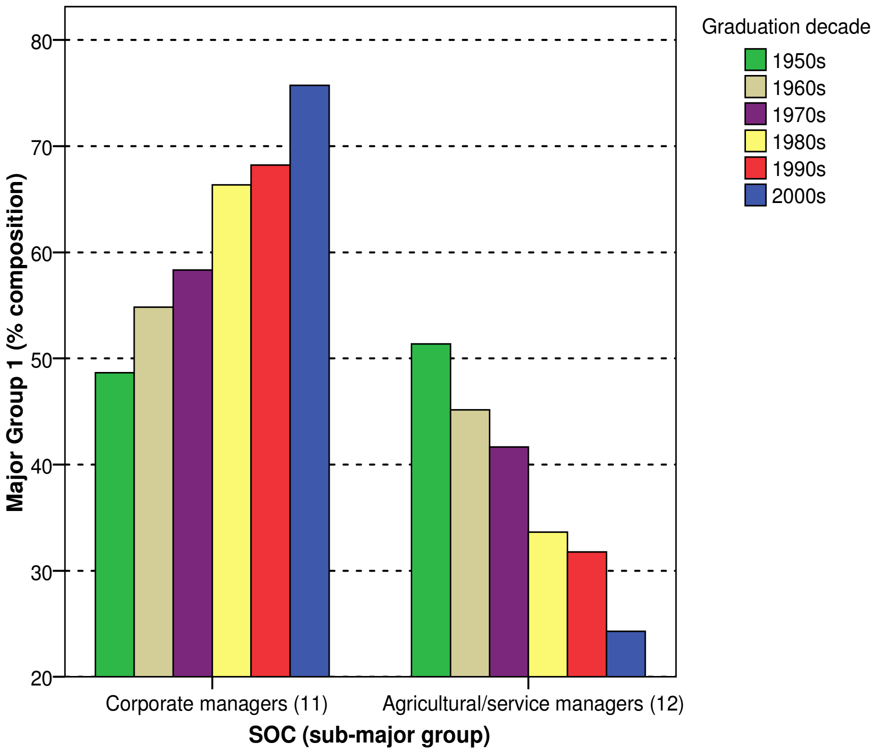


**Figure 6-22: Composition of major group 1 (managers and senior officials)**

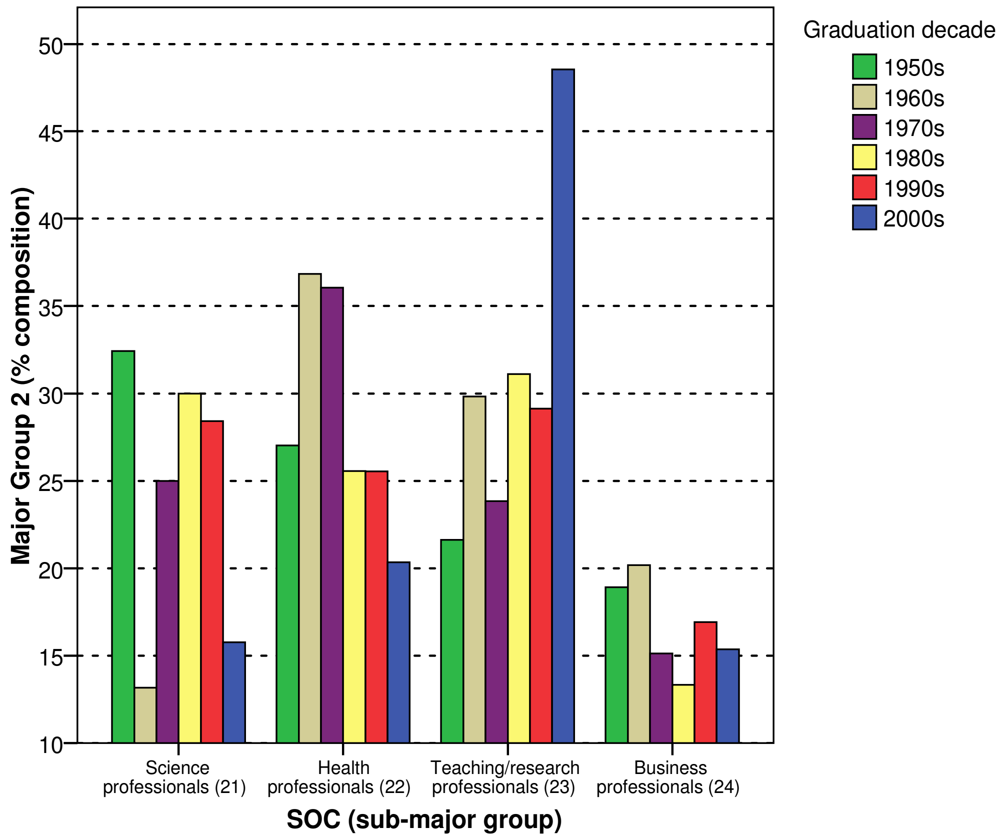


**Figure 6-23: Composition of major group 2 (professional occupations)**

Figure 6-25 reveals that the majority of Major Group 3 parents were business and public service associate professionals, until the 2000s when the number of business associate professionals fell at the same time as a substantial boost in the proportion of health and welfare associate professionals, and a rapid swell in the culture, media and sports occupations.

Figure 6-26 reveals bimodal distributions in administrative and secretarial occupations, with administrative occupations peaking in the 1950s and 1990s, and secretarial occupations peaking in the 1960s and 2000s. Administrative occupations far outweigh the number of secretarial occupations.

Figure 6-27 shows that the proportion of skilled agricultural workers (the majority of which are farmers) has increased since the 1960s, when it was at its lowest. This sub-major group accounts for the majority of parental occupations over time in this major group.

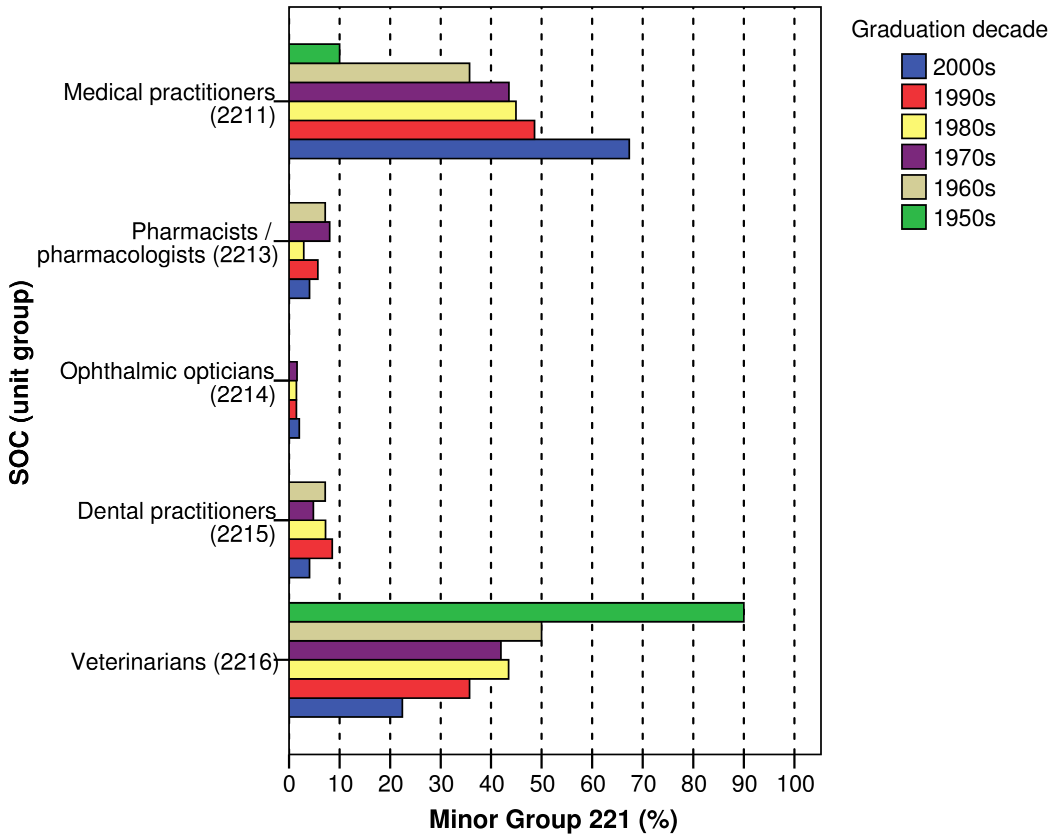


**Figure 6-24: Composition of minor group 221 (health professionals)**

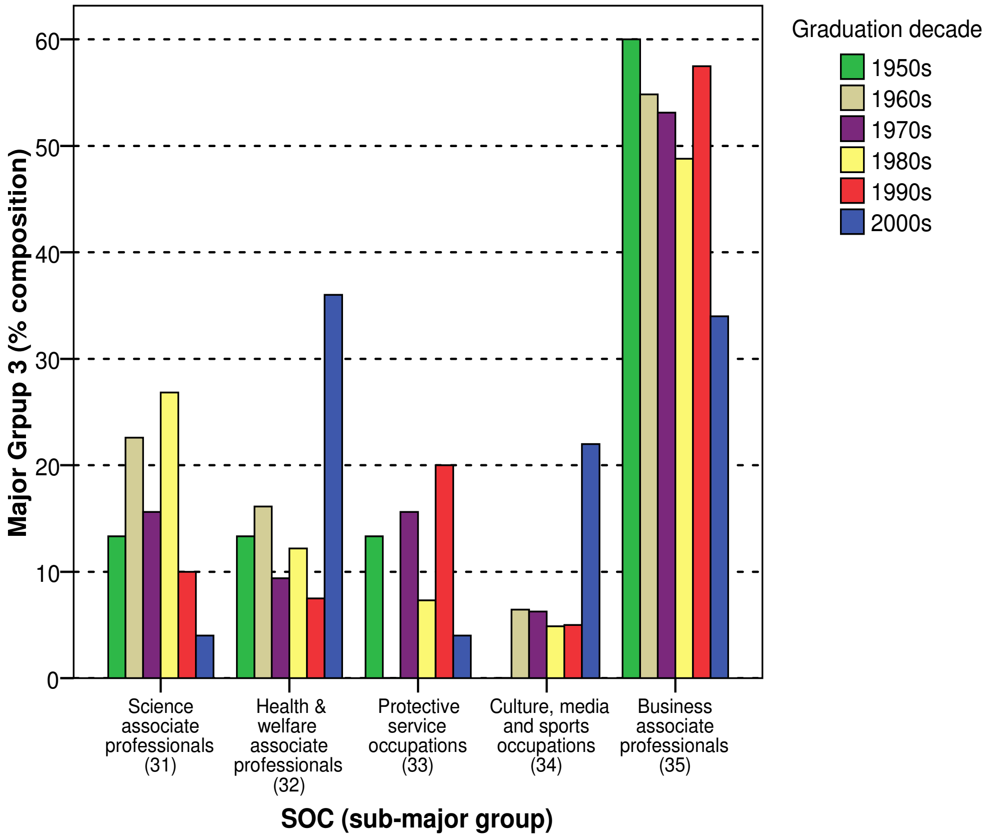


**Figure 6-25: Composition of major group 3 (associate professional and technical occupations)**

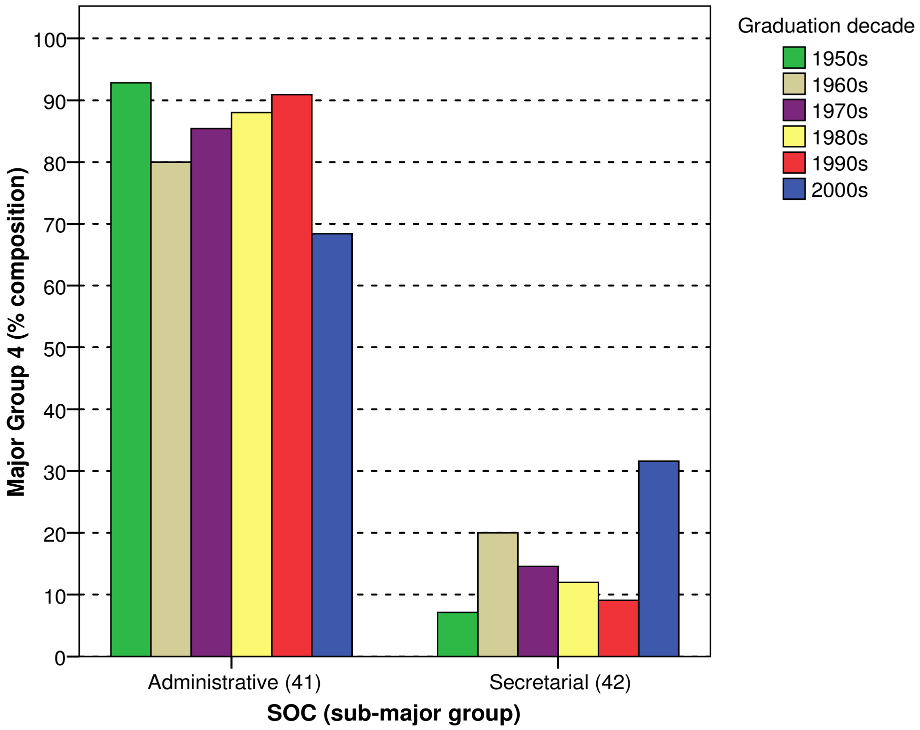


**Figure 6-26: Composition of major group 4 (administrative and secretarial occupations)**

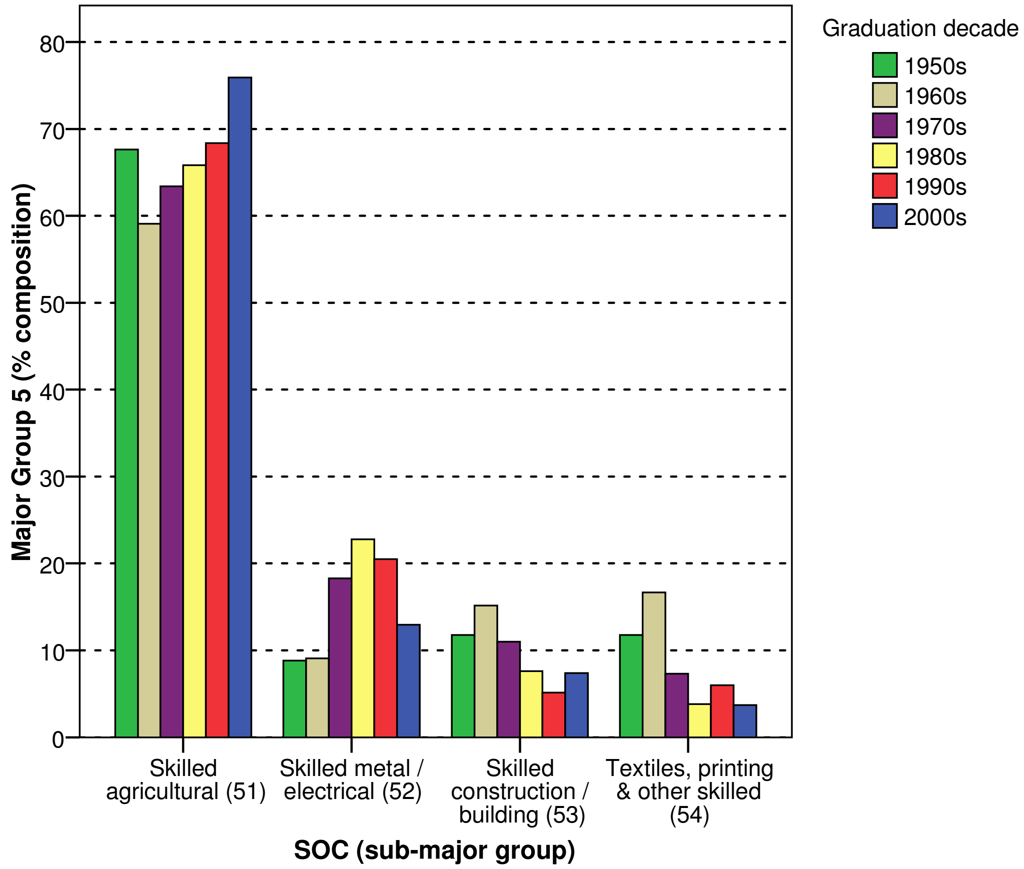


**Figure 6-27: Composition of major group 5 (skilled trades occupations)**

### 6.4.8 Summary of demographic results

Perhaps the most obvious point to pick out from the demographic survey is the consistent decline in male students since the 1950s, and a corresponding increase in female students. AVMA accreditation in 2000 had an impact on the demographics in the sense that in the 2000s, the number of mature students (>= 20 years) increased to about one third of all students. Another factor affecting age would be the fact that sixth year was made compulsory in Scotland during the 1990s. AVMA accreditation also had an impact on nationality, as did the Erasmus exchange scheme which resulted in an influx of European students who were generally enrolled for one year during the late 1980s and 1990s. A small number of African students were enrolled in the 1950s and 1960s, predating the veterinary schools in Africa that some of the Glasgow staff helped to set up. With regards to parental occupations, it appears that widening participation efforts have not yet made an impact on recruitment to the veterinary degree, with the majority of Glasgow graduates having managerial, professional and skilled parental backgrounds (major groups 1 to 5).

# 7 Discussion

The main aim of the discussion is to consolidate the findings of the questionnaire, interviews and focus groups, with appropriate learning theories. This serves as a basis for determining which methods and technologies best facilitate the development of higher order skills required for professional lifelong learning, and what curricular changes need to be considered to facilitate meaningful learning in learners who have the capacity to be self-directed. Other factors that affect student learning are also discussed.

## *7.1 Models of cognitive development*

Most learning theories – essentially models of cognitive development – are dichotomous or present levels of learning on a linear scale, with extreme examples at either end. For example, Marton and Säljö's (1976) deep-level versus surface-level processing can be aligned with Knowles' (1968) definition of andragogical approaches contrasted with pedagogical approaches. Learning taxonomies such as the psychomotor, affective and cognitive taxonomies proposed by Bloom (1956), and Biggs' SOLO taxonomy (Biggs and Collis 1982), distinguish lower-order from higher-order skills that can be evaluated using behavioural objectives. These conceptual frameworks for the understanding of intellectual development are presented in the chronological order that they were proposed, as a basis for discussing the use of various educational methods and technologies in veterinary education at Glasgow since 1949.

### 7.1.1 Bloom's taxonomy of educational objectives (cognitive domain)

Bloom and his associates proposed an educational taxonomy with three main domains: cognitive, psychomotor and affective, that relate to knowledge, skills and attitudes respectively. The cognitive domain is concerned with the development of intellectual skills and so for the purposes of this cursory introduction to learning theories, serves as a useful example of the transition from lower order skills in the novice to higher order skills in the expert.

| Level | Description | Description of verbs that may be used to for curriculum objectives |
|---|---|---|
| **Evaluation** | Student can make reasoned judgements about the value of ideas | Evaluate, conclude, justify, defend |
| **Synthesis** | Students can integrate knowledge from diverse sources to create new meaning or structure | Categorize, reconstruct, compile, organize |
| **Analysis** | Student can break concepts down into component parts | Analyze, compare, contrast, outline, relate |
| **Application** | Student can use concepts in new situations | Apply, demonstrate, discover, predict, prepare |
| **Comprehension** | Student can understand and grasp meaning | Explain, interpret, summarize, translate |
| **Knowledge** | Student can recall terminology, facts, methods | List, describe, state, label, identify |

**Table 7-1: Bloom's taxonomy: cognitive domain (Bloom 1956; Clark 2004)**

Bloom argued that all three domains are required for a holistic approach to education. The other two domains are the psychomotor domain, that provides a framework for the development of clinical skills; and the affective domain, that relates to the development of professionalism and ethical reasoning.

The cognitive domain is a hierarchical representation of intellectual development. At the lowest level, the student can merely recall facts. This is typical of a pedagogical approach, which is contrasted with an adult learning approach exemplified by evaluation which sits at the highest level of Bloom's cognitive domain.

### 7.1.2 Knowles' concept of 'andragogy' and the self-directed learner

Malcolm Knowles (1968) coined the term 'andragogy', stating that it involves "shifting from transmittal techniques [such] as lectures … to experimental techniques that make use of the learner's experience." In contrasting an andragogical approach with a pedagogical one, it would therefore be appropriate to suggest that a pedagogical approach is exemplified by a traditional lecture-intensive course, whilst an andragogical one is fostered by a curriculum strongly focused on self-directed learning. Merriam (2001) cited Knowles' assumptions underlying the concept of the adult learner (Knowles 1968, 1975), these being someone who:

- has an independent self-concept and who can direct his or her own learning
- has accumulated a reservoir of life experiences that is a rich source for learning
- has learning needs closely related to changing social roles
- is problem-centred and interested in the immediate application of knowledge, and
- is motivated to learn by internal rather than external factors.

Adult learners are typically viewed as being independent, intrinsically motivated, having the advantage of previous experiences that they can draw upon in the construction of new knowledge, attitudes, and skills (handled by the cognitive, affective and motor domains respectively), ultimately enabling them to problem-solve in a real world context. Therefore the pedagogy – andragogy continuum can be incorporated into this discussion as another model of cognitive development.

### 7.1.3 Ausubel's description of 'meaningful learning'

David Ausubel (1968) provided a model of intellectual development, known as the Concrete-Abstract Dimension of Cognitive Development, which was heavily influenced by Piaget's stage theory (Inhelder and Piaget 1958). Ausubel's model is shown in Table 7-2.

| Level | Description |
|---|---|
| **Abstract logical** | Adolescent is capable of assimilating abstract propositions and solving problems without the need for concrete-empirical props; and is able to formulate and test hypotheses |
| **Concrete operational** | Child is capable of acquiring secondary abstractions (concrete-empirical props) and using these for problem-solving purposes |
| **Pre-operational** | Child is capable of acquiring primary abstractions (concepts) and using these for problem-solving purposes |

**Table 7-2: Ausubel's model of cognitive development (Ausubel 1968)**

The core principle central to Ausubel's work is the concept of meaningful learning. Also influenced by Gagné's earlier work, Ausubel argued that cognitive development is one of the intrapersonal learning variables (factors within the learner) that also includes developmental readiness, intellectual ability, motivation and personality. These factors, he argued, influence the degree to which meaningful learning can occur, and are complemented by situational variables (factors in the learning situation) that include practice, instructional materials, group and social factors and teacher characteristics.

In contrasting meaningful from rote learning, Ausubel argued that "independent problem solving is often the only feasible way of testing whether students *really* comprehend meaningfully the ideas they are able to verbalize" (original emphasis). However, he cautioned that "Long experience in taking examinations makes students adept at memorizing not only key propositions and formulas, but also causes, examples, reasons, explanations, and ways of recognizing and solving 'type problems'."

### 7.1.4 Gagné's learning hierarchies

Robert Gagné (1970) put forward the notion of learning hierarchies in relation to the development of intellectual skills. In this model, shown in Table 7-3, the learner has to master the relevant lower-order skills before learning the related higher order skill. These are the internal conditions of learning that identify the prerequisite capabilities required for positive transfer to a new learning event. Gagné advised that the learning hierarchy serves as a basis for finding a suitable learning route for every student, but first, the teacher needs to find out what the student already knows, and begin instruction at that point.

| Level | Description |
|---|---|
| **Problem-solving** | Student can apply higher-order rules to solve a complex problem |
| **Rule learning** | Student can apply a basic rule to perform a simple task |
| **Concepts** | Student can classify objects/events by their attributes |
| **Discrimination learning** | Student can recognise difference between two objects/events |
| **Basic types of learning** | Student can name objects/events |

**Table 7-3: Learning hierarchies model of intellectual development (Gagné 1970)**

### 7.1.5 Marton and Säljö's deep versus surface learning approaches

Marton and Säljö (1976), in their study of prose reading in Swedish university students, identified four levels of outcome as evidence of qualitative differences in learning. This led them to distinguish surface-level processing, typified by rote-learning of a text, from deep-level processing, where the learner actively seeks to understand the principles embedded in a text. This work was subsequently extended by Entwistle and colleagues (Newble and Entwistle 1986; Entwistle 1988; Entwistle, McCune *et al.* 2001), that confirmed the existence of deep and surface learning approaches, and identified strategic learning as a third approach.

### 7.1.6 Biggs' SOLO taxonomy

John Biggs' Structure of the Observed Learning Outcome (SOLO) taxonomy (Biggs and Collis 1982) is shown in Table 7-4. The prestructural level is the lowest level where the student shows no evidence of learning. Learning begins at the basic unistructural level, with learners progressing through multistructural and relational stages before ultimately being able to demonstrate higher-order thinking skills at the extended abstract level.

| **Level** | **Description** | **Description of verbs that may be used to for curriculum objectives** |
|---|---|---|
| **Extended abstract** | Student conceptualises at a higher level of abstraction and applies knowledge to new and broader domains | Theorize, generalize, hypothesize, reflect |
| **Relational** | Student demonstrates understanding through integration of concepts | Compare/contrast, explain causes, analyse, relate, apply |
| **Multistructural** | Student gathers a number of facts but cannot connect or create meaning from these | Enumerate, describe, list, combine, do algorithm |
| **Unistructural** | Student focuses on a singular aspect of the learning task e.g. terminology | Identify, do simple procedure |
| **Prestructural** | Student shows little evidence of relevant learning | - |

**Table 7-4: SOLO taxonomy (Biggs 1980; Biggs and Collis 1982; Biggs 2003)**

Biggs and Collis (1982) pointed out that the first four levels of the SOLO taxonomy are identical to the four levels of outcome identified by Marton and Säljö (1976). They also stated that the levels are ordered in terms of characteristics that include progression from concrete to abstract, isomorphic to, but logically distinct from, Piaget's stages of development (pre-operational, early concrete, middle concrete, concrete generalisations and formal (abstract)). Furthermore, in relating levels of the SOLO taxonomy to deep versus surface level processing, Biggs and Collis pointed out that in empirical studies, high

SOLO scores were associated with intrinsically motivated students who avoided a strategy for rote-learning facts, whilst students who used a rote-learning approach scored highly in a memory test but obtained very low SOLO scores. Biggs and Collis also made reference to learning cycles, with learners applying the concepts of SOLO again and again to each new learning episode, thus illustrating the marriage between the cyclical nature of learning and the hierarchical nature of cognitive development.

### 7.1.7 Grow's Self-Directed Learning Model

The model of learning and teaching proposed by Gerald Grow (1991) assumes that the goal of education is to produce self-directed, lifelong learners, despite the fact that many educational practices in universities do more to perpetuate dependency than to create self-direction. Grow defined four stages in the development of self-directed learners, noting that "the teacher's purpose is to match the learner's stage of self-direction and prepare the learner to advance to higher stages". Thus, there are four complementary teacher styles required to help students progress to the next level. Grow's model is reproduced in Table 7-5.

| Stage | Student | Teacher | Examples |
|---|---|---|---|
| **Stage 4** | Self-directed | Consultant, delegator | Internship, dissertation, individual work or self-directed study-group. |
| **Stage 3** | Involved | Facilitator | Discussion facilitated by teacher who participates as equal. Seminar. Group projects. |
| **Stage 2** | Interested | Motivator, guide | Inspiring lecture plus guided discussion. Goal-setting and learning strategies. |
| **Stage 1** | Dependent | Authority, coach | Coaching with immediate feedback. Drill. Informational lecture. Overcoming deficiencies and resistance. |

**Table 7-5: Staged Self-Directed Learning Model (Grow 1991)**

Grow emphasised that none of these approaches are 'bad', and that problems only arise when the student and teacher are at different stages and therefore 'mismatched'. The most severe problems occur when dependent learners are mismatched with non-directive teachers, where students resent freedom they are not ready for and consequently resent their teacher; and when self-directed learners are mismatched with directive teachers, where students resent an authoritarian approach and are likely to be misconstrued as being rebellious.

Grow made reference to 'good teaching', that which matched the student's stage of self-direction and empowered the student to progress towards greater self-direction. This he contrasted with the traditional notion of 'good teaching', that has historically been attributed to teachers who excel in the first two stages. Good stage 1 teachers are considered to be experts whose mastery must be real, and who provide clear-cut objectives and straightforward techniques for achieving them, and who provide immediate task-oriented feedback. Good stage 2 teachers bring enthusiasm and motivation to the class, using a directive but highly supportive approach to enthuse learners. At stage 3, teachers and students share in the decision-making with the teacher acting as a facilitator, and at stage 4 the relationship between the student and the teacher is more collegial.

### 7.1.8 Kolb's experiential learning cycle

The experiential learning model proffered by David Kolb (1985) owes its origins to the earlier works of Lewin, Dewey and Piaget. The fundamental principle of the model is that learners have a concrete experience (CE), about which they have a reflective observation (RO) that leads them to develop an abstract conceptualization (AC) that is tested through active experimentation (AE). This feeds into another cycle of concrete experience and so on. Progressing around the cycle is the equivalent of moving up through the hierarchy models such as those proposed by Bloom and Biggs. The relevance of Kolb's model, shown in Figure 7-1, is that in terms of higher order thinking it recognizes the need for learners to develop theory and apply this to a real problem, evaluate the outcome and subsequently refine their understanding.

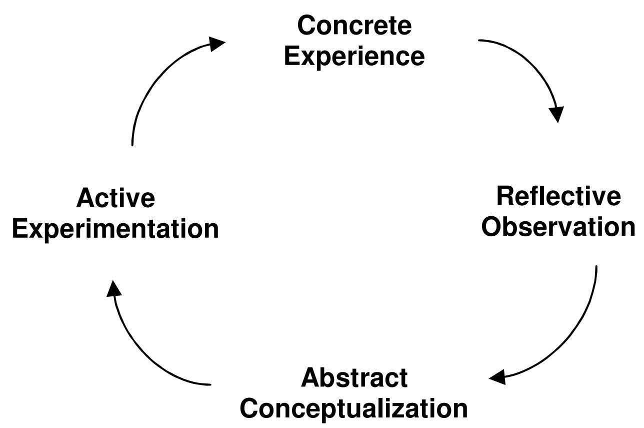


**Figure 7-1: Kolb's (1985) experiential learning cycle**

### 7.1.9 Supporting the transition from novice to expert

Ultimately, all these models of cognitive development are about the teacher's role in supporting the learner's transition from novice to expert. At one end of the continuum, in relation to this thesis, students are admitted to the veterinary course, and at the other end they are deemed competent to practice. What happens in the middle depends on a number of factors, not least the educational methods and technologies used by teachers and made available to students.

## *7.2 Educational methods and technologies*

The methods and technologies that form the basis of the questionnaire and focus group discussions are described here in relation to their role in aiding student learning, with reference to the cognitive theories outlined at the beginning of this chapter.
The ratings by study participants in brackets refer to the median scores from the questionnaire survey, where 1 = not at all useful and 5 = extremely useful.

### 7.2.1 Lecture (plenary) based methods and projection technologies

#### 7.2.1.1 Lecture / plenary sessions

**Figure 7-2: Students in a lecture during the 1960s ©University of Glasgow ImageBase**

**Figure 7-3: Students gathered before the start of a lecture in 2006 ©VHMD**

The study revealed that lectures were ubiquitously used throughout the period of study, rated highly by alumni (4), students (4) and teachers (4). Considered to be the "standard" way of teaching "most subjects" by alumni and current students, lectures were valued by all stakeholders for their role in providing a structure for the learner, and a focus on key points – the "basics" – that students require for examination purposes. Lectures were also highly regarded because they provide a face to face setting where teachers could enthuse students with the latest recent research findings (ideally from their own research), amply illustrated using visual aids. In addition, current teachers perceived the lecture to be an efficient way to impart factual information to students.

These findings echo those of McLeish (1968), who noted that the although the lecture should not be used as an all-purpose teaching method, its virtues include the ability of a scholar to communicate economically the latest information to his audience with enthusiasm, providing a framework for understanding key concepts and involving the audience in reflective thought. Similar suggestions were made by McLennan and Heath (2000), in describing a case study of veterinary staff and students' perceptions at the University of Queensland. They noted that whilst there was a general agreement that lectures should present ideas and concepts, impose a structure on the material, provide a guide for study, and expose students to new or unpublished knowledge, lectures in reality often failed to deliver. They also failed to meet expectations to be stimulating, motivating and interactive, and were seen to be largely unsuccessful in encouraging thinking.

Bligh (2000) argued that the lecture is as effective as other methods for transmitting information (with the exception of the personalised system of instruction based on programmed learning methods). He postulated that most lectures are not as effective as discussion for promoting thought, and that lectures are relatively ineffective for inspiring interest in a subject.

Given the growing and increasingly diverse student population, with individual learning needs, the lecture is unlikely to be as effective as it is perceived to be. Ramsden (2003) made the same point, noting that adherents to the lecture format proclaim its low cost in terms of transmitting information, despite the fact that it is a teacher-centred approach congruent with Säljö's (1984) description of the simplest conception of knowledge.

Goldstein and Benassi (2006) distinguished between those attributes identified by students and instructors required of excellent lecturers versus excellent discussion leaders. They identified a dichotomy between structure and process, with a focus on factual learning and structure characteristic of the lecture, which differs from the small group discussion whose leader focuses instead on students' personal and professional growth and on encouraging independent thinking and research.

It is clear that in terms of learning theory, lectures do not support a high level of cognitive processing. As noted by McLaughlin and Mandin (2001), in relation to Bloom's taxonomy, lecturing can only realistically reach the two lowest levels of 'knowledge' and 'comprehension', with the third level ('application') reached only in exceptional cases.

Both alumni and current students in this study noted that the quality of lectures were dependent to a great extent on the 'quality' of the teacher presenting them. At their least effective, lectures result in a surface learning approach focused on rote memorisation of facts, but when done effectively, the good lecturer can motivate students, 'scaffold' the learning process and provide the opportunity for them to relate new information to the knowledge they already possess, and encourage thinking. An effective lecture will also provide good direction for personal study (Isaacs 1994; McLennan and Heath 2000), a requirement of independent learning. As noted by Isaacs (1994):

> *"Learning only starts with the lecture; it does not end there."*

One of the biggest limitations Gagné (1970) cited of lectures was their lack of in-built assessment and feedback. However, McLaughlin and Mandlin (2001) noted that active learning could be increased by questioning. This can also be achieved using personal response systems, or handsets, that allow students to respond to questions created using plug-in software for PowerPoint (Draper and Brown 2004). Although used mainly to stimulate factual recall through multiple choice questions (MCQs), the new technology may be used to promote discussion. The impact of this technology on veterinary students' learning has yet to be assessed although its precursor – an electronic dial – was successfully used in undergraduate veterinary teaching during the 1960s to test students' understanding in lectures (Appleby 1968).

Despite the necessity of the lecture to impart basic information and the opportunity it offers for interactivity, it has long been argued that the traditional veterinary curriculum includes too many of them (King 1964; Armistead 1970a).

#### 7.2.1.2 Post-mortem demonstrations

Post-mortem demonstrations were highly rated by alumni from the Weipers era onwards (4), their success peaking during the post-Weipers era (5) and falling again in the Information era (4). Common feedback from alumni and current teachers included the fact that these classes fostered multi-disciplinary subject integration, particularly between medicine and pathology. They were also highly memorable, partly due to the fierce debates that took place between staff. Alumni and current students stated that the post-mortems promoted three-dimensional visualisation of structures, as well as an opportunity to consolidate theory from lectures. Both these groups also appreciated the follow through from case admission to post-mortem. Of the currently enrolled cohorts, the classes were most highly rated by first year students (5), who confused post-mortem demonstrations with anatomical dissections; however, all other student years gave a high rating to this type of class (4), as did veterinary and teachers (4) and non-veterinary teachers (4.5). Their main limitation, as perceived by alumni and teachers, were that cases were random and unrepresentative, whilst students argued that there were too few classes of this type.

Parker (2002) considered that in human medicine, the dissected body is an excellent tool for the teaching of whole-body pathology and understanding the interaction between different parts of the body when affected by the same disease process. Despite its lesser role within medical teaching, particularly in Glasgow where human dissection has been largely phased out, teaching based on autopsy is believed to facilitate the development of skills in clinico-pathological correlation, pathophysiology, anatomy and observation skills (Underwood 2003).

The integration of pathological and clinical features is a key characteristic of the clinico-pathological demonstrations at Glasgow, the renowned hallmark of the integrated pathology medicine course that was introduced in the late 1960s. However, recent years have seen a decline in this form of teaching, with a decreasing number of pathologists 'on the ground’ and a lack of interaction with clinicians resulting from the fact that more collaborative research now takes place between the basic scientists and the clinicians at the molecular level. In addition, more stringent health and safety guidelines, partly imposed by international accreditation requirements, have meant that cadavers are no longer dissected in the post-mortem demonstration theatre in front of the class. Gross specimens have been replaced by photographic images projected using PowerPoint, also a necessity of increasing student numbers. Post-mortem demonstrations have been sanitised and didacticised, with PowerPoint providing better visual access but at the expense of a sense of discovery and excitement, enhanced by the engaging of different senses, and the realisation among students that there are no ‘right answers’. The substitution of the cadaver with PowerPoint also explains the positive feedback from students about ‘good quality images’.

#### 7.2.1.3 Blackboard and chalk

Considered to be the “standard method of teaching” in the Weipers era, the blackboard (chalkboard) was regarded as useful by alumni because it permitted time for note-taking; was useful for showing diagrams, processes and headings; and could be interactive when used in discussion or for spontaneous explanations. Current students also applauded the use of the blackboard for the incremental build up of diagrams, as well as the fact that its use slowed the lecturer to the students’ pace. Similar benefits were cited by current teachers, but they noted that few were now available. The majority of blackboards in the school have been replaced with whiteboards, for health and safety reasons as well as practicality.

The blackboard was given mediocre or poor ratings by alumni (3), students (2-3) and teachers (3). Negative perceptions of alumni were that blackboards lacked visual impact and their use was dependent on the lecturer, while students considered them difficult to read and inferior to modern technologies such as PowerPoint.

The case has been stated for the continued use of chalkboards in science education. Ressler (2004) argued, in relation to the education of engineers, that as well as being reliable and easy to use, chalkboards facilitate student learning more effectively than PowerPoint, through allowing students to construct meaning from simultaneously visible chunks of information; through being self-pacing; and requiring note-taking which serves to promote student learning and the development of graphical communication skills.

It is clear that blackboards, like their modern equivalent (whiteboards), continue to be of some use because they are quick and easy to use, represent a very low level of technology, and lend themselves well to the ‘building up’ of complex structures in diagrammatic format; however, in most schools they have been superseded by modern projection aids.

#### 7.2.1.4 Glass lantern slides

Invented in the 19th century, lantern slides – which needed limelight for illumination – were used throughout the 1920s to the 1960s, when they were replaced by 35mm slides.

Lantern slides appear to have been used only in a limited fashion during the Weipers era, where they were given a mediocre rating (3). Although perceived by alumni to add visual interest to the lecture, their usefulness was limited by the fact that images were monochrome.

Thompson (1948) noted that the special advantages of lantern slides included the ability to project a slide in a room light enough for students to take notes and to read; flexible use; the possibility of making annotations when a slide is projected onto a blackboard; and (although not used in this format at Glasgow) the ability to make colour slides inexpensively.

In highlighting the value of making one’s own slides for nursing education and stressing the importance of accurate preparation, Kakosh, Bird *et al.* (1948) provided instructions on how to create various types of lantern slides including etched glass; slides made using pen, crayon and ink; gelatine; cellophane (for text); lumarith (onto which text could be typed directly); and tracing paper. This has implications for the use of lantern slides – it would have taken much longer to create these than more modern projection media, therefore it is reasonable to suggest that more thought would have gone into their creation and how they would be used to illustrate point in a lecture. In addition, they were the first projected visual aids to impose a structure on the lecture.

#### 7.2.1.5 Acetates

Acetates were regarded by alumni as similar to the blackboard but more colourful. They were perceived by alumni and teachers to be most useful in small group discussion, but in lectures the use of good freehand illustration was also thought by alumni and students to generate greater class involvement, especially given the fact that for the first time the lecturer could face the class.

Acetates received a mediocre rating from alumni (3), students (3) and teachers (3), and were particularly well used in anatomy classes. Like the blackboard, the usefulness of acetates was perceived by alumni to be dependent on the lecturer. Acetates shared the blackboard's potential for poor handwriting and poor visibility, although this was improved with the advent of pre-printed acetates. As with the blackboard, current students rated acetates as inferior to PowerPoint.

Pond 1963 (cited by Salaberry (2001) in relation to language teaching) stated that among several pedagogical advantages of this medium, acetates enable teachers to prepare materials in advance, allow information written on overlays to be easily and quickly hidden (in contrast with information written on the blackboard), enable the teacher to add, subtract, underline, and highlight information at will, do not require that the lights be dimmed, allow for simple creation of teaching materials, enable the teacher to face the class while writing on transparencies, and are not prone to failure or damage due to their technological simplicity.

#### 7.2.1.6 35mm slides

35mm slides were regarded by alumni as "essential", enabling the projection of high quality colour images for the first time, and providing access to clinical cases that students might otherwise not have seen. Current students also appreciated the use of this medium for displaying photographs and illustrations, particularly of disease, and the use of Diazo slides enabled teachers to present colour text slides for the first time.

High ratings were given to 35mm slides by alumni (4), and mediocre ratings by students (3), with teachers divided as to their usefulness (veterinary teachers – 4, non-veterinary teachers 3). On the downside, current students referred to "trigger happy" lecturers who overused the medium, and other negative perceptions were that 35mm slides were prone to technical glitches, something that alumni also commented on, while also noting the soporific effect of the slide projector because the lights were turned out. Current teachers viewed them as technically laborious to create and largely superseded by PowerPoint.

Herron and Land (1981) noted that the 2 by 2 slide is probably the most frequently used and abused visual aid. Noting that lecture planning usually starts with "getting some slides together", they provided guidelines for best practice so that slides should benefit a lecture by focusing the audience's attention, stimulating interest, compressing information or reinforcing oral communication.

Materials in the form of 35mm slides and cine film continue to be of value to veterinary teachers because of the large residual component of illustrative case material in non-digital format. Audio-visual methods provide access to rare conditions not seen in a tertiary referral hospital because of variable clinical throughput. Although many of these images have been digitised, this is a time-consuming process, and teachers sometimes prefer the quality of the original medium. Teachers also like to use methods they are familiar with, which explains the use of 35mm slides, made possible by the omnipresence of 35mm slide carousel projectors on campus. However, 35mm slides are largely unpopular with current students because there is no automatic printout available as there is with PowerPoint.

#### 7.2.1.7 Electronic slides (PowerPoint)

PowerPoint slides were rated highly by Information era alumni (4), current students (4-5) and teachers (veterinary teachers – 5, non-veterinary teachers – 4). A major benefit cited by alumni, students and teachers was that handouts could be automatically generated and circulated in advance, enabling students to listen in lectures. In addition, the inclusion of photographs and videos has been regarded as useful for visualisation, as well as the potential for animation. The use of PowerPoint to animate anatomical structures has been documented in the literature (Carmichael and Pawlina 2000).

On the negative side, the problem of 'death by PowerPoint' has been broadly commented on, with Winn (2003) stating that "PowerPoint for many is no more than a convenient way to 'publish' embellished teaching notes." One of the perceived dangers of this technology, noted by students and teachers in this study, is the possibility of bombarding students with information. In relation to the potential transformative effects of ICT, Noss and Pachler cautioned that:

> *"… viewing new technologies as merely an opportunity for faster or easier access to information will severely restrict the opportunities for positive educational change, and may even bring about change in the wrong direction."*
>
> (Noss and Pachler 1999)

The technology, in its efficiency, has compounded the problem of information overload, with there being no physical limit to the number of slides that can be presented in a lecture, or the amount of text on one slide. This is likely to encourage a surface approach to learning.

#### 7.2.1.8 Lecture-based methods and technologies – précis

In summary, the technologies used to project information to students in lectures have helped to facilitate one-way information transfer, which is the main purpose of a lecture and which generally corresponds to the lowest level of the various learning taxonomies outlined at the start of this chapter, although lecturer's explanations on the blackboard or acetates for example can aid comprehension. The development of visual aids over time has had a positive pedagogical effect in terms of enabling more image-based teaching with clinically relevant examples to enthuse students, but at the expense of increasing information overload that promotes a surface-based approach to learning. PowerPoint has ‘cheapened’ information, because of the ease with which unnecessarily large slide presentations can be made, compared with earlier presentation media such as acetates and lantern slides, which required more effort and consequently more thought on the part of the lecturer. The effect of PowerPoint as a replacement for live dissections in post-mortem demonstrations, combined with increasing student numbers, is that students now regard these classes as plenary sessions, which limits the potential for class discussion and debate, for which they are reliant on small group teaching.

### 7.2.2 Small group tutorial methods and technologies

#### 7.2.2.1 Peer-assisted learning

Peer-assisted learning (PAL) was given mediocre to high ratings by alumni (3-4, peaking in the Weipers era) and students (3-4), and a high rating by teachers (4).

One of the perceived benefits of PAL includes the development of teamwork skills. However, all respondents felt that the success of PAL depended on the individual members of a group, with a recognition that some competitive students preferred to work in isolation.

Informal peer-assisted learning has long been part of veterinary undergraduate education, with students coaching each other and revising together out of school. Formal peer-assisted learning is a relatively recent phenomenon, made necessary in practical classes as a result of low staff–student ratios. The peer-assisted learning approach has also been advocated in terms of group learning assignments, such as the SDLA, where students have been required to pool their knowledge and expertise for learning and assessment purposes.

The major advantage of peer-assisted learning to students, from this study, appears to be improving confidence of peer-tutors, by testing their own knowledge and abilities; and peer-learners having information explained to them from fellow students’ perspectives.

In medical education, Glynn, MacFarlane *et al.* (2006) found that peer assisted learning provided a safe learning environment for educational exchange between students and peer tutors. It was observed that learners were more willing to ask questions of their peers. Similarly, in veterinary education, peer tutors were regarded by students as more approachable than lecturers (Baillie, Shore *et al.* forthcoming).

#### 7.2.2.2 One-to-one tutorials

The single-most important form of the one-to-one formal tutorial, as evidenced in this study, is EMS, also known as "seeing practice". The one-to-one tutorial was rated highly by alumni (5 for all except Weipers era – 4), students (4-5) and teachers (veterinary teachers – 5, non-veterinary teachers – 4) for this reason. The biggest benefit cited by alumni and students about EMS was the provision of 'hands on' clinical training; however, the quality was perceived by alumni to be dependent on the EMS tutor. The difference between different EMS tutors can partly be attributed to varying interpretations about their role in supporting off-campus veterinary education (Getty 1977).

One-to-one tutorials were also used in Medicine, Surgery and some clinical rotations. Increasing student numbers have made the possibility of one-to-one tutorials virtually impossible. This was noted by current students. However, these are still preferred by some students who find it difficult to talk in front of other students, even in small groups.

#### 7.2.2.3 Small group tutorials

Group tutorials were rated fairly highly by alumni (4), students (3-4, lowest in 1st and 2nd year) and teachers (3.5-4). Alumni, students and teachers all described the informal opportunity for discussion and questions, and noted that the tutorials helped consolidate information from lectures.

On the negative side, alumni felt that some quiet students could be overshadowed by more confident ones, while students noted that tutors sometimes lacked the required expertise to facilitate effective discussion. Teachers noted that the success was dependent on the input of students; however, the large class sizes meant that group sizes were too big to facilitate effective discussion involving all group members.

Ramsden (2003) recognised all of these criticisms (with the exception of large group sizes). He also recognised that some teachers use the tutorial as a 'mini-lecture', something picked up in staff interviews and student focus groups in this study. Biggs (2003) noted that in large groups, the tutor is more likely to take centre stage, while Ledingham and Crosby (2001) stated that with large numbers the group may split into two smaller groups.

As cited by Goldstein and Benassi (2006), McKeachie (1986) concluded that group discussion results in higher-level cognitive processing than does the lecture. It is clear that when done well, the tutorial acts as a complement to the lecture, allowing students the opportunity to clarify their misunderstandings with peers and tutors. Crosby (2003) concluded that small group teaching promotes deep learning, citing Entwistle *et al.* (1992)

who stated that active teaching based on small group enquiry methods stimulates higher order thinking. Crosby also stated that small group teaching aided in the development of generic skills (particularly communication); encouraged students to take responsibility for their own learning, promoted adult learning; helped cater for different learning styles; and stimulated student motivation.

#### 7.2.2.4 Flipcharts / whiteboards

Flipcharts and whiteboards appear to have been used by participants in this study in the same way as the blackboard. Benefits stated by alumni, students and teachers were that flipcharts/whiteboards could be used for summarising, explaining and drawing diagrams and for brain-storming in small groups. The flipchart has the added advantage that it is portable and low-tech, so can be used in clinical situations such as the teaching cattle byre, which is how it was used by one former teacher.

The flipchart received mediocre ratings from alumni (3), students (3) and teachers (3). Cited problems were that flipcharts were messy and not eco-friendly. However, as an aid for brainstorming and simple explanations the flipchart works well and promotes an interactive approach to teaching.

#### 7.2.2.5 Small group methods and technologies – précis

The major benefit of small group teaching was neatly summarised by Crosby (2003):

> *"Small group work more accurately reflects the adult learning styles that will be adopted in the postgraduate setting."*

This is true of the group tutorials and one-to-one tutorials in this study, particularly in the clinical setting of EMS. Through problem-solving and discussion, thinking at higher cognitive levels can be supported, resulting in deep learning. However, this depends on the tutorials being run effectively to encourage student effort, participation and reflection rather than being passive listeners in a mini-lecture. The flipchart or whiteboard serves as a useful aid in eliciting and giving feedback.

### 7.2.3 Directed self study methods and technologies

#### 7.2.3.1 Textbooks

Textbooks have become much more numerous in recent years, compared with the Weipers era, when there were few suitable texts available. Alumni rated them highly (4-5, highest in the pre-Weipers era) as did teachers (4) whilst the student ratings were lower (3-4, least well rated by fourth year).

Alumni mentioned particular textbooks– by Sisson (anatomy), Blood and Henderson (Medicine) and Vander (Physiology) – as the authoritative tomes on these subjects. Alumni and students used textbooks, at their own pace, mainly for reference or for clarification of material in lectures or course notes. Teachers considered some textbooks to be authoritative sources and felt it was important for students to look up information themselves.

The limitations of textbooks were listed as the fact that many were expensive, and often contained 'too much information'. They were also not suitable for all subject areas, and were sometimes dated or contained conflicting information.

#### 7.2.3.2 Printed student notes

Glasgow was not by any means the only veterinary school to produce a comprehensive system of student notes, although it must have been one of the earliest. A system of student notes called the 'Transparency-Illustration-Notebook (TIN)' method was introduced at the University of Montreal in the late 1970s (DeRoth 1978). These student notes included bullet points and technical illustrations on the left side of each page, with space for student's notes on the right, to be made during or after the lecture (taking into account left brain processing of words and right brain processing of images). The TIN method was developed in response to the fact that no integrated systems textbooks were available, and as a means of providing rapid access to core material. Observed benefits cited by DeRoth included eliminating the need for continuous note-taking, thereby encouraging discussion in the teaching session, as well as the diagrams being regarded as superior to blackboard illustrations.

In this study, student notes were highly rated by alumni (4-5) students (4-5) and teachers (4). A frequently expressed sentiment by alumni was "Learn and pass", because the notes covered all examinable material, whilst current students considered them to be "essential". Like textbooks, notes had the advantage of being student-paced. They alleviated the need for copious note-taking, allowing students to listen in lectures, and furthermore could be annotated. These advantages saw the continuation of the use of student notes, in booklet form, at Glasgow from the 1940s through to the 2000s.

Teachers recognised the above benefits, particularly in the absence of a suitable textbook, but cautioned that students could become over-reliant on notes. The concept of spoon-feeding was one which students recognised in the focus groups and accepted given the heavy course content.

A number of studies have compared the outcome of students being given handouts versus students taking their own notes in class. An early example, Freyberg (1956) carried out an experiment in which some students took no lecture notes, some took notes, and others were given a handout. Although the first group demonstrated evidence of better retention in the short term, the group who had been given the handout performed better in the longer term.

It was picked up in the staff interviews of this study that students still liked to take notes in lectures, even though they had access to the printed notes. This tendency has also been recorded in students on a medical biochemistry course (Morrison, McLaughlin *et al.* 2002), where it was also noted that most students heavily annotated the notes they were given. This is something that students need to do in order to fully engage with the text:

> *"Unless students do something to personalize this material, to 'make it their own', there must be some doubt as to how much of it will be internalised and available when needed."*
>
> (Isaacs 1994)

This was something that students were observed doing in the lecture and practical class observations, particularly the use of highlighter pens to select key points in printed notes and laboratory guides.

Printed student notes at Glasgow have been replaced in recent years by their fragmented electronic equivalents, as they can be more easily updated and made available to students immediately. In addition, staff perceived the bound student notes to be prohibiting self-directed learning because students were using these exclusively rather than seeking information from alternative sources. However, a grouped compilation of core information was still the ideal in the eyes of students in terms of identifying examinable material.

#### 7.2.3.3 Photocopied handouts

The questionnaire and focus group revealed that handouts were used in much the same way as printed student notes, with the exception that handouts can be left partially blank for students to fill in themselves. They were rated highly by alumni (4), students (4-5) and teachers (4).

Alumni and students regarded handouts as a supplement to the lectures that saved them having to draw diagrams in class, whilst at the same time ensuring attendance. Current students and teachers cited the benefits in particular of PowerPoint handouts, although both felt that students could become over-reliant on this type of resource.

Handouts can be used successfully, to stimulate thought, encourage interaction, and to break the flow of a lecture or tutorial, particularly if they leave blank spaces for students to fill in. Best accompanied with some sort of activity, they form a jointly owned resource that students can subsequently reflect on – assuming they have not been misplaced, which was a problem cited by alumni.

#### 7.2.3.4 Journals

Journal use was consistently lower than perceived availability by all questionnaire participants, highlighting the fact that they are not a primarily used resource. Alumni gave them a mediocre-high rating (3-4, highest in the pre-Weipers era), whilst they were rated less positively by current students (2-3.5). Teachers gave a mediocre rating (3). All participants felt that in general they were too detailed for undergraduates; however, they were useful for particular subjects / cases and provided up-to-date information. The study revealed that undergraduate students are very unlikely to read journal articles of their own accord – with the possible exception of the *Veterinary Record* or *In Practice*, which are perceived to have clinical relevance.

In recent years, attempts have been made to encourage students to consult these primary sources through independent learning assignments, such as the SDLA, the pharmacology library project and the CLA in fourth year. Students in the focus groups appreciated knowing how to locate journal articles – largely replaced by their electronic equivalent in recent years – and considered this to be an essential professional skill, even if they did not all appreciate the in-depth coverage of subjects perceived to be only marginally relevant for a career as a veterinary surgeon.

#### 7.2.3.5 Tape-slide programmes ('auto-tutorials')

Tape-slide programmes were used by a third of post-Weipers alumni, and received a mediocre rating (3). They were perceived to be useful for revision, and could be used at the student's own pace, but users found it 'hard to concentrate', and the programmes were considered to be 'a bit boring'.

In dentistry, tape-slide programmes were considered to be beneficial because lecture material could be edited; illustrations presented more effectively; course material organised in optimum sequence; and teaching could be standardised. They were also inexpensive to produce; easily revised; available at times that suited students, who were more attentive and favoured the method; and enabled a reduction of teacher time and required course duration (Kampfe and Kerber 1976).

Veterinary pathology slide-tape programs used at the University of Missouri were observed to capitalise on the learning principle of repetition, as well as promoting small group discussion (Clapp, Tweeddale *et al.* 1974). These were seen to be of particular use in catering for a diverse student population.

B.F. Skinner (1958) was the proponent of autotutorials in the form of small units of instruction. Gagné (1970) disagreed with Skinner, saying that the use of small independent units prevented learners accessing information as an integrated whole, and he cited Pressey (1962), who noted that auto-instruction would be a more useful adjunct to existing methods, rather than as a replacement for textbooks, which did allow the reader to see at once its structure and contents.

#### 7.2.3.6 Computer-aided learning (CAL) programs

Interestingly, alumni and students stated in the questionnaire and focus groups that CAL should only be used as an adjunct to traditional methods and not as a replacement. This echoes Pressey's recommendations about autotutorials, as well as the findings of an earlier Glasgow study of CAL as a lecture replacement (Dale, Sullivan *et al.* 1999) . CAL – the successor to tape-slide programmes – does not seem to have taken advantage of the new pedagogical opportunities afforded by the technology, and has for the most part replicated old pedagogies. For example, many CAL programmes appear to be page-turning exercises, essentially electronic textbooks. Comments from the student focus groups in this study reveal that this type of CAL is not helpful to students' learning. For these reasons, CAL received a mediocre rating from Information era alumni (3), while students' experiences were mixed (2-4). Staff opinion of CAL was high (4) potentially reflecting a mismatch between students and teachers on the usefulness of CAL as a learning tool.

Bushby and Ward (1983) postulated that the increased use of computers in the early 1980s, corresponding with the knowledge explosion, would serve to supersede the cerebrum in terms of its capacity for data storage and retrieval, allowing learners to operate at higher levels of Bloom's cognitive taxonomy than the traditional level of knowledge that required information to be rote-learned. Despite increases in processing power however, CAL does not appear to have helped students to reach the higher cognitive domains, but instead promulgated the low order skills of drill and rote memorisation, perpetuating the learner's dependency on spoon-fed information, tested at the level of factual recall rather than the higher levels of application, synthesis and evaluation. This would explain why the CLIVE project, although an excellent model of educational collaboration across the UK veterinary schools, failed to transform teaching and learning practice, despite fulfilling its aspirations to make CAL an established and expanding feature of veterinary education in the UK.

#### 7.2.3.7 Internet

It has been suggested that the internet makes learning more accessible, results in improved learning, whilst containing the per unit costs of instruction, especially if collaboration between institutions is undertaken to share web resources (Owston 1997). At the time that the data were gathered for this study, the internet was still a relatively recent phenomenon, and it seems that few students or teachers had harnessed its potential for learning. It received a mediocre rating from Information era alumni (3) and mediocre to high ratings from students (3-4, highest in the first three years), and teachers (3-4, highest in non-veterinary teachers). There appears to have been a certain amount of serendipity about the discovery of useful information – on the part of both students and teachers. The main advantage of the internet however, is online access to up-to-date information, something that the Moodle VLE provides. Although viewed as a 'file distribution system', it has taken over from the lecture to some extent in being the central linchpin of learning resources – a single portal to lecture presentations, notes, past examination papers, self-assessment quizzes, and where appropriate, electronic versions of journal articles. However, its limitation in terms of meaningful learning was captured in an interview with one member of staff, who considered that providing a single gateway to the resources made learning 'too easy'.

The introduction of Web 2.0 technologies (encompassing wikis, blogs and podcasts) offer the potential for greater collaboration and interactivity through social networking (Boulos and Wheeler 2007). Unlike the early World Wide Web (Web 1.0), where files on external sites may be moved or deleted without warning, the internet is moving towards being a jointly owned resource, serving individual user needs and personalised learning. The fact that blogs and wikis encourage a degree of reflection should help to promote deeper learning.

#### 7.2.3.8 Directed self study methods and technologies – précis

The directed self-study resources described in this study – textbooks, notes, handouts, tape-slide programmes and CAL programs – may aid students' comprehension – the second level in Bloom's taxonomy, but traditionally they have not provided a facility for students to apply their knowledge in practice. (The exception may be the case-based CAL programs which require students to make decisions that they might make in practice.)

It can be argued, therefore, that directed self-study methods have generally promoted a surface approach to learning, and this is best exemplified by the printed student notes. Journals are an exception to this argument in the sense that students are expected to retrieve information from these resources to enable them to problem-solve. Students have been encouraged to use these resources independently as part of self-directed learning assignments, but feedback from students suggests that there is little time in the curriculum available for them to do so, and little reward in terms of these assignments contributing significantly to their final marks. The low ratings and usage of journals reflects students' reluctance to engage with these resources at an independent learning level. The higher ratings attributed to the internet by students in the first three years may reflect greater familiarity with the technology among newer students. The internet can be used on both a surface and a deep level – at the surface learning level, it is an electronic gateway to more spoon-fed resources. At a deep learning level, it is a portal to information which students have to find themselves and assess the merits of in relation to assimilating information for problem solving. In addition, it is anticipated that Web 2.0 technologies such as wikis and blogs will support deep learning, because of their role in promoting collaborative learning and student-centred learning (Boulos, Maramba *et al.* 2006).

### 7.2.4 Practical ('Hands-on' training)

#### 7.2.4.1 Practical classes

Practical classes were viewed by alumni, students and teachers as an opportunity to consolidate the theory provided in lectures. These were rated highly by alumni (4-5, highest in the Information era), students (4-5) and teachers (veterinary teachers – 5, non-veterinary teachers – 4). All participants considered these classes to be "essential hands-on" that allowed students to engage all senses including the handling of instruments that allowed for the development of psychomotor skills, and the visualisation of structures. Visualisation in anatomy teaching is associated with a deep approach to learning (Pandey and Zimitat 2007).

Used effectively across a range of subjects from anatomy to surgery, the usefulness of practical classes was mainly perceived to be limited by logistical factors such as large student numbers. Because the classes provide the opportunity for students to apply theoretical knowledge to practical tasks, they promote a higher level of cognitive processing. In terms of Bloom's taxonomy, this would be the level of 'application', potentially through to the highest level, 'evaluation'. As Gagné (1970) noted:

> *"… the laboratory can undoubtedly serve as a mode for teaching certain strategies and methods of science. Among these are the procedures of formulating hypotheses, making operational definitions, controlling and manipulating variables, conducting experiments, designing "models", and interpreting data."*

The above statement is equally applicable to the dissection class. The dissections, as noted by students and teachers, are essential for meaningful discovery learning.

**Figure 7-4: Third year students in a microbiology practical class on bacterial identification ©VHMD**

Despite their potential for high level cognitive processing, it is possible for students to work through these classes without active reflection. Gagné cautions against them becoming simply exercises in "following a procedure". This is more likely to happen with large class sizes, and can be the result of students following the instruction in workbooks (as seen in Figure 7-4), unless questions are included in the workbook to stimulate thought. In interacting with students and asking questions, tutors or demonstrators have an important role to play in stimulating student thought, experimentation and reflection. Active experimentation is part of Kolb's (1985) reflective learning cycle, required for students to reach higher levels of conceptual understanding. Without the expert guidance of adequate numbers of demonstrators, the danger is that students will follow laboratory instructions recipe-fashion at a superficial level. They will be less likely to experiment freely or make mistakes, as there will be less opportunity for feedback and correction. Given the importance of making mistakes as a student in a non-critical environment – in reducing the occurrences of errors in real life (Ziv, Ben-David *et al.* 2005) – this is something the schools cannot afford to compromise. At the extreme level, inadequate staff coverage could lead to the eventual abandonment of this form of teaching, as has been slowly happening with the clinico-pathological demonstrations.

#### 7.2.4.2 Hands-on clinical training

Hands-on training was considered by alumni, students and teachers to be one of – if not *the* most – useful elements of the course – with the sentiment commonly expressed that "there could be no substitute for the *real thing*". Although anatomy practical classes involve the use of the live animal, it is generally only in clinical situations that the live animal becomes a focus for problem-solving rather than a reference aid. Representative of cases in the real world, hands-on clinical training opportunities in fourth and final year, and on extra-mural studies, best approximate work-based learning, and in this regard are the most likely of all the types of training to encourage students to explore the higher cognitive levels. Consequently all participants rated this type of training highly – alumni (5 for all except pre-Weipers era – 3), students (4-5, highest in the last three years) and teachers (4.5-5, highest in veterinary teachers). Animal handling skills and relevance to the job of a veterinary surgeon were the benefits cited by alumni and students who requested more of this type of training. Current students and teachers both highlighted inadequate staff supervision as one limitation, due to increasing student numbers.

**Figure 7-5: Fourth year students getting hands on experience of clinical reflex testing ©VHMD**

### 7.2.4.3 Posters

This study revealed that the poster is a peripheral learning resource with little appeal, with the exception of reference material such as animal breeds. It received mediocre ratings from alumni (3) and teachers (3). Students' ratings were low to mediocre (2-3, lowest in third year). All participants perceived the poster to have a value as a reference aid, with teachers citing its use in clinics in this way. Alumni and students cited anatomy and animal husbandry as courses where posters were best used, particularly for animal breeds and diagrams.

Although the suggestion did not emerge during this study, where posters may add value to the learning process is in collaborative assignments, jointly produced by students in the same way that they have cooperatively produced essays and presentations. With electronic production, A4 handouts could easily be disseminated to other class members. The use of the poster as an assessment tool has been described in nursing education (Wharrad, Allcock *et al.* 1995; Moneyham, Ura *et al.* 1996) where its strength as a tool for groupwork, networking and communicating ideas was highlighted.

As a basis for checking factual details or viewing the relationships between diagrammatic structures, the poster only supports low level cognitive processing.

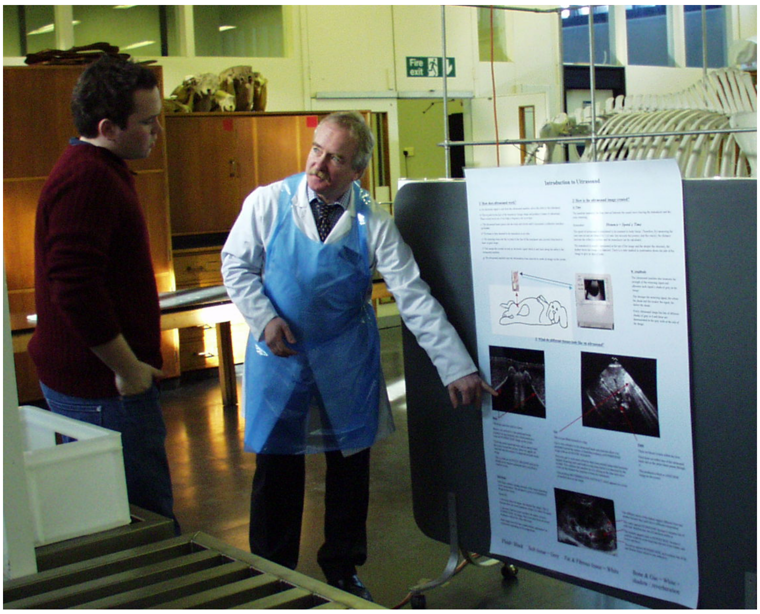


**Figure 7-6: Teacher making use of posters in an anatomy practical class where ultrasonography was employed ©VHMD**

### 7.2.4.4 Models / mannequins

Models received mediocre to high ratings from alumni (3-4, highest in the Weipers era), students (3-4, highest in the first and third years), and teachers (veterinary teachers – 3, non-veterinary teachers – 4). The high alumni ratings during the alumni era may reflect the use of models created with new plastics at that time, while first and third year students would rate them highly because of their use in anatomy and pathology. Permitting three-dimensional visualisation and an understanding of skeletal relationships and topographical landmarks, skeletal models were considered to be particularly useful for surgical anatomy teaching. The value of models was highlighted particularly in a focus group by the final year student who said that they provided clinical relevance in the preclinical years of the course, and helped students revise their anatomy in the clinical years, therefore they can be argued to promote vertical integration.

**Figure 7-7: Cabinet of models, skeletal material and embalmed specimens in the former Department of Anatomy ©VHMD**

Current teachers and students also highlighted the importance of virtual reality simulators for clinical skills training, such as the haptic cow, considered to be a valuable tool in preparing students to perform rectal examinations in practice. The Faculty's recently created clinical skills laboratory is equipped with a number of surgical models, highlighting the clinical application of these devices. All of these exhibits offer an approximation of the real animal as an aid to clinical problem solving.

#### 7.2.4.5 Preserved specimens

Preserved specimens received mediocre ratings from alumni (3), and mediocre to high ratings from current students (3-4, highest in first and second year) and teachers (veterinary teachers – 3, non-veterinary teachers – 4). Apart from historical interest, storing embalmed specimens in clear plastic or glass pots benefit students' learning in allowing them to view the specimens from most angles. Information gathered from participants revealed that these were not regarded as being as useful as fresh specimens, which anatomy teachers at Glasgow have continued to go to great effort to provide. One of the characteristics of preserved specimens is the loss of original colour and texture, which gives the specimens an unrealistic appearance, although alumni and students noted their value in providing access to abnormal or rare conditions.

The advent of plastination has since provided a useful alternative, as the original colours of tissues are preserved, and the specimens are more robust (Nicaise, Simoens *et al.* 1994). However, the use of the plastination unit at Glasgow has been hampered by lack of time among qualified anatomy staff.

#### 7.2.4.6 Practical methods and technologies – précis

Practical methods – particularly practical classes and hands-on clinical training – provide the best opportunity of all the methods discussed so far for the student to operate at a high level of cognitive processing, but this is dependent on availability and access to resources. In particular, it is vital that students have access to supervisory teaching staff to provide feedback and to create a safe atmosphere for students to engage in cycles of active experimentation and reflection. Hands on clinical training encourages a deep approach because it most closely resembles work-based learning and therefore students are intrinsically motivated to engage with tasks that they perceive to be relevant to their future role. Bringing case-based teaching into earlier parts of the course – increasing vertical integration – would be one method of fostering the deep learning approach.

### 7.2.5 Miscellaneous audiovisual aids

#### 7.2.5.1 Closed Circuit Television (CCTV)

Although an extensive CCTV network was installed at Garscube, it appears to have had limited usage only in the descriptive areas such as anatomy and pathology, and was not used to any extent in clinical education, despite the advantages of the technology to relay detailed operations to observers.


**Figure 7-8: Control panel for the CCTV network in the anatomy dissection laboratory ©VHMD**

If the lecture continues to predominate, modern CCTV systems may be used in future however, to accommodate increasing student numbers, although current students gave a low rating to this type of technology in the pilot study. This may not be relayed to a second lecture theatre, but made available online, in the form of streaming video or podcasts. One of the potential dangers of this technology however is the lack of two-way communication, what one former teacher referred to as ‘being able to feel the audience’. This has implications for communication in the classroom, addressed in section 7.3.4.

#### 7.2.5.2 Cine films

Cine film projectors are no longer available, however in this study, cine was perceived to be available in the Weipers and post-Weipers eras, when alumni attributed a mediocre rating of 3. Indeed, teachers still use cine film, converted to VHS format, which on rare occasions has been subsequently digitised. With the quality of cine far superseded by analogue and digital video, the major benefit of cine films to learning is clearly in providing access to rare case material, such as distemper, or to provide a historical background for interest, for example the first BSE case presented at Glasgow, rather than its original use of showcasing new surgical techniques.

#### 7.2.5.3 Educational television broadcasts

Educational television broadcasts appear not to have been used to any great extent, despite the availability of programmes offered by the Open University from the 1970s. The major problem with broadcast television, highlighted by one study participant, was the fact that it restricted the lecturer to a particular time, whereas video allowed the lecturer to replay the programme at their convenience. The only television broadcast cited by a number of alumni in the questionnaire were the James Herriot stories – which played an important role from the 1970s onwards in enthusing school pupils to aspire to become veterinary surgeons. James Herriot's stories and their televised equivalents should be celebrated for bringing the veterinary profession into the public eye, despite arguments against omnicompetence that deride the notion of veterinary surgeons as being able to administer to 'all creatures great and small'.

#### 7.2.5.4 Audio recordings

Audio recordings appear to have had limited usage and – like the examples cited in the literature – have been restricted to replaying cardiology sounds. A number of alumni referred to 'in car learning', with audio tapes from the BSAVA for example constituting a form of CPD. However, they appear to have made little impact on undergraduate veterinary education, and received a low median rating (2) from post-Weipers alumni. The availability of digital podcasts may transform student attitudes' to audio recordings, as they welcome the opportunity to replay lectures that they may have missed, or for revision purposes.

#### 7.2.5.5 Video recordings

Video was given a mediocre rating by Post-Weipers and Information era alumni (3), a mediocre to high rating by students (3-4, highest in fourth year) and a high rating from staff (4).

Video – like cine and still images – has played a major role in providing access to rare cases and material that students would not otherwise have access to. It has been used – also in the case of one lecturer who described his teaching as 'video rich' – as a means of compensating for the variable caseload going through clinics. It offers what Laurillard (Laurillard 2002) calls a 'vicarious experience'. Video can be made available in large and small group teaching sessions, as well as for individual self-study where it offers the opportunity for self-paced learning.

Like audio, the original analogue format (show in Figure 7-9) has been surpassed with digital equivalents, reflected by the increasing rarity of analogue video players. As is the case with audio, podcasts are likely to take over as the predominant means of access, given the increasing availability of this personal technology.

**Figure 7-9: Video cassettes on display in the James Herriot library ©VHMD**

### 7.2.5.6 Miscellaneous audiovisual aids – précis

Of the miscellaneous audio and visual aids, the major change that has had an impact on student learning has been the shift from analogue to digital technologies, creating greater opportunity for user control, as well as the creation of short, reusable learning objects that can either be used in a teacher-centred or student-centred context. As well as providing a vicarious experience of clinical cases, that students in reality might not have access to, the miscellaneous aids discussed in this section have also provided a means of recording lectures that students can access in their own time, at their own pace. However, these media typically support a low level of cognitive processing, facilitating information transfer.

### 7.2.6 Which methods and technologies to use and when?

Clark (1983) argued that it is not the technological media which make a difference to students learning, but the pedagogical methods used to facilitate learning. In response, (Kozma 1991) argued that students use the different characteristics of different media to construct knowledge.

In the light of the evidence presented in this thesis, it becomes possible to reject the alternative hypothesis that teaching methods and technologies employed at Glasgow between 1949 and 2006 have had no impact on students' learning. In fact, the methods and technologies reviewed in this study generally fall into three major categories:

- Lecture-based methods and technologies that support low level cognitive processing
- Small group methods and technologies that support intermediate level cognitive processing
- Practical methods and technologies (including hands on clinical training) that support high level cognitive processing

It is clear that to support a population of learners with diverse learning needs, many different methods and technologies are required. However, it is not simply a case of throwing everything at students in the hope that one method will be successful. Rather, the merits of each method and technology have to be considered in relation to the intended learning outcomes, and the level of cognitive processing required. Certain other factors have been shown in this study to have an impact on the effectiveness of students' learning – such as the prior knowledge of the student, the overloaded curriculum (also referred to as the 'cult of coverage'), the type of assessment methods used, the increasing student–staff ratio, and a recognised need to invest further in the scholarship of teaching.

## *7.3 Other factors affecting learning*

### 7.3.1 Selection of students

In terms of student enrolment to the BVMS course, some factors do not appear to have changed; students admitted to the course are still high achievers, but as entrance standards and competition for veterinary school places have increased, so it has become more common for applicants to possess a larger number of grade A qualifications, as well as increasing experience of seeing practice and other aspects of animal care before admission. The parental background of students appears not to have changed, with most students coming from families with professional backgrounds, often medics, veterinary surgeons or teachers.

Over the period of study – 57 years – the gender balance has switched from predominantly male to predominantly female (see Figure 6-18). As a result of AVMA accreditation in 2000, and the influx of adult learners in the form of North American graduates, students are gradually becoming more mature, having already done a degree and therefore theoretically more capable of self-directed learning. Their admission is also reflected in the changing nationality of veterinary students. Ultimately this means that the student body has become increasingly diverse – in terms of students' prior experience, expectations of the course, and their approaches to study. This requires teachers to understand that students are not a homogeneous entity, but that they are individuals requiring education tailored to their needs, and the opportunity to personalise their own learning. Methods that promote deep learning and the opportunity for individualised feedback – such as small group teaching and self-directed learning – enable this more readily than mass teaching methods such as the lecture, although the lecture still has a useful role to play in disseminating factual information as well as the potential for the teacher to motivate students.

### 7.3.2 The curriculum

To avoid unnecessary duplication, evidence from the literature and from the focus group and interviews in this study point to the need for a more integrated approach in teaching.

#### 7.3.2.1 An integrated approach

Ironically, it appears that the curriculum of the early Weipers era (Table 2-3) demonstrated more vertical integration than is currently the case. In the 1950s, students were exposed to clinical medicine and surgery in their third year. Animal husbandry was in the third and fourth years of the course, following on from the animal management classes of the first and second years. Surgical anatomy was identified as a separate topic within the final year. Clearly more vertical and horizontal integration is currently needed, as evidenced by analysis of the teacher interviews and student focus groups.

Ausubel's (1968) work is particularly insightful for veterinary educators because he explicitly addressed the transfer problem in medical education. The problem he identified in medical students' learning was the rote memorisation of the large volume of material they are presented with for examination purposes, and "relying compulsively on their lecture notes". This pattern has been strongly identified in this study, with students revising copious amounts of material for the purposes of examination at a surface level, and immediately forgetting much of it. Given the mass of new information that veterinary students are expected to learn, it is easy to see why they feel compelled to adopt a surface approach to learning:

> *"If we subtract the words and expressions primarily used in human medicine or in animal breeding as well as those of chemical, physical and botanical origin etc., the remainder may be estimated at 50,000 words. This means that a veterinary student should learn some 50 thousand words until approbation."*
>
> (Karasszon 1988)

In terms of meaningful (deep) learning, Ausubel proposed that transfer would be best facilitated if preclinical subjects were taught from the perspective of their clinical relevance, with basic principles revisited in the clinical years:

> *"The most widely-used approach to this problem of maximizing the transferability of preclinical medical knowledge both to clinical subject matter and to problems of clinical practice involves the use of explicit transitional materials and devices. During the first preclinical year, for example, some anatomy is presented in the context of its explicit relevance for surgery … During the clinical years, the articulation of preclinical and clinical background knowledge is approached from the opposite direction."*
>
> (Ausubel 1968)

Interviews with current and former staff, as well as class observations, revealed that this has been the approach taken to promote vertical integration over the whole period of this study. However, to facilitate continual clinical relevance and meaningful learning, subject integration needs to be more widespread than simply presenting some clinical facts in the first year, with a revision session of underlying anatomy in final year. In addition, given that learning, teaching and assessment practice needs to be constructively aligned (Biggs 2003), integrated assessment is advocated.

### 7.3.3 Assessment as a driver for learning

Any discourse about learning is inseparable from the assessment processes that govern what is learned. One of the major problems underlying the current educational system is that students are typically motivated to rote-memorise information to pass examinations in individual subjects. Knowles (1968) highlighted the problem of this type of assessment, the grading of a student's performance at odds with the notion of a self-directed learner:

> *"Probably the most crushing blow to any self-respecting human being is the act of another person giving him a grade … it is anti-learning."*

Godfrey (1995) made reference to the "continuing tyranny" of examinations in undergraduate medical education, citing Osler (1913) on the use of examinations as an end in education rather than an aid in its acquisition. Godfrey made a plea for the need for change to assessment practices, noting the need for assessments that better approximated the work of a junior practitioner. Within a university system, there needs to be some measure of satisfactory performance so that students can ultimately be deemed responsible and able to practice within a profession; however, ideally this should encourage the types of thinking and performance required in practice.

#### 7.3.3.1 Miller's pyramid

The hierarchical model of clinical assessment proposed by Miller (1990) provides a framework for constructing appropriate assessments. The stages in cognitive development models may be mapped onto Miller's pyramid to align teaching and assessment. Gagné's (1970) learning hierarchies model has been added (in italics in blue) as an example.

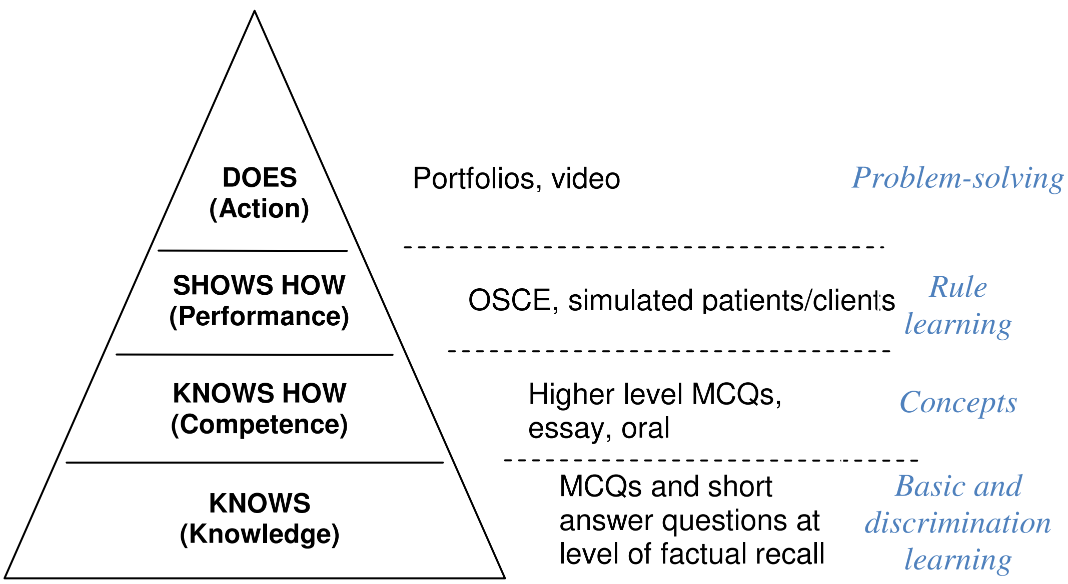


**Figure 7-10: Framework for clinical assessment (after Miller 1990)**

Ultimately, if assessment methods only test at the lowest level i.e. knowledge recall, then students will be less motivated to engage in higher level cognitive processing such as abstract thought.

### 7.3.4 Effective communication in the classroom

To an observer, the classroom observations and the interviews and focus groups highlighted the importance of good communication in the classroom. This realisation is by no means a new concept. Gagné (1970) stated that communication is a major part of instruction, and defined its components as follows

- Gaining and controlling attention
- Providing a model for expected learning outcomes
- Stimulating recall of prerequisite capabilities
- Presenting the stimuli for learning
- Offering guidance for learning
- Appraising learned performances
- Providing feedback on the correctness of the learner's responses
- Providing for the transfer of learned concepts and rules to novel situations
- Enhancing retention

Effective communication is also highlighted in Laurillard's conversational model (Laurillard 1993), that represents "a continuing iterative dialogue between teacher and student". McLennan and Heath (2000) reported that the veterinary staff and students in Queensland agreed that lecturers should be good communicators, although there was little support for formal training in communication or in teaching. In their study of perceptions of excellent lecturers versus excellent discussion leaders, Goldstein and Benassi (2006) stated that their research was "grounded in Lowman's view that effective teachers (a) present material in a clear and engaging manner and (b) focus on the interpersonal factors that characterize classrooms and establish rapport with students". The importance of good rapport to create a relaxed environment for learning was also cited by McLaughlin and Mandlin (2001).

An alternative model for communication in the classroom is based on the Calgary-Cambridge model of communication in medical education. A version adapted for undergraduate veterinary education through the NUVACS programme (National Unit for the Advancement of Veterinary Communication Skills) has been used in UK veterinary schools as a framework for formal communication skills training (Radford, Stockley *et al.* 2003; Radford, Stockley *et al.* 2006).

The model lends itself well to communication between students and teachers, especially in face-to-face teaching. Normally the model is presented in top-down fashion.

Figure 7-11 shows it presented from the bottom up. Envisaging the model as a metaphorical ladder is appropriate, since effective communication enables the student to progress to higher cognitive levels. The fact that the teacher provides structure throughout the course of instruction implies the use of scaffolding.

During the whole of the classroom interaction, observation of students is required. Teachers must provide structure to the classroom event, signposting and attending to flow. Throughout, the teacher is building a relationship with students through non-verbal behaviour (eye contact, tone of voice, body language), developing rapport and actively involving the student.

Quotes from interviews with teachers help illustrate some of the key communication skills used in teaching:

- **Body language / rapport:**

  *"The lecture ...that's where student feedback – interaction with the students - is very important. You have the ability to put humour in, change your body position, jump up and down, trip over something, you've got to use all the tricks to keep them awake."*

- **Signposting:**

  *"I used the overheads and the blackboard, where I used to write up what was going to happen in the lecture, so that it was there, and then I'd go ahead to talk and use the overhead projector."*

- **Giving the correct amount of information:**

  *"Selection of material is important, I think sometimes a research worker might spend too much time on his particular area of research. I think the teachers should teach a balanced course."*

- **Pitching information appropriately:**

  *"Teaching is a lot about communication, and a lot about understanding the pace at which people can acquire information and learn facts. That's where the good teacher inspires, the good teacher delivers, and the good teacher understands their audience."*

- **Observation:**

  *"With pregnancy testing, you can just look at them and you can tell whether they're just making it up, or whether actually the light's come on. And you see the lights come on. You see the difference very easily, just by communicating with the students."*

- **Empathy:**

  *"You need to be aware that people have other – either personal pressures or sporting pressures or whatever - that are equally important to them."*

Many of the communication skills used in the classroom are dependent on the teacher subscribing to the scholarship of teaching, the need for which was extensively commented on in the literature review in Chapter 3.

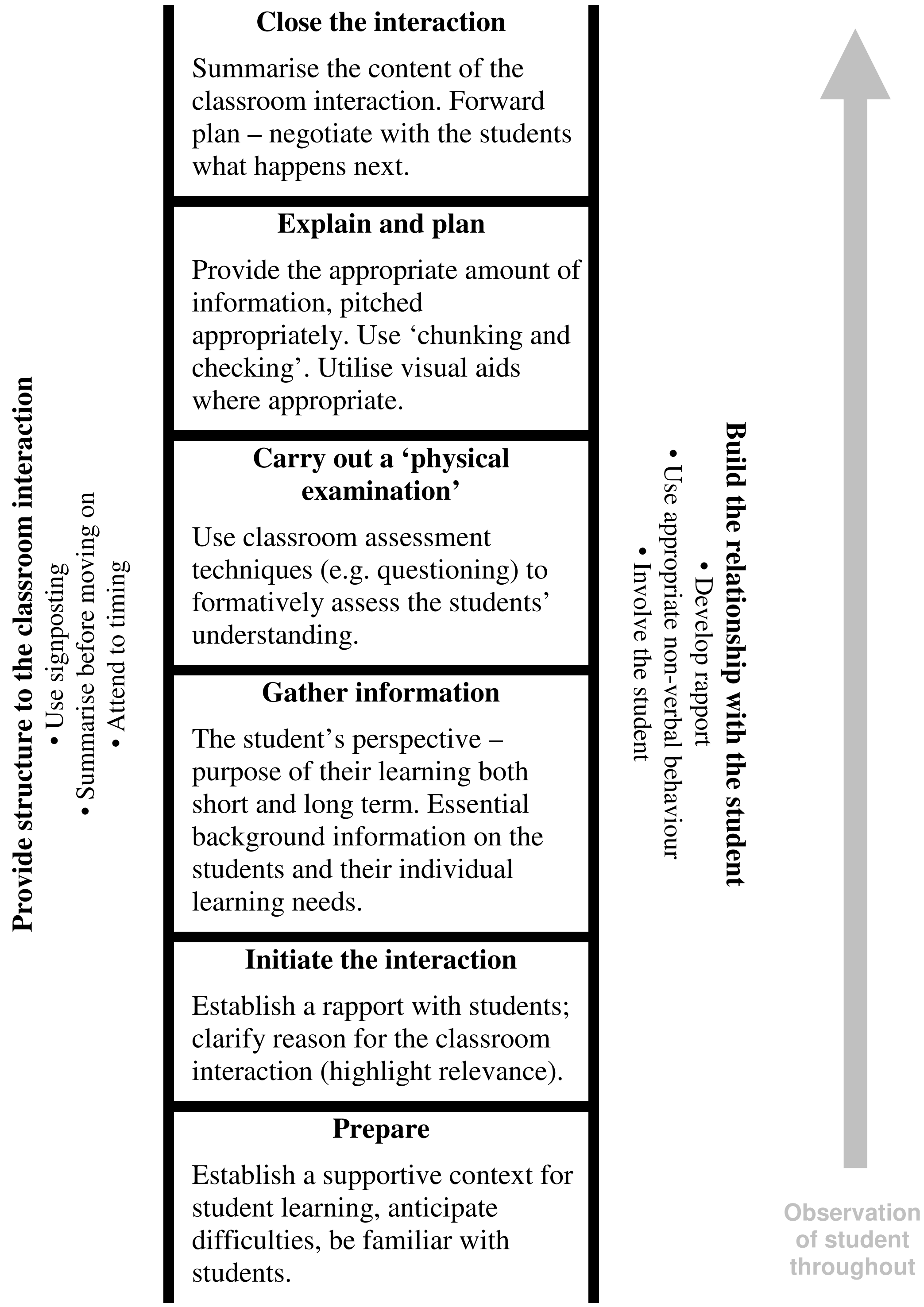


**Figure 7-11: NUVACS model of clinical communication adapted for use in the classroom**

### 7.3.5 The scholarship of teaching – a prerequisite for self-directed learning

Interviews with staff revealed that although teacher training programmes helped them to identify communication aspects of their teaching, such as facing the audience, projecting their voice or using clear slides, they were unable to apply their knowledge of learning theories in practice.

The negative implication of this is that teachers will probably restrict their teaching to lower order thinking skills, rather than facilitating the development of self-directed learning and development of higher order thinking skills. This is further compounded by the fact that commonly used assessments such as MCQs and short answer questions typically test lower order thinking.

It is interesting that the attributes of a 'good' teacher cited in the teacher interviews and student focus groups mirror those of the first two stages in Grow's (1991) model – being knowledgeable and having research expertise or experience of working in practice (giving them 'expert' status); being inspirational and having enthusiasm for their subject (making them 'motivational'), being disciplined and structured, and communicating clearly (from the perspective of giving students information rather than interpreting cues from students). No reference was made to the attributes of Grow's successful stage 3 or stage 4 teachers.

This may partly explain why teachers and students have not completely 'bought into' independent learning assignments such as the SDLA in first year, the pharmacology library project in third year, or the CLA in fourth year, which are characteristic of the third stage in Grow's model and require students to be independent, but not self-directed to the extent of an externship or dissertation, which typically does not happen at the veterinary undergraduate level. The third stage is associated with self-directed learning strategies such as critical thinking, problem-solving and cooperative learning, where the role of teacher is not the authority or motivator but the facilitator.

One of the challenges veterinary schools face, in making self-directed learning strategies successful, is enabling the teacher to move from their authoritative stance of content transmitter to becoming a facilitator of learning. Knowles (1975) made reference to this difficult transition, noting that as well as the painful redefinition of self this would entail, teachers must also develop a new skill set.

A number of authors have argued the need for faculty development to support the development of lifelong learning skills, and to promote an awareness of adult learning principles in veterinary education, including Freeman and Muir (1988) and Seeler and

Brace (1992). Glicken (2004) provided ten adult learning principles for effective teaching that promote lifelong learning. Steinert and Mann (2006) also made a number of recommendations for staff development to promote a better appreciation of the adult learner. Evidence from the medical field suggests that staff can be made aware of and become committed to the application of adult learning theories in their teaching through faculty development, but that there is a need for follow-up training to support and expand mastery of these teaching skills (Pololi, Clay *et al.* 2001). Without faculty development mechanisms in place, there is the potential for the mismatch of teaching and learning styles illustrated by Grow (1991). Part of the overall ethos of the scholarship of teaching is that teachers are appropriately rewarded for teaching excellence. However, evidence has been presented in this study of teachers' perceived lack of reward for investing in teaching excellence, which is unlikely to predispose them to educational change.

### 7.3.6 Guided discovery learning – a way forward

The need to change staff skill sets is not the only barrier to implementing SDL. Blumberg (2005) identified three main barriers – excessive course content requiring superficial learning, assessment methods that emphasise knowledge acquisition over understanding, and accreditation schemes. The first two have been extensively commented on in this thesis. Blumberg advocated the problem-based learning (PBL) approach, and cited the advantages of students taking responsibility for their own learning, engaging in multidisciplinary, integrated learning to solve collaboratively an authentic problem representative of the real world. The approach is essentially SDL implemented to its full extent. However, as highlighted by the teacher interviews in this study, one of the major problems of the PBL approach in medical education is represented by the gaps in basic science knowledge, particularly in relation to anatomy (Collins, Given *et al.* 1994; Waterston and Stewart 2005). Other opposing arguments to PBL have been presented, such as that by Kirschner, Sweller et al. (2006), who argued that guided instruction was preferential to unguided 'discovery' or problem-based learning because it "ignores the structures that constitute human cognitive architecture", particularly long-term and working-memory systems. Given the reluctance among faculty to go down the fully problem-based 'route', but the need for a more self-directed learning approach in veterinary undergraduate education, the system of guided discovery learning proposed by Spencer and Jordan (1999) offers a solution, the key features of which include:

- A context and frame for student learning through the provision of learning outcomes
- Learners have responsibility for exploration of content necessary for understanding through self-directed learning
- Study guides are used to facilitate and guide self-directed learning
- Understanding is reinforced through application in problem-oriented, task-based and work-related experiences

This is likely to be the most acceptable and workable compromise between the existing curriculum and problem-based learning, what Spencer and Jordan call “a mixed economy … in which the best of traditional methods are combined with more innovative approaches to provide a learning environment conductive to deep learning.”

This sentiment captures the essence of what this thesis has tried to show – that curriculum reform need not dispense with the traditional methods that have been shown to be effective in supporting students’ learning and their progression from novice to expert. The main message is that teachers require a thorough knowledge of educational frameworks and taxonomies that they can understand and apply to their day-to-day activities, so that methods and technologies are employed to the best pedagogical (or andragogical) advantage. This requires an investment in the scholarship of teaching, and for teaching excellence to be acknowledged and rewarded. As well as an understanding of and ability to apply learning theory in practice, part of teaching scholarship is having an appreciation for the way that veterinary education has evolved over time, and understanding the problems that have thwarted curricular reform, in order to challenge them.

# 8 Conclusions

## 8.1 The role of methods and technologies

This thesis has highlighted the use of educational methods and technologies over a 57 year period. The main methods of teaching have included:

- Lecture-based methods and technologies that generally support low level cognitive processing
- Small group methods and technologies that generally support intermediate level cognitive processing
- Practical methods and technologies (including hands on clinical training) that generally support high level cognitive processing

Clinical hands-on experience was the most valued aspect of undergraduate training on the part of students, also evidenced in the responses from alumni. EMS plays an important role in providing students with essential clinical experience, complementing the structured approach to diagnosis taught in veterinary school with non-representative referral cases. Most importantly, clinical rotations and EMS promote an adult learning approach because they are situated in the workplace.

Other visual aids and learning resources designed from a case-based perspective – such as CAL or printed student notes organised by presenting signs – were also valued, as students could perceive the relevance of the material with reference to their eventual goal to become practising veterinary surgeons.

In his publication entitled ‘Blueprint for a modern veterinary college’, Armistead (1970a) made a number of recommendations, based on those of Reed (1970). He argued that the veterinary school should closely resemble the workplace as much as possible, and that the curriculum should constantly be examined with reference to changing professional requirements. Armistead also called for a de-emphasis of lectures in favour of independent learning and laboratory and patient-side learning.

Armistead’s proposals still ring true today. The aim of veterinary education is to produce competent veterinary graduates, with the fully developed intellectual capability to solve problems in practice. This need not be veterinary practice – it is generally accepted that the veterinary undergraduate course is preparing students for a range of possible careers, such as research, teaching, and public health.

Ultimately, the aim of higher education is to promote high level cognitive processing, so that graduates will be able to problem-solve in the real world. However, as acknowledged by Gagné (1970) moving to a new level is dependent on mastering the preceding level. Grow (1991) also noted that when faced with a new subject, self-directed learners may revert to being dependent learners. The important role that teachers have to play in the learning process is 'scaffolding' students' learning – providing them with learning objectives and real world problems (experiential learning) that allow students to progress from novice to expert status. In this way, they will be able to support increased self-directed learning in the form of guided discovery learning as identified by Spencer and Jordan (1999) that will enable students to become effective lifelong learners. This will require a substantial investment in the scholarship of teaching. Teachers will be required to be knowledgeable about the discipline of veterinary education as well as possessing subject expertise and good communication skills. The system of 'scaffolding' student learning should be mirrored in staff development, to enable teachers to develop their roles as facilitators of self-directed learning.

## *8.2 Limitations of the study*

### 8.2.1 The questionnaire

#### 8.2.1.1 Response bias

Valid responses were received from only 11.5% of alumni, and only 23.8% of students. Table 6-1 showed that with the exception of the pre-Weipers era, which is peripheral to this study, the remainder of the alumni responses were equally divided between the Weipers, Post-Weipers and Information eras, meaning that the response rates from these groups, although low, were comparable. The data from students reflects a larger response bias (see Table 6-2) in that fourth year student responses were dominant, constituting almost half of the responses. Response rates from veterinary and non-veterinary staff were comparable. Where there is an obvious response bias, results should be interpreted with caution.

#### 8.2.1.2 Length of questionnaire

The major design flaw of the questionnaire was its length, which would have discouraged a number of recipients from completing it. On reflection, it was probably not essential to duplicate the main part of the questionnaire to allow recipients to answer from their postgraduate perspectives. There was also a lack of consistency in the way that alumni answered the postgraduate section of the questionnaire, given their diverse roles as practitioners, teachers, and other professional roles, working and retired, therefore this substantial data set was excluded from the analysis. In addition, the fact that the pilot analysis revealed few significant differences between the undergraduate and postgraduate ratings might also suggest that in many cases, participants were unable to distinguish their current perceptions from their earlier perceptions as a student.

#### 8.2.1.3 Sequencing of questionnaire components

Another factor that may have influenced response rates includes the layout of the questionnaire, specifically the sequencing of the five component sections. The demographics section (Part 5) appeared last. However, the literature advises (Lydeard 1991; Trochim 2005) that questionnaires should begin with easier questions, progressing to more difficult ones. In light of this argument, ideally the demographics section should have immediately followed the consent form. On the other hand, Oppenheim (1992) suggested that asking personal data questions too early in the questionnaire might appear threatening.

#### 8.2.1.4 Sensitivity of Likert scale data to non-parametric tests

Another potential problem with the questionnaire was the 5-point Likert scale (‘Not at all useful’ to ‘Extremely useful’). The analyses revealed little difference between the quartiles and medians of the different study groups’ responses (for example different alumni eras, or different years of students) because of the small range of possible responses (1-5). Although a 1-5 Likert scale is most common (Trochim 2005), and the one used was borrowed directly from Shaw (1998) a broader scale, such as 1-9, would have allowed for more variation in the respondents’ responses. A larger scale would have generated data that would be more sensitive to the non-parametric tests used (Mann-Whitney U Test and the Wilcoxon Signed Ranks Test). Because of this, any significant differences can only be used as a guide to interpretation, as it is likely that more significant differences would have emerged from analyses of data rated on a larger Likert scale.

#### 8.2.1.5 Rating of individual methods/technologies

The questionnaire also assumed that participants would be able to rate objectively the different methods and technologies independent of the teachers who used them. That this was not the case was evident by quotes such as “Dependent on the lecturer.” This has an impact on the validity of the resource questionnaire as a measure of the usefulness of different methods.

### 8.2.2 The interviews and focus groups

#### 8.2.2.1 Use of an unstandardised, 'semi-structured' approach

In that pro-formas were defined in advance of the focus groups, they can be considered to be semi-structured rather than structured. However, the same questions were not posed to different groups of participants, for example different student years. Professor of Psychology and Human Development, Andrew Tolmie (pers. comm.) described interviewing approaches as 'structured', 'semi-structured', 'clinical' and 'forensic'. On hindsight, the difficulty with using the Calgary-Cambridge model as an interviewing 'structure' is that it advocates a clinical approach to information-gathering, which places a greater emphasis on the interviewee's agenda, rather than that of the interviewer. A consequence of this lack of standardisation in interviews and focus groups is that the qualitative aspects of the study were less generalisable and reliable in the traditional scientific sense. However, because they allowed the interviewee/focus group participant to establish their agenda, they can perhaps be argued to provide a more authentic account of individuals' experiences.

#### 8.2.2.2 Sampling

Cohen, Manion *et al.* (2000) recommend between 4-12 participants for a focus group. In a couple of the focus groups, only two to three students participated, which meant that the emerging dialogue would have been unrepresentative of the larger student population. Conclusions drawn from the focus groups therefore need to be interpreted with caution.

### 8.2.3 Additional data sources

The study could have been consolidated by the incorporation of data from the one-year and five-year graduation surveys carried out in the Faculty. Time did not permit this, but the responses to the graduation surveys have provided a rich source of data that could be mined in future studies to verify or complement the findings of this thesis.

## *8.3 Areas for future exploration*

There are at least three different ways in which this study could be expanded in the future.

### 8.3.1 Comparisons with other biomedical disciplines

First, comparisons could be drawn with other biomedical subjects, such as dentistry and medicine, in the same university. This would serve to draw a comparison between a traditional veterinary curriculum, a fully problem-based medicine curriculum, and a new dentistry curriculum that sits somewhere in between the two, having incorporated aspects of problem-based learning but retaining a traditional framework.

### 8.3.2 National survey of all UK veterinary schools

Secondly, a survey could be made of the use of various educational methods and technologies in other UK veterinary schools, which may have given the study greater generalisability. However, with the adoption of a new curriculum in London, and a new veterinary school in Nottingham, it is anticipated that the use of teaching and learning resources employed at the schools would be markedly different. In addition, there are other variables influencing veterinary education at the different schools, such as available budgets for teaching. A more fruitful study might be to consider the different philosophies underpinning the teaching at the different schools, with a view to assessing the performance and attitudes of graduates, as identified by themselves, educators and employers. Despite the difficulties comparing educational practices across institutions, recent studies in computing science have shown that it is possible to carry out multi-national, multi-institutional educational research (Sanders, Fincher *et al.* 2005).

### 8.3.3 Students' learning styles and orientations

There are a number of learning style inventories that can be administered to students to allow them to identify their preferred approaches to study, such as those by Dunn and Dunn (1979), Kolb (1985), and Honey and Mumford (1992)

The most relevant to this study would be the ASSIST tool (Approaches to Study Inventory for Students) developed by Entwistle and colleagues (Entwistle 1988), which can be used to identify students' dominant learning orientation – deep, surface or strategic. It is anticipated that most students in the current curriculum would exhibit a predominantly surface approach to learning, given the dependency on didactic teaching methods and the limited success in implementing self-directed learning strategies to date.

## *8.4 Role of this thesis in discussions on veterinary education*

Despite its recognised limitations, this thesis is the first of its kind to examine the role(s) of educational methods and technologies in veterinary education over a fifty-year period. Although based around a non-generalisable case study, it is hoped that by bringing together relevant aspects of the literature, along with the empirical evidence presented here, the thesis will stimulate discussion about the need for curricular change, and how it may be best implemented.

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# Appendices

## *Appendix A1: Veterinary curriculum in the early Weipers era, 1953-54*

| Year | Term | Subject | Format (where specified) |
|---|---|---|---|
| 1st | 1 | Botany | Lectures, practicals |
| | | Chemistry | Lectures, practicals |
| | | Physics | Lectures, practicals |
| | | Animal management | |
| | 2 | Botany | Lectures, practicals |
| | | Chemistry | Lectures, practicals |
| | | Physics | Lectures, practicals |
| | | Zoology | Lectures, practicals |
| *March exam – Botany & Physics* | | | |
| | 3 | Chemistry | Lectures, practicals |
| | | Zoology | Lectures, practicals |
| | | Animal management | |
| *June exam – Chemistry & Zoology* | | | |
| 2nd | 4 | Anatomy | Lectures, practicals |
| | | Animal management | |
| | | Histology & embryology | Lectures, practicals |
| | | Biochemistry & physiology | Lectures, practicals |
| | 5 | Anatomy | Lectures, practicals |
| | | Animal management | |
| | | Histology | Lectures, practicals |
| | | Histology & embryology | Lectures, practicals |
| | | Physiology | Lectures, practicals |
| | | Biochemistry | Lectures, practicals |
| | 6 | Anatomy | Lectures, practicals |
| | | Animal management | |
| | | Histology | Lectures, practicals |
| | | Histology & embryology | Lectures, practicals |
| | | Physiology | Lectures, practicals |
| | | Biochemistry | Lectures, practicals |
| *June exam – Histology & embryology; Animal management* | | | |
| 3rd | 7 | Anatomy | Lectures, practicals |
| | | Physiology | Lectures, practicals |
| | | Biochemistry | Lectures, practicals |
| *December exam – Veterinary anatomy & physiology* | | | |
| | 8 | Materia medica | |
| | | Clinical medicine & surgery | Lectures, polyclinics |
| | | General pathology | Lectures, practicals |
| | | Bacteriology | Lectures, practicals |
| | 9 | Materia medica | |
| | | Clinical medicine & surgery | Polyclinics |
| | | Animal husbandry | |
| | | Pathology | Lectures, practicals |
| | | Bacteriology | Lectures, practicals |
| | | Morbid anatomy | |
| | | Parasitology | Lectures, practicals |
| *June exam - Materia medica* | | | |

| | | | |
|---|---|---|---|
| 4th | 10 | Animal husbandry | Lectures, practicals, farm demos in groups |
| | | Systematic medicine | Lectures, demos |
| | | Microbiology | Lectures, practicals |
| | | Morbid anatomy | |
| | | Parasitology | Lectures, practicals |
| | | Pathology | Lectures, practicals |
| | 11 | Animal husbandry | Lectures, practicals, farm demos in groups |
| | | Systematic surgery | Lectures, demos |
| | | Obstetrics | Lectures |
| | | Microbiology | Lectures |
| | | Morbid anatomy | |
| | | Parasitology | Lectures, practicals |
| | | Pathology | Lecture, clinical |
| *March exam – Veterinary pathology, bacteriology & parasitology* | | | |
| | 12 | Systematic medicine | Lectures, practicals |
| | | Systematic surgery | Lectures, practicals |
| | | Infertility | Lectures, practicals |
| | | Animal husbandry | Lectures, practicals |
| *June exam – Animal husbandry & preventive medicine* | | | |
| 5th | 13 | Surgery | Lectures, inc. five lectures on infertility |
| | | Medicine | Lectures |
| | | Clinical medicine & surgery | Lectures |
| | | Radiology, anaesthetics & obstetrics | Ten lectures each |
| | | Hospital cases | |
| | | Meat hygiene | |
| | | Surgical anatomy | |
| | | Operative surgery | In groups. |
| | | Medical, surgical & obstetric clinics | In groups. |
| | 14 | Medicine | Lectures, inc. ten lectures on jurisprudence |
| | | Surgery | Lectures inc. five lectures on infertility. |
| | | Clinical medicine & surgery | Lectures |
| | | Hospital cases | |
| | | Meat hygiene | |
| | | Surgical anatomy | |
| | | Operative surgery | In groups |
| | | Medical, surgical & obstetric clinics | In groups |
| | 15 | Clinical medicine & surgery | Lectures |
| | | Hospital cases | |
| | | Meat hygiene | |
| | | Surgical anatomy | |
| | | Operative surgery | In groups |
| | | Medical, surgical & obstetrics clinics | In groups |
| *June exam – Veterinary medicine; Veterinary Surgery and obstetrics* | | | |

## *Appendix A2: Veterinary curriculum in the late Weipers era, 1970-71*

| Year | Term | Subject | Format (where specified) |
|---|---|---|---|
| 1st | 1 | Biology | Lectures, practicals |
| | | Chemistry | Lectures, practicals |
| | | Physics | Lectures, practicals, tutorials |
| | 2 | Biology | Lectures, practicals |
| | | Chemistry | Lectures, practicals |
| | | Physics | Lectures, practicals, tutorials |
| | 3 | Biology | |
| | | Chemistry | Lectures, practicals |
| | | Physics | Lectures, tutorials |
| *June exam – Biology, Chemistry & Physics* | | | |
| 2nd | 4 | Anatomy, embryology, histology | Lectures, practicals |
| | | Biochemistry | Lectures |
| | | Physiology | Lectures, practicals |
| | 5 | Anatomy, histology, embryology | Lectures, practicals |
| | | Biochemistry | Lectures, practicals |
| | | Physiology | Lectures, practicals |
| | 6 | Anatomy, embryology, histology | Lectures, practicals |
| | | Biochemistry | Lectures, practicals |
| | | Physiology | Practicals |
| *June exam – Veterinary anatomy, including histology & embryology. Veterinary biochemistry. Veterinary physiology.* | | | |
| 3rd [2] | 7 | Pathology | |
| | | Microbiology, morbid anatomy & meat inspection | |
| | | Animal husbandry | Lectures, practicals |
| | 8 | Pathology | |
| | | Microbiology, morbid anatomy & meat inspection | |
| | | Animal husbandry | Lectures, practicals |
| | 9 | Pathology | |
| | | Microbiology, morbid anatomy & meat inspection | |
| | | Animal husbandry | Lectures, practicals |
| *June exam - Animal husbandry (including animal management). Veterinary pathology (including microbiology & parasitology).* | | | |
| 4th | 10 | Pathology/Medicine | Lectures, demonstrations, practicals |
| | | Meat inspection | |
| | | Practical meat inspection | Early morning classes by arrangement |
| | | Pharmacology | Lectures |
| | | Surgery, [reproduction] and integrated anatomy | Lectures |
| | | Reproduction | |
| | | Clinical conference / visiting lecturer | (Alternate weeks) |
| | 11 | Pathology/Medicine | Lectures, demonstrations, |

[2] Optional pathology disappears. Morbid anatomy goes back in, as does meat inspection, both combined with microbiology.

| | | | |
|---|---|---|---|
| | | | practicals |
| | | Practical meat inspection | Early morning classes by arrangement |
| | | Meat inspection | |
| | | Pharmacology | Lectures, practicals |
| | | Surgery and integrated anatomy | Lectures |
| | | Reproduction | |
| | | Clinical conference & visiting lecturer (alternate weeks) | |
| | 12 | Pathology/Medicine | Lectures, practicals |
| | | Postmortem dems | |
| | | Pharmacology | Lectures |
| | | Surgery and integrated anatomy | Lectures |
| | | Reproduction | |
| | | Clinical conference & visiting lecturer (alternate weeks) | |
| *June exam – Combined Integrated Studies – Veterinary pathology (including microbiology & parasitology), food hygiene & meat inspection, Veterinary Medicine. Veterinary Surgery (including reproduction). Veterinary material medica, pharmacy and pharmacology.* | | | |
| 5th | 13 | Systematic surgery & reproduction | Lectures |
| | | Medicine | Lectures |
| | | Postmortem dems. | |
| | | Clinical instruction | In groups |
| | | Groups (medicine) and clinical conference (surgery) alternating with visiting lecturer | |
| | 14 | Systematic surgery, reproduction & integrated anatomy | Lectures |
| | | Medicine | Lectures |
| | | Postmortem dems. | |
| | | Clinical instruction | In groups |
| | | Groups (medicine) and clinical conference (surgery) alternating with visiting lecturer | |
| | 15 | Systematic surgery, reproduction & integrated anatomy | Lectures |
| | | Medicine | Lectures |
| | | Postmortem dems. | |
| | | Clinical instruction | In groups |
| | | Groups (medicine) and clinical conference (surgery) alternating with visiting lecturer | |
| *June exam – Veterinary medicine. Veterinary Surgery and Veterinary Reproduction.* | | | |

## *Appendix A3: Veterinary curriculum in the post-Weipers era, 1978-79*

| Year | Term | Subject | Format (where specified) |
|---|---|---|---|
| 1st | 1 | Vet Botany | Lectures, practicals |
| | | Anatomy | Lectures, practicals |
| | | Chemistry | Lectures, practicals |
| | | An. Husbandry | Lectures, practicals |
| | 2 | Physiology | Lectures, practicals |
| | | Vet Botany | Lectures, practicals |
| | | Anatomy | Lectures, practicals |
| | | Biochemistry | Lectures |
| | | Chemistry | Lectures, practicals |
| | | Vet Biology | Lectures |
| | | An. Husbandry | Lectures, practicals |
| | 3 | Physiology | L&P |
| | | Vet Botany | L&P |
| | | Anatomy | L&P |
| | | Vet Biology | L |
| | | Biochemistry | L&P |
| | | An. Husbandry | L&P |
| *June exam – Chemistry/Vet Biochemistry; Vet Biology/Vet Anatomy/ Vet Physiology; An. Husbandry and Management I/Vet Botany* | | | |
| 2nd | 4, 5, 6 | Biochemistry | L&P |
| | | Physiology | L&P |
| | | Integrated Studies | L&P |
| | | Anatomy | L&P |
| *June exam – Veterinary Anatomy. Veterinary biochemistry. Veterinary physiology.* | | | |
| 3rd | 7, 8, 9 | Microbiology or Parasitology | Lectures, practicals |
| | | Pathology | Lectures, practicals |
| | | Animal husbandry | Lectures, practicals |
| *June exam - Animal husbandry (including animal management). Veterinary pathology (including microbiology & parasitology).* | | | |
| 4th | 10 | Pathology/Medicine | Lectures, tutorials/practicals |
| | | Postmortem demonstrations | |
| | | Clinical path. dems. | |
| | | Food hygiene & meat inspection | |
| | | Practical meat inspection | Early morning classes by arrangement |
| | | Pharmacology | Lectures, practicals |
| | | Surgery, reproduction and integrated anatomy | Lectures |
| | | Surgery and reproduction (clinical work in groups). | Alternated with pharmacology practicals. |
| | | Visiting lecturer (alternate weeks) | |
| | 11 | Pathology/Medicine | Lectures, tutorials/practicals |
| | | Postmortem demonstrations | |
| | | Clinical path. dems. | |
| | | Food hygiene & meat inspection | |
| | | Practical meat inspection | Early morning classes by arrangement |

| | | | |
|---|---|---|---|
| | | Pharmacology | Lectures, practicals |
| | | Surgery & integrated anatomy | Lectures |
| | | Surgery and reproduction (clinical work in groups). | Alternated with pharmacology practicals. |
| | | Visiting lecturer (alternate weeks) | |
| | 12 | Pathology/Medicine | Lectures, tutorials/practicals |
| | | Postmortem dems | |
| | | Clinical path. dems. | |
| | | Practical meat inspection | Early morning classes by arrangement |
| | | Pharmacology | Lectures |
| | | Surgery and integrated anatomy | Lectures |
| | | Groups (clinical work) & visiting lecturer (alternate weeks) | |
| *June exam – Combined Integrated Studies – Veterinary Medicine / Vet Pathology, Parts I and II. Veterinary Surgery (including reproduction). Veterinary Pharmacology.* | | | |
| 5th | 13, 14 | Systematic surgery, reproduction & integrated anatomy | Lectures |
| | | Medicine | Lectures |
| | | Postmortem dems. | |
| | | Surgical exercise classes | |
| | | Clinical instruction | In groups |
| | | Groups (clinical work) alternating with visiting lecturer | |
| | 15 | Systematic surgery, reproduction & integrated anatomy | Lectures |
| | | Medicine | Lectures |
| | | Postmortem dems. | |
| | | Surgical exercise classes | |
| | | Clinical instruction | In groups |
| | | Groups (medicine) and clinical conference (surgery) alternating with visiting lecturer | |
| *June exam – Veterinary medicine. Veterinary Surgery and Veterinary Reproduction.* | | | |

## *Appendix A4: Veterinary curriculum in the early Information era, 1991-92*

<table>
<tr><th>Year</th><th>Subject</th><th>Format (where specified)</th></tr>
<tr><td>1st</td><td>Veterinary Biomolecular Sciences</td><td rowspan="4">Lectures, tutorials, practicals</td></tr>
<tr><td></td><td>Veterinary Anatomy</td></tr>
<tr><td></td><td>Veterinary Physiology</td></tr>
<tr><td></td><td>Veterinary Animal Husbandry I</td></tr>
<tr><td colspan="3">June exam – (i) Veterinary Biomolecular Sciences (ii) Veterinary Animal Husbandry I<br>September – Second diet of examination</td></tr>
<tr><td>2nd</td><td>Veterinary Anatomy</td><td rowspan="3">Lectures, tutorials, practicals</td></tr>
<tr><td></td><td>Veterinary Physiology</td></tr>
<tr><td></td><td>Veterinary Animal Husbandry II</td></tr>
<tr><td colspan="3">June exam – (i) Veterinary Anatomy (ii) Veterinary Physiology<br>(iii) Veterinary Animal Husbandry II<br>September – Second diet of examination</td></tr>
<tr><td>3rd</td><td>Veterinary Pathology</td><td rowspan="5">Lectures, tutorials, practicals</td></tr>
<tr><td></td><td>Veterinary Microbiology</td></tr>
<tr><td></td><td>Veterinary Parasitology</td></tr>
<tr><td></td><td>Veterinary Pharmacology and Therapeutics</td></tr>
<tr><td></td><td>Introduction to Clinical Methods</td></tr>
<tr><td colspan="3">June exam – (i) Veterinary Pathology / Veterinary Microbiology / Veterinary Parasitology (ii) Veterinary Pharmacology and Therapeutics<br>September – Second diet of examination</td></tr>
<tr><td>4th</td><td>Combined Integrated Studies – Veterinary Pathology, Veterinary Microbiology and Veterinary Parasitology, Veterinary Medicine and Therapeutics, Veterinary Public Health and Veterinary Animal Husbandry</td><td>Teaching on a species block basis with VPH taught and examined as an additional block.</td></tr>
<tr><td></td><td>Veterinary Surgery and Reproduction</td><td></td></tr>
<tr><td colspan="3">June exam – (i) Veterinary Surgery and Reproduction<br>September – Second diet of examination.<br>(i) Combined integrated studies (ii) Veterinary Surgery and Reproduction</td></tr>
<tr><td>5th</td><td>Veterinary Medicine</td><td rowspan="3">Lecture-free course of practical clinical training. Tutorials on therapeutics, aspects of reproduction, large and small animal medicine and anaesthetics etc. held throughout the fifth year.</td></tr>
<tr><td></td><td>Veterinary Surgery and Reproduction</td></tr>
<tr><td></td><td>Veterinary Jurisprudence</td></tr>
<tr><td colspan="3">June – Examinations in (i) Veterinary Medicine (ii) Veterinary Surgery and Reproduction consist of an extensive clinical/oral examination.<br>10% of the marks awarded for the Reproduction component of the Final Professional Examination will be allotted to the practical project in Veterinary Reproduction carried out by Final Year Students during the course of the session.<br>September – Second diet of examination.</td></tr>
</table>

## *Appendix A5: Veterinary curriculum, 2006-7*

| Year | Subject | Format |
|---|---|---|
| 1st | Veterinary Biomolecular Sciences I | Lectures, tutorials, practicals, Self-Directed Learning Assignment (SDLA) |
| | Veterinary Anatomy I | |
| | Veterinary Physiology I | |
| | Veterinary Animal Husbandry I | |
| *June exam – Integrated examination consisting of two papers each covering two of the four courses above. September – Second diet of examination* | | |
| 2nd | Veterinary Biomolecular Sciences II | Lectures, tutorials, practicals |
| | Veterinary Anatomy II | |
| | Veterinary Physiology II | |
| | Veterinary Animal Husbandry II | |
| *June exam – (i) Veterinary Biomolecular Sciences (ii) Veterinary Anatomy (iii) Veterinary Physiology (iv) Veterinary Animal Husbandry September – Second diet of examinations* | | |
| 3rd | Veterinary Pathology | Lectures, tutorials, practicals, Pharmacology library project, Parasitology Open Essay Assignment (OEA) |
| | Veterinary Microbiology | |
| | Veterinary Parasitology | |
| | Veterinary Pharmacology | |
| *June exam – (i) Veterinary Pathology (ii) Veterinary Microbiology (iii) Veterinary Parasitology (iv) Veterinary Pharmacology September – Second diet of examinations* | | |
| 4th | Combined Integrated Course (including Farm Animal Diseases and Veterinary Public Health) | |
| | Veterinary Companion Animal Science | Including clinico-pathological case conferences, clinical groups, Collaborative Learning Assignment (CLA) |
| *December exam – Veterinary Companion Animal Science Part I March exam – Combined Integrated Course – Farm Animal Diseases & VPH June exam – Veterinary Companion Animal Science Part 2 / Part 3 September – second diet of examinations: (i) Combined Integrated Course – Farm Animal diseases & VPH (ii) Veterinary Companion Animal Science* | | |
| 5th | Large Animal Clinical Studies (including Farm Animal Medicine and Production (including Public Health) and Equine Clinical Studies) | Lecture-free rotational courses of practical clinical training in small groups. |
| | Small Animal Clinical Studies (including clinico-pathological case conferences, grand rounds) | |
| *June – Examinations in Large Animal (Farm Animal, Equine Animal and Public Health) and Small Animal consist of an extensive clinical/oral examinations. September – Second diet of examinations In addition, performance in assessed course work and class exams will contribute to the overall final mark for each course in FIRST, SECOND and THIRD year and in FOURTH year Veterinary Companion Animal Science (CAS).* | | |

## *Appendix B1: Questionnaire, pre-pilot study with lecturing staff and local practitioners*

(This document was originally 14 pages long with the introduction on one page.)

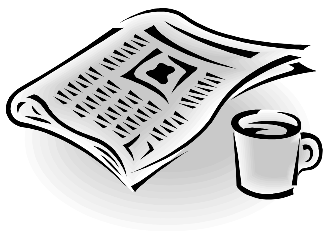
**UNIVERSITY**
***of***
**GLASGOW**

**"Exploring the Role of Educational Methods and Technologies in Undergraduate Veterinary Medical Education"**

**Questionnaire for University of Glasgow [Alumni]**

[modify as appropriate for current students and staff]

Dear [named individual],



For my PhD research, I am inviting you to participate in a pilot study about your experiences of educational technologies and teaching methods. I anticipate that you will be able to complete the questionnaire over coffee, so it should not take up too much of your time. The form looks bulky, but there will be items that you will be able to skip.

My PhD study is on the use of educational technologies in undergraduate veterinary medical education at the Faculty of Veterinary Medicine, University of Glasgow (formerly Glasgow Veterinary College). This pilot questionnaire is being sent to 20 specially selected alumni [will be revised for actual study], and I would really appreciate your response, within 3-4 days of receiving the questionnaire, if at all possible. As soon as I receive your feedback, I will be able to modify the questionnaire, and send the final version out with the Faculty Newsletter in July [omit last detail for questionnaire to student and staff].

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As an incentive, I am offering three £25 book tokens. A prize draw will take place on June 7th and three randomly selected respondents will win one book token each. Please write your RCVS registration number in this box so that I can identify you if you are a winner[3]. [amend as appropriate to target audience]

RCVS reg. no.

Your help in providing this information will be *really* helpful to me, and to the Faculty in continuing to improve the veterinary undergraduate course.

This questionnaire is also available online, at www.gla.ac.uk/vhmd/

If you could complete the online questionnaire, it would be even more helpful as it would allow me to collate the responses more quickly.

Thank you *very* much in advance, for participating in this pilot study, that will form the basis of my PhD research.

Yours sincerely,

Vicki H.M. Dale

[3] This page will be detached from the remainder of this questionnaire when I receive it, and another anonymous identifier put on the questionnaire. Identifiers linked to RCVS registration numbers will be stored physically in a locked cabinet and electronically on my computer, accessible by password only. The only reason for needing to identify responses is so that I can identify any potential biases in the results.

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## Before completing this questionnaire …

**PART 1.**

1. **This section is very important. Please read it carefully and then sign it, or check the box on the online version.**

"I understand that my participation in this study is completely voluntary, and that I have the right to withdraw from the study at any time, or to withdraw any data previously supplied.

It is my understanding that any information supplied should be kept safely – either in a locked cabinet or on computer, accessible by password only, and any information supplied is on the basis that it will be kept securely, by the person undertaking this research [Vicki Dale], and her supervisors [Prof. Martin Sullivan and Dr. Erica McAteer], subject to legal limitations [such as subpoena, freedom of information claim, or mandatory reporting].

The information is being supplied also on the basis that:

- The researcher and supervisors will endeavour to maintain confidentiality [subject to legal limitations], so as not to cause any embarrassment to any of the participants.
- Identifiers and identifiable data will be destroyed at the end of the period of study.
- The information will be used only for the purposes of Ms. Dale's PhD study, and any conference papers or publications that arise from that research.
- That information supplied will not affect any ongoing professional relationships."

Signed ……………………………………. Date …………………………....

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## PART 2.

2. **Thinking back to when you were an <u>undergraduate student</u>, or if you are currently an undergraduate student, please rate the following teaching methods and educational technologies in relation to your veterinary training.**

Please note – It would be helpful if you could record your reason for rating a particular resource, but it is not necessary for you to record reasons for all resources. If you could list subjects that made particularly good use of these technologies it would allow me to compare the use of technologies and teaching methods throughout the undergraduate course.

Also, if a resource is not applicable, just put 'NA' beside it, for example if you have not heard of a particular resource or if it was no longer in use when you commenced your studies - thanks.

| Resources | Tick if avail -able | Tick if used | Not at all useful | Not very useful | Useful | Very useful | Extre -mely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|
| Example | ✓ | ✓ | | | | ✓ | | Good access to high quality visual images. | Pathology, anatomy |
| Example | | | | | | | | NA | |
| a) Lectures | | | | | | | | | |
| b) One-to-one tutorials | | | | | | | | | |

Row height representative of original questionnaire – reduced on succeeding pages for brevity.

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| Resources | Tick if avail -able | Tick if used | Not at all useful | Not very useful | Useful | Very useful | Extre -mely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|
| c) Group tutorials | | | | | | | | | |
| d) Practical classes | | | | | | | | | |
| e) Hands-on clinical training ('Realia') | | | | | | | | | |
| f) Post-mortem demons -trations | | | | | | | | | |
| g) Blackboard & chalk | | | | | | | | | |
| h) Flipcharts / marker boards | | | | | | | | | |
| h) Posters | | | | | | | | | |
| i) Lantern slides | | | | | | | | | |
| j) 35mm slides | | | | | | | | | |
| k) Acetates with overhead projector | | | | | | | | | |
| l) Cine films | | | | | | | | | |
| m) Tape-slide programs | | | | | | | | | |
| n) Analogue audio recordings | | | | | | | | | |
| o) Programmed learning | | | | | | | | | |


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| **Resources** | **Tick if avail -able** | **Tick if used** | **Not at all useful** | **Not very useful** | **Useful** | **Very useful** | **Extre -mely useful** | **Reason for answer** | **Courses where particularly good use of this method / technology was made** |
|---|---|---|---|---|---|---|---|---|---|
| p) Closed Circuit Television (CCTV) | | | | | | | | | |
| q) Broadcast television | | | | | | | | | |
| r) Models / mannequins | | | | | | | | | |
| s) Preserved specimens | | | | | | | | | |
| t) Analogue video recordings | | | | | | | | | |
| u) Videodisc | | | | | | | | | |
| v) Data projector (LCD or tablet) | | | | | | | | | |
| w) Powerpoint presentations | | | | | | | | | |
| x) Computer-aided learning (CAL) packages (including CD-i) | | | | | | | | | |
| y) Internet (online) resources (incl. virtual learning environments) | | | | | | | | | |
| z) Printed student course notes | | | | | | | | | |
| aa) Photocopied handouts (diagrams & notes) | | | | | | | | | |
| ab) Textbooks | | | | | | | | | |
| ac) Journal articles | | | | | | | | | |


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## PART 3.

3. **From your current perspective, please rate the following teaching methods and educational technologies.**

As before, please put 'NA' where not appropriate. [If you are currently an undergraduate student, please ignore this section and go to Part 4 of the questionnaire.]

| Resources | Tick if avail -able | Tick if used | Not at all useful | Not very useful | Useful | Very useful | Extre -mely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|
| a) Lectures | | | | | | | | |
| b) One-to-one tutorials | | | | | | | | |
| c) Group tutorials | | | | | | | | |
| d) Practical classes | | | | | | | | |
| e) Hands-on clinical training ('Realia') | | | | | | | | |
| f) Post-mortem demons -trations | | | | | | | | |
| g) Blackboard & chalk | | | | | | | | |
| h) Flipcharts / marker boards | | | | | | | | |
| h) Posters | | | | | | | | |
| i) Lantern slides | | | | | | | | |
| j) 35mm slides | | | | | | | | |
| k) Acetates with overhead projector | | | | | | | | |
| l) Cine films | | | | | | | | |
| m) Tape-slide programs | | | | | | | | |



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| Resources | Tick if avail -able | Tick if used | Not at all useful | Not very useful | Useful | Very useful | Extre -mely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|
| n) Analogue audio recordings | | | | | | | | |
| o) Programmed learning | | | | | | | | |
| p) Closed Circuit Television (CCTV) | | | | | | | | |
| q) Broadcast television | | | | | | | | |
| r) Models / mannequins | | | | | | | | |
| s) Preserved specimens | | | | | | | | |
| t) Analogue video recordings | | | | | | | | |
| u) Videodisc | | | | | | | | |
| v) Data projector (LCD or tablet) | | | | | | | | |
| w) Powerpoint presentations | | | | | | | | |
| x) Computer-aided learning (CAL) packages (including CD-i) | | | | | | | | |
| y) Internet (online) resources (incl. virtual learning environments) | | | | | | | | |
| z) Printed student course notes | | | | | | | | |
| aa) Photocopied handouts (diagrams & notes) | | | | | | | | |
| ab) Textbooks | | | | | | | | |
| ac) Journal articles | | | | | | | | |


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## PART 4.

It would be helpful to have some information about yourself so that I can assess whether there are any differences between the responses of alumni of different gender, occupation, or who studied at different times.

4. **Please check the box that best describes your current role.**

☐ Undergraduate student ☐ Postgraduate student

☐ University teacher ☐ Practitioner

☐ Retired university teacher ☐ Retired practitioner

☐ Other (Please specify) ……………………………………………..

(Please tick one option.)

**In what year did you begin studying veterinary medicine?** | 1 | 9 | | |

5. **In what year did you graduate?** | 1 | 9 | | |

6. **What age were you when you were admitted to the course?** | | | (years)

7. **Are you …**

☐ Male

☐ Female (Please tick one option.)

8. **Please can you tell me where you spent the majority of your most formative years i.e. primary and secondary school years.**
(This will help me to identify any cultural differences in the responses.)

☐ Asia ☐ Africa

☐ Australasia ☐ Britain

☐ North America ☐ South America

(Please tick one option.)


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**PART 5.** [will not be included for real study, only pilots]

As this is a pilot study, it would be really useful to have your comments about this form, so that I can modify it as appropriate, and send an improved version to all other alumni.

**10. How long did it take you to complete this form?**

…………………………………….. (minutes)

**11. Please list any other teaching methods/resources not included on this form, that you think should be included.**

………………………………………………………………………………………

………………………………………………………………………………………

**12. Was the text legible?** (Please tick one option.)

- ☐ Yes
- ☐ No

**13. Was the size of the text …**

- ☐ Too small
- ☐ Too large
- ☐ Just right (Please tick one option.)

**14. Was the language …**

- ☐ Clear
- ☐ Sometimes ambiguous | ………………………………………………...
- ☐ Very ambiguous | ………………………………………………...

(Please tick one option, citing any examples in the spaces above.)

*Thank you very much for taking the time to participate in this study.*
*Your help is really appreciated. If you completed the paper-based questionnaire, please return it in the postage-paid addressed envelope provided. Thank you.*

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# *Appendix B2: Questionnaire, pilot study with local practitioners and alumni*

(This document was originally 14 pages long.)

**UNIVERSITY**
***of***
**GLASGOW**

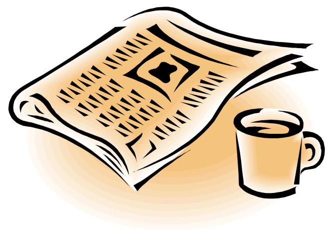
**Faculty of Veterinary Medicine**
**Faculty of Education**

## "Educational Methods and Technologies in Undergraduate Veterinary Medicine"

**Questionnaire for University of Glasgow Alumni, Current Students and Teaching Staff**

**Win £25 book token!**

Dear [named individual]



As you are a University of Glasgow Veterinary School alumnus, I would like to invite you to participate in a pilot study about your experiences of educational methods and technologies. I anticipate that you will be able to complete the questionnaire over coffee, so it should not take up too much of your time. The form looks bulky, but there will be items that you will be able to skip.

My study is on the use of educational methods and technologies in undergraduate veterinary medicine at the Faculty of Veterinary Medicine, University of Glasgow (formerly Glasgow Veterinary College). This pilot questionnaire is being sent to 20 specially selected alumni.

I would really appreciate your response, within 3-4 days of receiving the questionnaire, if at all possible. Please be assured that data will be held in accordance with the Data Protection Act 1998.

*Please turn over …*

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As soon as I receive your feedback, I will be able to modify the questionnaire, and send the final version with the Faculty Newsletter in July to all alumni.

It's really very important that I get as many responses as possible, to be able to provide a representative view of educational methods and technologies in undergraduate veterinary education.

**Name in block capitals**

Therefore, as a small token of appreciation, I am offering three £25 book tokens. A prize draw will take place on June 21st and three randomly selected respondents will win one book token each. Please write your name and year of graduation in these boxes so that I can identify you if you are a winner[4].

**Year of graduation**

Your help in providing this information will be *really* helpful to me, and to the Faculty in continuing to improve the veterinary undergraduate course.

This questionnaire is also available online, at www.gla.ac.uk/vhmd/

If you could complete the online questionnaire, it would be even more helpful as it would allow me to collate the responses more quickly.

Thank you very much in advance for participating in this pilot study, that will form the basis of my PhD research, and will inform the Faculty of Veterinary Medicine on how best to develop good practice with educational methods and technologies.

Yours sincerely,

[4] Please print your name in the box above. This page and the following one will be detached from the remainder of this questionnaire when received.

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**Before completing this questionnaire …**

# PART 1.

1. **This section is very important. Please read it carefully and then sign it, or check the box on the online version.**

In agreeing to take part in this research you can be confident that:

- any data that you provide through taking part in this research will be held in accordance with the Data Protection Act 1998.
- all data will be anonymised and any reference to you as an individual will be removed, unless express permission has been given by you to acknowledge any recommendations given.
- your data will only be used for the stated research purposes.

I hereby consent to taking part in this research and consent to my data being used in accordance with the above constraints.

Name (please print) ______________________________________

Name: (please sign) ______________________________________

Organisation: ______________________________________

Date: ____________________

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# PART 2.

2. **Thinking back to when you were an undergraduate student, or if you are currently an undergraduate student, please rate the following teaching methods and educational technologies in relation to your veterinary training.**

## GUIDELINES

Availability and use: With regards to availability of a method/technology, or whether it was used, please tick either 'Y' (yes/available), 'N' (no/not available), or 'NS' (not sure/cannot remember).

Rating: Please rate each method/technology by ticking one of the five boxes ranging from 'Not at all useful' to 'Extremely useful', as far as you can remember.

Reason for answer: It would be helpful if you could record your reason for rating a particular resource, but you need not feel compelled to record reasons for all resources.

Courses making good use of methods/technologies: If you remember subjects where teachers made particularly good use of these methods and technologies and could list them, it would allow me to compare their use throughout the undergraduate course.

| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Example | Y | ✓ | Y | ✓ | | | | ✓ | | Good access to high quality visual images. | Pathology, anatomy |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| Example | Y | | Y | | | | | | | | NA |
| | N | | N | | | | | | | | |
| | NS | ✓ | NS | | | | | | | | |
| **Lecture (plenary) based methods and projection technologies** | | | | | | | | | | | |
| **1) Lectures / plenary sessions** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **2) Post-mortem** (clinico-pathological) demonstrations | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |

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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3) Blackboard & chalk** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **4) Glass lantern slides projected** (used in 1950's, 1960's; precursor to 35mm slides) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **5) Acetates projected using in class using overhead projector** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **6) 35mm slides projected in class** (= Diazo or '2 by 2' slides) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **7) Electronic slides** (on teacher's computer, projected in class using data projector) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Small group tutorial methods and technologies** | | | | | | | | | | | |
| **8) One-to-one tutorials** (including 'seeing practice' or EMS) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **9) Small group tutorials** (approx. 5-7 students with tutor) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **10) Flipcharts / whiteboards** (successor to blackboards, used commonly in small group tutorials) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |



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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **11) Laserdisc** (electronic media in early 1990s, similar in shape to LP record, containing digital images, linked to television screen) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Directed self study methods and technologies** | | | | | | | | | | | |
| **12) Textbooks** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **13) 'Book' of printed student course notes** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **14) Photocopied handouts** (diagrams & notes distributed in tutorials or lectures) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **15) Journal articles** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **16) Programmed learning** (1960s-1970s, students assessing themselves with workbook and/or tape-slide or early computer programmes) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |


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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **17) Computer-aided learning (CAL) packages** e.g. on CDROM or on Local Area Network (1980's-1990's, also for self-assessment) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **18) Internet (online) resources** (including Virtual Learning Environments, late 1990's onwards) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Practical ('Hands-on' training) – preclinical, paraclinical and clinical** | | | | | | | | | | | |
| **19) Practical classes** (laboratories, including cadaver dissection and surgery) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **20) Hands-on clinical training** (with real animal) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **21) Wall-mounted posters** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **22) Models / mannequins** (e.g. plastic or skeletal) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **23) Preserved specimens** (e.g. in formaldehyde or Perspex) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |


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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Audiovisual aids** | | | | | | | | | | | |
| **24) Closed Circuit Television (CCTV)** (e.g. for relaying a demonstration or lecture to a 2nd lecture theatre) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **25) Cine films** (16mm or 32 mm formats, precursor to video) e.g. projected in lecture or tutorial | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **26) Educational television broadcasts** (e.g. Open University TV programmes) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **27) Analogue audio (cassette) recordings** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **28) Video recordings** (VHS or Betamax) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |



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# PART 3.

3. **From your <u>current perspective</u> please reconsider these resources i.e. how you use/experience these methods/technologies in your current role as a teacher, practitioner or in another postgraduate role.**

If you are an undergraduate student, and your responses in Part 2 speak for your current perspective, please skip this part and proceed to Part 4.

| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lecture (plenary) based methods and projection technologies** | | | | | | | | | | |
| **1) Lectures / plenary sessions** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **2) Post-mortem** (clinico-pathological) demonstrations | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **3) Blackboard & chalk** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **4) Glass lantern slides projected** (used in 1950's, 1960's; precursor to 35mm slides) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **5) Acetates projected using overhead projector** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **6) 35mm slides projected in class** (= Diazo or '2 by 2' slides) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |

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| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **7) Electronic slides** (on teacher's computer, projected using data projector) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **Small group tutorial methods and technologies** | | | | | | | | | | |
| **8) One-to-one tutorials** (including 'seeing practice' or EMS) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **9) Small group tutorials** (approx. 5-7 students with tutor) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **10) Flipcharts / whiteboards** (successor to blackboards, used commonly in small group tutorials) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **11) Laserdisc** (electronic media in early 1990s, similar in shape to long-play record, containing digital images, linked to television screen) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **Directed self study methods and technologies** | | | | | | | | | | |
| **12) Textbooks** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **13) 'Book' of printed student course notes** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |

| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **14) Photocopied handouts** (diagrams & notes distributed in tutorials or lectures) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **15) Journal articles** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **16) Programmed learning** (1960s-1970s, students assessing themselves with workbook and/or tape-slide or early computer programmes) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **17) Computer-aided learning (CAL) packages** e.g. on CDROM or on Local Area Network (1980's onwards) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **18) Internet (online) resources** (including Virtual Learning Environments, late 1990's onwards) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **Practical ('Hands-on' training) – preclinical, paraclinical and clinical** | | | | | | | | | | |
| **19) Practical classes** (laboratories, including cadaver dissection and surgery) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **20) Hands-on clinical training** (with real animal) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |



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| Resources | Tick if Available | | Tick if in Use | | This method/technology is … | | | | | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | |
| **21) Wall-mounted posters** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **22) Models / mannequins** (e.g. plastic or skeletal) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **23) Preserved specimens** (e.g. in formaldehyde or Perspex) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **Sound and vision (moving pictures)** | | | | | | | | | | |
| **24) Closed Circuit Television (CCTV)** (e.g. for relaying a demonstration or lecture to a 2nd lecture theatre) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **25) Cine films** (16mm or 32 mm formats, precursor to video) e.g. projected in lecture or tutorial | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **26) Educational television broadcasts** (e.g. Open University TV programmes) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **27) Analogue audio (cassette) recordings** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **28) Video recordings** (VHS or Betamax) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |

# PART 4.

It would be helpful to have some information about yourself so that I can assess whether there are any differences between the responses of alumni of different gender, occupation, or who studied at different times.

4. **Please tick the box that best describes your current role.** (Please tick one option.)

☐ Undergraduate student ☐ Postgraduate student

☐ University teacher ☐ Practitioner

☐ Retired university teacher ☐ Retired practitioner

☐ Other (Please specify) ………………………………………

5. **In which year did you begin studying veterinary medicine?** ☐☐☐☐

6. **In which year did you graduate?** ☐☐☐☐

7. **What age were you when you entered the undergraduate veterinary course?** ☐☐ (years)

8. **Are you …**

☐ Male

☐ Female

9. **Please can you tell me where you spent the majority of your most formative years i.e. primary and secondary school years.** (Please tick one option.)

☐ Asia ☐ Africa

☐ Australasia ☐ Europe (not UK and Eire)

☐ North America ☐ UK and Eire

☐ South America

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# PART 5.

As this is a pilot study, it would be really useful to have your comments about this form, so that I can modify it as appropriate, and send an improved version to all other alumni.

**10. Please list any other teaching methods/resources not included on this form, that you think should be included.**

……………………………………………………………………………………………

……………………………………………………………………………………………

**11. How long did it take you to complete this form?**

…………………………………….. (minutes)

**12. Was the text legible?** (Please tick as appropriate.)

☐ Yes ☐ No

**13. Was the language …**

☐ Clear ☐ Ambiguous

(Please tick as appropriate, citing any examples in the spaces below.)

……………………………………………………………………………………………

……………………………………………………………………………………………

**14. Please provide any other feedback, comments or questions.**
**Your input is very much valued.**

……………………………………………………………………………………………

……………………………………………………………………………………………

**Thank you very much for taking the time to participate in this pilot study.**
**Your help is really appreciated.**

If you completed the paper-based questionnaire, please checked that you have signed the consent form in Part 1, then return the completed questionnaire in the postage-paid addressed envelope provided. Thank you.

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*Appendix B3: Questionnaire, pilot study with students*

(This document was originally 9 pages long.)

**Name:**

**Matric. no.:**

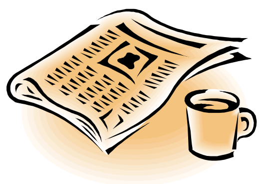
**UNIVERSITY**
***of***
**GLASGOW**

**Faculty of Veterinary Medicine**

**Faculty of Education**

# "Educational Methods and Technologies in Undergraduate Veterinary Medicine"

**Questionnaire for University of Glasgow Alumni, Current Students and Teaching Staff**



As you are a University of Glasgow Veterinary School student, I would like to invite you to participate in a pilot study about your experiences of educational methods and technologies. I anticipate that you will be able to complete the questionnaire over coffee, so it should not take up too much of your time.

My study is on the use of educational methods and technologies in undergraduate veterinary medicine at the Faculty of Veterinary Medicine, University of Glasgow. The attached Plain Language Statement provides more information about the study, that is also designed to gather information from staff and alumni.

I would really appreciate your response, within 3-4 days of receiving the questionnaire, if at all possible. Please be assured that data will be held in accordance with the Data Protection Act 1998.

Thank you very much in advance for participating in this pilot study, that will form the basis of my PhD research, and will inform the Faculty of Veterinary Medicine on how best to develop good practice with educational methods and technologies in undergraduate teaching.

Yours sincerely,



Vicki H.M. Dale: Educational Technologist
Faculty of Veterinary Medicine, University of Glasgow, Glasgow G61 1QH
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Email: v.dale@vet.gla.ac.uk

**Before completing this questionnaire …**

# PART 1.

1. **This section is very important. Please read it carefully and then sign it, or check the box on the online version.**

In agreeing to take part in this research you can be confident that:

- any data that you provide through taking part in this research will be held in accordance with the Data Protection Act 1998.
- all data will be anonymised and any reference to you as an individual will be removed, unless express permission has been given by you to acknowledge any recommendations given.
- your data will only be used for the stated research purposes.

I hereby consent to taking part in this research and consent to my data being used in accordance with the above constraints.

Name (please print) ______________________________

Name: (please sign) ______________________________

Organisation: UNIVERSITY OF GLASGOW

Date: ____________________

This page will be detached from the remainder of the questionnaire once received.

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# PART 2.

3. **Please rate the following teaching methods and educational technologies in relation to your undergraduate veterinary training:**

## GUIDELINES

Availability and use: With regards to availability of a method/technology, or whether it is has been used, please tick either ‘Y’ (yes/available), ‘N’ (no/not available), or ‘NS’ (not sure/cannot remember).

Rating: Please rate each method/technology by ticking one of the five boxes ranging from ‘Not at all useful’ to ‘Extremely useful’, as far as you can remember.

Reason for answer: It would be helpful if you could record your reason for rating a particular resource, but you need not feel compelled to record reasons for all resources.

Courses making good use of methods/technologies: If you remember subjects where teachers have made particularly good use of these methods and technologies and could list them, it would allow me to compare their use throughout the undergraduate course.

If you have used any of these technologies in another context e.g. a previous degree, and would like to comment on them from that perspective, please do so in the *Reason for answer* box.

| Resources | Tick if Available | | Tick if Used | | This method/technology is ... Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology is made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Example | Y | ✓ | Y | ✓ | | | | ✓ | | Good access to high quality visual images. | Pathology, anatomy |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| Example | Y | | Y | | | | | | | | NA |
| | N | | N | | | | | | | | |
| | NS | ✓ | NS | | | | | | | | |
| **Lecture (plenary) based methods and projection technologies** | | | | | | | | | | | |
| 1) Lectures / plenary sessions | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| 2) Post-mortem (clinico-pathological) demonstrations | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |


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| Resources | Tick if Available | | Tick if Used | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology is made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3) Blackboard & chalk** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **4) Glass lantern slides projected** (used in 1950's, 1960's; precursor to 35mm slides) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **5) Acetates projected using in class using overhead projector** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **6) 35mm slides projected in class** (= Diazo or '2 by 2' slides) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **7) Electronic slides** (on teacher's computer, projected in class using data projector) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Small group tutorial methods and technologies** | | | | | | | | | | | |
| **8) One-to-one tutorials** (including 'seeing practice' or EMS) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **9) Small group tutorials** (approx. 5-7 students with tutor) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **10) Flipcharts / whiteboards** (successor to blackboards, used commonly in small group tutorials) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |



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| Resources | Tick if Available | | Tick if Used | | This method/technology is … | | | | | Reason for answer | Courses where particularly **good** use of this method / technology is made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | | |
| **11) Laserdisc** (electronic media in early 1990s, similar in shape to long-play record, containing digital images, linked to television screen) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **Directed self study methods and technologies** | | | | | | | | | | | |
| **12) Textbooks** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **13) 'Book' of printed student course notes** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **14) Photocopied handouts** (diagrams & notes distributed in tutorials or lectures) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **15) Journal articles** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **16) Programmed learning** (1960s-1970s, students assessing themselves with workbook and/or tape-slide or early computer programmes) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **17) Computer-aided learning (CAL) packages** e.g. on CDROM or on Local Area Network (1980's-1990's, also for self-assessment) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |



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Email: v.dale@vet.gla.ac.uk

| Resources | Tick if Available | | Tick if Used | | This method/technology is … | | | | | Reason for answer | Courses where particularly **good** use of this method / technology is made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | | |
| **18) Internet (online) resources** (including Virtual Learning Environments, late 1990's onwards) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **Practical ('Hands-on' training) – preclinical, paraclinical and clinical** | | | | | | | | | | | |
| **19) Practical classes** (laboratories, including cadaver dissection and surgery) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **20) Hands-on clinical training** (with real animal) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **21) Wall-mounted posters** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **22) Models / mannequins** (e.g. plastic or skeletal) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **23) Preserved specimens** (e.g. in formaldehyde or Perspex) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **Audiovisual aids** | | | | | | | | | | | |
| **24) Closed Circuit Television (CCTV)** (e.g. for relaying a demonstration or lecture to a 2nd lecture theatre) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |



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| Resources | Tick if Available | | Tick if Used | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology is made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **25) Cine films (16mm or 32 mm formats, precursor to video)** e.g. projected in lecture or tutorial | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **26) Educational television broadcasts** (e.g. Open University TV programmes) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **27) Analogue audio (cassette) recordings** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **28) Video recordings** (VHS or Betamax) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |

# PART 3.

It would be helpful to have some information about yourself so that I can assess whether there are any differences between the responses of alumni of different gender, occupation, or who studied at different times.

3. **In which year did you begin studying veterinary medicine?** ☐☐☐☐

4. **What year are you in now?** (In the 2003-4 session; e.g. 1, 2, 3, 4 or 5) ☐

5. **What age were you when you entered the undergraduate veterinary course?** ☐☐ (years)



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6. **Are you …**

☐ Male ☐ Female

7. **Please can you tell me where you spent the majority of your most formative years i.e. primary and secondary school years.**
(Please tick one option.)

☐ Asia ☐ Africa

☐ Australasia ☐ Europe (not UK and Eire)

☐ North America ☐ UK and Eire

☐ South America

# PART 4.

As this is a pilot study, it would be really useful to have your comments about this form, so that I can modify it as appropriate, and send an improved version to all other students.

**8. Please list any other teaching methods/resources not included on this form, that you think should be included.**

……………………………………………………………………………………………

……………………………………………………………………………………………

**9. How long did it take you to complete this form?**

……………………………………….. (minutes)

**10. Was the text legible?** (Please tick as appropriate.)

☐ Yes ☐ No



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Telephone: 0141 330 2319; Fax: 0141 942 7215
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**12. Was the language …**

☐ Clear ☐ Ambiguous

(Please tick as appropriate, citing any examples in the spaces below.)

……………………………………………………………………………………

……………………………………………………………………………………

**13. Please provide any other feedback, comments or questions.**
**Your input is very much valued.**

……………………………………………………………………………………

……………………………………………………………………………………

…………………………………………………………………………………

**Thank you very much for taking the time to participate in this pilot study.**
**Your help is really appreciated.**

Please checked that you have signed the consent form in Part 1,
then place the completed questionnaire in the **marked box**
**which will be placed outside my office door**.

(I am based in the new offices opposite the Assembly Hall,
the second door on the left)

Thank you very much again for taking the time to participate in this pilot study.



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# *Appendix B4: Questionnaire, 'live' study with alumni, students and staff*

(Originally 14 pages long including the plain language statement, and double-sided.)

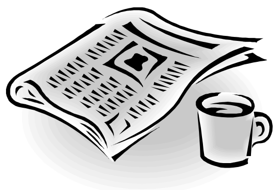
**"Educational Methods and Technologies in Undergraduate Veterinary Medicine"**

**Questionnaire for University of Glasgow Veterinary Alumni, Students and Teaching Staff**

**UNIVERSITY *of* GLASGOW**

**Faculty of Veterinary Medicine**
**Faculty of Education**

Dear [salutation, personalised for alumni and staff]



As you have close links with the University of Glasgow Veterinary School, I would like to invite you to participate in a survey about your experiences of educational methods and technologies. I anticipate that you will be able to complete the questionnaire over coffee, so it should not take up too much of your time. The form looks bulky, but there will be items that you will be able to skip.

My study is on the use of educational methods and technologies in undergraduate veterinary medicine at the Faculty of Veterinary Medicine, University of Glasgow (formerly Glasgow Veterinary College). This questionnaire is being sent to all alumni, current staff and students.

I would <u>really</u> appreciate your response, within 3-4 days of receiving the questionnaire, if at all possible. Please be assured that data will be held in accordance with the Data Protection Act 1998.

Your help in providing this information will be very helpful to me, and to the Faculty in continuing to improve the veterinary undergraduate course.

This questionnaire is also available electronically, at www.gla.ac.uk/vhmd/

If you could complete the online questionnaire, it would be even more helpful as it would allow me to collate the responses more quickly.
**Please note that the cost of return postage is covered for UK residents but overseas alumni might want to complete the electronic form to avoid postage costs.**

<u>Thank you very much</u> in advance for participating in this pilot study, that will form the basis of my PhD research, and will inform the Faculty of Veterinary Medicine on how best to develop good practice with educational methods and technologies.

Your sincerely,



Vicki H.M. Dale: Educational Technologist
Faculty of Veterinary Medicine, University of Glasgow, Glasgow G61 1QH
Telephone: 0141 330 2319; Fax: 0141 942 7215
Email: v.dale@vet.gla.ac.uk

## Before completing this questionnaire …

## PART 1.

1. **This section is very important. Please read it carefully and then sign it, or check the box on the online version.**

In agreeing to take part in this research you can be confident that:

- any data that you provide through taking part in this research will be held in accordance with the Data Protection Act 1998.
- all data will be anonymised and any reference to you as an individual will be removed, unless express permission has been given by you to acknowledge any recommendations given.
- your data will only be used for the stated research purposes.

I hereby consent to taking part in this research and consent to my data being used in accordance with the above constraints.

Name (please print) ________________________________________

Name: (please sign) ________________________________________

Organisation: ________________________________________

Date: ____________________



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UNIVERSITY
*of*
GLASGOW

**Faculty of Veterinary Medicine**
**Faculty of Education**

# PLAIN LANGUAGE STATEMENT

**(To be retained by participants; Please detach from questionnaire and keep)**

I am conducting this research as part of my PhD, which I am undertaking part-time, at the Faculty of Education and the Faculty of Veterinary Medicine, in the University of Glasgow. I am currently employed at the Faculty of Veterinary Medicine as an Educational Technologist, and am being supervised jointly by Professor Martin Sullivan, who is the Associate Dean for Teaching and Learning in the Faculty of Veterinary Medicine; and Dr. Erica McAteer, who is a Senior Lecturer in the Faculty of Education, University of Glasgow, but who will soon be taking up a research post at the University of Strathclyde.

The subject of my research is exploring the role of educational technologies in undergraduate veterinary education. I am focusing on the veterinary school at Glasgow, and inviting alumni, former teachers, and current students and teachers to participate in the study.

All alumni, current students and current staff will receive a questionnaire. At the time of data collection there will be approximately 2650 alumni targeted, 500 current students, and 50 teaching staff. I will also be conducting approximately 30-50 interviews with current members of staff, and arranging focus group discussions with about 25-50 current students. Some alumni addresses have been obtained from the Royal College of Veterinary Surgeons member database, with RCVS permission, and others from the RCVS Register.

PTO.

Vicki Dale: Educational Technologist
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I anticipate that the questionnaire will take between 15-30 minutes to complete, and I will require signed consent in order to be able to use this information. The questionnaire is also being made available online, and where participants have chosen to complete the online version, a tick box will need to be checked, indicating consent.

I will be audio recording, with the participants' agreement, interviews and focus groups. Consent will be recorded on paper and verbally.

Approximately 20 former members of staff will also be invited to participate in face to face or telephone interviews. These individuals are considered to have substantial experience in teaching veterinary students at Glasgow, and have been specially selected with the help of a colleague who has spent a considerable proportion of their professional life at the Faculty of Veterinary Medicine. The issues of consent to use the data and audio-record the interviews, discussed above, will apply here too. I anticipate that interviews and focus groups will last approximately one hour.

I am aware of the ethical requirements of good research practice, and have completed the appropriate ethics form for the Faculty of Education. Specifically, I will endeavour to maintain confidentiality at all times, sharing necessary details only with my supervisors, subject to legal limitations.

All data will be held in accordance with the Data Protection Act 1998.

When my PhD study is complete, and I have submitted (hopefully in 2006, but may be 2007), any identifiers and identifiable data will be destroyed.

Participation in this study is completely voluntary, and I respect the right of individuals not to participate in any aspect of the study, for whatever reason. Participants are free to withdraw consent at any time, and withdraw any data previously supplied.

If participants have any concerns about the nature of this study, they can contact Professor Rex Whitehead, Ethics Officer, Centre for Science Education, Faculty of Education, University of Glasgow.

Yours sincerely,

Vicki Dale: Educational Technologist
Faculty of Veterinary Medicine, University of Glasgow, Glasgow G61 1QH
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Email: v.dale@vet.gla.ac.uk

# PART 2.

2. **Thinking back to when you were an undergraduate student, or if you are currently an undergraduate student, please rate the following teaching methods and educational technologies in relation to your veterinary training.**

## GUIDELINES

Availability and use: With regards to availability of a method/technology, or whether it was used, please tick either 'Y' (yes/available), 'N' (no/not available), or 'NS' (not sure/cannot remember).

Rating: Please rate each method/technology by ticking one of the five boxes ranging from 'Not at all useful' to 'Extremely useful', as far as you can remember.

Reason for answer: It would be helpful if you could record your reason for rating a particular resource, but you need not feel compelled to record reasons for all resources.

Courses making good use of methods/technologies: If you remember subjects where teachers made particularly good use of these methods and technologies and could list them, it would allow me to compare their use throughout the undergraduate course.

| Resources | Tick if Available | | Tick if Used | | This method/technology was ... | | | | | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | | |
| Example | Y | ✓ | Y | ✓ | | | | ✓ | | Good access to high quality visual images. | Pathology, anatomy |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| Example | Y | | Y | | | | | | | | NA |
| | N | | N | | | | | | | | |
| | NS | ✓ | NS | | | | | | | | |
| **Lecture (plenary) based methods and projection technologies** | | | | | | | | | | | |
| 1) Lectures / plenary sessions | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| 2) Post-mortem (clinico-pathological) demonstrations | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |

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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3) Blackboard & chalk** | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **4) Glass lantern slides projected** (used in 1950's, 1960's; precursor to 35mm slides) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **5) Acetates projected in class** (using overhead projector) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **6) 35mm slides projected in class** (= 2x2" photographic slides or blue & white diazos) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **7) Electronic slides** (on teacher's computer, projected in class using data projector) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **Small group tutorial methods and technologies** | | | | | | | | | | | |
| **8) Peer-assisted learning** (studying with classmates) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **9) One-to-one tutorials** (including 'seeing practice' or EMS) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |
| **10) Small group tutorials** (approx. 5-7 students with tutor) | Y | | Y | | | | | | | | |
| | N | | N | | | | | | | | |
| | NS | | NS | | | | | | | | |

| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly good use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **11) Flipcharts / whiteboards** (successor to blackboards, used commonly in small group tutorials) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Directed self study methods and technologies** | | | | | | | | | | | |
| **12) Textbooks** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **13) 'Book' of printed student course notes** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **14) Photocopied handouts** (diagrams & notes distributed in tutorials or lectures) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **15) Journal articles** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **16) Tape-slide programs** (1960's-1980's; booth containing slides which student browses through while listening to audio cassette) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **17) Computer-aided learning (CAL) packages** e.g. on CDROM or on Local Area Network (1980's-1990's, also for self-assessment) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |


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| Resources | Tick if Available | | Tick if Used | | This method/technology was … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer | Courses where particularly **good** use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **18) Internet (online) resources** (including Virtual Learning Environments, late 1990's onwards) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Practical ('Hands-on' training) – preclinical, paraclinical and clinical** | | | | | | | | | | | |
| **19) Practical classes** (laboratories, including cadaver dissection and surgery) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **20) Hands-on clinical training** (with real animal) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **21) Wall-mounted posters** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **22) Models / mannequins** (e.g. plastic or skeletal) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **23) Preserved specimens** (e.g. in formaldehyde or Perspex) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **Audiovisual aids** | | | | | | | | | | | |
| **24) Closed Circuit Television (CCTV)** (e.g. for relaying a demonstration or lecture to a 2nd lecture theatre) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |

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| Resources | Tick if Available | | Tick if Used | | This method/technology was … | | | | | Reason for answer | Courses where particularly <u>good</u> use of this method / technology was made |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | | |
| **25) Cine films (16mm or 32 mm formats, precursor to video)** e.g. projected in lecture or tutorial | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **26) Educational television broadcasts** (e.g. Open University TV programmes) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **27) Analogue audio (cassette) recordings** | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |
| **28) Video recordings** (VHS or Betamax) | **Y** | | **Y** | | | | | | | | |
| | **N** | | **N** | | | | | | | | |
| | **NS** | | **NS** | | | | | | | | |



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## PART 3.

3. **From your <u>current perspective</u> please reconsider these resources i.e. how you use/experience these methods/technologies in your current role as a teacher, practitioner (for example in CPD and/or the provision of EMS) or in another postgraduate role.**
   (If you have different views about the use of a method or technology for different contexts e.g. "useful for my own CPD but I would not rate it highly for undergraduate teaching", please express this in your own words in the relevant *Reason for answer* box.)

**If you are an undergraduate student, or have recently graduated, and your responses in Part 2 speak for your current perspective, please skip this part and proceed to Part 4.**

| Resources | Tick if Available | | Tick if in Use | | This method/technology is … | | | | | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | |
| **Lecture (plenary) based methods and projection technologies** | | | | | | | | | | |
| **1) Lectures / plenary sessions** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **2) Post-mortem (clinico-pathological) demonstrations** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **3) Blackboard & chalk** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **4) Glass lantern slides projected** (used in 1950's, 1960's; precursor to 35mm slides) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **5) Acetates projected in class** (using overhead projector) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |

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| Resources | Tick if Available | | Tick if in Use | | This method/technology is … | | | | | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Not at all useful | Not very useful | Useful | Very useful | Extremely useful | |
| **6) 35mm slides projected in class** (= 2x2” photographic slides or blue & white diazos) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **7) Electronic slides** (on teacher’s computer, projected using data projector) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **Small group tutorial methods and technologies** | | | | | | | | | | |
| **8) Peer-assisted learning** (studying with colleagues) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **9) One-to-one tutorials** (including ‘seeing practice’ or EMS) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **10) Small group tutorials** (approx. 5-7 students with tutor) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **11) Flipcharts / whiteboards** (successor to blackboards, used commonly in small group tutorials) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **Directed self study methods and technologies** | | | | | | | | | | |
| **12) Textbooks** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |



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| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **13) 'Book' of printed student course notes** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **14) Photocopied handouts** (diagrams & notes distributed in tutorials or lectures) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **15) Journal articles** | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **16) Tape-slide programs** (1960's-1980's; booth containing slides which student browses through while listening to audio cassette) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **17) Computer-aided learning (CAL) packages** e.g. on CDROM or on Local Area Network (1980's onwards) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **18) Internet (online) resources** (including Virtual Learning Environments, late 1990's onwards) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |
| **Practical ('Hands-on' training) – preclinical, paraclinical and clinical** | | | | | | | | | | |
| **19) Practical classes** (laboratories, including cadaver dissection and surgery) | Y | | Y | | | | | | | |
| | N | | N | | | | | | | |
| | NS | | NS | | | | | | | |



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| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **20) Hands-on clinical training** (with real animal) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **21) Wall-mounted posters** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **22) Models / mannequins** (e.g. plastic or skeletal) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **23) Preserved specimens** (e.g. in formaldehyde or Perspex) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **Sound and vision (moving pictures)** | | | | | | | | | | |
| **24) Closed Circuit Television (CCTV)** (e.g. for relaying a demonstration or lecture to a 2nd lecture theatre) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **25) Cine films (16mm or 32 mm formats, precursor to video)** e.g. projected in lecture or tutorial | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **26) Educational television broadcasts** (e.g. Open University TV programmes) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |

| Resources | Tick if Available | | Tick if in Use | | This method/technology is … Not at all useful | Not very useful | Useful | Very useful | Extremely useful | Reason for answer |
|---|---|---|---|---|---|---|---|---|---|---|
| **27) Analogue audio (cassette) recordings** | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |
| **28) Video recordings** (VHS or Betamax) | **Y** | | **Y** | | | | | | | |
| | **N** | | **N** | | | | | | | |
| | **NS** | | **NS** | | | | | | | |

# PART 4.

It would be helpful to have some information about yourself so that I can assess whether there are any differences between the responses of participants of different gender, occupation, or who studied at different times.

4. **Please tick the box that best describes your current role.**
   (Please tick one option.)

☐ Undergraduate student ☐ Postgraduate student

☐ Practitioner ☐ Retired practitioner

☐ University teacher ☐ Retired university teacher

☐ Other (Please specify) ………………………………..

5. **In which year did you begin studying veterinary medicine?** ☐☐☐☐

6. **In which year did you graduate?** ☐☐☐☐
   (If you are an undergraduate student please skip this question and go to Q9.)

7. **If not Glasgow, which veterinary school did you graduate from?**

   ……………………………

8. **If you were/are a university teacher, which subject(s) did/do you teach?**
(Practitioners and alumni who are not university teachers please skip this question and go to Q10.)

…………………………………………………….

9. **If you are currently an undergraduate student, which year are you in presently?** ☐
e.g. 1, 2, 3, 4 or 5.
(If you have already graduated please skip this question and go to Q10.)

10. **What age were you when you entered the undergraduate veterinary course?** ☐☐ (years)

11. **Are you …**

☐ Male ☐ Female

12. **Please can you tell me where you spent the majority of your most formative years i.e. primary and secondary school years.** (Please tick one option.)

☐ Asia ☐ Africa ☐ Australasia

☐ UK and Eire ☐ Europe (not UK and Eire) ☐ North America

☐ South America

13. **Please provide any other feedback, comments or questions. Your input is very much valued.**

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**Thank you very much for taking the time to participate in this study.**
**Your help is really appreciated.**

If you completed the paper-based questionnaire, please checked that you have signed the consent form in Part 1. Please return the completed questionnaire in the postage-paid addressed envelope provided (UK residents only). Thank you.

Vicki Dale: Educational Technologist
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## Appendix C: Letter sent to Veterinary Record

### Calling all Glasgow Graduates!

I would like to appeal to graduates of the Faculty of Veterinary Medicine, University of Glasgow (formerly Glasgow Veterinary College), to participate in a questionnaire survey that I hope will influence the delivery of undergraduate veterinary education in the future.

The questionnaire has been designed to gather information about what teaching methods and technologies have been used in veterinary undergraduate education at Glasgow between 1949 and the present, and their usefulness, from a student point of view and subsequently as a teacher or through continuing professional development. Respondents are also encouraged to make comments where appropriate.

It is hoped that as well as gathering information about veterinary education at Glasgow to date, I can draw up some recommendations for the future based on participants' attitudes to teaching and learning methods. I also believe that the results will be of interest to other veterinary schools.

Building on the results of the survey, I would like to conduct interviews and focus groups over the coming months with alumni, current students and teachers, and retired members of teaching staff.

A copy of the questionnaire was sent to approximately 2600 alumni on the mailing list of the Glasgow Veterinary Faculty Newsletter in August, and I'm tremendously grateful to the 300 people who have already completed and returned the questionnaire.

There is an electronic version available at www.gla.ac.uk/vhmd which can be downloaded, completed offline and emailed. I'd be really grateful if Glasgow alumni who have not yet had a chance to complete the questionnaire, or who did not receive a copy, could complete the electronic form. If you would like to receive a paper-based form please let me know.

With many thanks,

Vicki H.M. Dale

Teaching Unit, Faculty of Veterinary Medicine, University of Glasgow
Tel. 0141 330 2319, Email v.dale@vet.gla.ac.uk

## *Appendix D1: Coding scheme for the pilot data analysis*

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| identify | Identifier | None | Nominal |
| ug_lec_a | UG_Lecture_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_lec_u | UG_Lecture_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_lec_r | UG_Lecture_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_pms_a | UG_PMs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pms_u | UG_PMs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pms_r | UG_PMs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_bbs_a | UG_BBoard_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_bbs_u | UG_BBoard_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_bbs_r | UG_BBoard_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ltn_a | UG_Lantern_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ltn_u | UG_Lantern_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ltn_r | UG_Lantern_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_act_a | UG_Acetates_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_act_u | UG_Acetates_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_act_r | UG_Acetates_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_35m_a | UG_35mm_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_35m_u | UG_35mm_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_35m_r | UG_35mm_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ppt_a | UG_Eslides_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ppt_u | UG_Eslides_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ppt_r | UG_Eslides_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ind_a | UG_IndTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ind_u | UG_IndTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ind_r | UG_IndTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_grp_a | UG_GrpTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_grp_u | UG_GrpTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_grp_r | UG_GrpTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_flp_a | UG_Flipcht_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_flp_u | UG_Flipcht_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| ug_flp_r | UG_Flipcht_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ldc_a | UG_Ldisc_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ldc_u | UG_Ldisc_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ldc_r | UG_Ldisc_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_tbk_a | UG_Tbooks_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tbk_u | UG_Tbooks_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tbk_r | UG_Tbooks_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_nts_a | UG_Notes_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_nts_u | UG_Notes_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_nts_r | UG_Notes_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_hnt_a | UG_Handouts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hnt_u | UG_Handouts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hnt_r | UG_Handouts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_jnl_a | UG_Journals_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_jnl_u | UG_Journals_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_jnl_r | UG_Journals_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_prg_a | UG_ProgLearn_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prg_u | UG_ProgLearn_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prg_r | UG_ProgLearn_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_cal_a | UG_CAL_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cal_u | UG_CAL_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cal_r | UG_CAL_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_int_a | UG_Internet_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_int_u | UG_Internet_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_int_r | UG_Internet_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_prc_a | UG_Pracs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prc_u | UG_Pracs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prc_r | UG_Pracs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_hdn_a | UG_Handson_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hdn_u | UG_Handson_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hdn_r | UG_Handson_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_pst_a | UG_Posters_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pst_u | UG_Posters_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

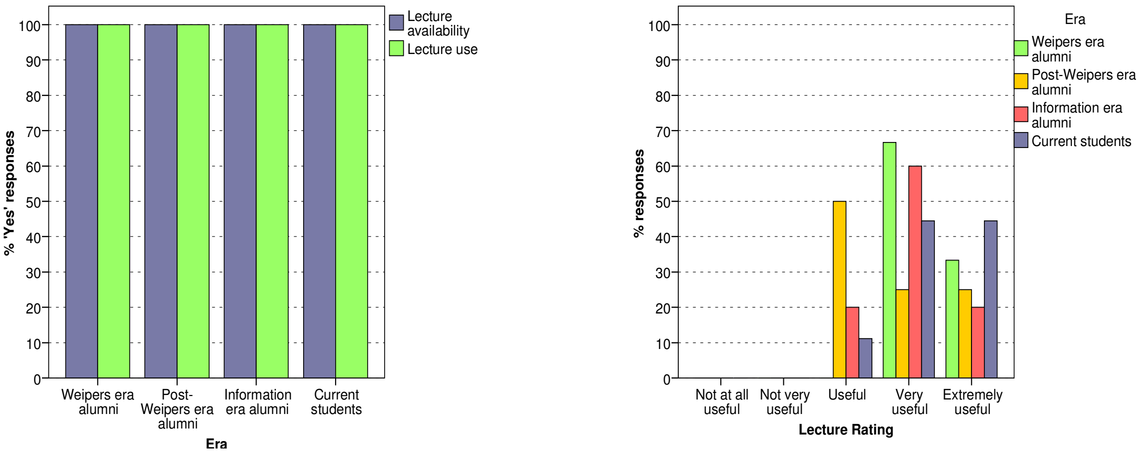
| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| ug_pst_r | UG_Posters_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_mod_a | UG_Models_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_mod_u | UG_Models_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_mod_r | UG_Models_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_spc_a | UG_Spec_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_spc_u | UG_Spec_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_spc_r | UG_Spec_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ctv_a | UG_CCTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ctv_u | UG_CCTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ctv_r | UG_CCTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_cin_a | UG_Cine_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cin_u | UG_Cine_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cin_r | UG_Cine_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_etv_a | UG_EdTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_etv_u | UG_EdTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_etv_r | UG_EdTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_aud_a | UG_Audio_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_aud_u | UG_Audio_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_aud_r | UG_Audio_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_vid_a | UG_Video_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_vid_u | UG_Video_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_vid_r | UG_Video_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_lec_a | PG_Lecture_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_lec_u | PG_Lecture_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_lec_r | PG_Lecture_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_pms_a | PG_PMs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pms_u | PG_PMs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pms_r | PG_PMs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_bbs_a | PG_BBoard_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_bbs_u | PG_BBoard_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_bbs_r | PG_BBoard_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ltn_a | PG_Lantern_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ltn_u | PG_Lantern_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_ltn_r | PG_Lantern_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_act_a | PG_Acetates_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_act_u | PG_Acetates_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_act_r | PG_Acetates_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_35m_a | PG_35mm_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_35m_u | PG_35mm_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_35m_r | PG_35mm_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ppt_a | PG_Eslides_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ppt_u | PG_Eslides_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ppt_r | PG_Eslides_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ind_a | PG_IndTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ind_u | PG_IndTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ind_r | PG_IndTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_grp_a | PG_GrpTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_grp_u | PG_GrpTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_grp_r | PG_GrpTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_flp_a | PG_Flipcht_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_flp_u | PG_Flipcht_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_flp_r | PG_Flipcht_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ldc_a | PG_Ldisc_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ldc_u | PG_Ldisc_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ldc_r | PG_Ldisc_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_tbk_a | PG_Tbooks_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tbk_u | PG_Tbooks_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tbk_r | PG_Tbooks_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_nts_a | PG_Notes_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_nts_u | PG_Notes_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_nts_r | PG_Notes_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_hnt_a | PG_Handouts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hnt_u | PG_Handouts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hnt_r | PG_Handouts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_jnl_a | PG_Journals_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_jnl_u | PG_Journals_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

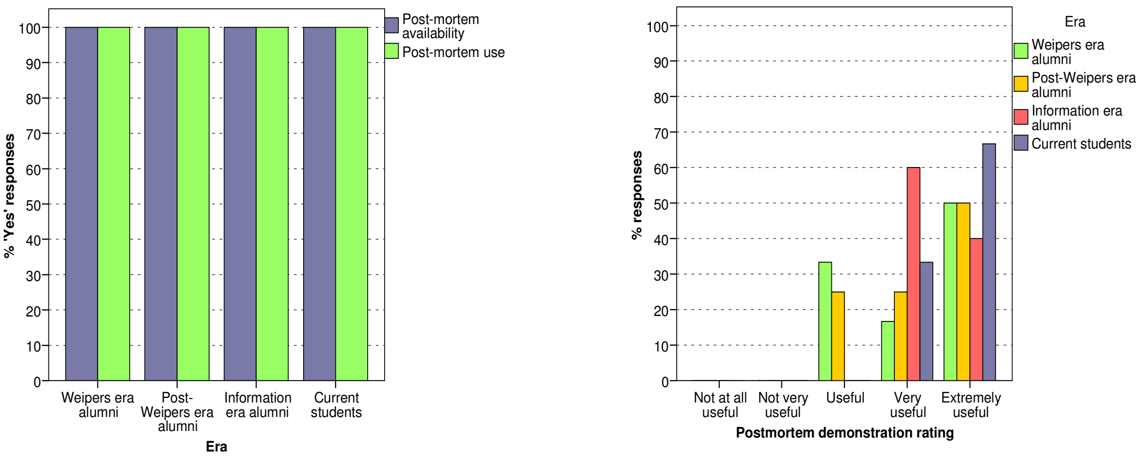
| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_jnl_r | PG_Journals_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_prg_a | PG_ProgLearn_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prg_u | PG_ProgLearn_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prg_r | PG_ProgLearn_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_cal_a | PG_CAL_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cal_u | PG_CAL_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cal_r | PG_CAL_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_int_a | PG_Internet_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_int_u | PG_Internet_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_int_r | PG_Internet_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_prc_a | PG_Pracs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prc_u | PG_Pracs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prc_r | PG_Pracs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_hdn_a | PG_Handson_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hdn_u | PG_Handson_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hdn_r | PG_Handson_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_pst_a | PG_Posters_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pst_u | PG_Posters_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pst_r | PG_Posters_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_mod_a | PG_Models_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_mod_u | PG_Models_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_mod_r | PG_Models_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_spc_a | PG_Spec_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_spc_u | PG_Spec_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_spc_r | PG_Spec_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ctv_a | PG_CCTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ctv_u | PG_CCTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ctv_r | PG_CCTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_cin_a | PG_Cine_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cin_u | PG_Cine_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cin_r | PG_Cine_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_etv_a | PG_EdTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_etv_u | PG_EdTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_etv_r | PG_EdTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_aud_a | PG_Audio_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_aud_u | PG_Audio_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_aud_r | PG_Audio_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_vid_a | PG_Video_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_vid_u | PG_Video_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_vid_r | PG_Video_Used | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| role | Role | 1=Undergraduate student, 2=Postgraduate student, 3=University teacher, 4=Practitioner, 5=Retired university teacher, 6=Retired practitioner, 7=Other, 9=Missing | Nominal |
| admitted | Year of admittance | yyyy | Scale |
| study_yr | Year of study | 1=First year; 2=Second year; 3=Third year; 4=Fourth year; 5=Fifth year | Ordinal |
| graduatd | Year of graduation | yyyy | Scale |
| era | Era | 1=pre-weipers, 2=weipers, 3=post-weipers, 4=information, 9=Missing | Nominal |
| age | Admission age | n | Scale |
| gender | Gender | 1=Male, 2=Female, 9=Missing | Nominal |
| culture | Culture | 1=Asia, 2=Africa, 3=Australasia, 4=Europe, 5=North America, 6=UK and Eire, 7=South America, 8=Dual affiliation, 0=Other, 9=Missing | Nominal |
| time | Form completion time | n | Scale |
| legible | Legibility of form | 0=No, 1=Yes, 9=Missing | Nominal |
| language | Language - how clear | 0=Ambiguous, 1=Clear, 9=Missing | Nominal |

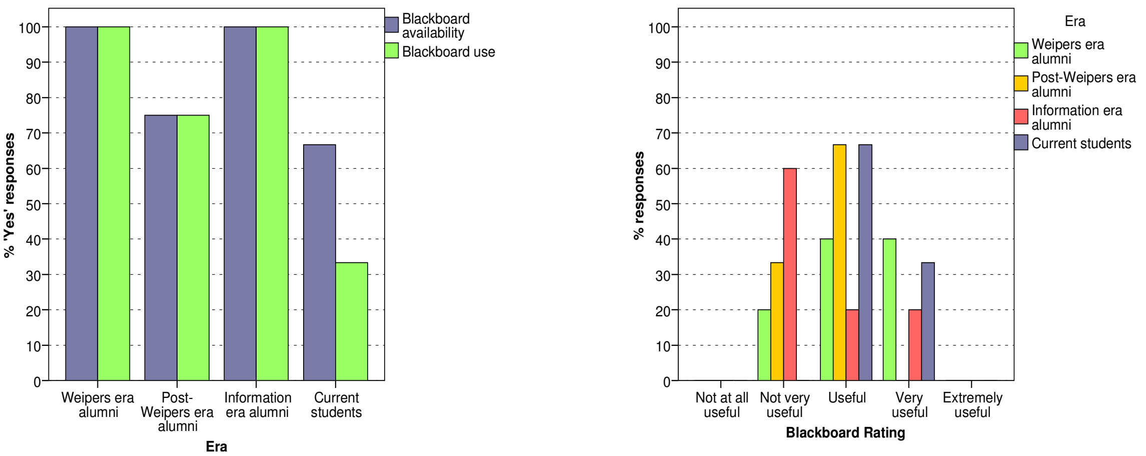
# Appendix D2: Availability, use and rating of methods and technologies by alumni and current students in pilot study



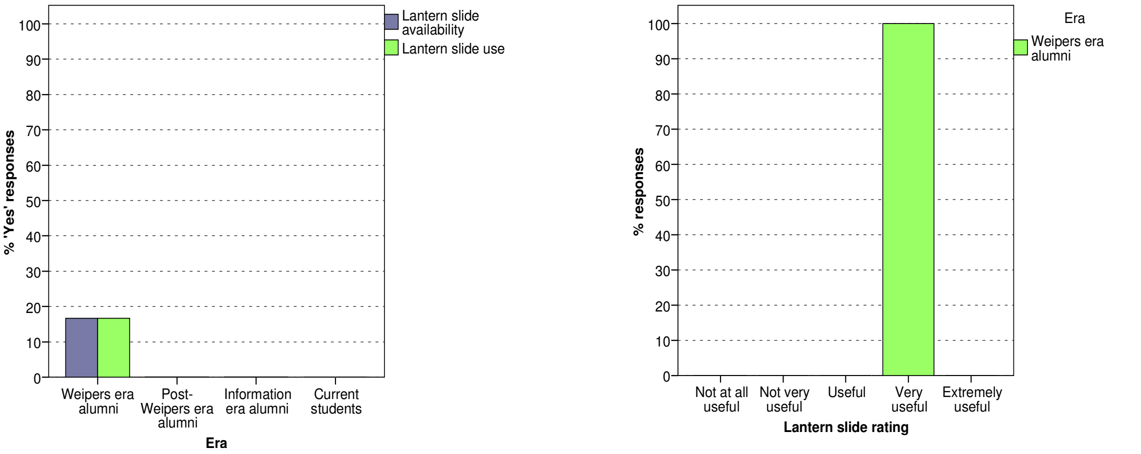

**Availability, use and rating of the lecture**



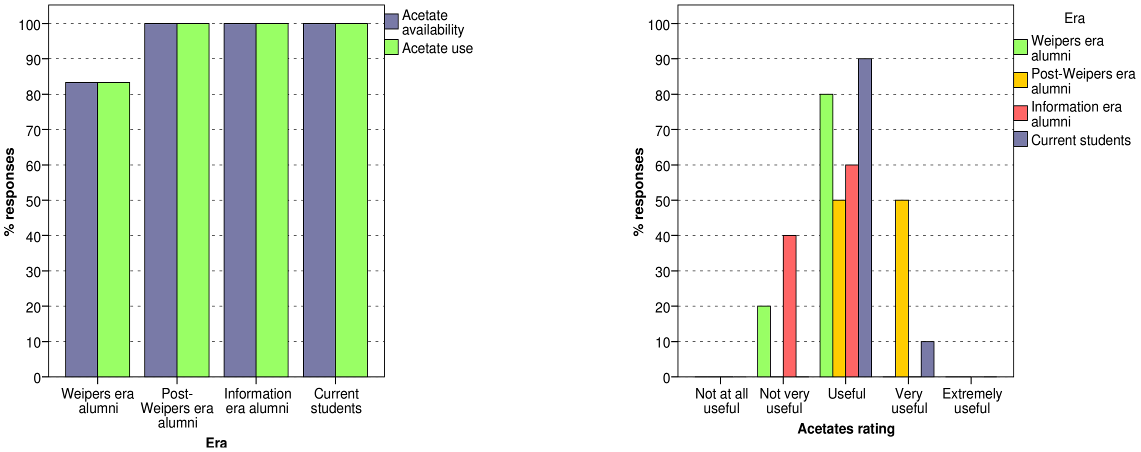

**Availability, use and rating of the post-mortem demonstration**



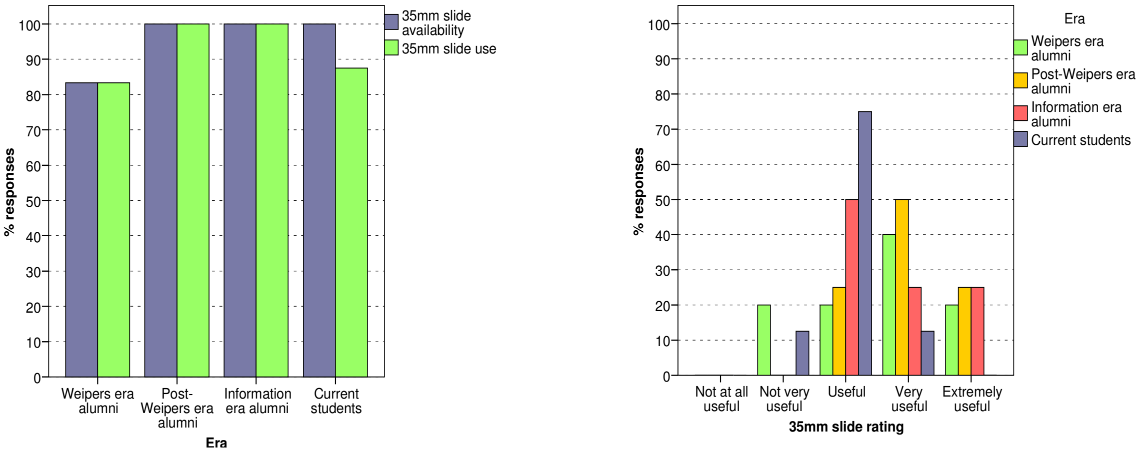

**Availability, use and rating of the blackboard**



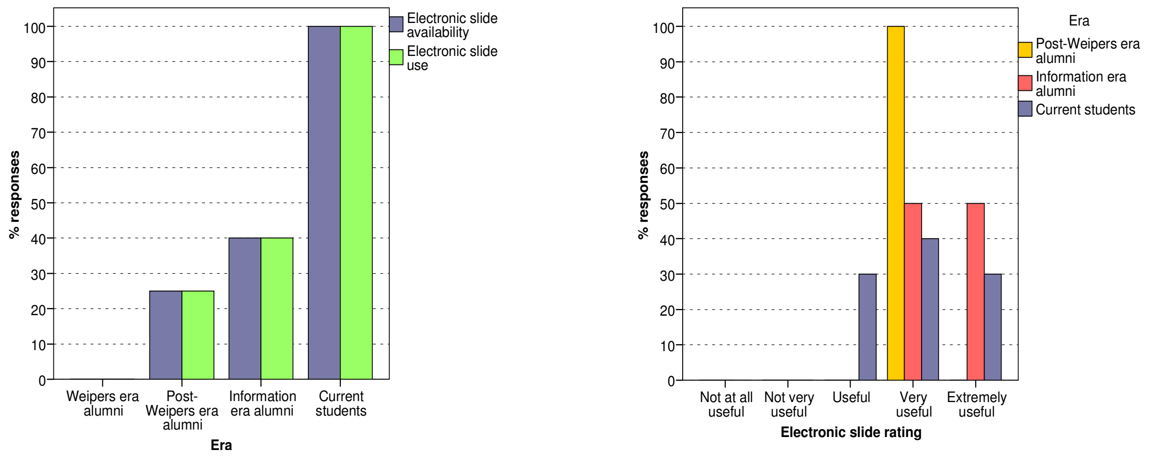

**Availability, use and rating of lantern slides**



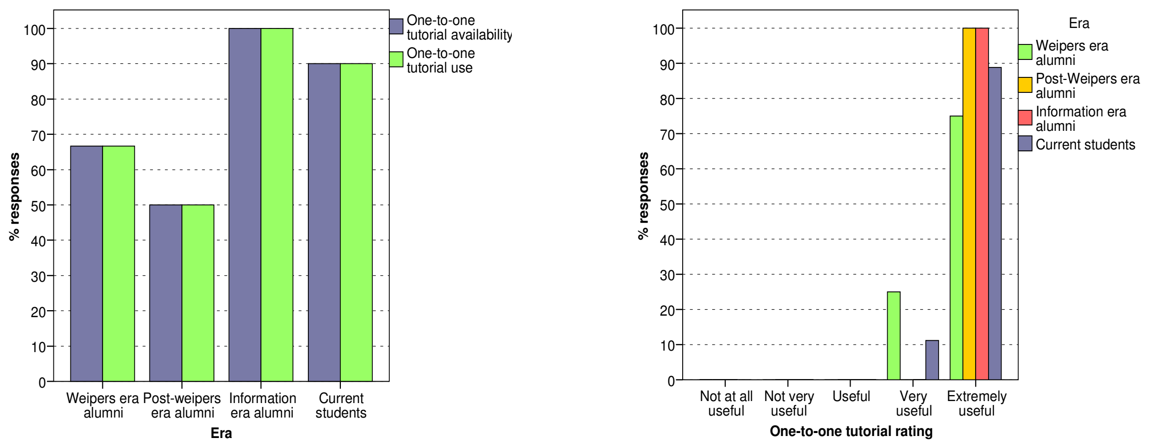

**Availability, use and rating of acetates**



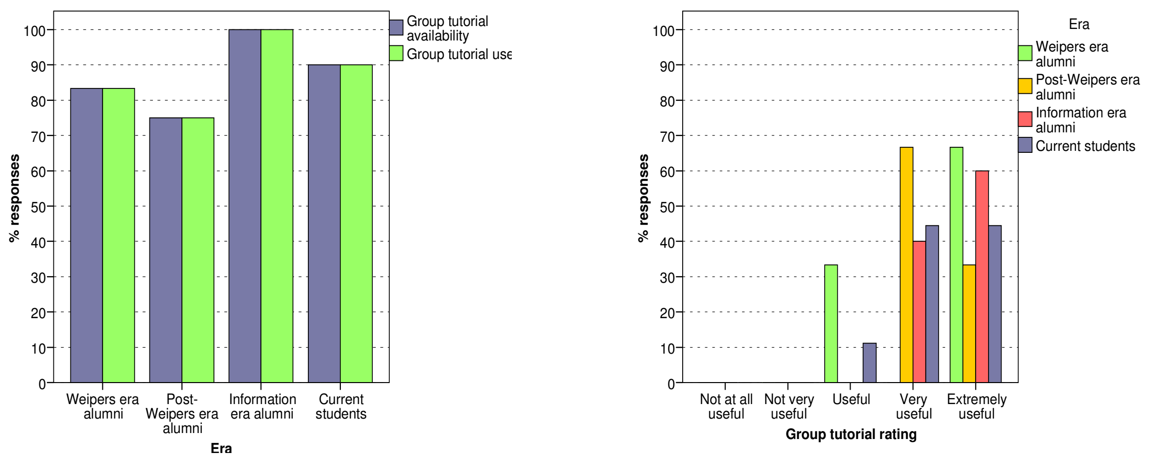

**Availability, use and rating of 35mm slides**



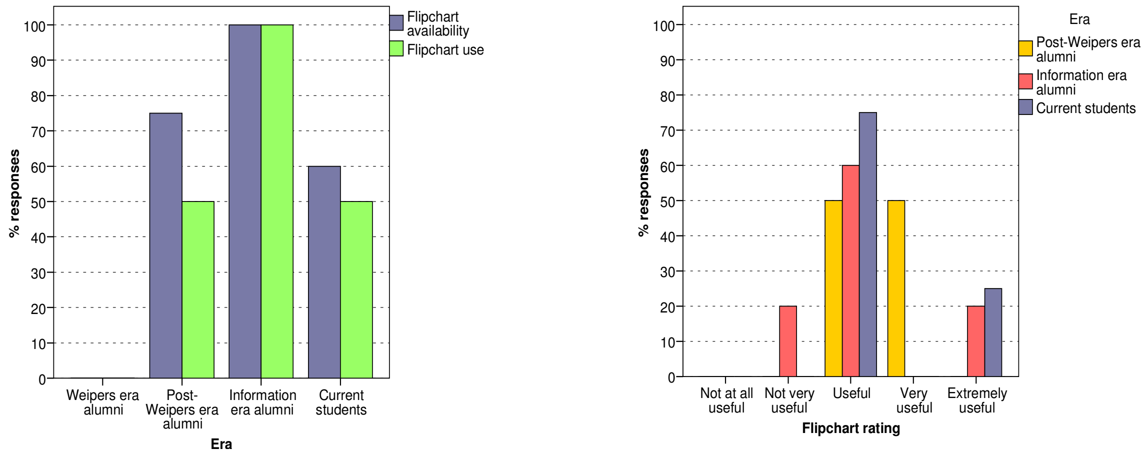

**Availability, use and rating of electronic slides (PowerPoint)**



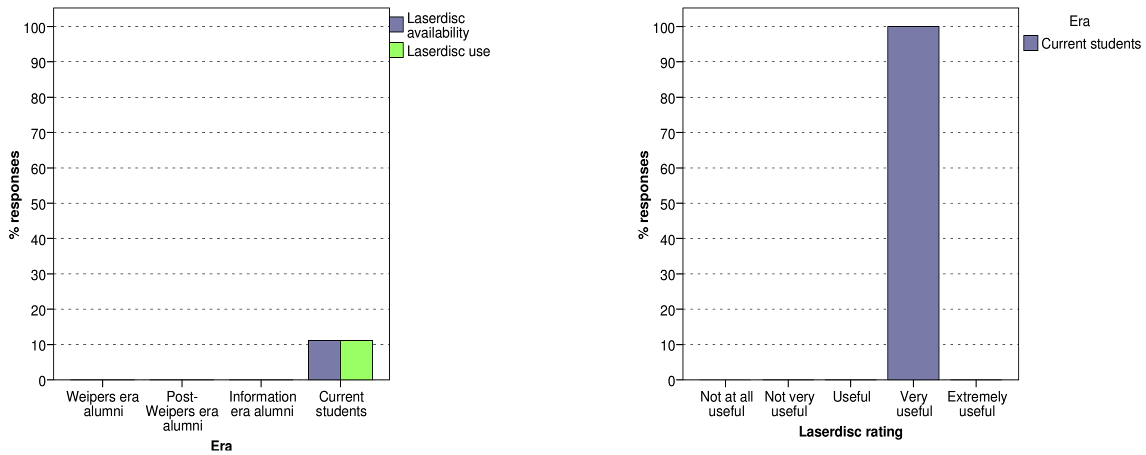

**Availability, use and rating of the one-to-one tutorial**



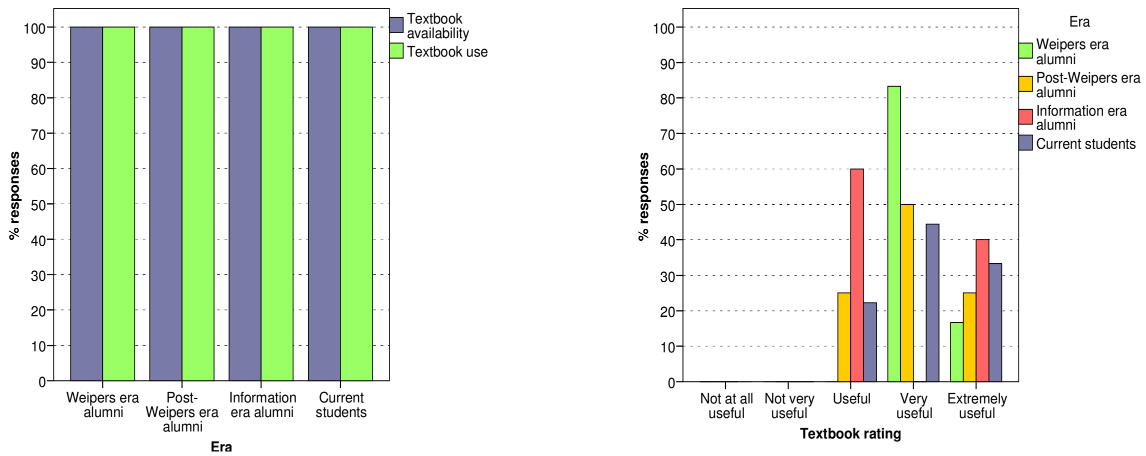

**Availability, use and rating of the group tutorial**



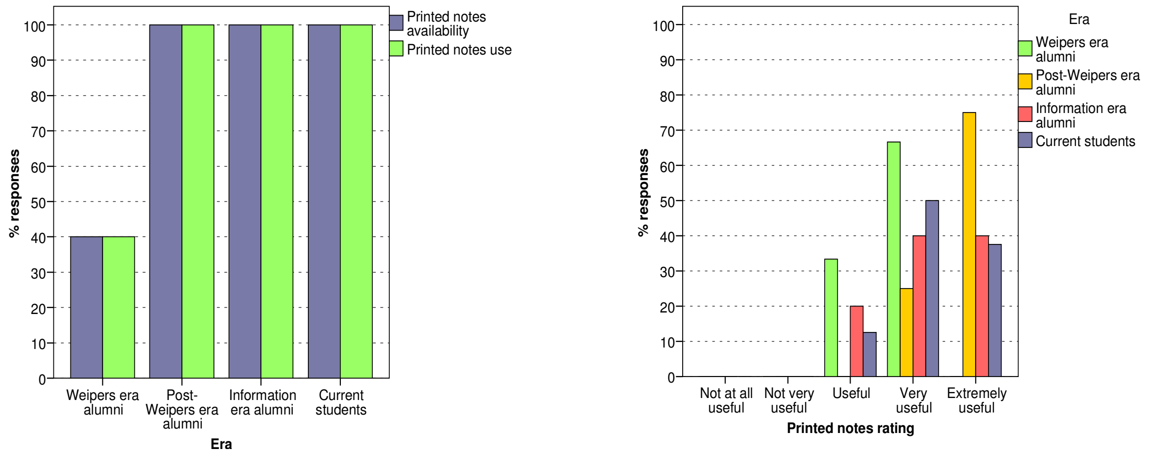

**Availability, use and rating of flipcharts/whiteboards**



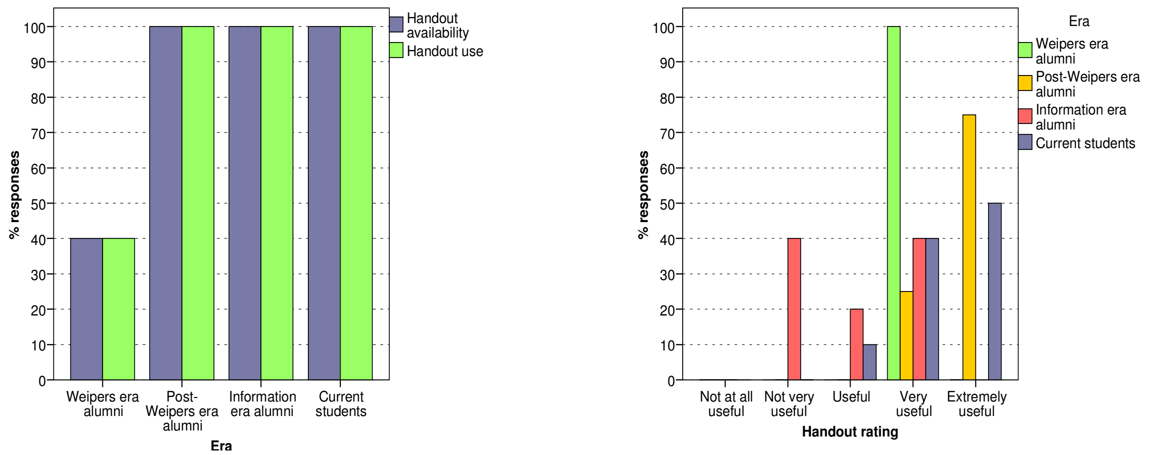

**Availability, use and rating of laserdiscs**



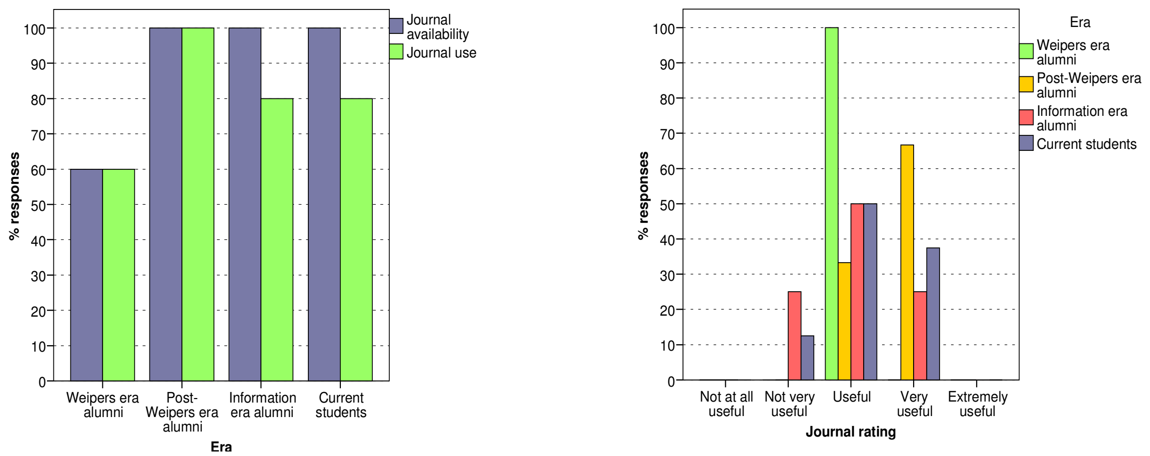

**Availability, use and rating of textbooks**



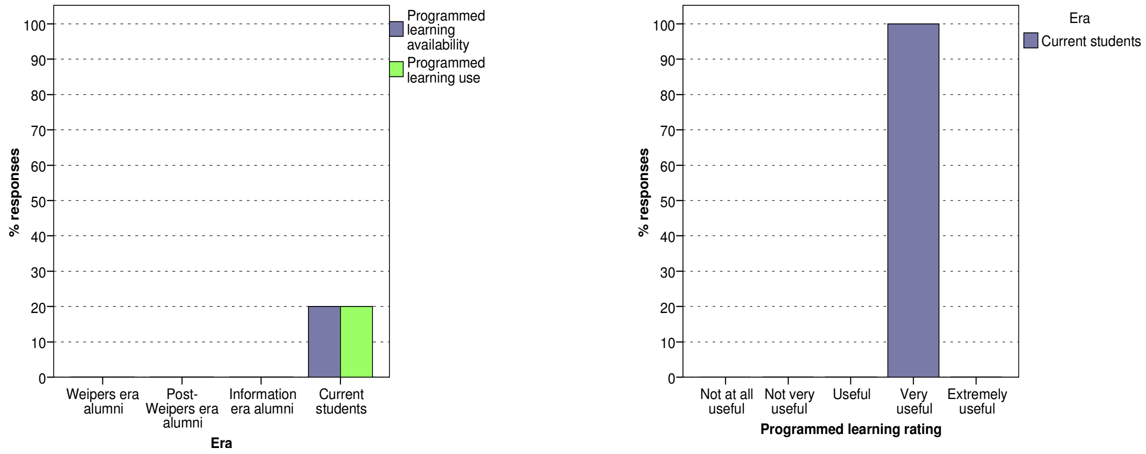

**Availability, use and rating of printed student notes**



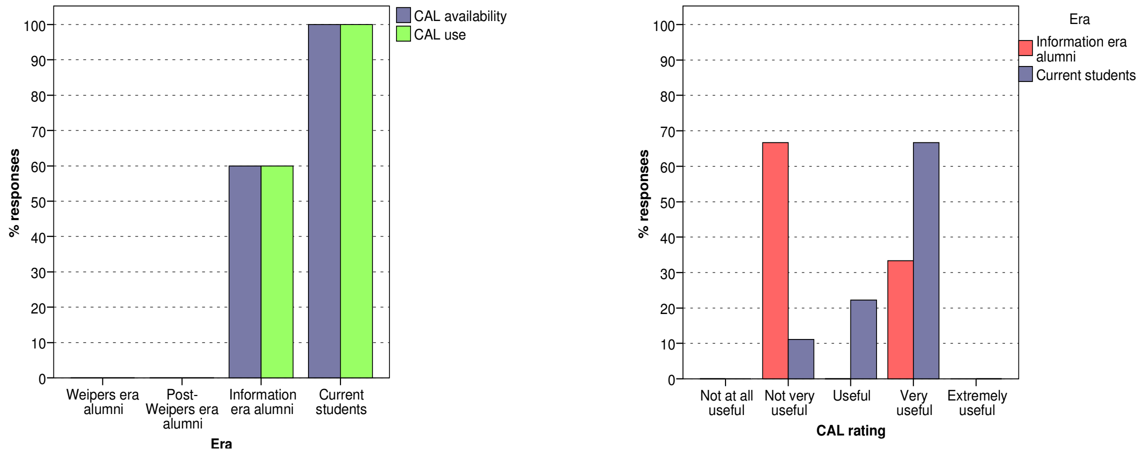

**Availability, use and rating of handouts**



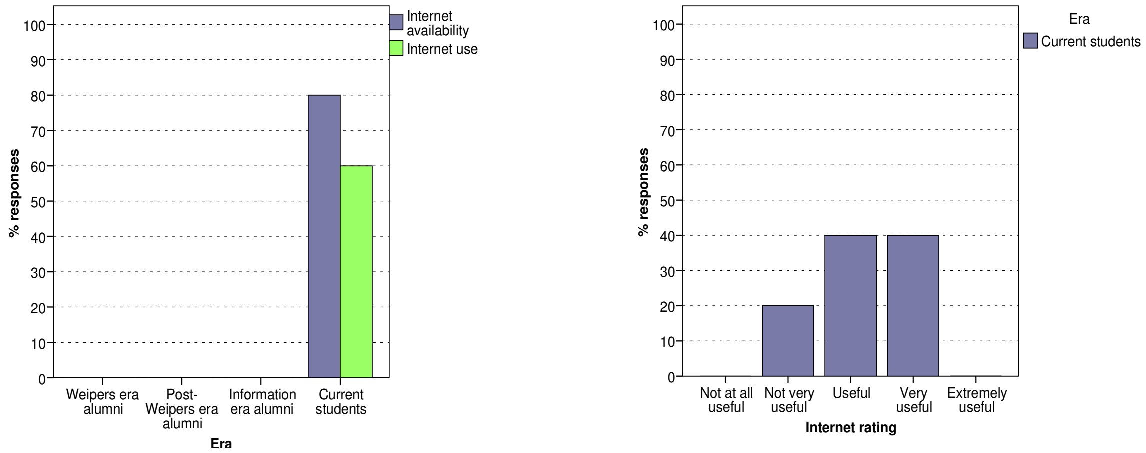

**Availability, use and rating of journals**



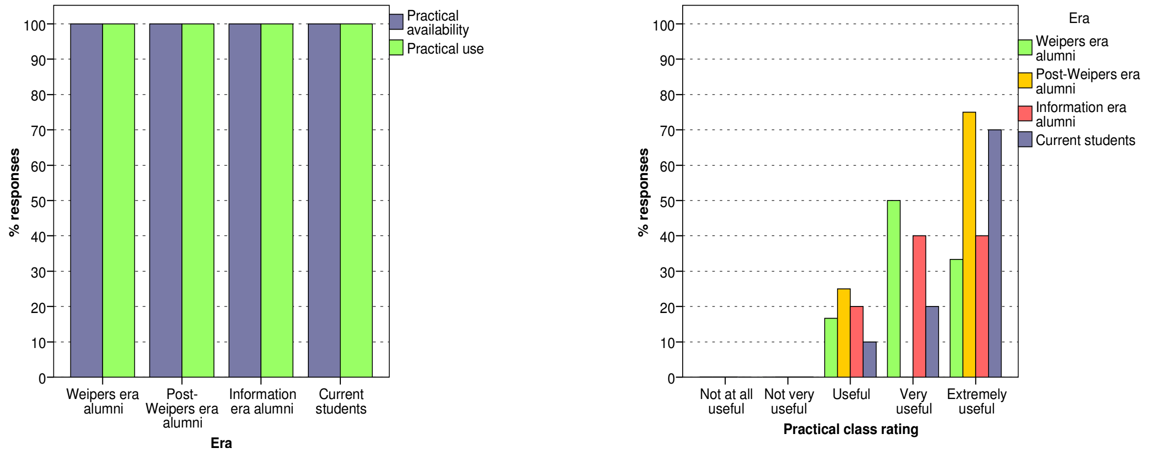

**Availability, use and rating of programmed learning**



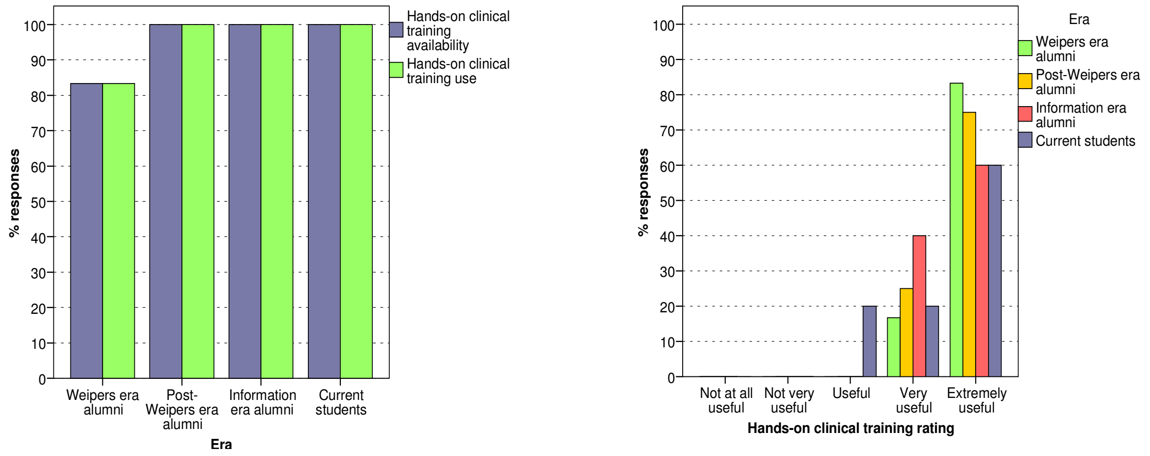

**Availability, use and rating of CAL programs**



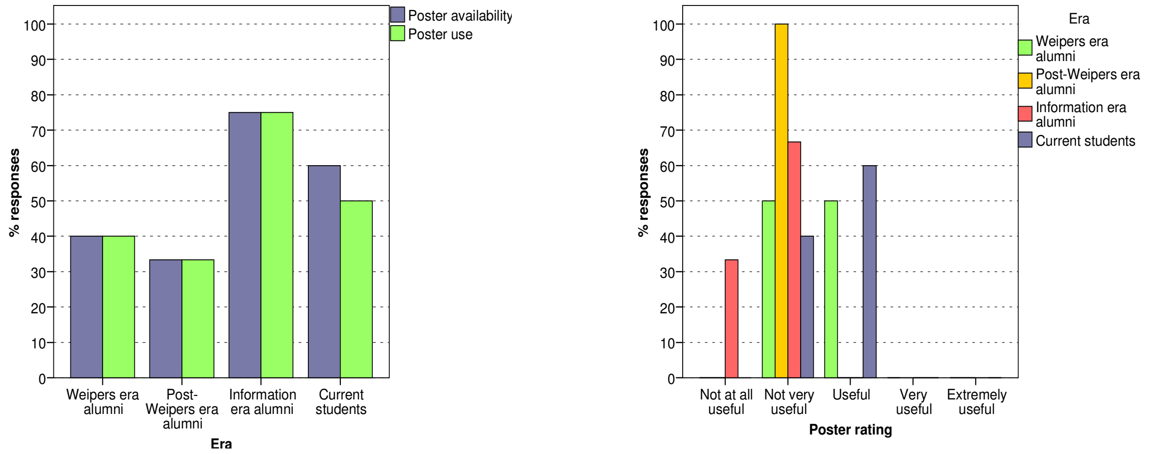

**Availability, use and rating of the internet**



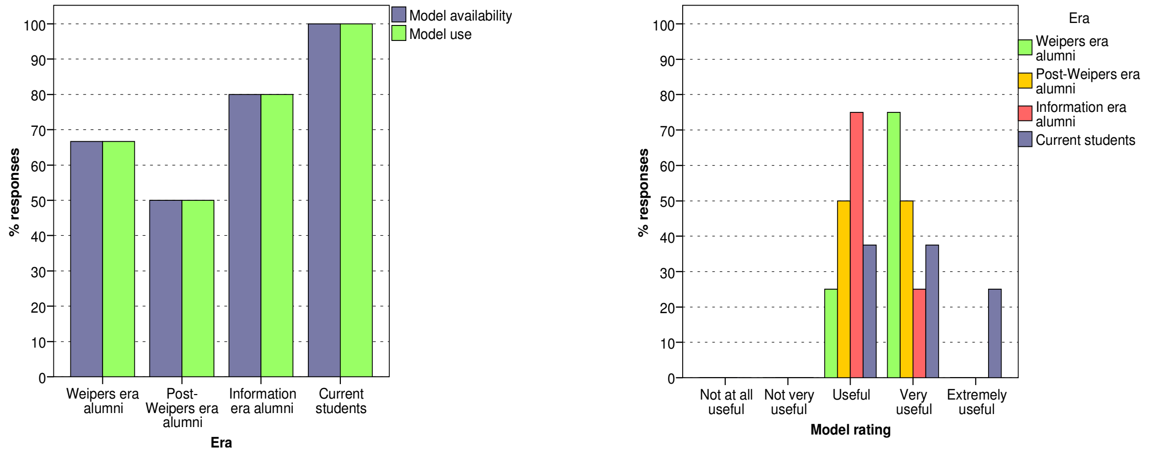

**Availability, use and rating of the practical class**



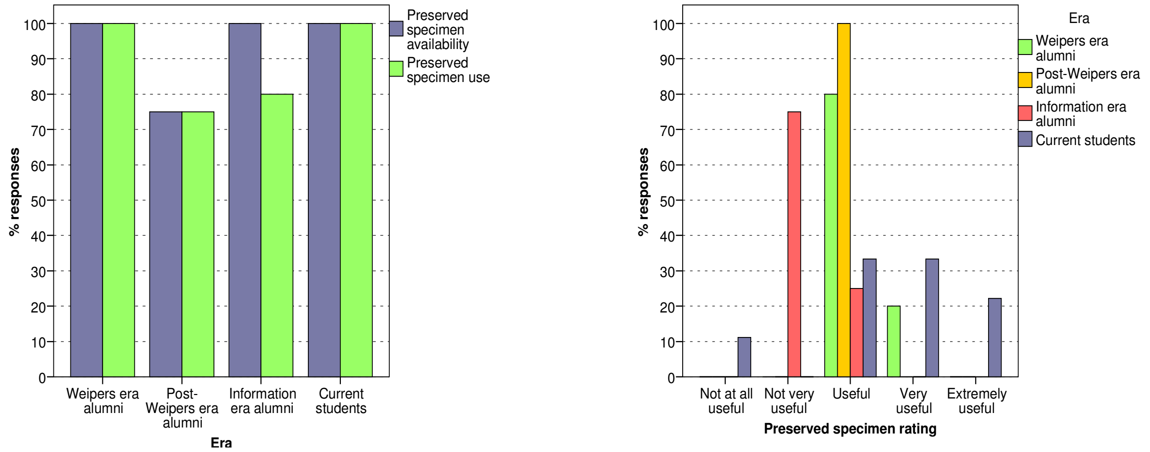

**Availability, use and rating of hands-on clinical training**



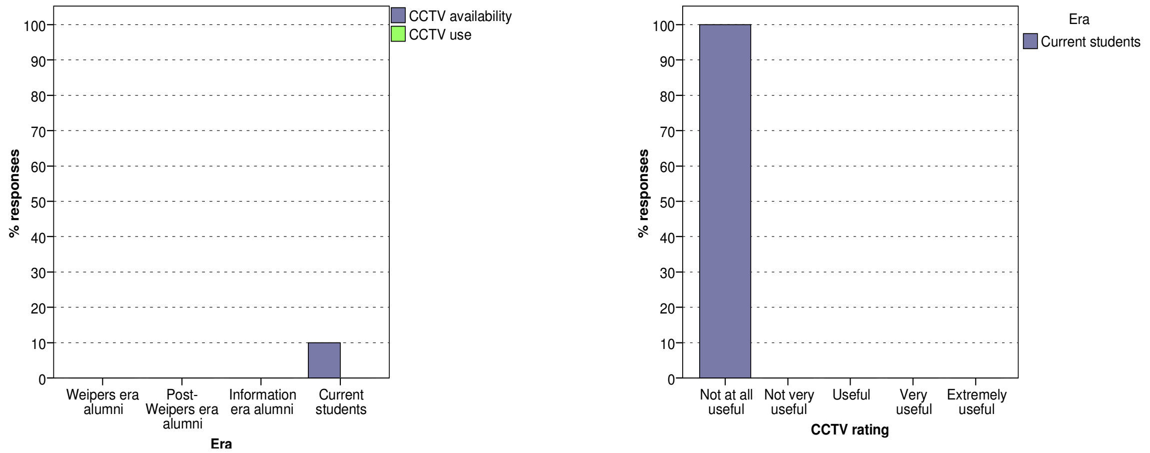

**Availability, use and rating of posters**



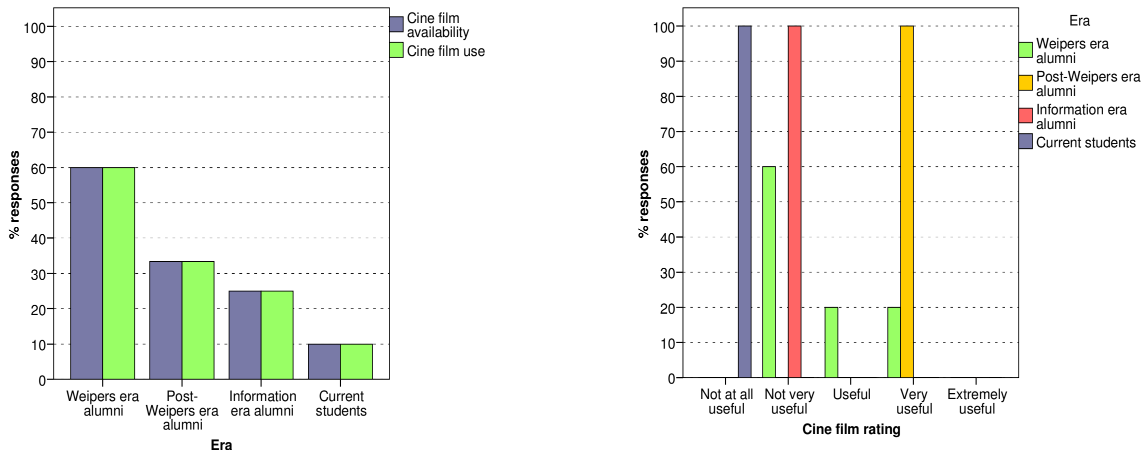

**Availability, use and rating of models**



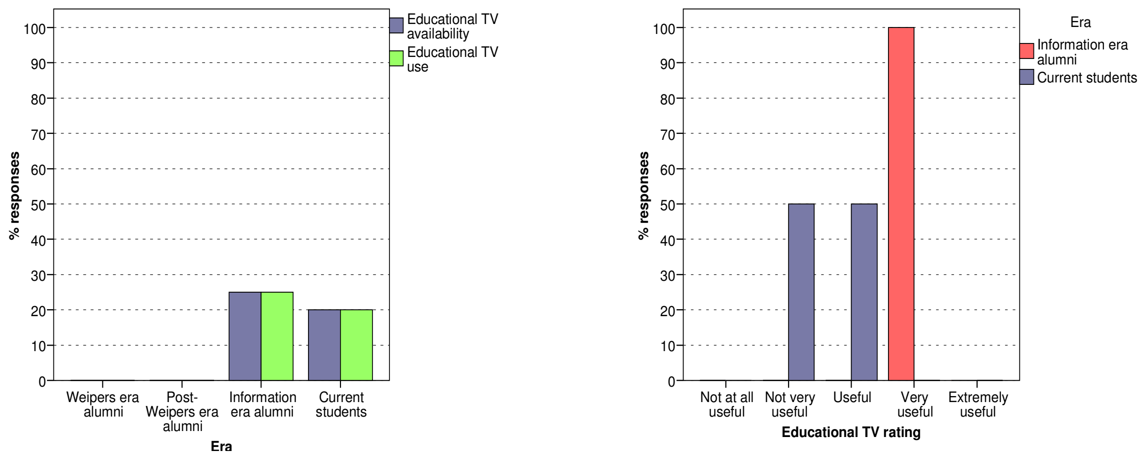

**Availability, use and rating of preserved specimens**



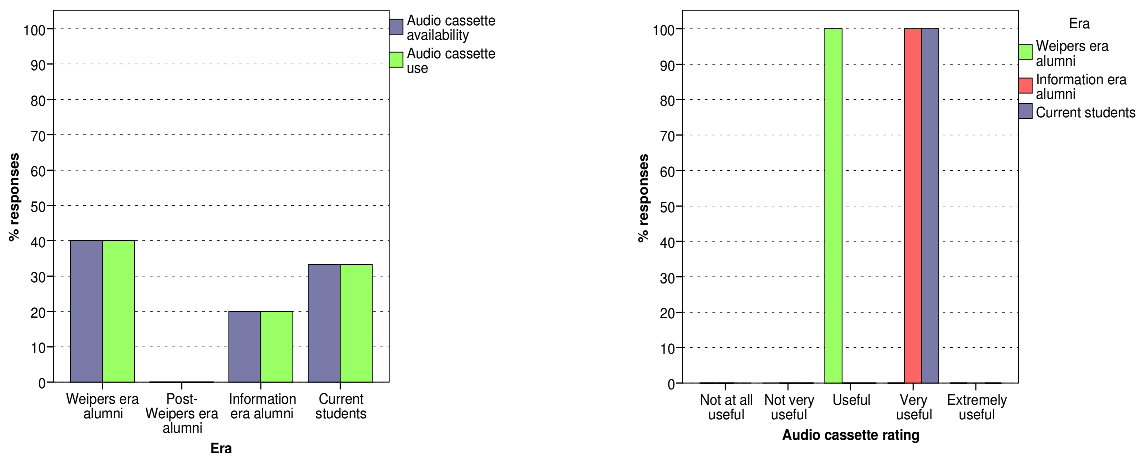

**Availability, use and rating of CCTV**



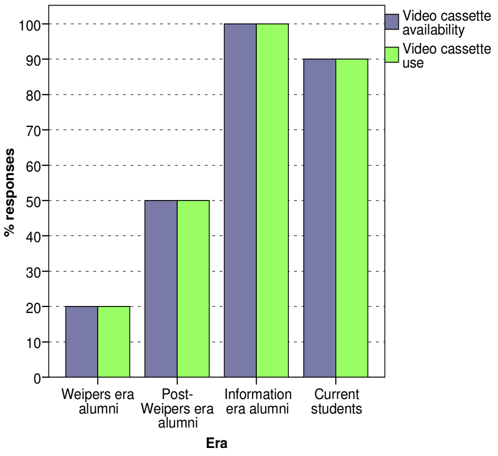

**Availability, use and rating of cine films**

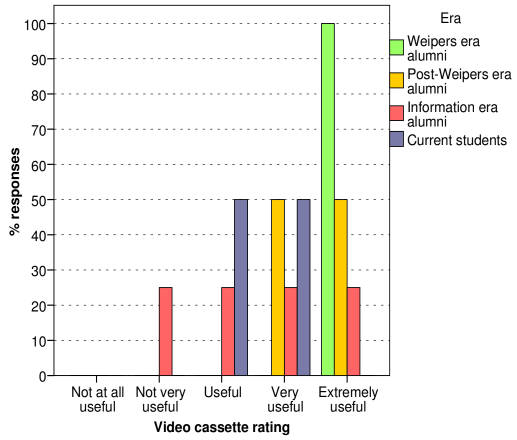



**Availability, use and rating of educational television**




**Availability, use and rating of audio cassettes**




**Availability, use and rating of video cassettes**

## *Appendix D3: Coding scheme for analysis of real survey data*

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| identify | Identifier | None | Nominal |
| ug_lec_a | UG_Lecture_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_lec_u | UG_Lecture_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_lec_r | UG_Lecture_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_pms_a | UG_PMs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pms_u | UG_PMs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pms_r | UG_PMs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_bbs_a | UG_BBoard_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_bbs_u | UG_BBoard_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_bbs_r | UG_BBoard_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ltn_a | UG_Lantern_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ltn_u | UG_Lantern_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ltn_r | UG_Lantern_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_act_a | UG_Acetates_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_act_u | UG_Acetates_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_act_r | UG_Acetates_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_35m_a | UG_35mm_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_35m_u | UG_35mm_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_35m_r | UG_35mm_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ppt_a | UG_Eslides_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ppt_u | UG_Eslides_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ppt_r | UG_Eslides_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_pr_a | UG_Peer_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pr_u | UG_Peer_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug+pr_r | UG_Peer_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ind_a | UG_IndTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ind_u | UG_IndTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ind_r | UG_IndTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_grp_a | UG_GrpTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_grp_u | UG_GrpTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| ug_grp_r | UG_GrpTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_flp_a | UG_Flipcht_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_flp_u | UG_Flipcht_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_flp_r | UG_Flipcht_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_tbk_a | UG_Tbooks_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tbk_u | UG_Tbooks_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tbk_r | UG_Tbooks_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_nts_a | UG_Notes_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_nts_u | UG_Notes_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_nts_r | UG_Notes_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_hnt_a | UG_Handouts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hnt_u | UG_Handouts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hnt_r | UG_Handouts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_jnl_a | UG_Journals_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_jnl_u | UG_Journals_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_jnl_r | UG_Journals_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_tps_a | UG_TapeSlide_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tps_u | UG_TapeSlide_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_tps_r | UG_TapeSlide_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_cal_a | UG_CAL_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cal_u | UG_CAL_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cal_r | UG_CAL_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_int_a | UG_Internet_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_int_u | UG_Internet_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_int_r | UG_Internet_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_prc_a | UG_Pracs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prc_u | UG_Pracs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_prc_r | UG_Pracs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_hdn_a | UG_Handson_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hdn_u | UG_Handson_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_hdn_r | UG_Handson_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_pst_a | UG_Posters_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_pst_u | UG_Posters_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| ug_pst_r | UG_Posters_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_mod_a | UG_Models_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_mod_u | UG_Models_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_mod_r | UG_Models_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_spc_a | UG_Spec_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_spc_u | UG_Spec_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_spc_r | UG_Spec_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_ctv_a | UG_CCTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ctv_u | UG_CCTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_ctv_r | UG_CCTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_cin_a | UG_Cine_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cin_u | UG_Cine_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_cin_r | UG_Cine_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_etv_a | UG_EdTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_etv_u | UG_EdTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_etv_r | UG_EdTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_aud_a | UG_Audio_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_aud_u | UG_Audio_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_aud_r | UG_Audio_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| ug_vid_a | UG_Video_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_vid_u | UG_Video_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| ug_vid_r | UG_Video_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_lec_a | PG_Lecture_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_lec_u | PG_Lecture_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_lec_r | PG_Lecture_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_pms_a | PG_PMs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pms_u | PG_PMs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pms_r | PG_PMs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_bbs_a | PG_BBoard_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_bbs_u | PG_BBoard_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_bbs_r | PG_BBoard_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ltn_a | PG_Lantern_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ltn_u | PG_Lantern_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_ltn_r | PG_Lantern_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_act_a | PG_Acetates_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_act_u | PG_Acetates_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_act_r | PG_Acetates_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_35m_a | PG_35mm_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_35m_u | PG_35mm_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_35m_r | PG_35mm_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ppt_a | PG_Eslides_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ppt_u | PG_Eslides_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ppt_r | PG_Eslides_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_pr_a | PG_Peer_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pr_u | PG_Peer_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pr_r | PG_Peer_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ind_a | PG_IndTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ind_u | PG_IndTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ind_r | PG_IndTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_grp_a | PG_GrpTuts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_grp_u | PG_GrpTuts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_grp_r | PG_GrpTuts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_flp_a | PG_Flipcht_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_flp_u | PG_Flipcht_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_flp_r | PG_Flipcht_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_tbk_a | PG_Tbooks_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tbk_u | PG_Tbooks_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tbk_r | PG_Tbooks_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_nts_a | PG_Notes_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_nts_u | PG_Notes_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_nts_r | PG_Notes_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_hnt_a | PG_Handouts_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hnt_u | PG_Handouts_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hnt_r | PG_Handouts_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_jnl_a | PG_Journals_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_jnl_u | PG_Journals_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_jnl_r | PG_Journals_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_tps_a | PG_TapeSlide_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tps_u | PG_TapeSlide_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_tps_r | PG_TapeSlide_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_cal_a | PG_CAL_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cal_u | PG_CAL_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cal_r | PG_CAL_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_int_a | PG_Internet_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_int_u | PG_Internet_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_int_r | PG_Internet_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_prc_a | PG_Pracs_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prc_u | PG_Pracs_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_prc_r | PG_Pracs_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_hdn_a | PG_Handson_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hdn_u | PG_Handson_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_hdn_r | PG_Handson_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_pst_a | PG_Posters_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pst_u | PG_Posters_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_pst_r | PG_Posters_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_mod_a | PG_Models_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_mod_u | PG_Models_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_mod_r | PG_Models_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_spc_a | PG_Spec_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_spc_u | PG_Spec_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_spc_r | PG_Spec_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_ctv_a | PG_CCTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ctv_u | PG_CCTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_ctv_r | PG_CCTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_cin_a | PG_Cine_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cin_u | PG_Cine_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_cin_r | PG_Cine_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_etv_a | PG_EdTV_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_etv_u | PG_EdTV_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |

| Variable name | Label | Coding | Variable type |
|---|---|---|---|
| pg_etv_r | PG_EdTV_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_aud_a | PG_Audio_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_aud_u | PG_Audio_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_aud_r | PG_Audio_Rating | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| pg_vid_a | PG_Video_Avail | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_vid_u | PG_Video_Used | 0=No, 1=Yes, 2=Not sure, 9=missing | Nominal |
| pg_vid_r | PG_Video_Used | 1=Not at all useful, 2=Not very useful, 3=Useful, 4=Very useful, 5=Extremely useful, 9=Missing | Ordinal |
| role | Role | 1=Undergraduate student, 2=Postgraduate student, 3=Practitioner, 4=Retired practitioner, 5=University teacher, 6=Retired university teacher, 7=Other, 9=Missing | Nominal |
| admitted | Year of admittance | yyyy | Scale |
| graduatd | Year of graduation | yyyy | Scale |
| school | School of graduation | 1=Glasgow, 2=Other vet school, 9=Missing | Nominal |
| subject | Subjects taught | 1=preclinical, 2=paraclinical, 3=clinical, 4=mixture, 9=missing | Nominal |
| study_yr | Year of study | 1=First year; 2=Second year; 3=Third year; 4=Fourth year; 5=Fifth year | Ordinal |
| age | Admission age | n | Scale |
| gender | Gender | 1=Male, 2=Female, 9=Missing | Nominal |
| culture | Culture | 1=UK and Eire, 2=Europe, 3=North America, 4=Asia, 5=Africa, 6=Australasia, 7=South America, 8=Dual affiliation, 0=Other, 9=Missing | Nominal |
| era | Era | 1=pre-weipers, 2=weipers, 3=post-weipers, 4=information, 9=Missing | Nominal |

# *Appendix E: Interview pro-forma (not circulated to participants)*

***<u>Preparation, opening, gathering information, explanation and planning, closing</u>***

- Greeting and introduction, small talk to put participants at ease
- Express thanks for allowing me to conduct the interview
- Explain that if participants have any concerns or questions to raise them immediately
- Introduce the goals of the study, outlining what is expected of the interviewee in terms of input
- Provide overview of the structure of the interview (signposting)
- Make sure participants are comfortable
- Refer participants to consent form and any ethical issues, get consent
- Commence interview, starting with open questions, using funnelling approach to get more specific feedback
- Observe participant throughout interview
- Recognise participant's agenda, try to match that with my own
- Be open-minded, but guide participants back to the structure of the interview when appropriate, having given them a copy of the questions in advance
- Active listening, empathy
- Echoing to probe for more details
- Clarifying and summarising where appropriate
- Conclude interview, thanking participant for their time
- Check if participant has any further questions

This pro-forma was structured around the Calgary-Cambridge model of communication skills training in medical education (Kurtz, Silverman *et al.* 1998), which was later adapted for use in veterinary medicine (Radford, Stockley *et al.* 2006).

***Methodology (will proceed in roughly this order)***

"You know that my research is about the role of educational technologies, and their role in undergraduate veterinary medical education. To begin with, do you have any questions, or are there any points that you would like me to clarify?"

[checking that participant is comfortable]

"Would you like to tell me a bit about your experience of using educational technologies as a **student**?"

[citing examples if participant has difficulty getting started, remembering to give participant enough time to think and respond]

"That's very interesting."

[acknowledge participant's input].

Can you tell me a bit more?

[gathering information in open way]"

"Is there anything else that you would like to comment on?"

[gathering more information, allowing participant to reveal their 'agenda']

"So you've told me about A, and B, and how using C made you feel … Is there anything else, in relation to your student experience of educational technologies, that you would like to comment on?"

[Summarise what participant has said so that they can identify any points they have missed, giving them the opportunity to discuss these as well]

I was very interested to hear about X. Could you tell me a bit more about that?"

[probing]

“Obviously you experienced educational technologies from a **teacher’s perspective** too, and you have been specially selected, with the help of a colleague, to take part in this study because of your teaching experience. Can you tell me a bit about your experiences of using educational technologies from that point of view?”

[open question]

“That’s very interesting.”

[acknowledge participant’s input].

“Can you tell me a bit more?”

[gathering information in open way]”

“Is there anything else that you would like to comment on?”

[gathering more information, allowing participant to reveal their ‘agenda’]

“So you’ve told me about E, and F, and how using G made you feel … Is there anything else, in relation to your teaching experience of educational technologies, that you would like to comment on?”

[Summarise what participant has said so that they can identify any points they have missed, giving them the opportunity to discuss these as well]

I was very interested to hear about Y. Could you tell me a bit more about that?”

[probing]

**Then, once got all this data, or in the process of trying to get participant back to the structure, can get the answers to specific questions …**

(For clarification will need to separate methods and technologies, explaining that methods include lectures and seminars, whilst technologies include data projectors and computer-aided learning, for example.)

Specific questions to gather information from student perspective:

- Which methods/technologies helped you as a student?
- Why was that?
- Were there any potential difficulties with using this method/technology when you were studying?
- Were there any technical, or logistical difficulties?
- What were the benefits to your learning?

If respondents only mention some methods/technologies, I can use checklist approach: "You've mentioned 35mm slides, and cine film – what about programmed learning?"… "And student notes – did you use these?"

Specific questions to gather information from teacher perspective:

- Which methods/technologies did you use as a lecturer?
- Why was that?
- Which ones helped you in getting information across to the students?
- How did they do this?
- Was this method/technology interactive? [explain if necessary]
- Were there any potential difficulties with using this method/technology when you were studying?
- Were there any technical, or logistical difficulties?
- Did you get student feedback about this technology you taught with?

Again, if respondents only mention some methods/technologies, I can use checklist approach: “You’ve mentioned powerpoint slides, and overhead projectors – what about videos” … “And computer-aided learning – did you use this?”

# *Appendix F: Coding scheme for student records data*

## Graduate status

| Code | Status |
|---|---|
| G | Graduate |
| C | Current student |
| E | Erasmus |
| O | Overseas (temporary enrolment) |

| Code | Status |
|---|---|
| T | Transferred |
| W | Withdrawn |
| X | Excluded |
| | |

## Nationality

| Recorded nationality | Code 1 | Code 2 |
|---|---|---|
| African | 1 | 5 |
| American | 2 | 3 |
| American / British | 3 | 8 |
| American / Canadian | 4 | 8 |
| Australian | 5 | 6 |
| Barbadian | 6 | 0 |
| Belgian | 7 | 2 |
| Botswana | 8 | 5 |
| British (unspecified) | 9 | 17 |
| Canadian | 10 | 3 |
| British Canadian | 11 | 8 |
| Ceylonese | 12 | 4 |
| Channel islands | 13 | 2 |
| Chilean | 14 | 7 |
| Cuban | 15 | 7 |
| Czech | 16 | 2 |
| Danish | 17 | 2 |
| Danish / British | 18 | 8 |
| Dutch | 19 | 2 |
| East African | 20 | 5 |
| English | 21 | 12 |
| French | 22 | 2 |
| French / British | 23 | 8 |
| German | 24 | 2 |
| German / British | 25 | 8 |
| Ghanaian | 26 | 5 |
| Gold Coast | 27 | 5 |
| Hong Kong | 28 | 6 |
| Ibo | 29 | 5 |
| Indian | 30 | 4 |
| Iraqi | 31 | 0 |

| Recorded nationality | Code 1 | Code 2 |
|---|---|---|
| Irish | 32 | 14 |
| Israeli | 33 | 0 |
| Israeli / Belgian | 34 | 8 |
| Italian | 35 | 2 |
| Jamaican | 36 | 0 |
| Kenyan | 37 | 5 |
| Malaysian | 38 | 4 |
| Northern Irish | 39 | 13 |
| Nigerian | 40 | 5 |
| Norwegian | 41 | 2 |
| Omani | 42 | 0 |
| Pakistan | 43 | 4 |
| Peruvian | 44 | 7 |
| Polish | 45 | 2 |
| Portugese | 46 | 2 |
| Rhodesian | 47 | 5 |
| Russian | 48 | 0 |
| Scottish | 49 | 11 |
| Sierra Leonean | 50 | 5 |
| Singaporean | 51 | 4 |
| Singaporean / British | 52 | 8 |
| South African | 53 | 5 |
| Spanish | 54 | 2 |
| Swedish | 55 | 2 |
| Tanganyikan | 56 | 5 |
| Trinidadian | 57 | 0 |
| Ugandan | 58 | 5 |
| Welsh | 59 | 15 |
| West Indian | 60 | 0 |
| British (overseas) | 91 | 16 |
| | | |

Code 2 was derived from the same groupings used to record cultural affiliation in the questionnaire.

| Code 2 | Recorded nationality |
|---|---|
| 1 | UK and Eire |
| 11 | Scottish |
| 12 | English |
| 13 | Northern Irish |
| 14 | Irish |
| 15 | Welsh |
| 16 | British (overseas) |
| 17 | British (unspecified) |

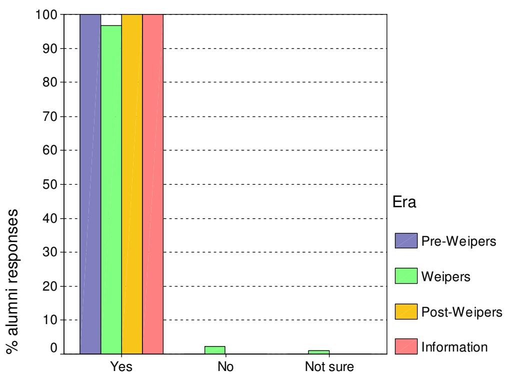
| Code 2 | Recorded nationality |
|---|---|
| 2 | Europe |
| 3 | North America |
| 4 | Asia |
| 5 | Africa |
| 6 | Australasia |
| 7 | South America |
| 8 | Dual affiliation |
| 0 | Other |

Standard Occupational Classification (2000)

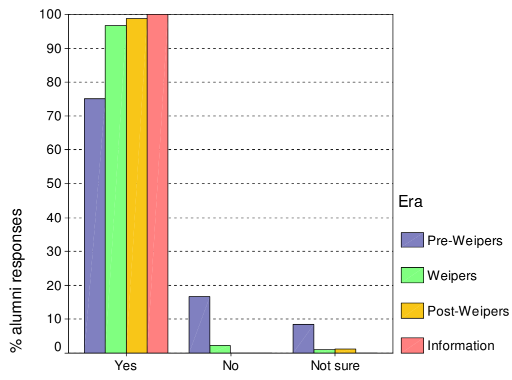
| Major group | Sub-major group | Group title |
|---|---|---|
| 1 | | Managers and senior officials |
| | 11 | Corporate managers |
| | 12 | Managers and proprietors in agriculture and services |
| 2 | | Professional occupations |
| | 21 | Science and technology professionals |
| | 22 | Health professionals |
| | 23 | Teaching and research professionals |
| | 24 | Business and public service professionals |
| 3 | | Associate professional and technical occupations |
| | 31 | Science and technology associate professionals |
| | 32 | Health and social welfare associate professionals |
| | 33 | Protective service occupations |
| | 34 | Culture, media and sports occupations |
| | 35 | Business and public service associate professionals |
| 4 | | Administrative and secretarial occupations |
| | 41 | Administrative occupations |
| | 42 | Secretarial and related occupations |
| 5 | | Skilled trades occupations |
| | 51 | Skilled agricultural trades |
| | 52 | Skilled metal and electrical trades |
| | 53 | Skilled construction and building trades |
| | 54 | Textiles, printing and other skilled trades |
| 6 | | Personal service occupations |
| | 61 | Caring personal occupations |
| | 62 | Leisure and other personal service occupations |
| 7 | | Sales and customer service occupations |
| | 71 | Sales occupations |
| | 72 | Customer service occupations |
| 8 | | Process, plant and machine operatives |
| | 81 | Process, plant and machine operatives |
| | 82 | Transport and mobile machine drivers and operators |
| 9 | | Elementary occupations |
| | 91 | Elementary trades, plant and storage related occupations |
| | 92 | Elementary administration and service occupations |

# *Appendix G: Bar chart representations of questionnaire data*

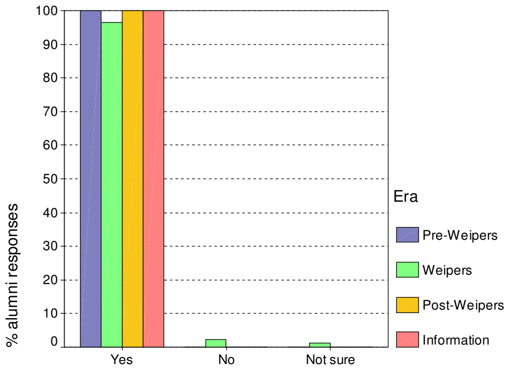
## Alumni



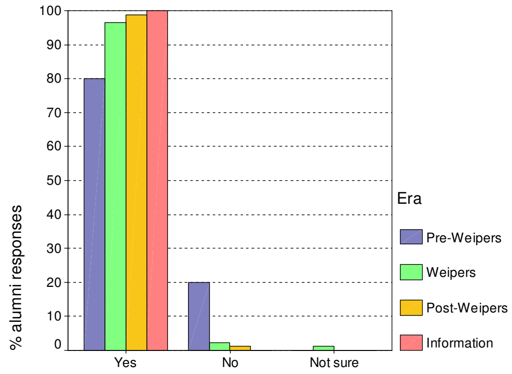

Lecture availability



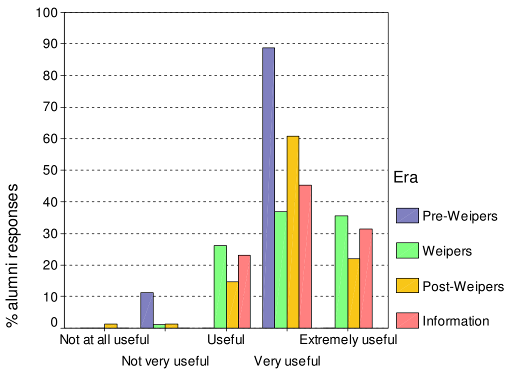

Post-mortem demonstration availability



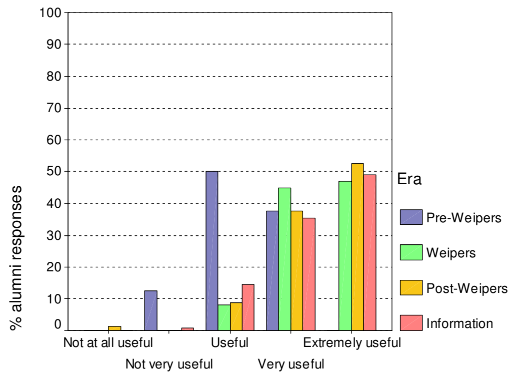

Lecture use




Post-mortem demonstration use



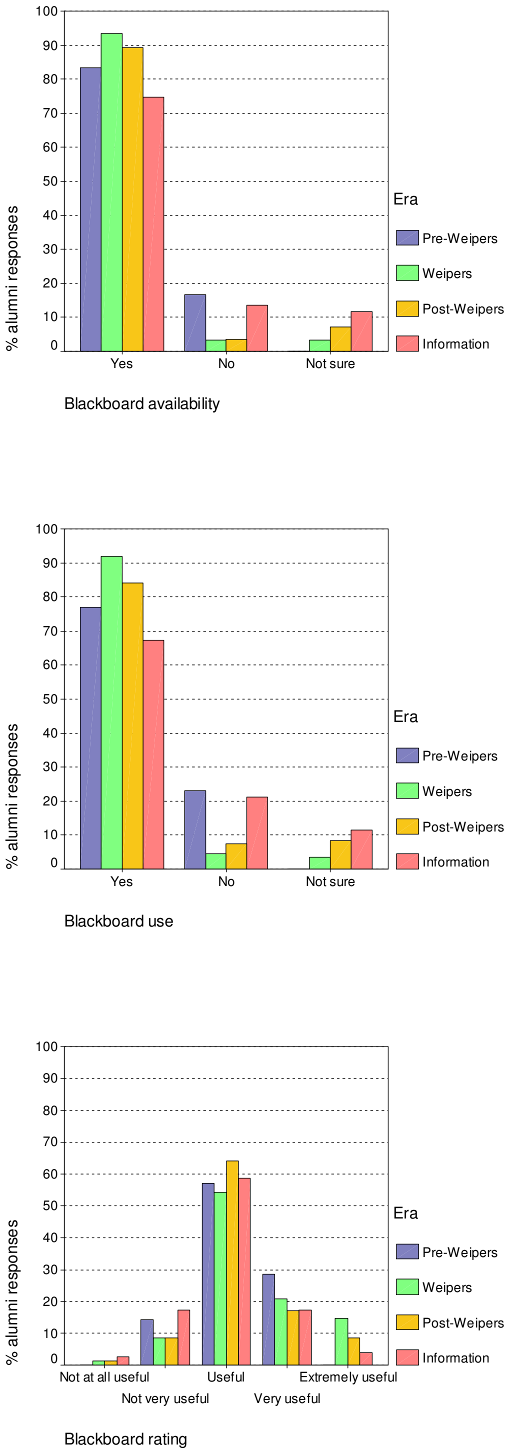

Lecture rating



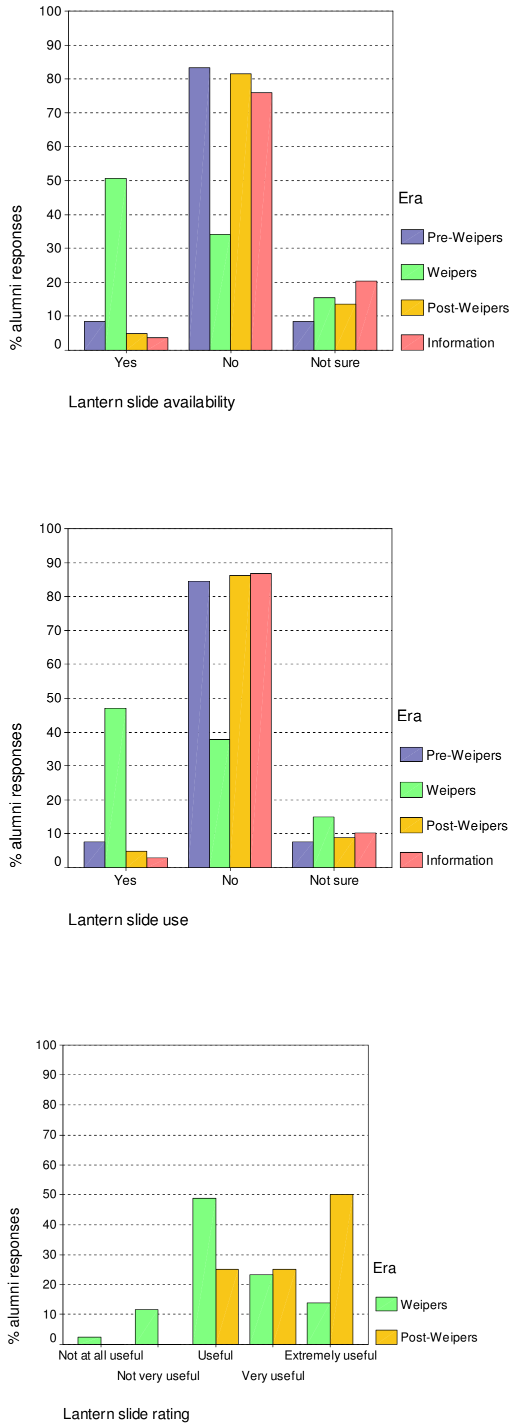

Post-mortem demonstration rating

**Availability, use and rating of lectures as perceived by different alumni eras**

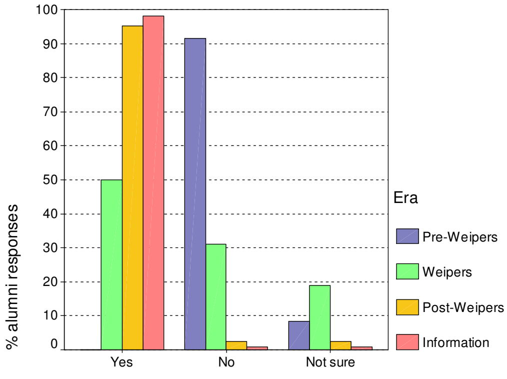
**Availability, use and rating of post-mortem demonstrations as perceived by different alumni eras**



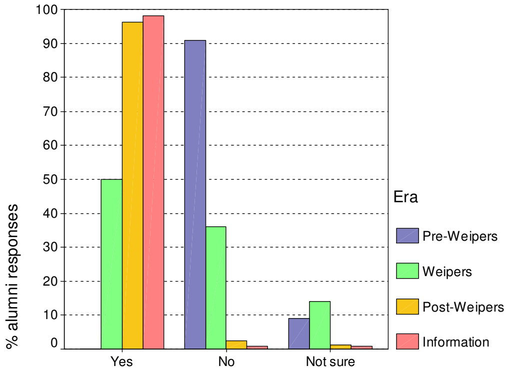

**Availability, use and rating of blackboards as perceived by different alumni eras**



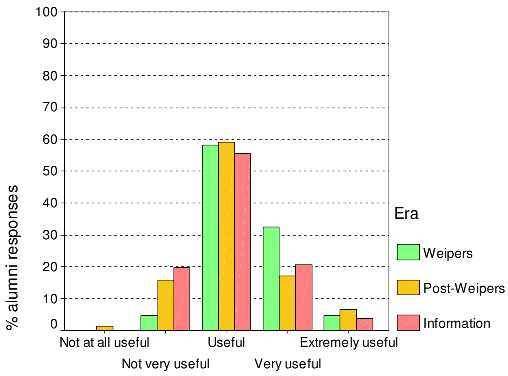

**Availability, use and rating of lantern slides as perceived by different alumni eras**




Acetate availability

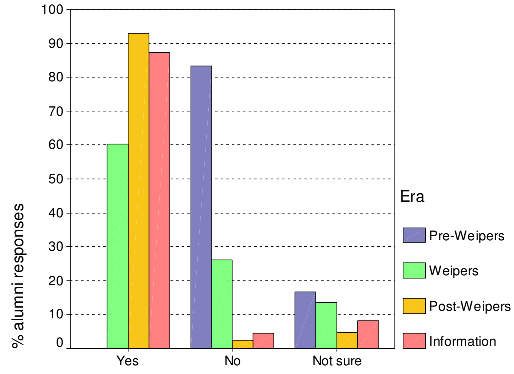



Acetate use

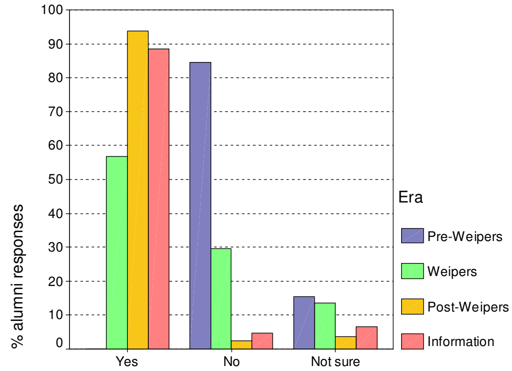



Acetate rating

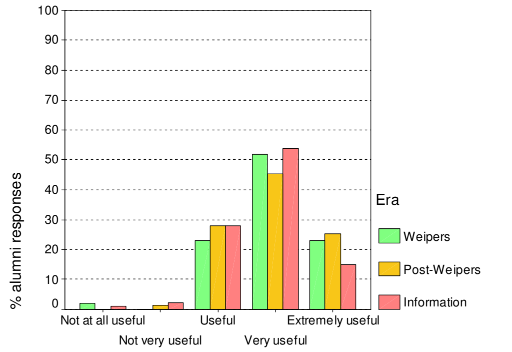
**Availability, use and rating of acetates as perceived by different alumni eras**




35mm slide availability

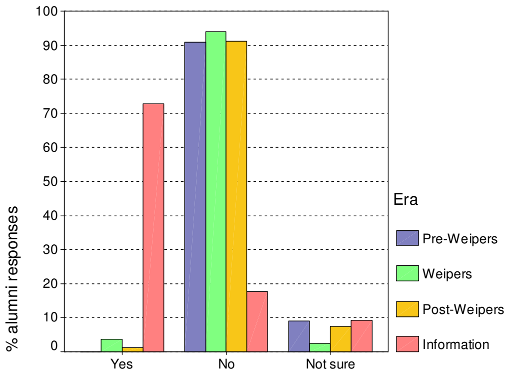



35mm slide use

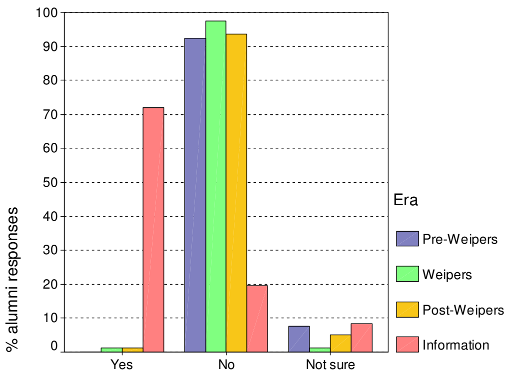



35mm slide rating

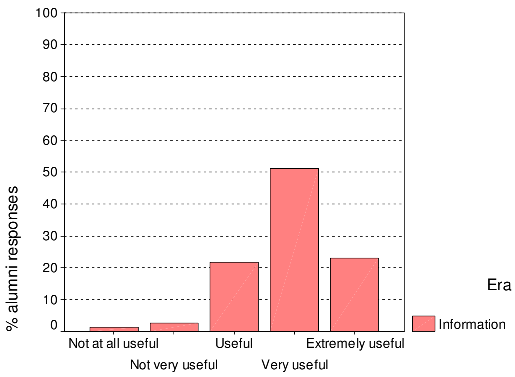
**Availability, use and rating of 35mm slides as perceived by different alumni eras**




Electronic slide availability

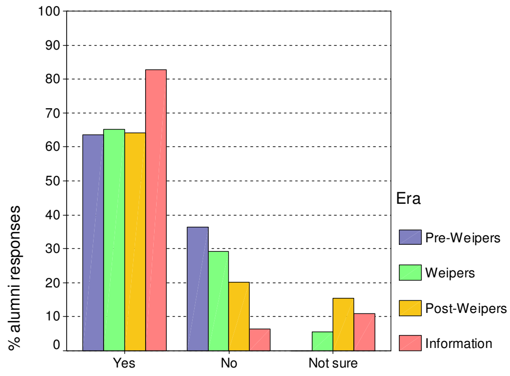



Electronic slide use

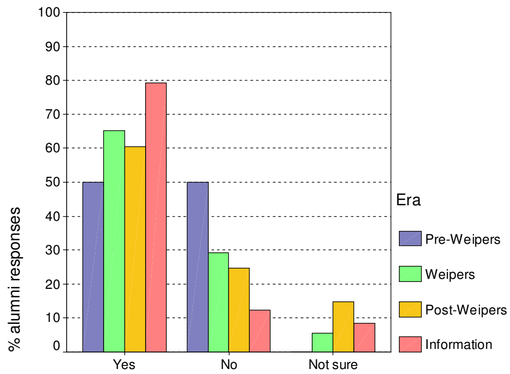



Electronic slide rating

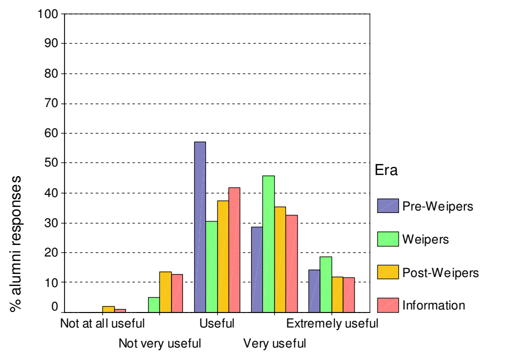
**Availability, use and rating of electronic slides as perceived by different alumni eras**




Peer-assisted learning availability

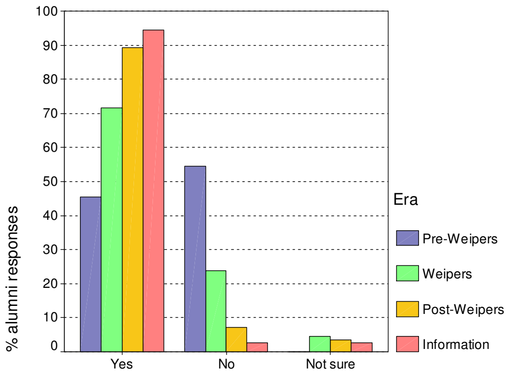



Peer-assisted learning use

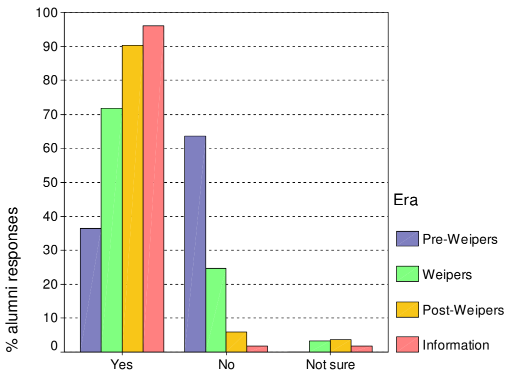



Peer-assisted learning rating

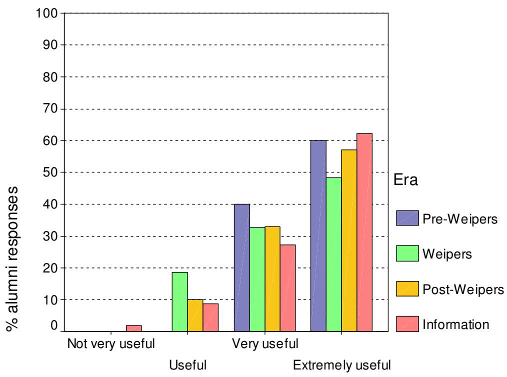
**Availability, use and rating of peer-assisted learning as perceived by different alumni eras**




One-to-one tutorial availability

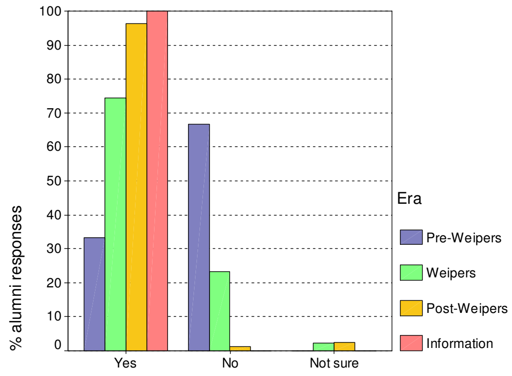



One-to-one tutorial use

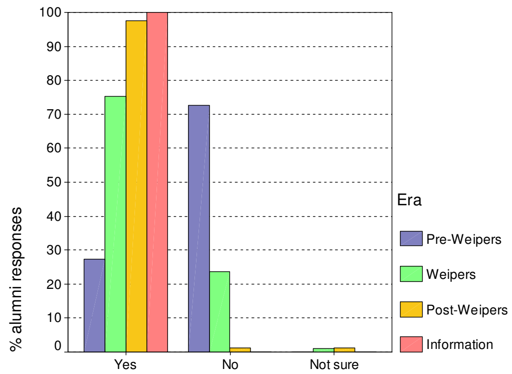



One-to-one tutorial rating

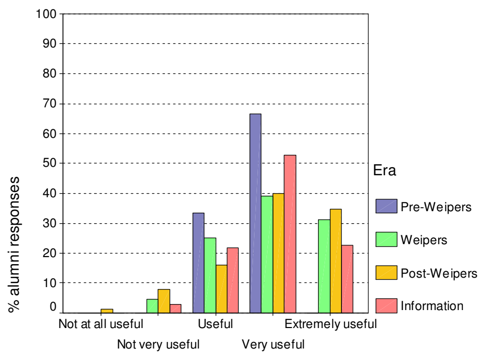
**Availability, use and rating of one-to-one tutorials (including EMS) as perceived by different alumni eras**




Group tutorial availability

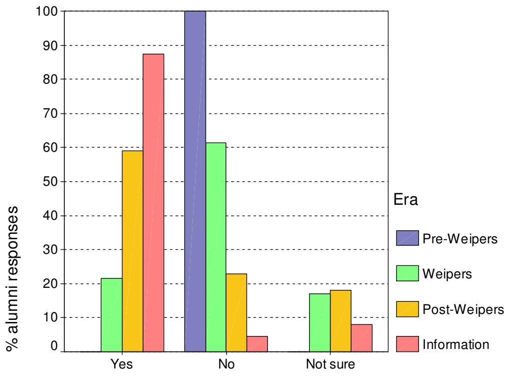



Group tutorial use

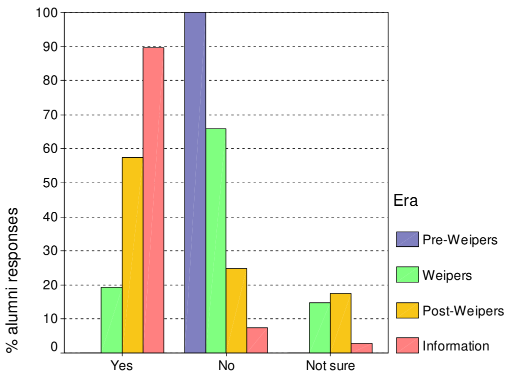



Group tutorial rating

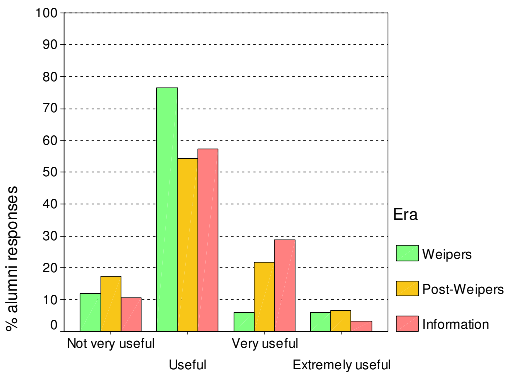
**Availability, use and rating of group tutorials as perceived by different alumni eras**




Flipchart availability

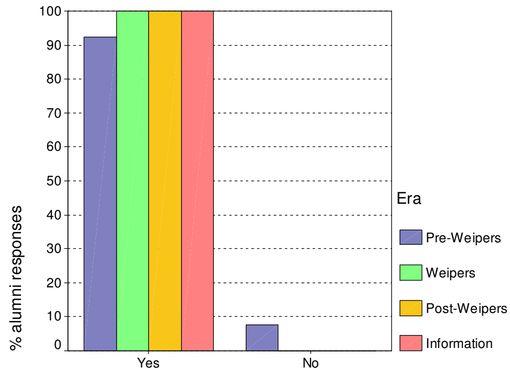



Flipchart use

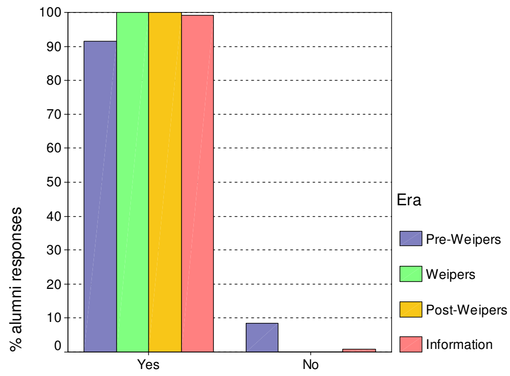



Flipchart rating

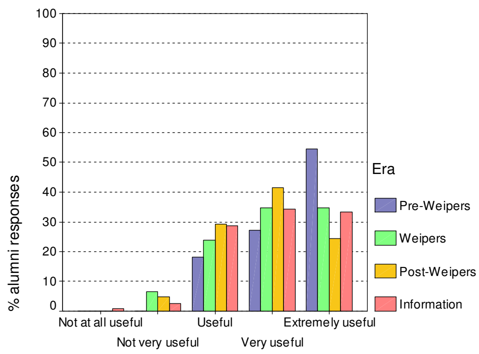
**Availability, use and rating of flipcharts as perceived by different alumni eras**




Textbook availability

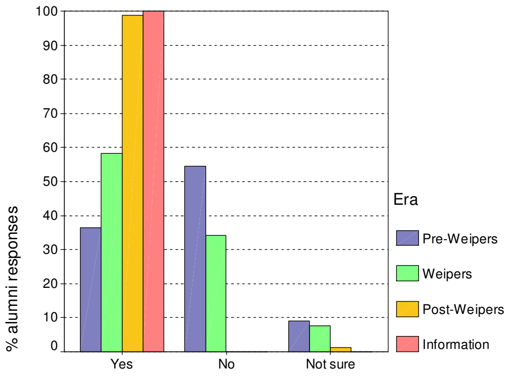



Textbook use

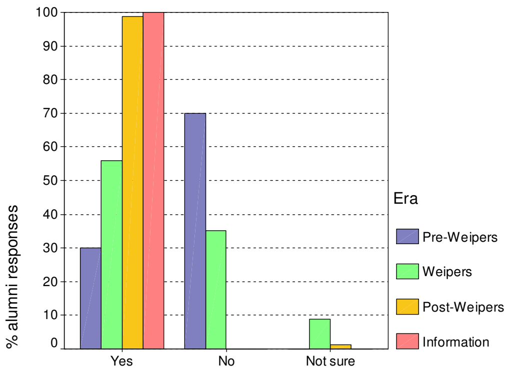



Textbook rating

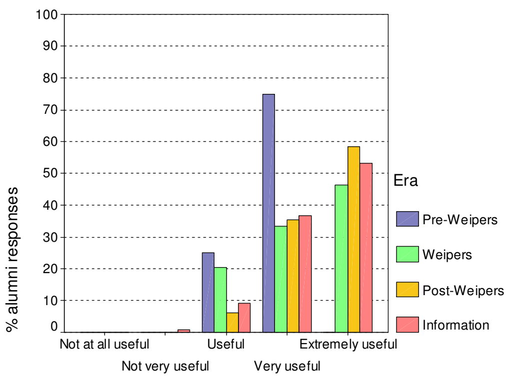
**Availability, use and rating of textbooks as perceived by different alumni eras**




Student notes availability

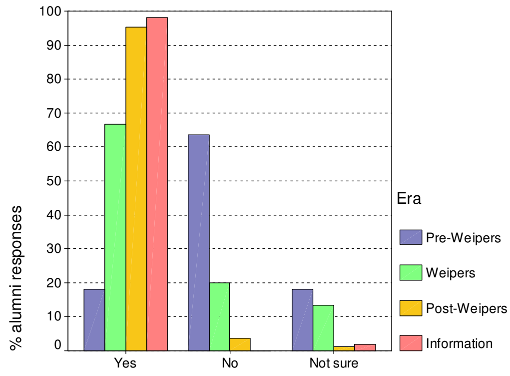



Student notes use

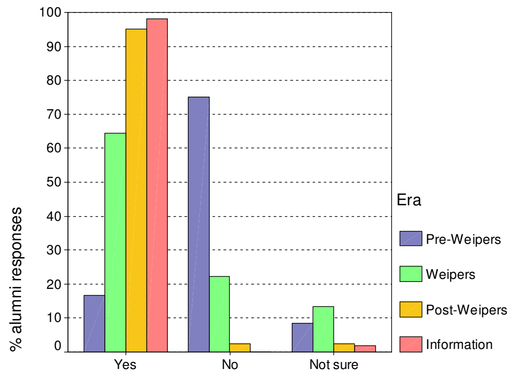



Student notes rating

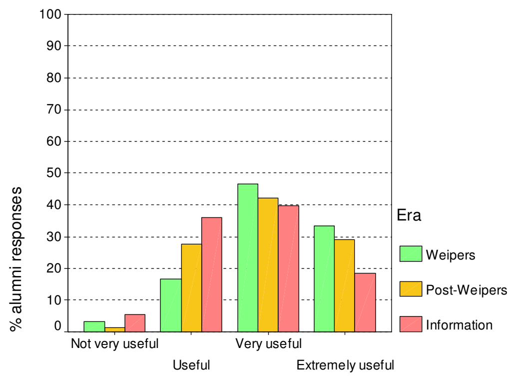
**Availability, use and rating of student notes as perceived by different alumni eras**




Handout availability

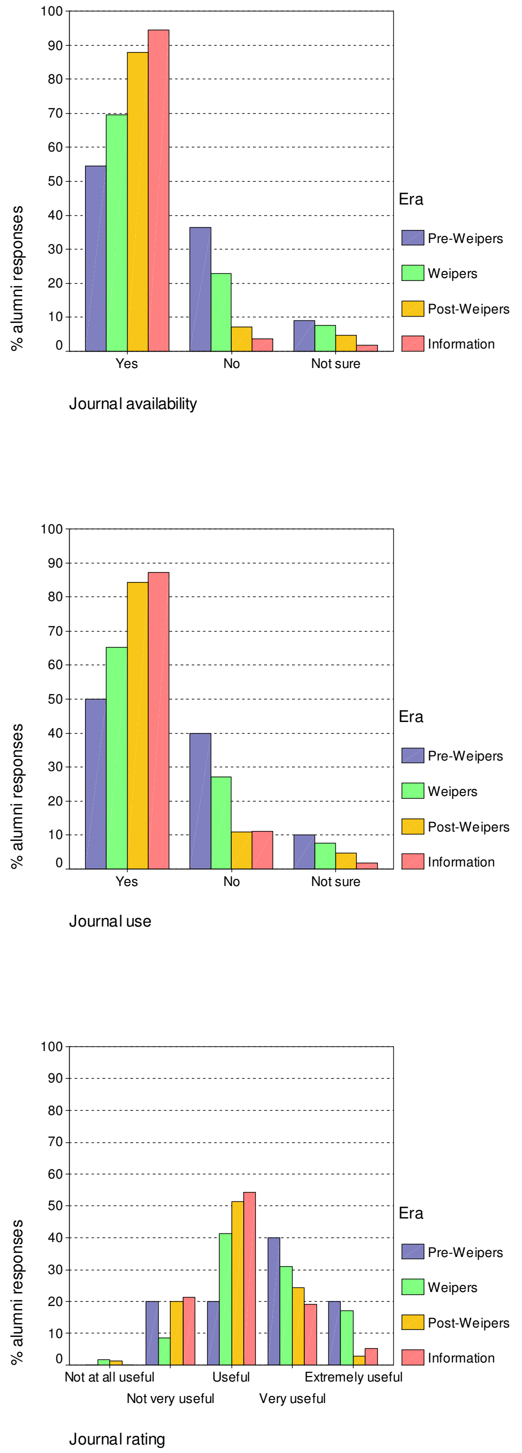



Handout use

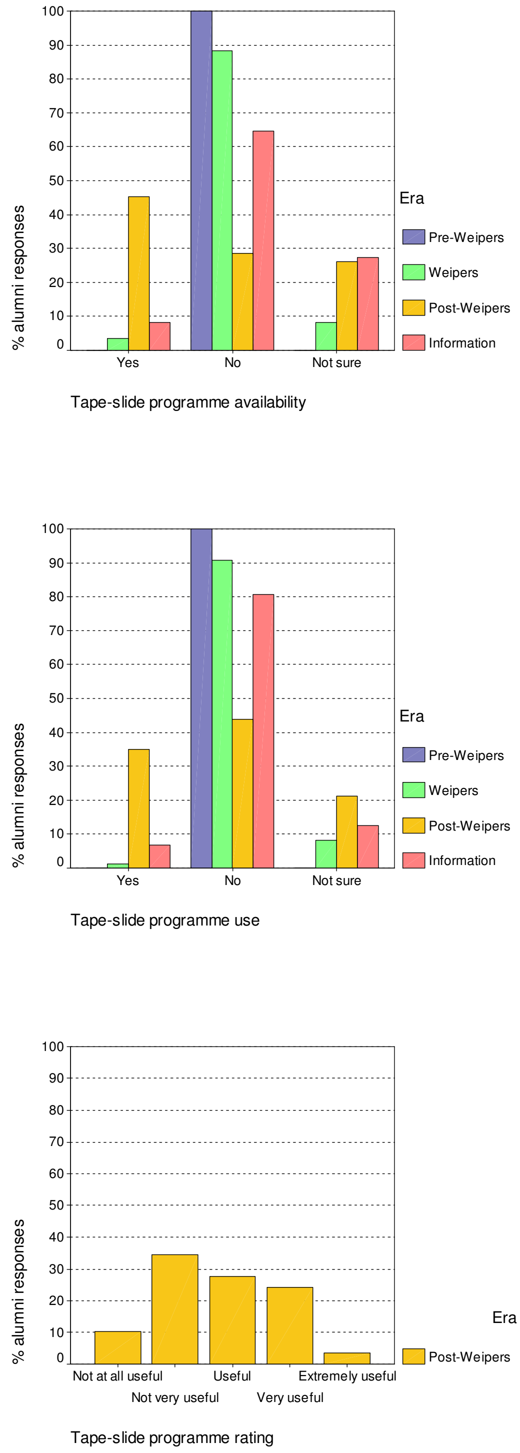



Handout rating

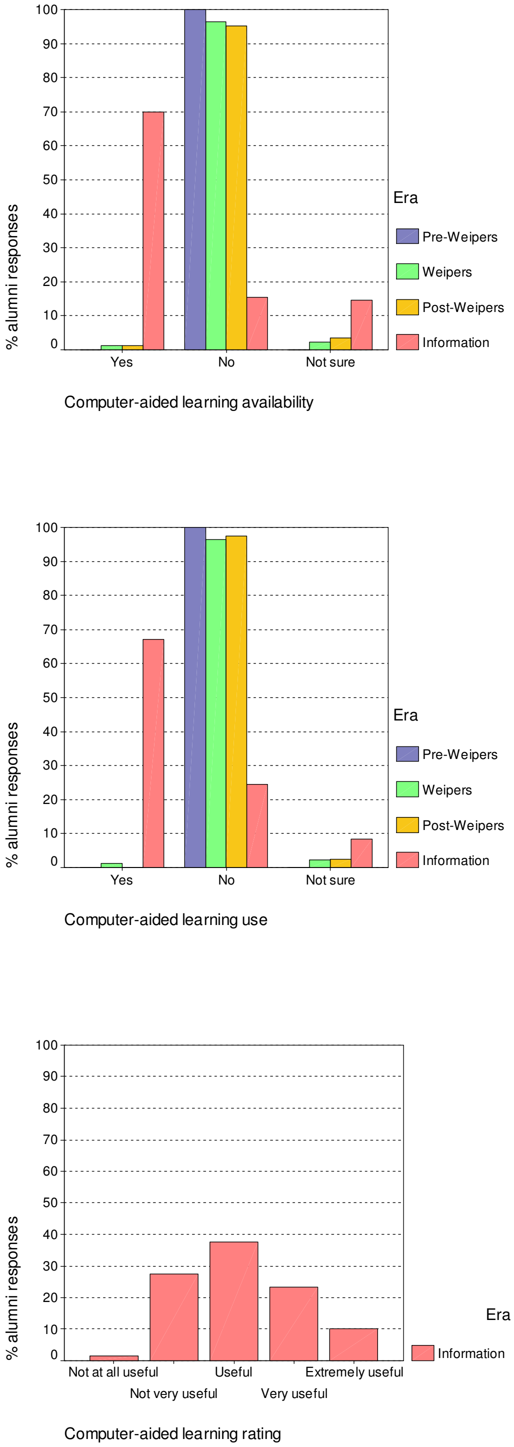
**Availability, use and rating of handouts as perceived by different alumni eras**



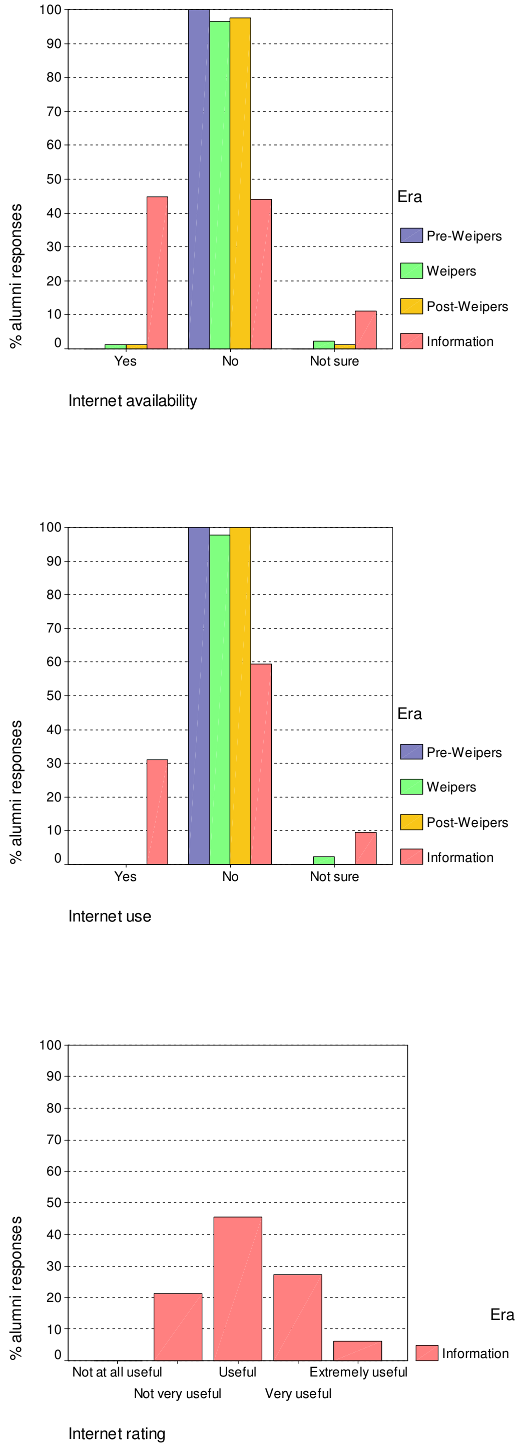

**Availability, use and rating of journals as perceived by different alumni eras**



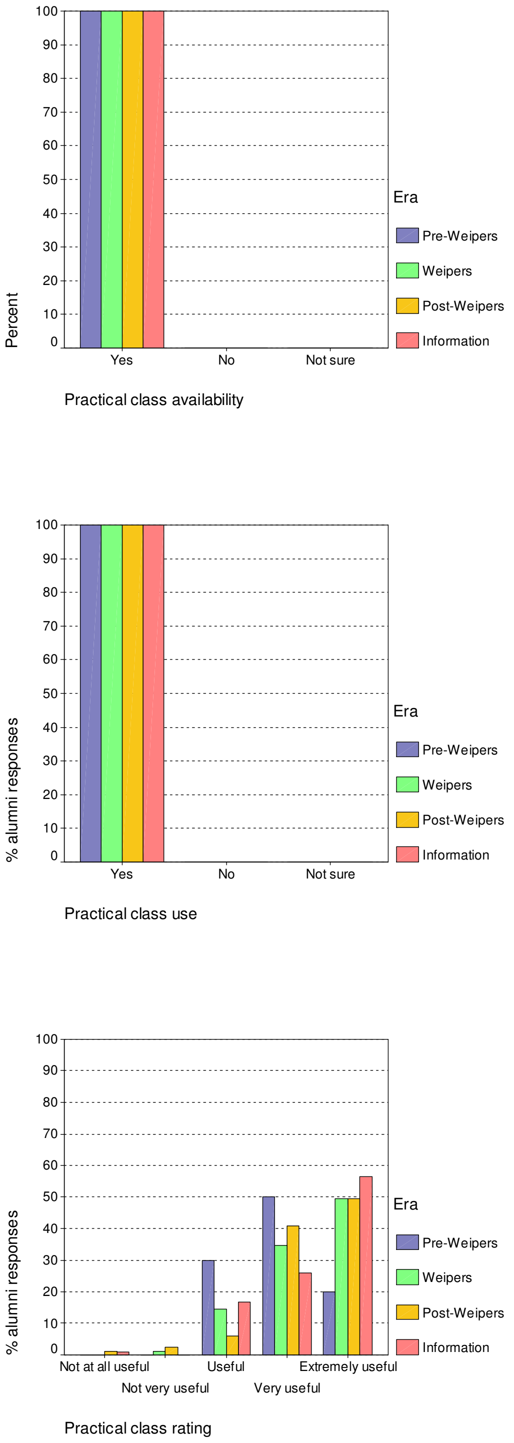

**Availability, use and rating of tape-slide programmes as perceived by different alumni eras**



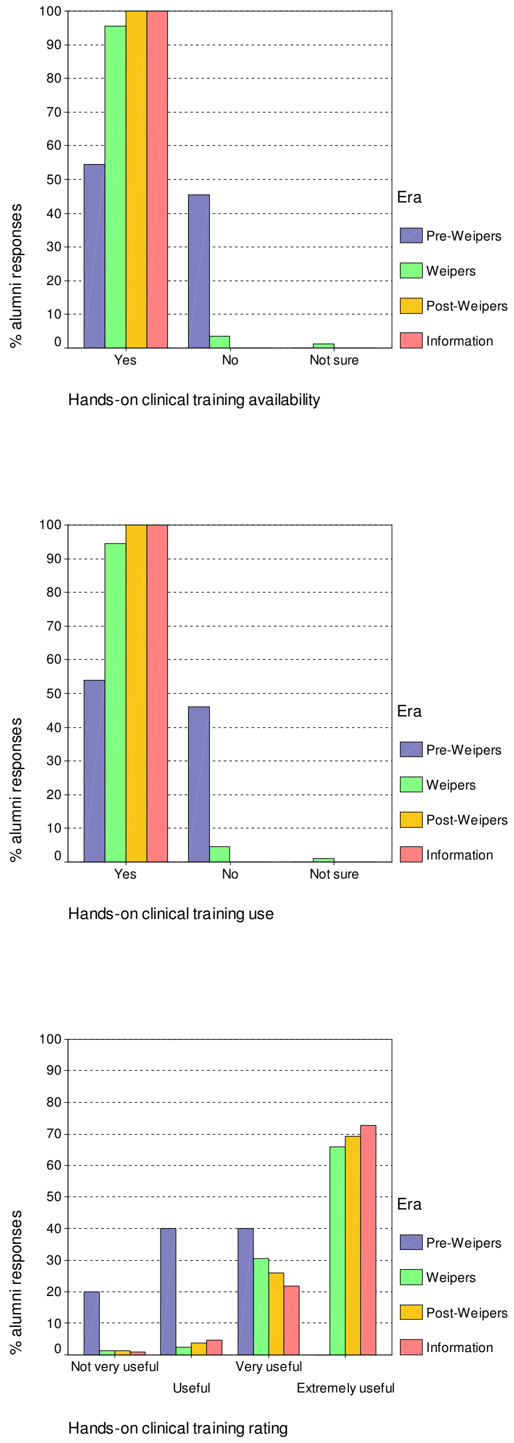

**Availability, use and rating of computer-aided learning as perceived by different alumni eras**



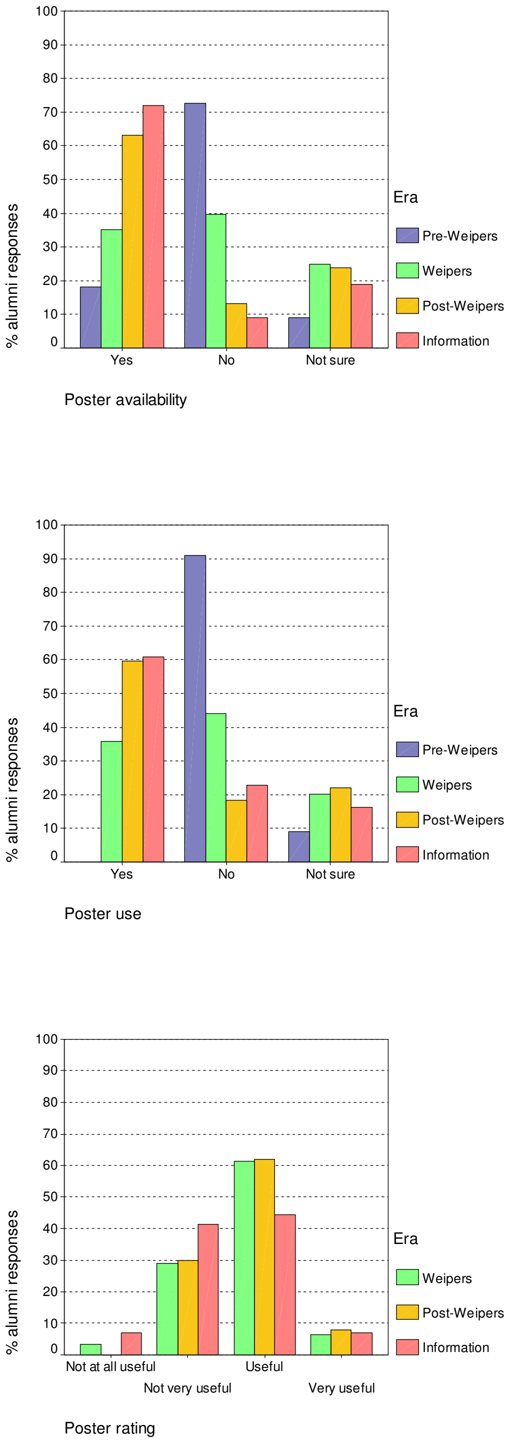

**Availability, use and rating of the Internet as perceived by different alumni eras**



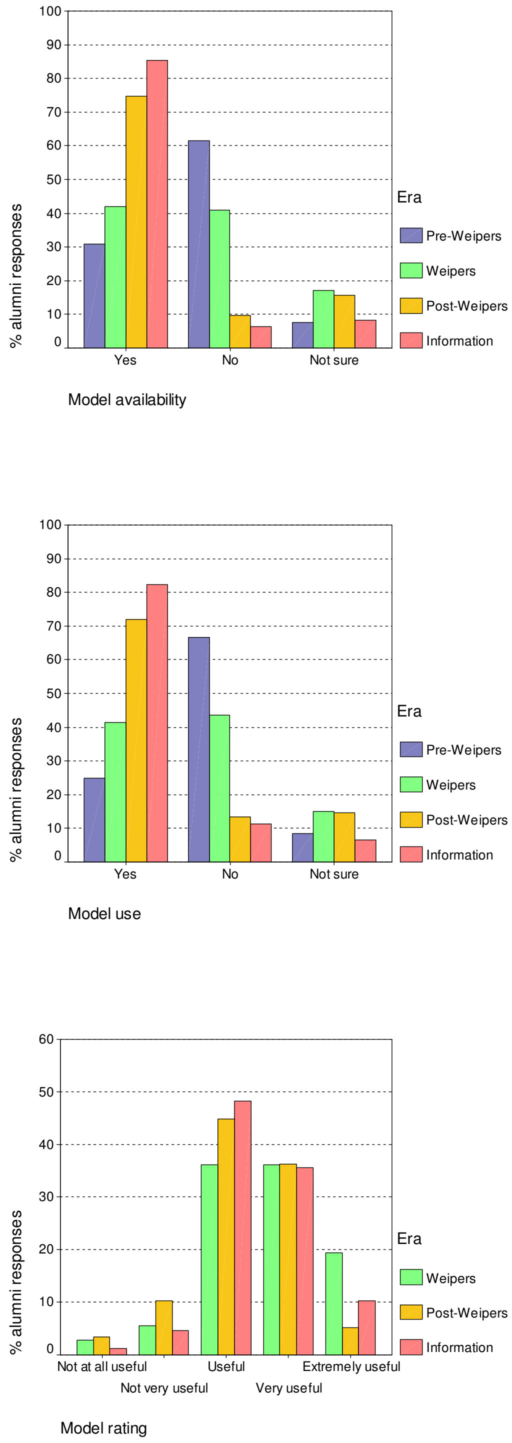

**Availability, use and rating of practical classes as perceived by different alumni eras**



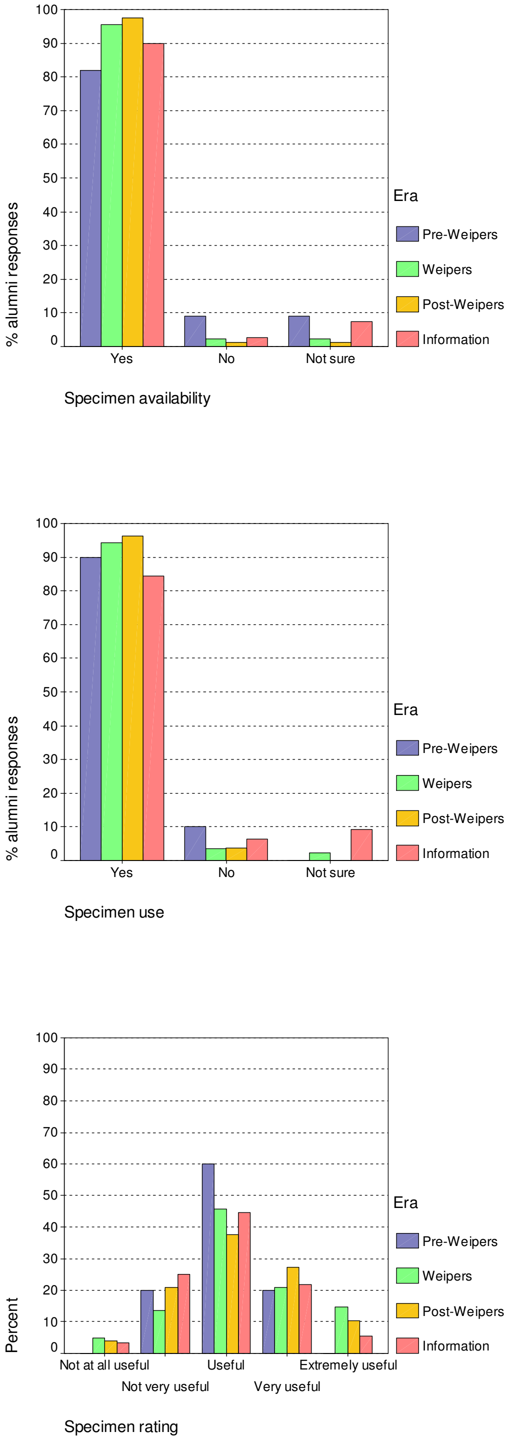

**Availability, use and rating of hands-on clinical training (with live animal) as perceived by different alumni eras**



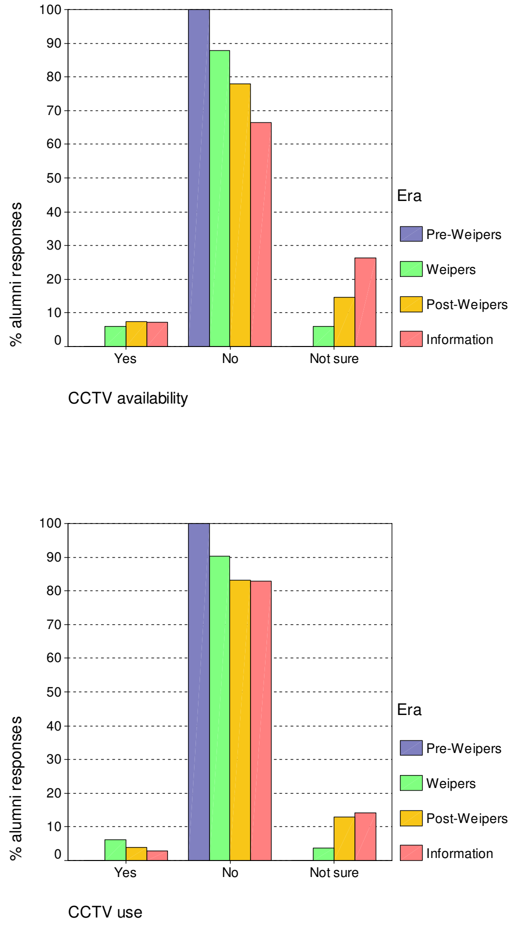

**Availability, use and rating of posters as perceived by different alumni eras**



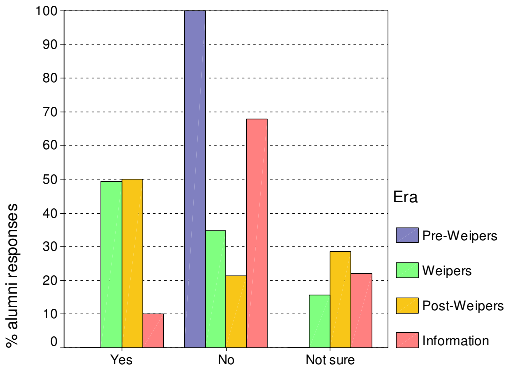

**Availability, use and rating of models as perceived by different alumni eras**



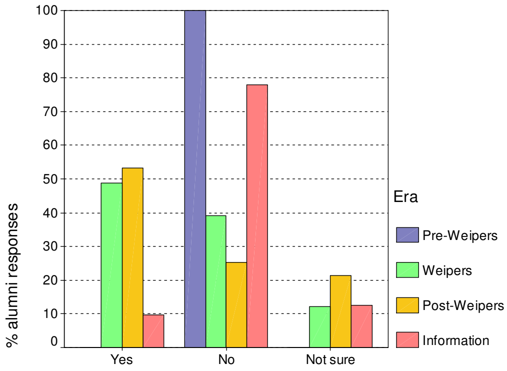

**Availability, use and rating of preserved specimens as perceived by different alumni eras**



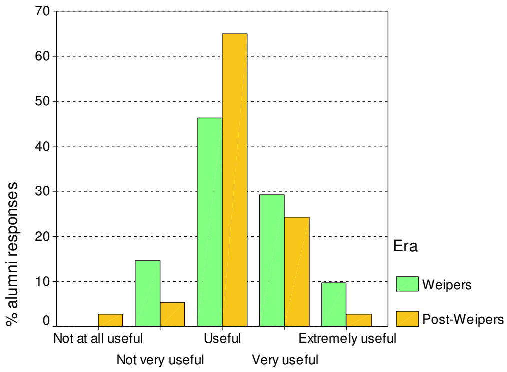

**Availability and use of closed-circuit television as perceived by different alumni eras**




Cine film availability

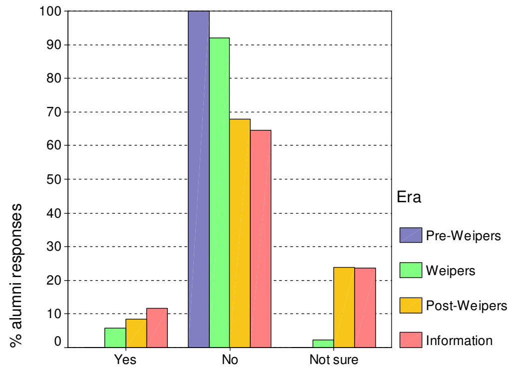



Cine film use

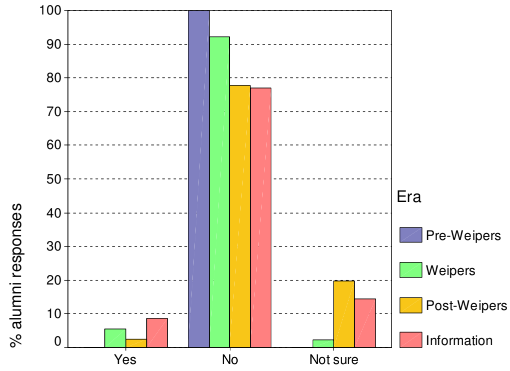



Cine film rating

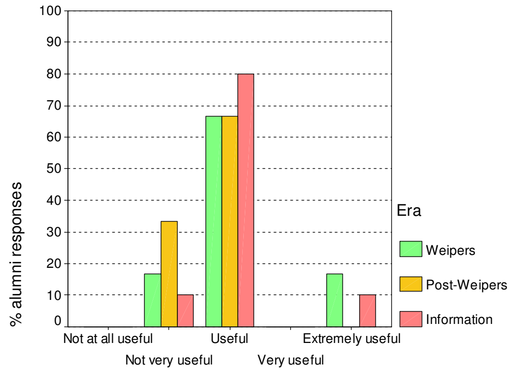
**Availability, use and rating of cine films as perceived by different alumni eras**




Educational TV availability

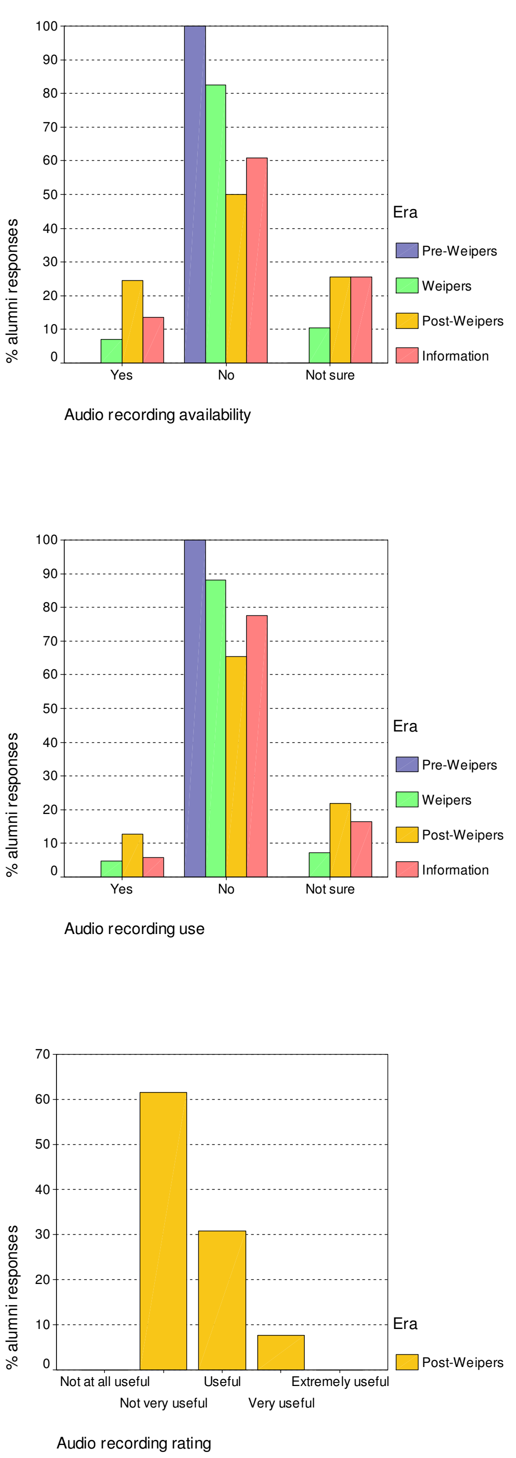



Educational TV use

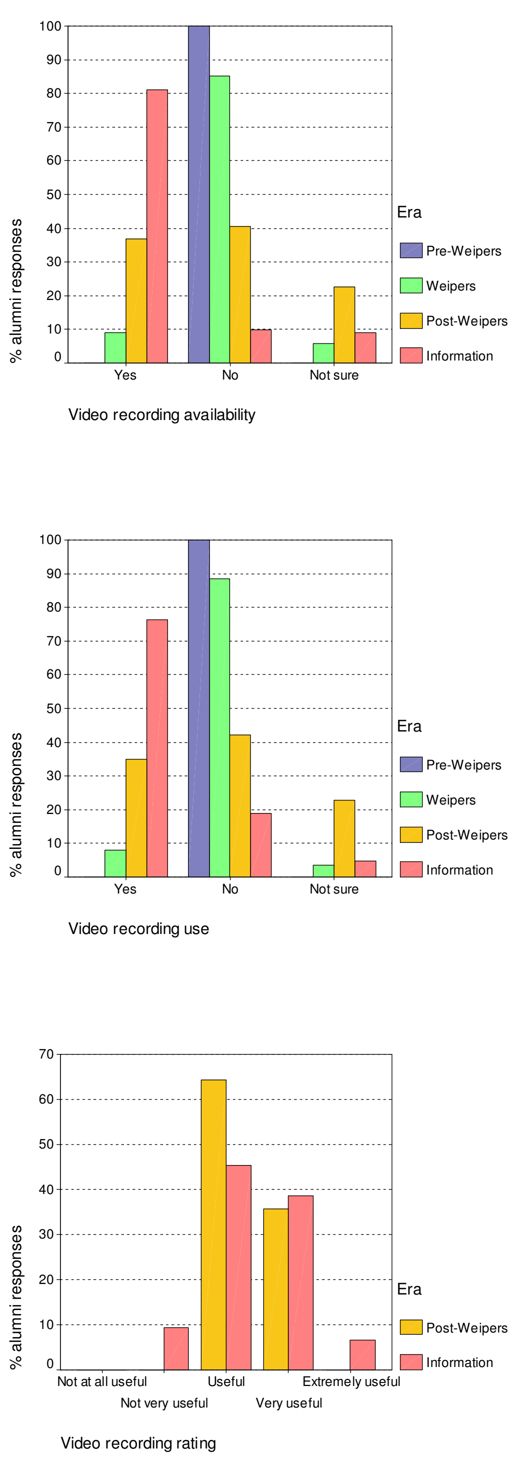



Educational TV rating

**Availability, use and rating of educational television as perceived by different alumni eras**

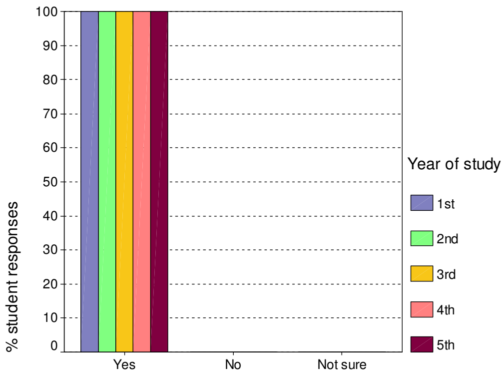



**Availability, use and rating of audio-recordings as perceived by different alumni eras**

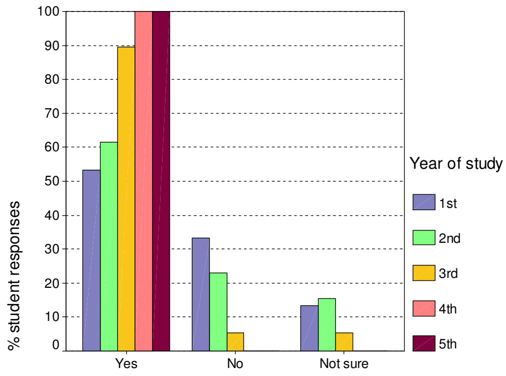



**Availability, use and rating of video-recordings as perceived by different alumni eras**

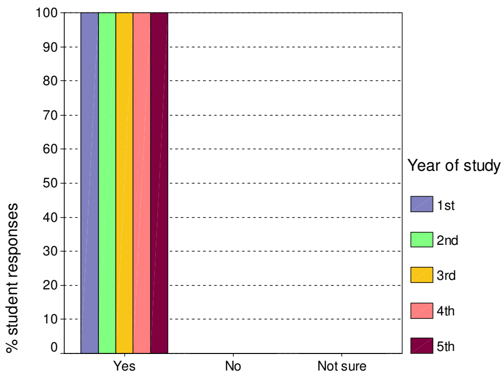
# Students



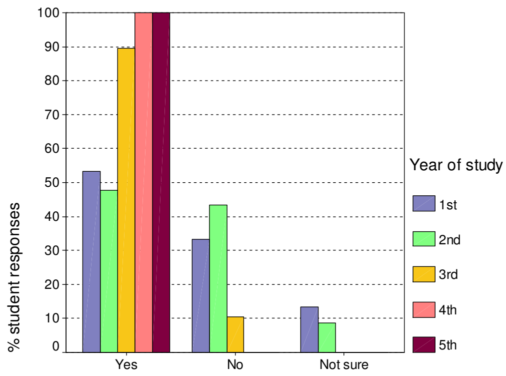

Lecture availability



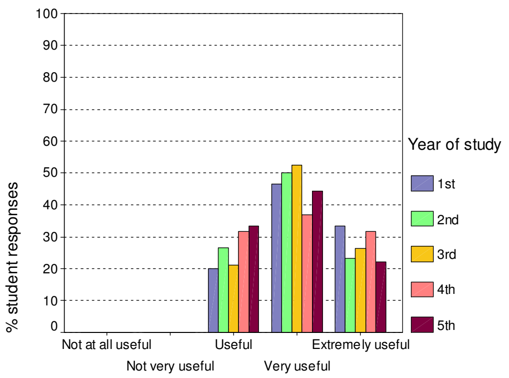

Postmortem demonstration availability



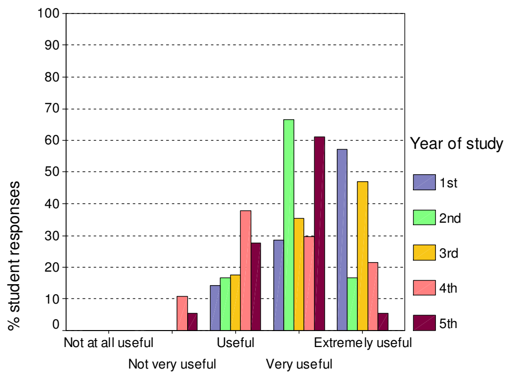

Lecture use




Postmortem demonstration use



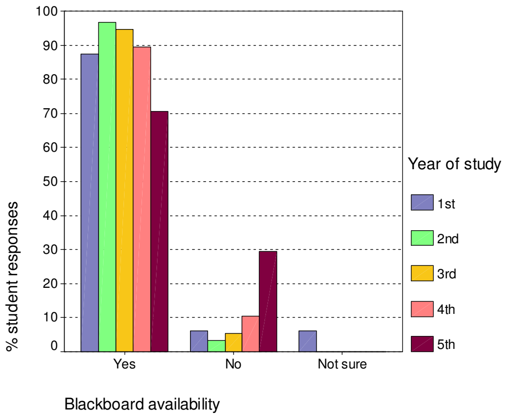

Lecture rating

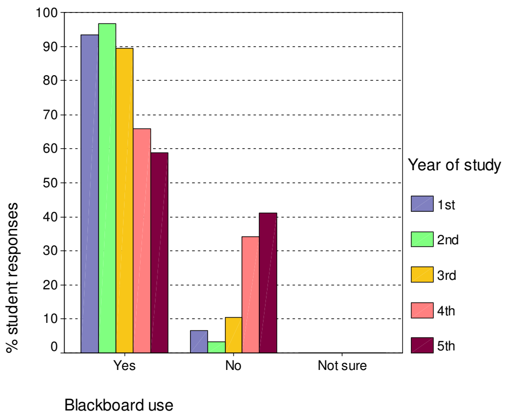


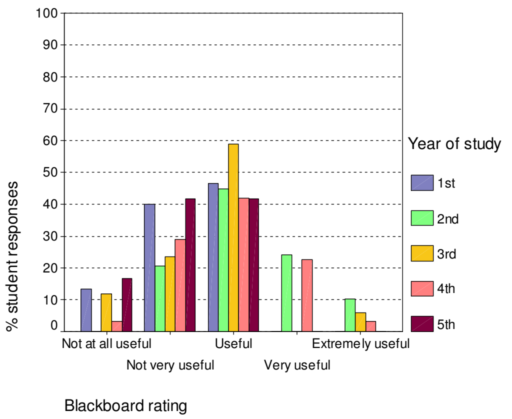

Post-mortem demonstration rating

**Availability, use and rating of lectures as perceived by different student years**

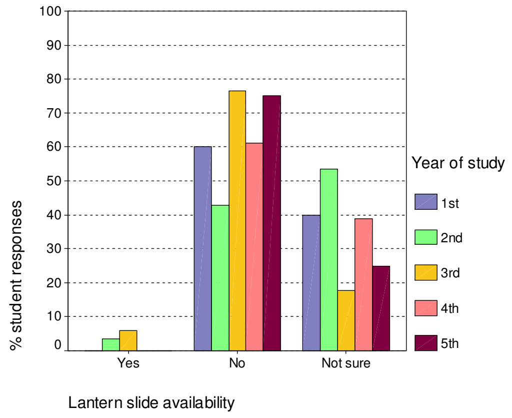
**Availability, use and rating of post-mortem demonstrations as perceived by different student years**

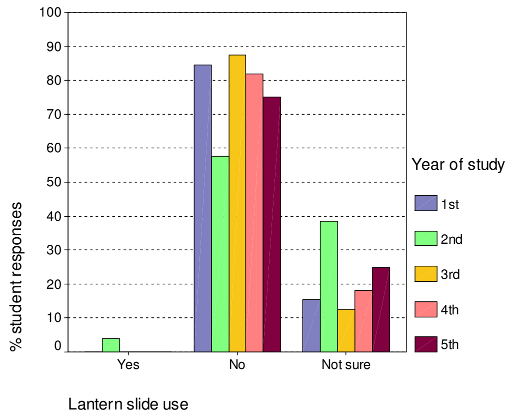


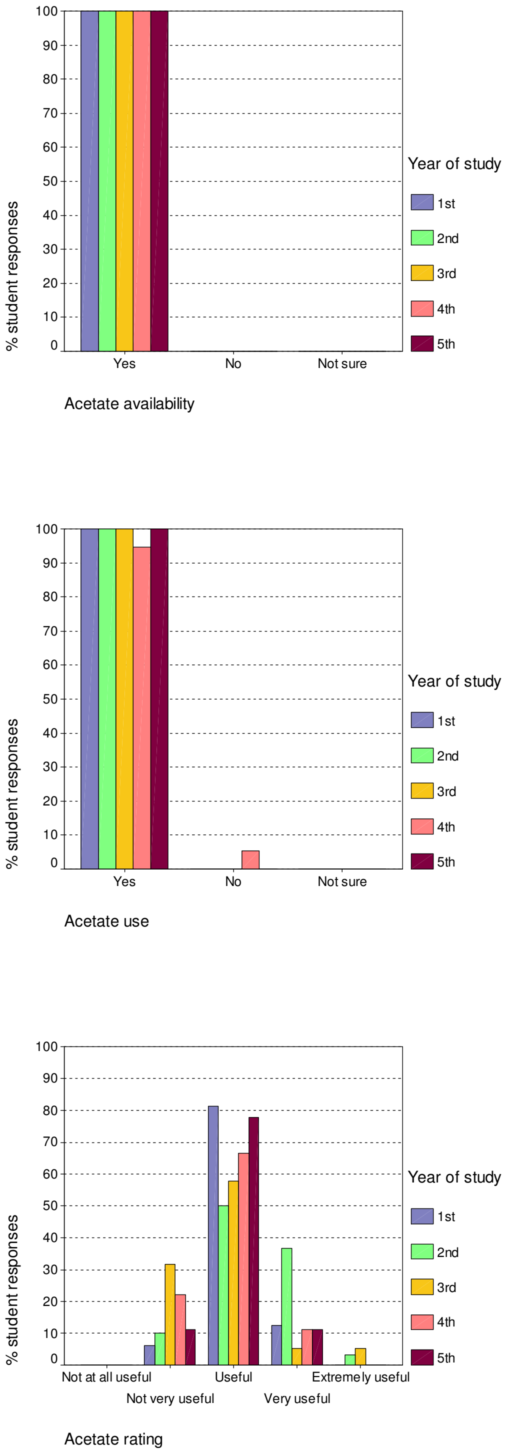




**Availability, use and rating of blackboards as perceived by different student years**

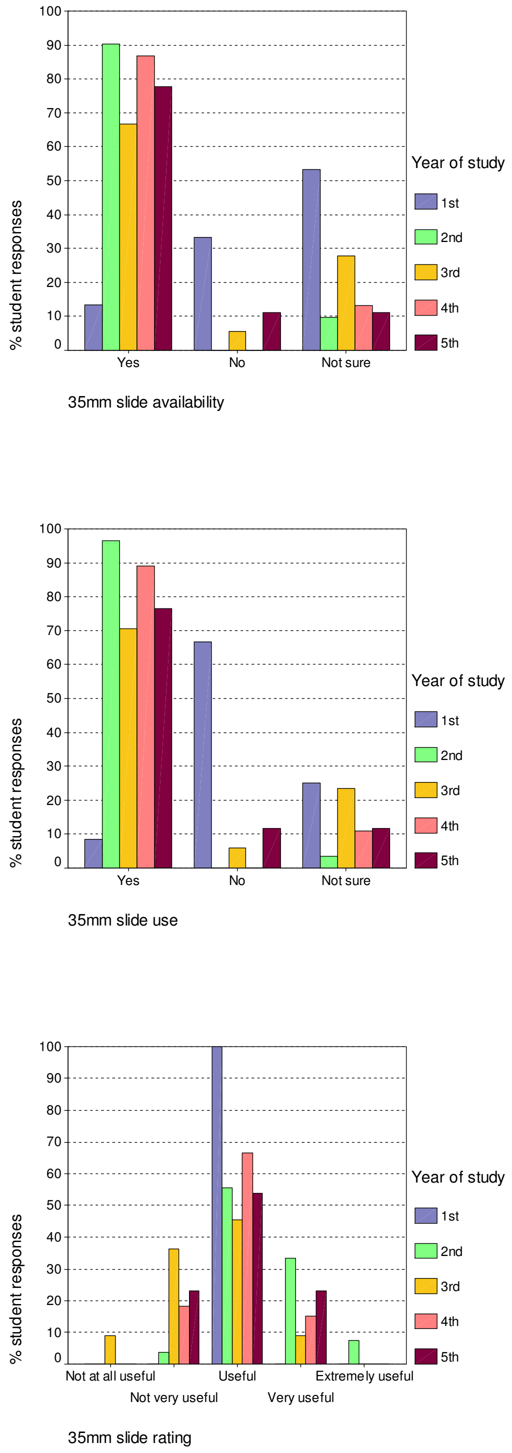


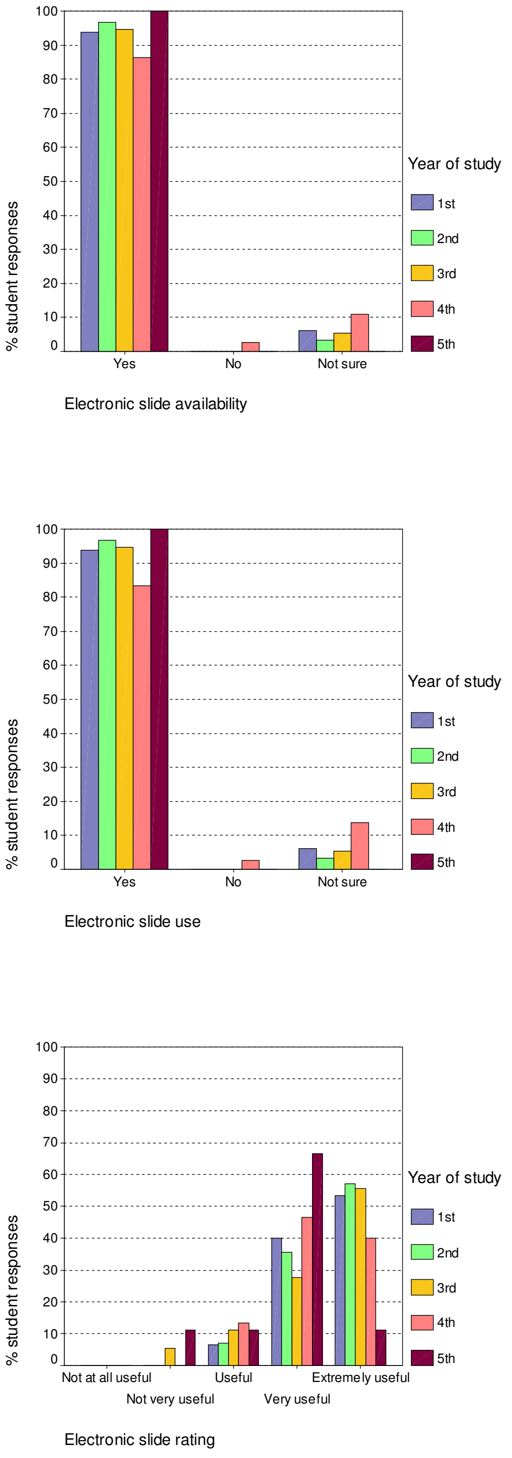

**Availability and use of lantern slides as perceived by different student years**



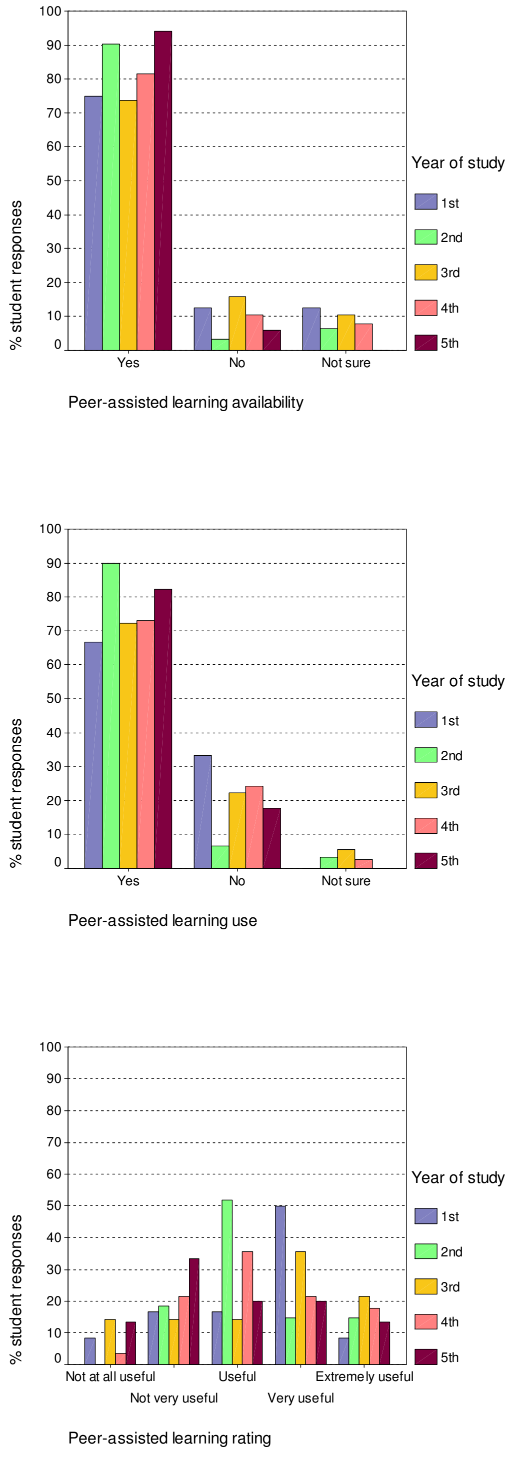

**Availability, use and rating of acetates as perceived by different student years**



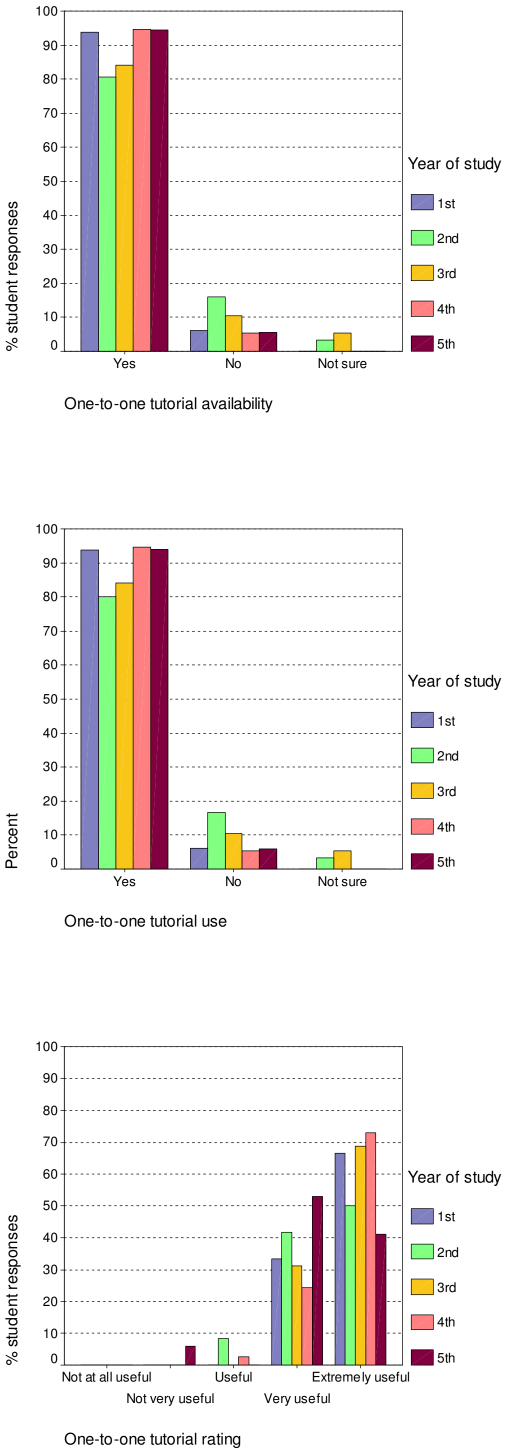

**Availability, use and rating of 35mm slides as perceived by different student years**



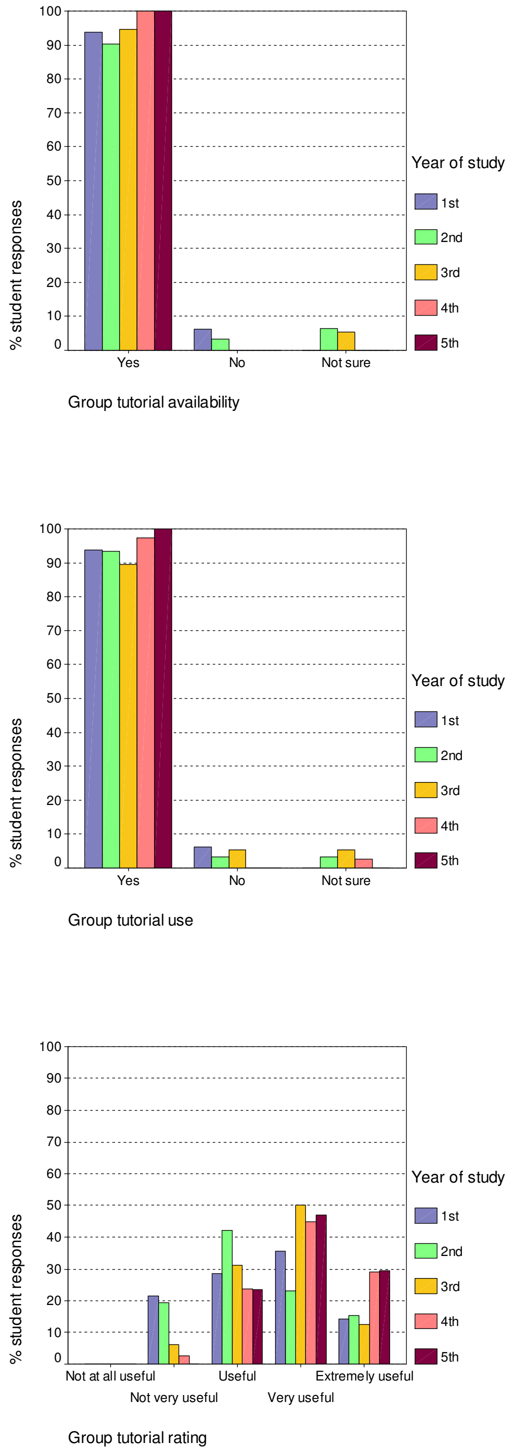

**Availability, use and rating of electronic slides as perceived by different student years**



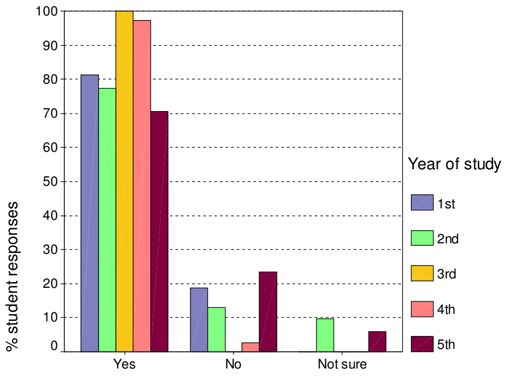

**Availability, use and rating of peer-assisted learning as perceived by different student years**



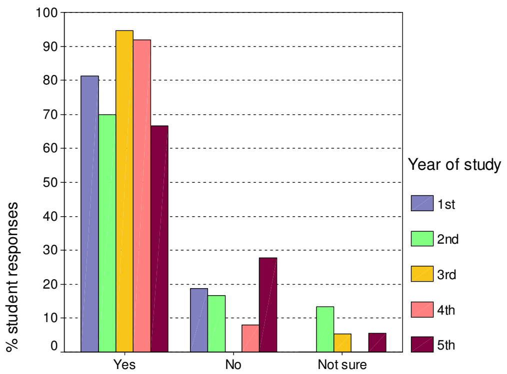

**Availability, use and rating of one-to-one tutorials (including EMS) as perceived by different student years**



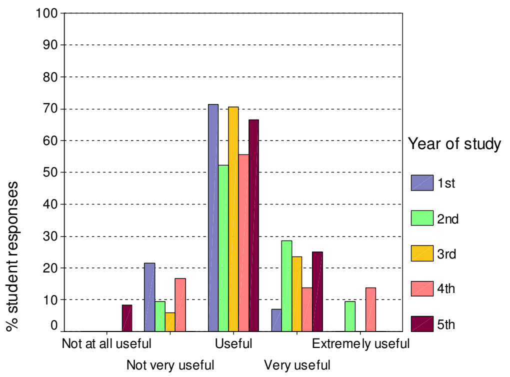

**Availability, use and rating of group tutorials as perceived by different student years**




Flipchart availability

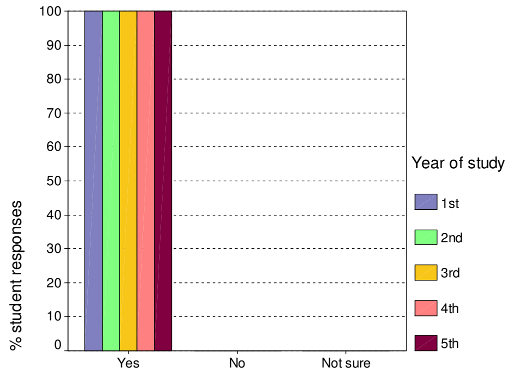



Flipchart use

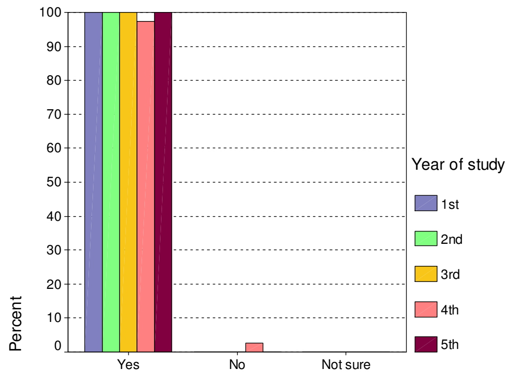



Flipchart rating

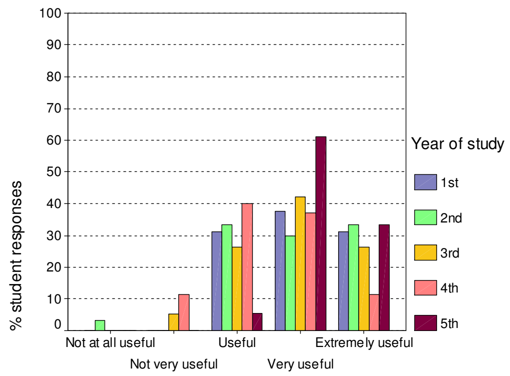
**Availability, use and rating of flipcharts as perceived by different student years**




Textbook availability

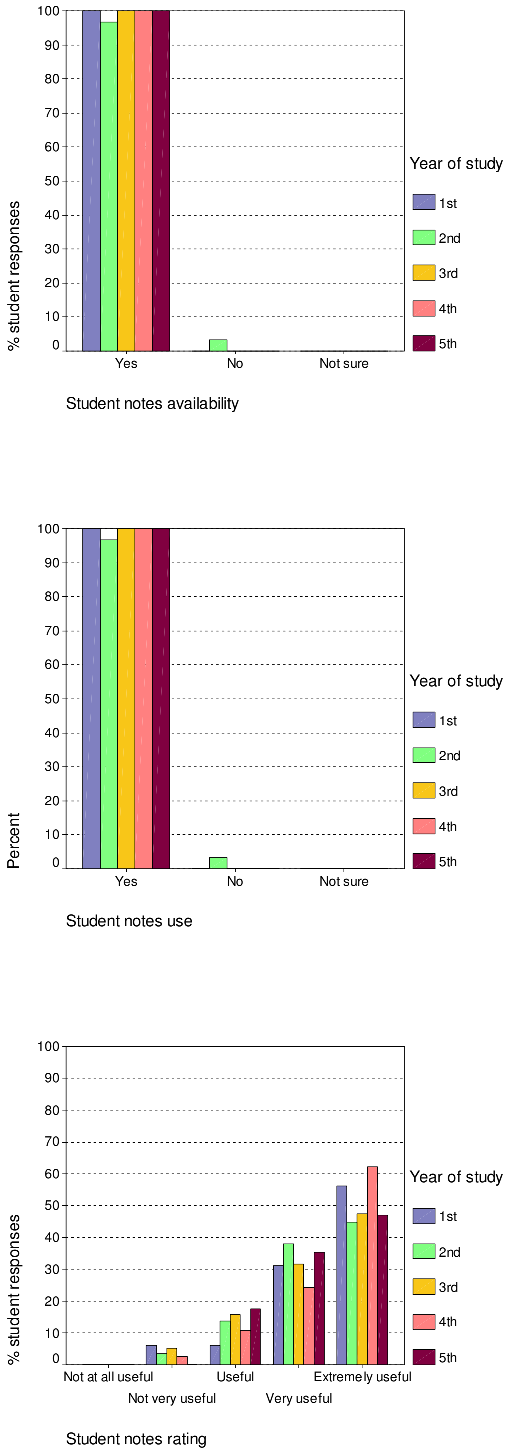



Textbook use

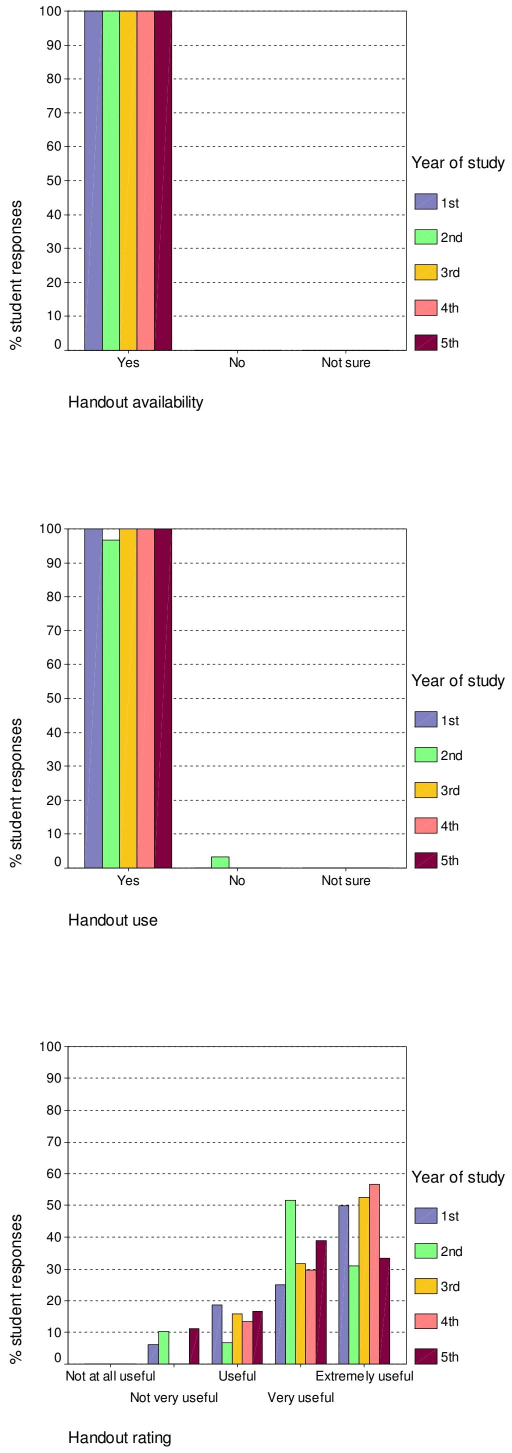



Textbook rating

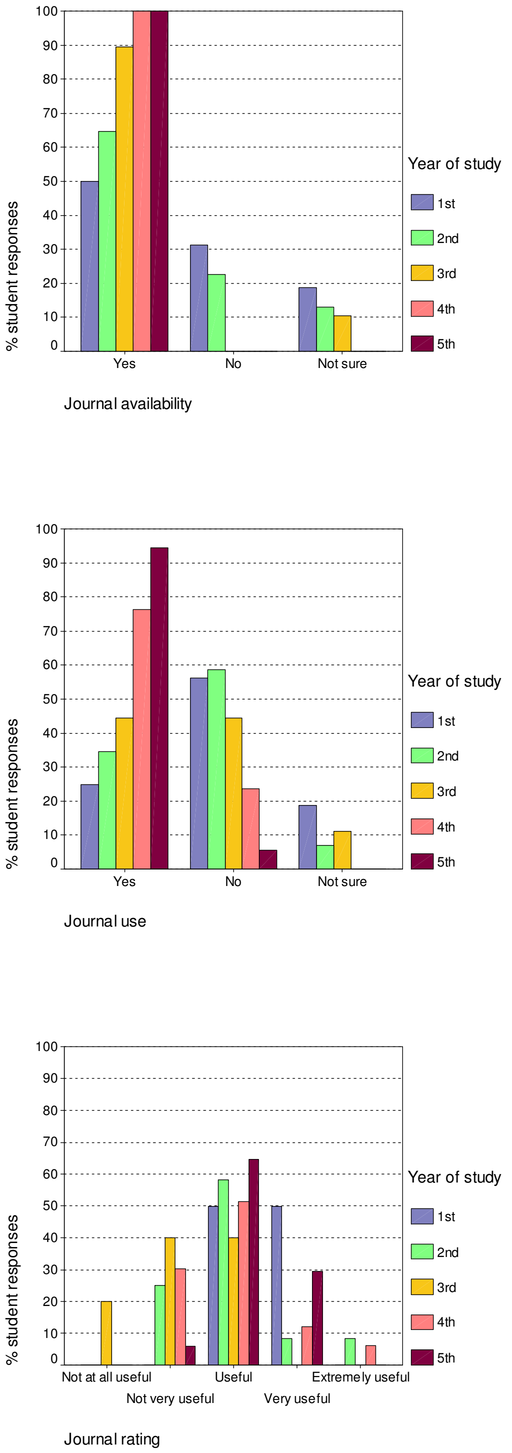
**Availability, use and rating of textbooks as perceived by different student years**



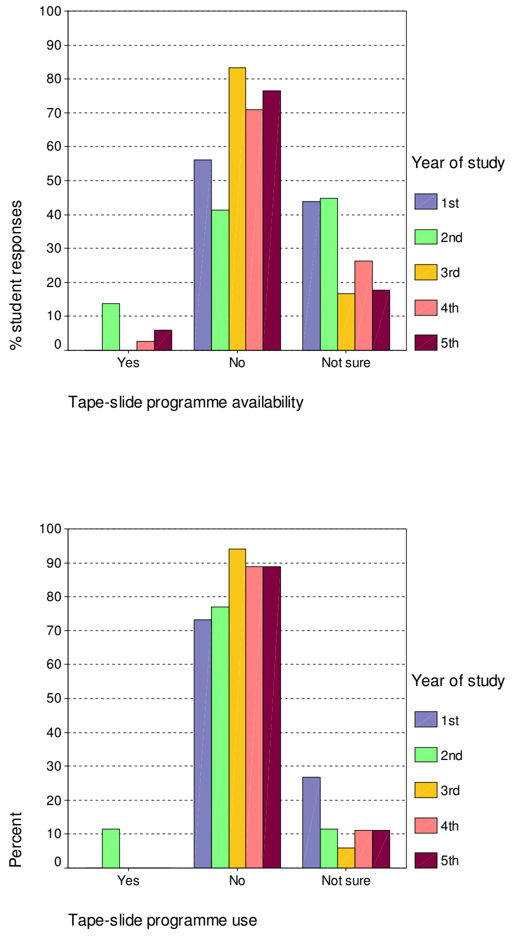

**Availability, use and rating of student notes as perceived by different student years**



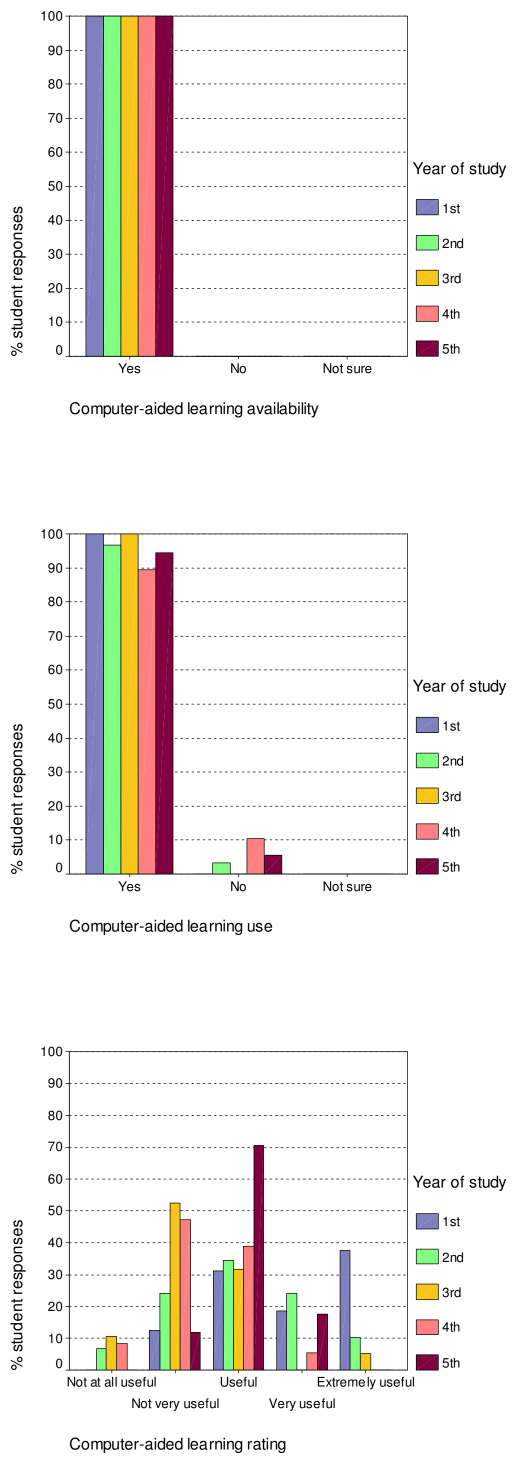

**Availability, use and rating of handouts as perceived by different student years**



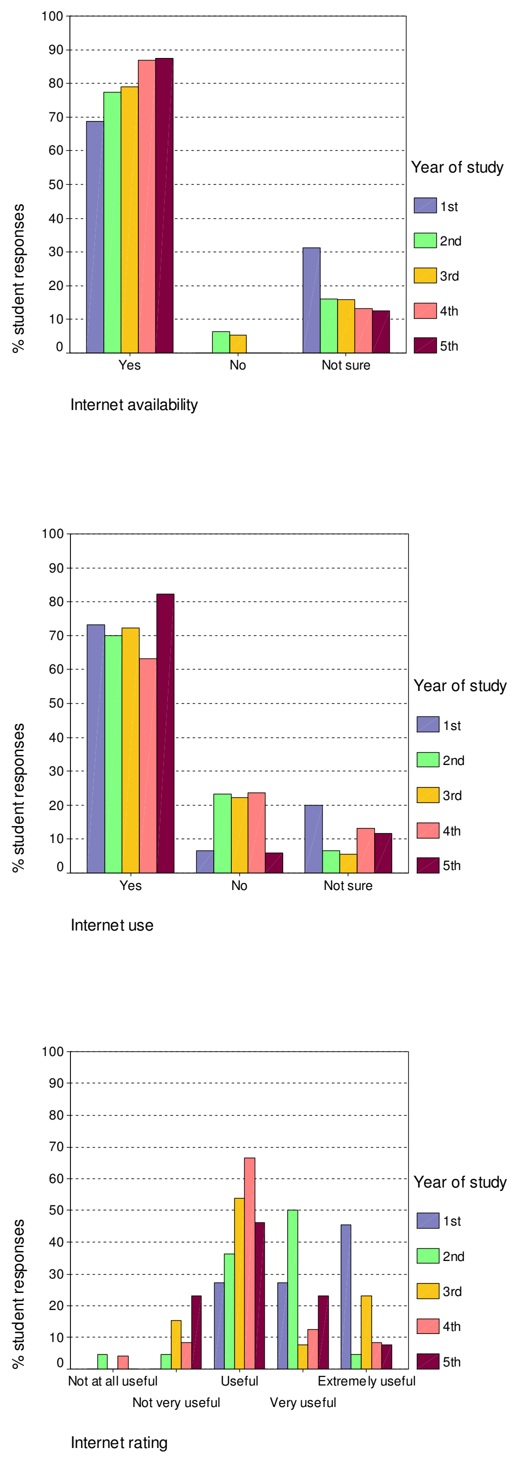

**Availability, use and rating of journals as perceived by different student years**



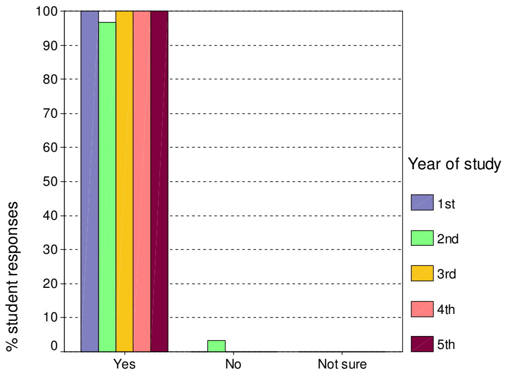

**Availability and use of tape-slide programmes as perceived by different student years**



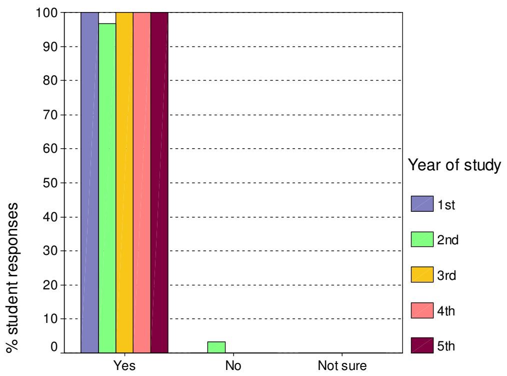

**Availability, use and rating of computer-aided learning as perceived by different student years**



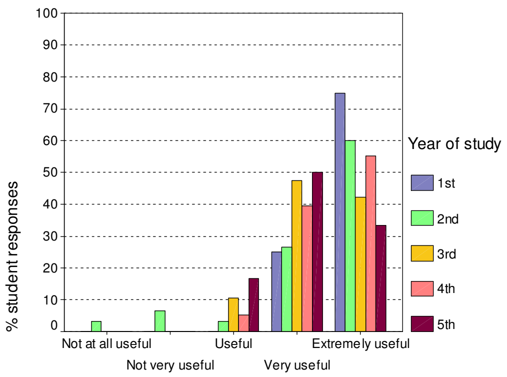

**Availability, use and rating of the Internet as perceived by different student years**




Practical class availability

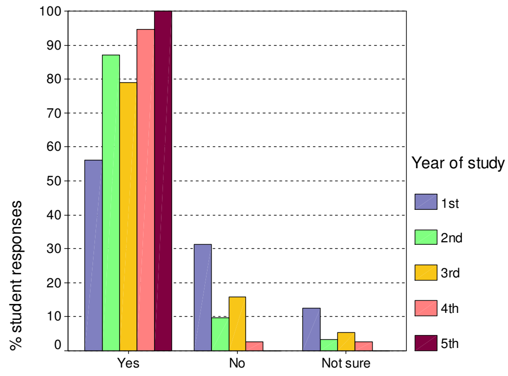



Practical class use

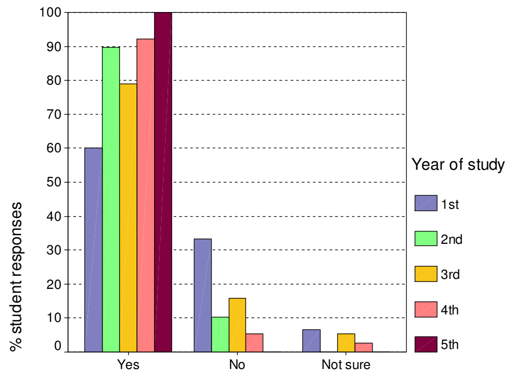



Practical class rating

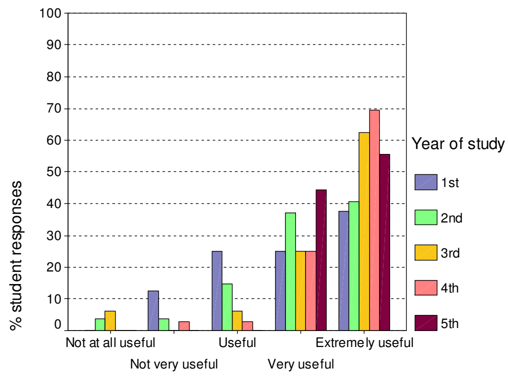
**Availability, use and rating of practical classes as perceived by different student years**




Hands-on clinical training availability

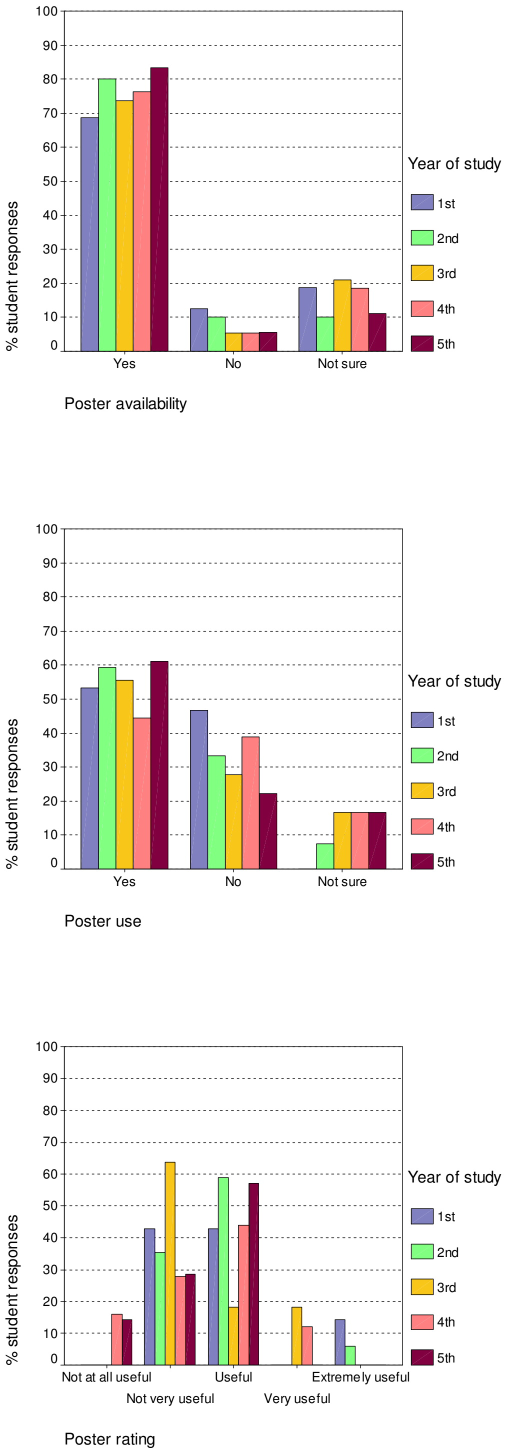



Hands-on clinical training use

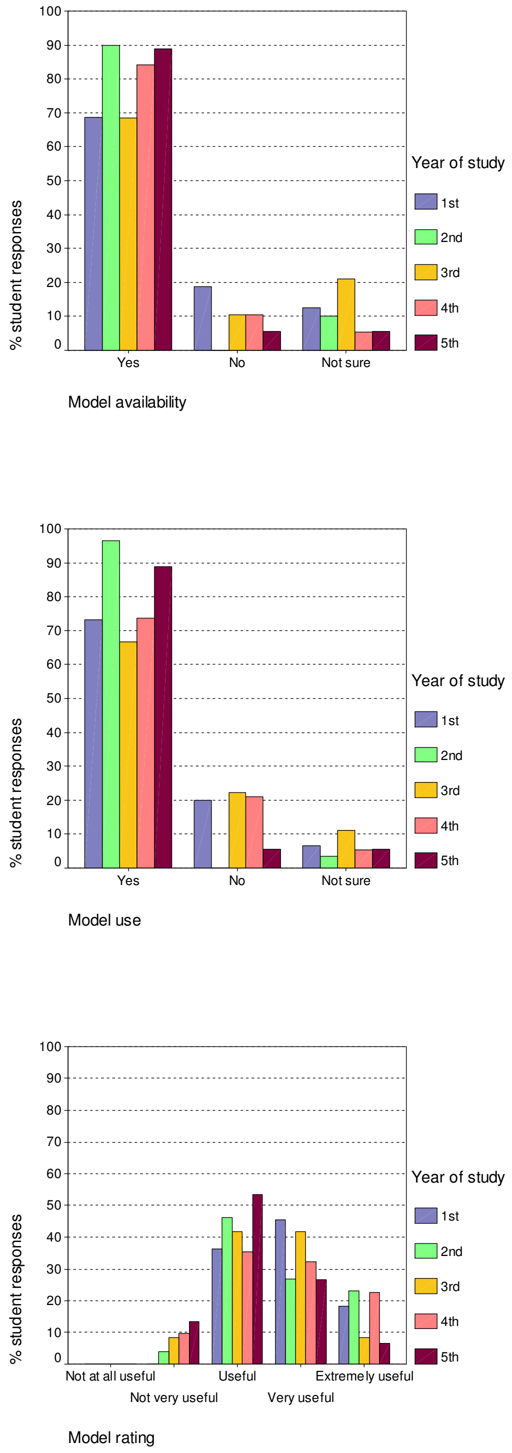



Hands-on clinical training rating

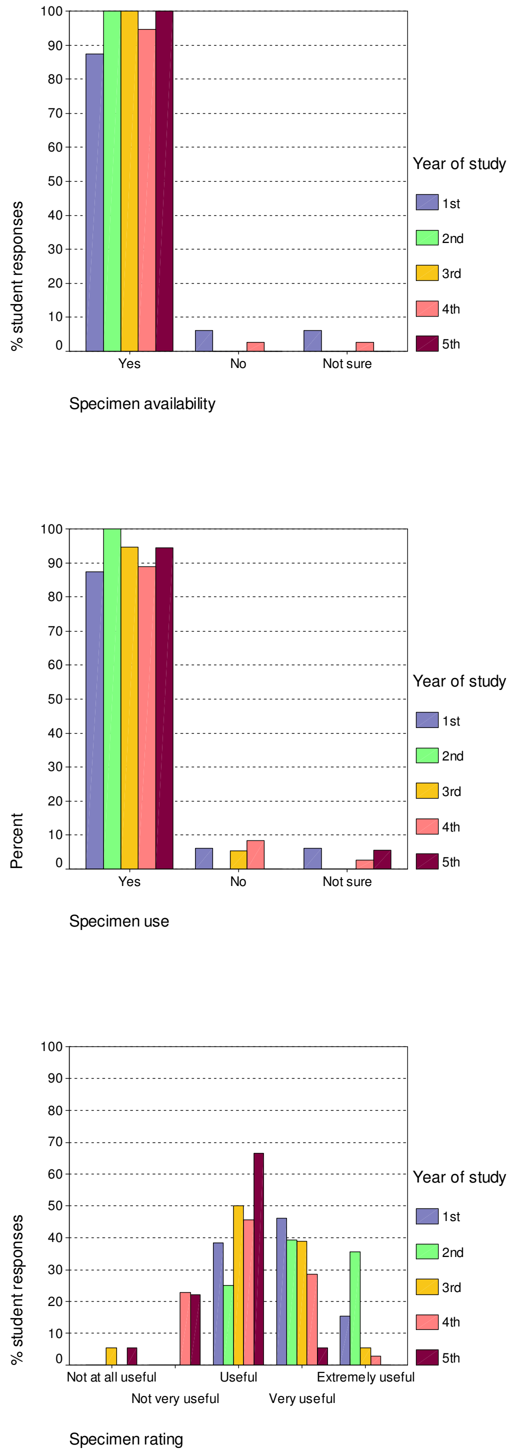
**Availability, use and rating of hands-on clinical training (with live animal) as perceived by different student years**



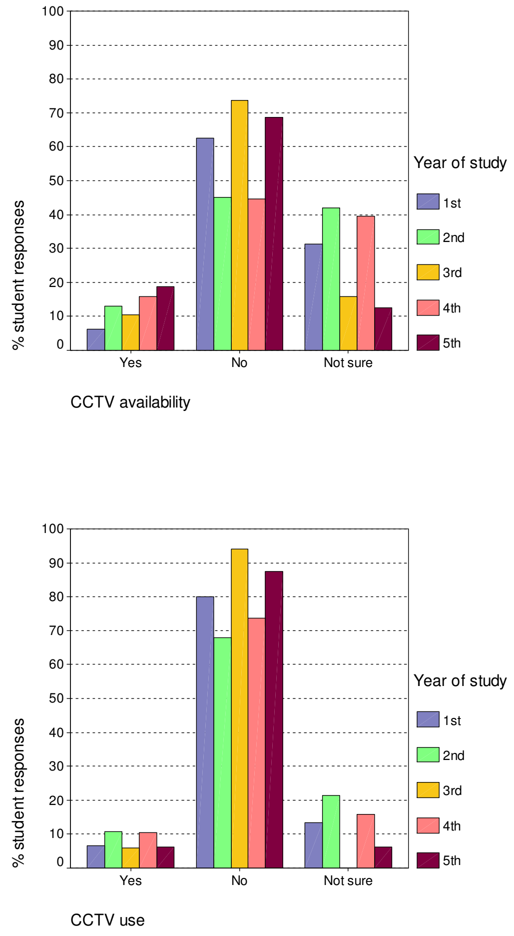

**Availability, use and rating of posters as perceived by different student years**



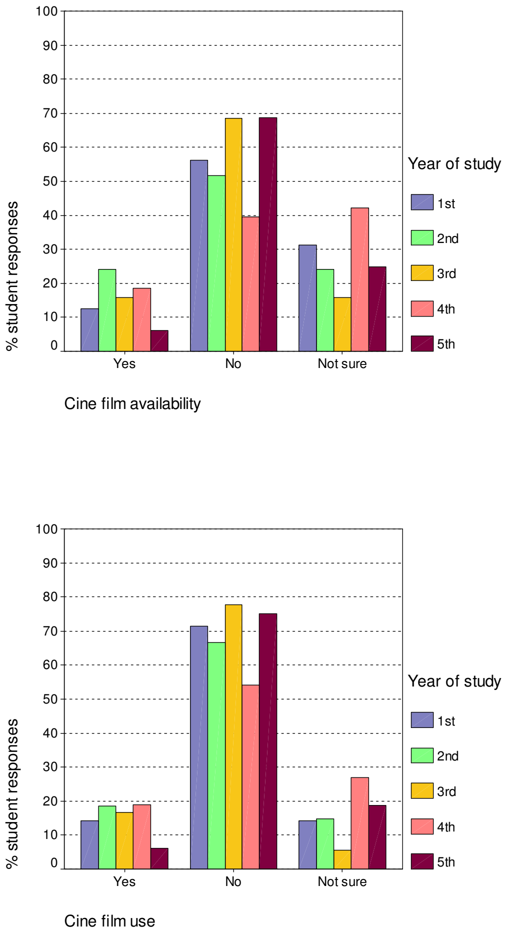

**Availability, use and rating of models as perceived by different student years**



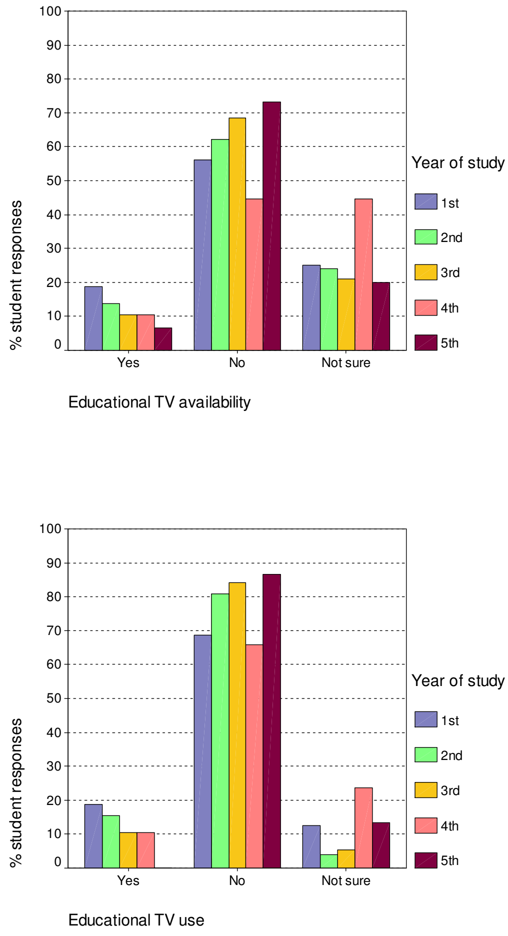

**Availability, use and rating of preserved specimens as perceived by different student years**



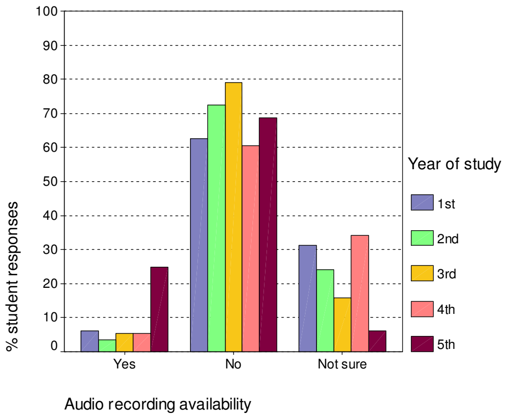

**Availability and use of closed-circuit television as perceived by different student years**

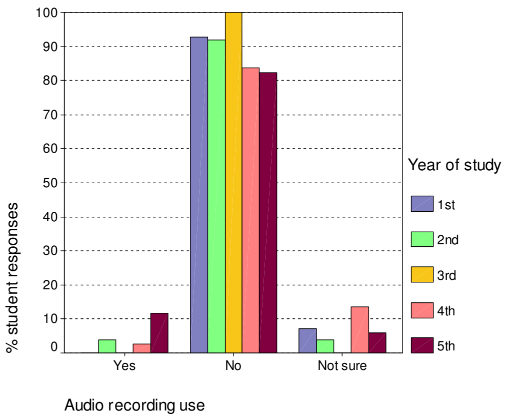



**Availability and use of cine films as perceived by different student years**

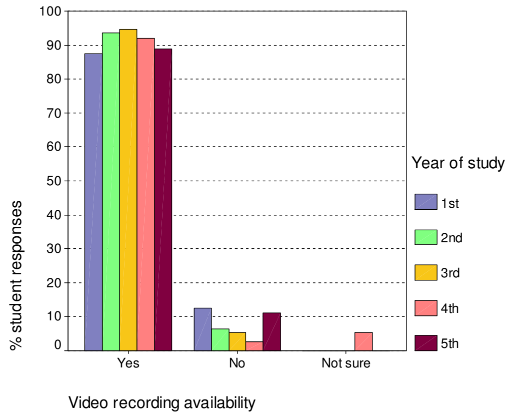


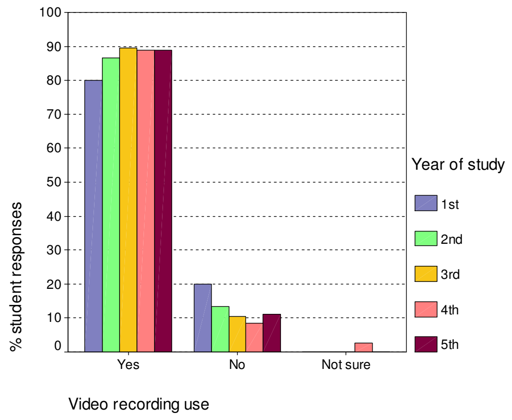

**Availability and use of educational television as perceived by different student years**

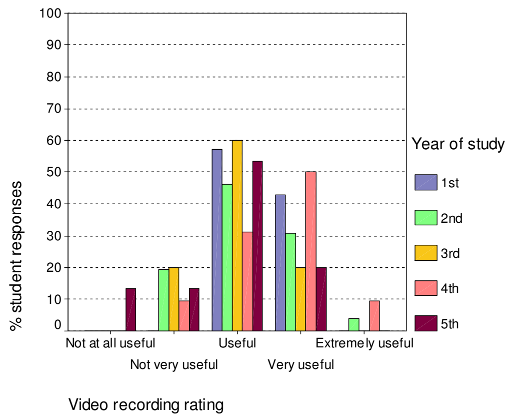



**Availability and use of audio-recordings as perceived by different student years**

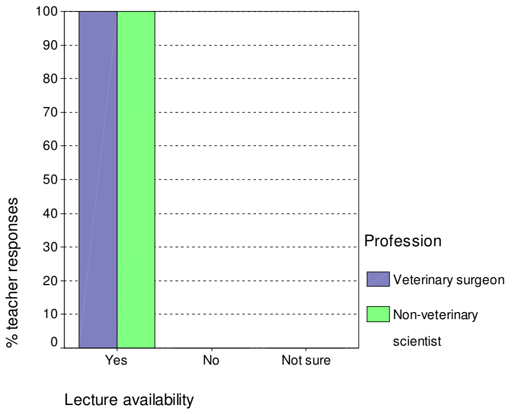


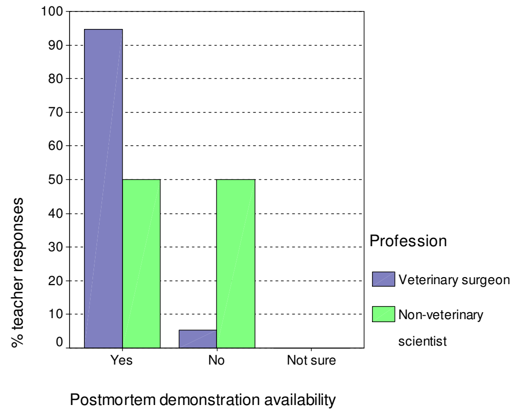



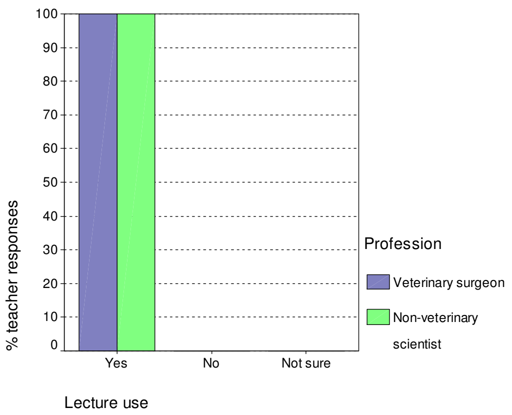



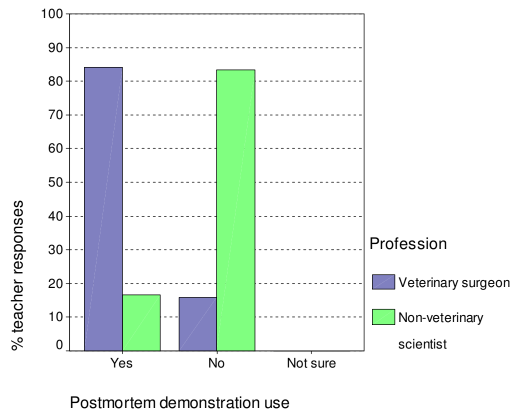

**Availability, use and rating of video-recordings as perceived by different student years**

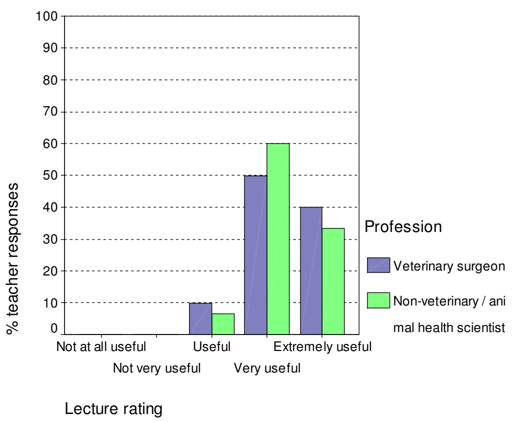
# Lecturing staff

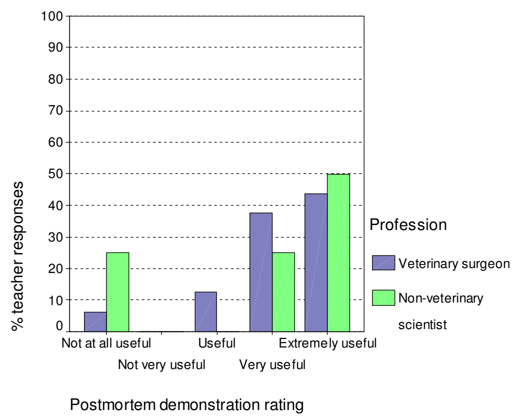


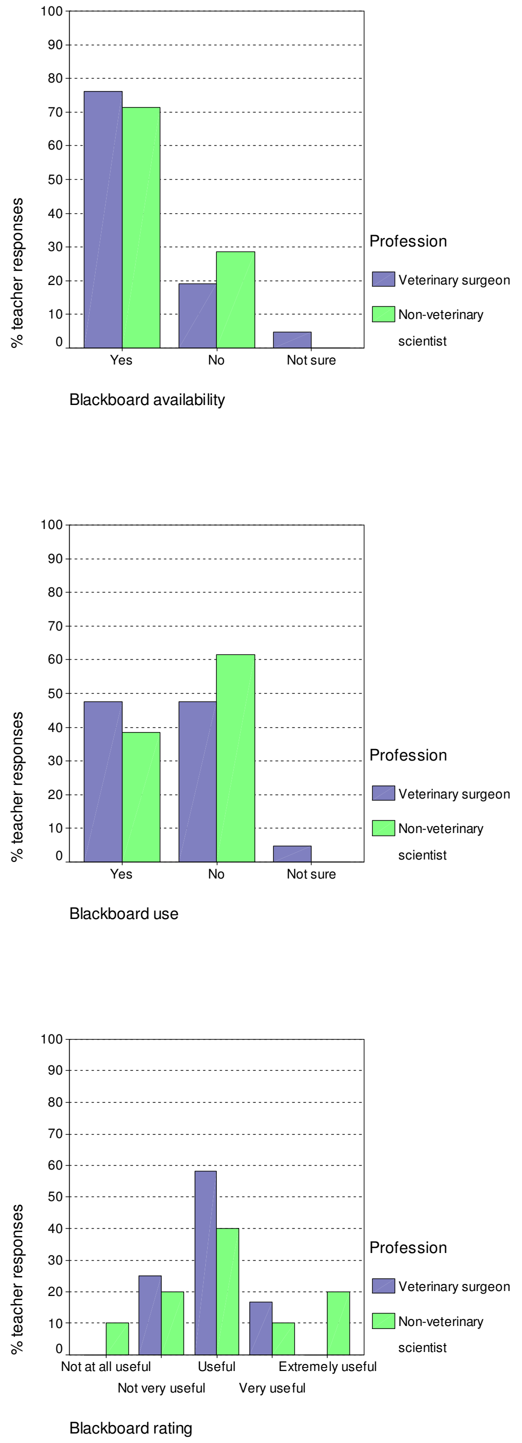



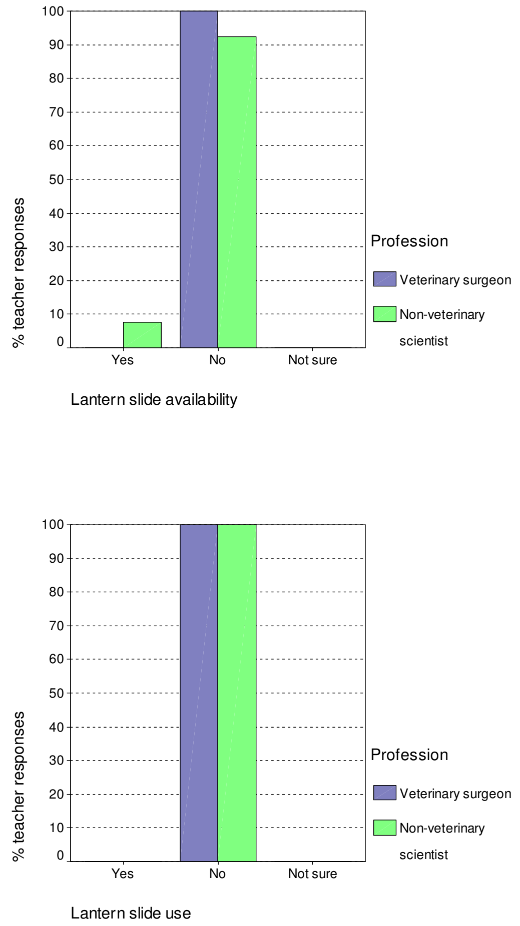




**Availability, use and rating of lectures as perceived by teachers**

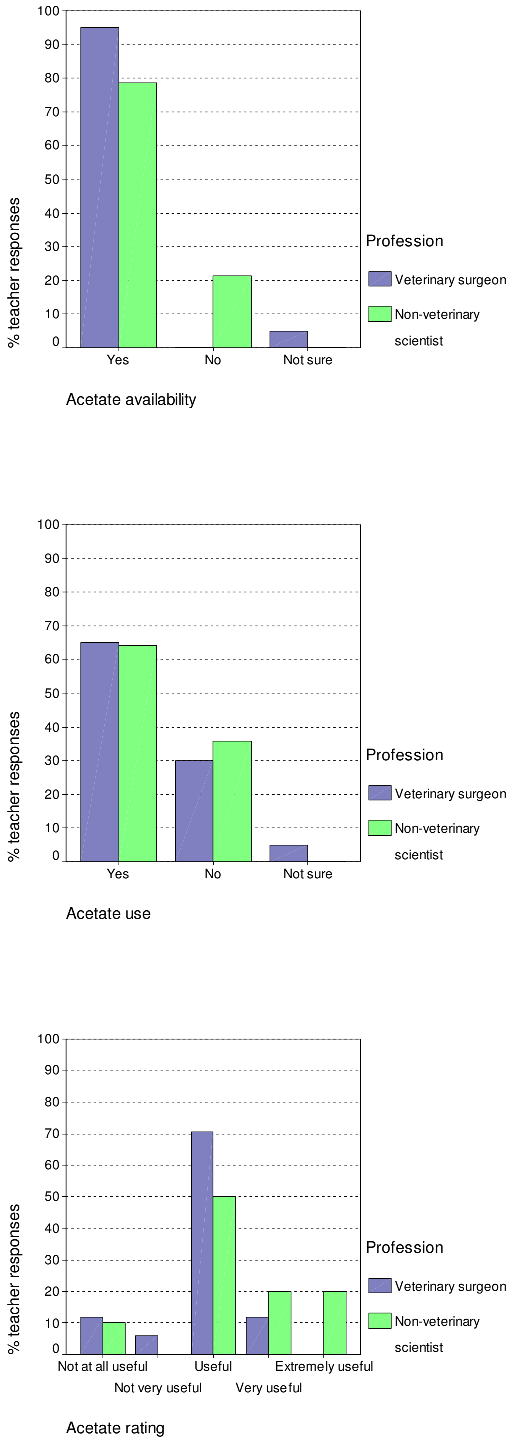
**Availability, use and rating of post-mortem demonstrations as perceived by teachers**



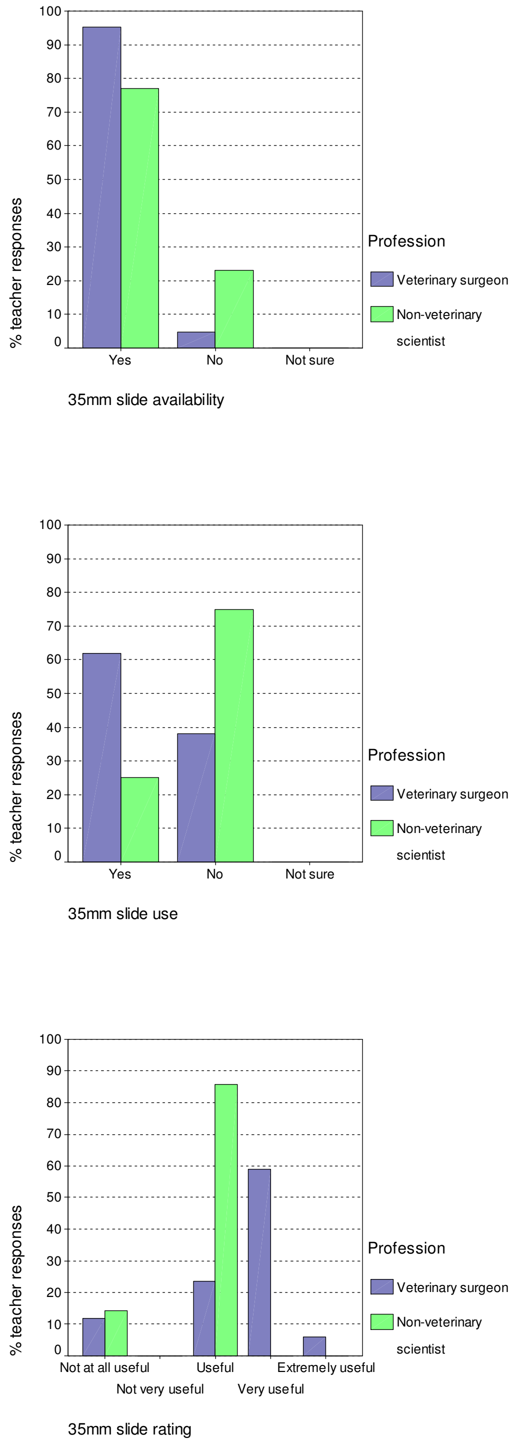

**Availability, use and rating of blackboards as perceived by teachers**



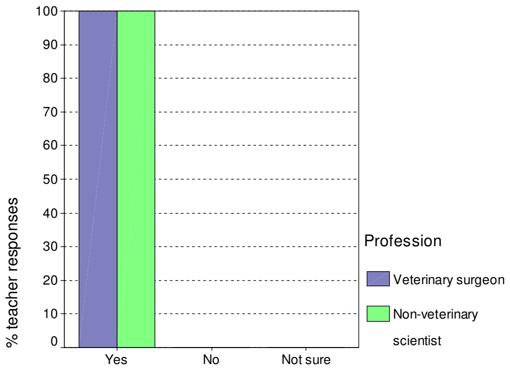

**Availability and use of lantern slides as perceived by teachers**



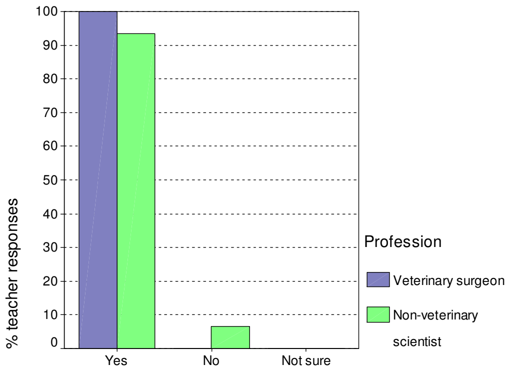

**Availability, use and rating of acetates as perceived by teachers**



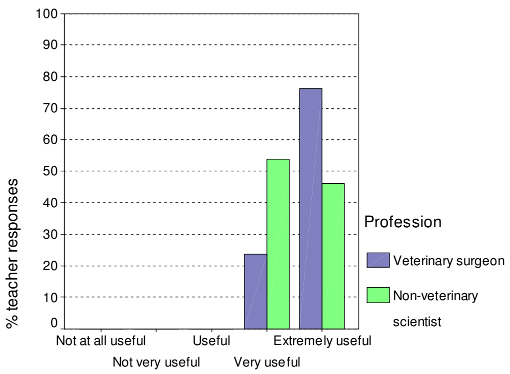

**Availability, use and rating of 35mm slides as perceived by teachers**




Electronic slide availability

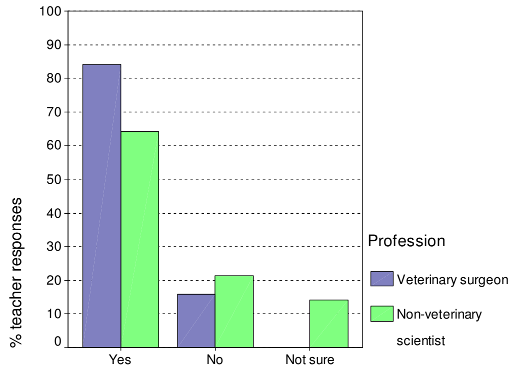



Electronic slide use

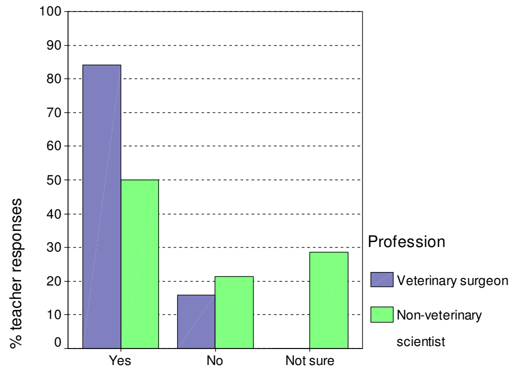



Electronic slide rating

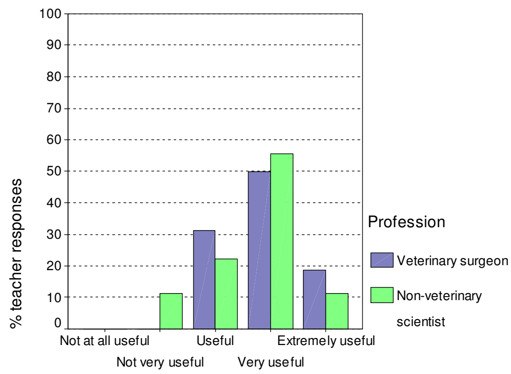
**Availability, use and rating of electronic slides as perceived by teachers**




Peer-assisted learning availability

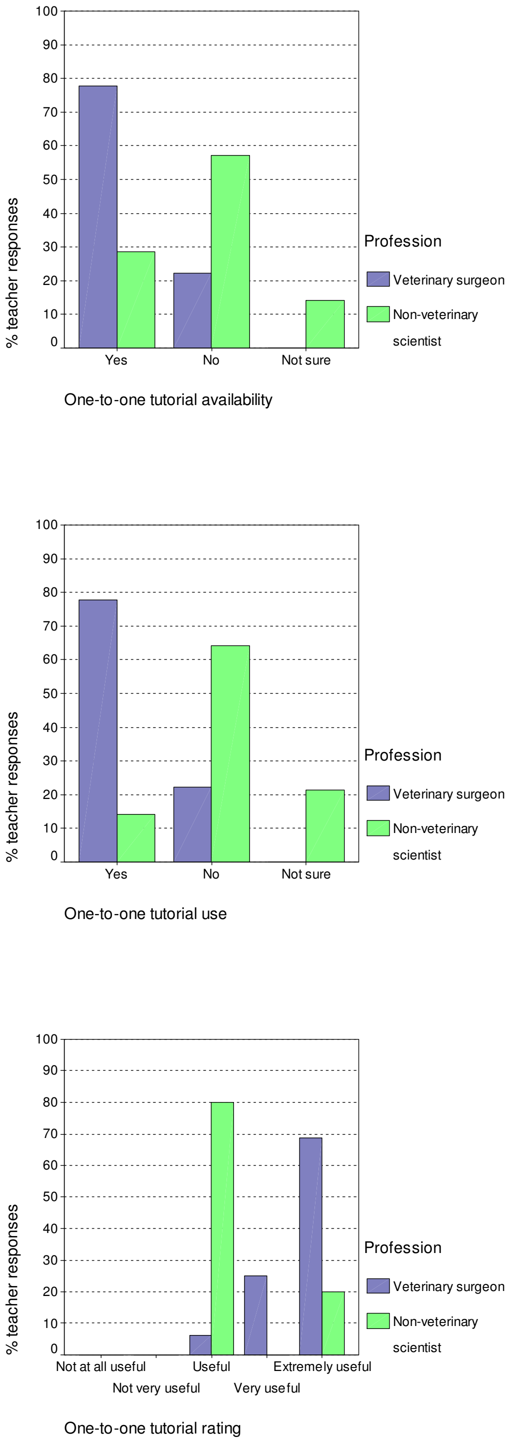



Peer-assisted learning use

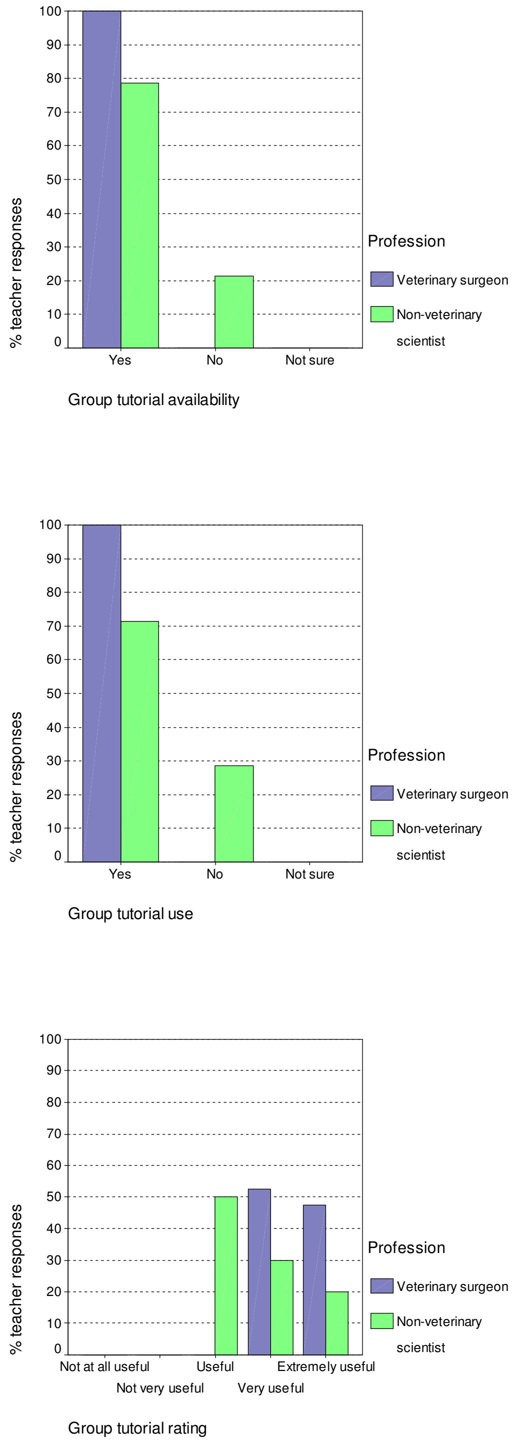



Peer assisted learning rating

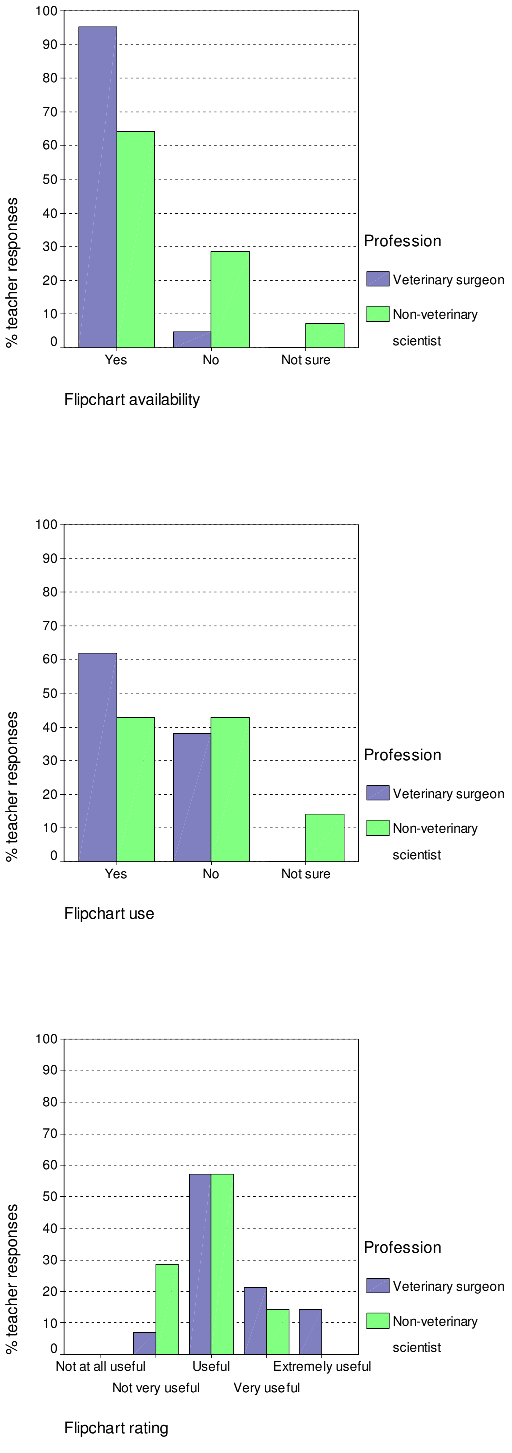
**Availability, use and rating of peer-assisted learning as perceived by teachers**



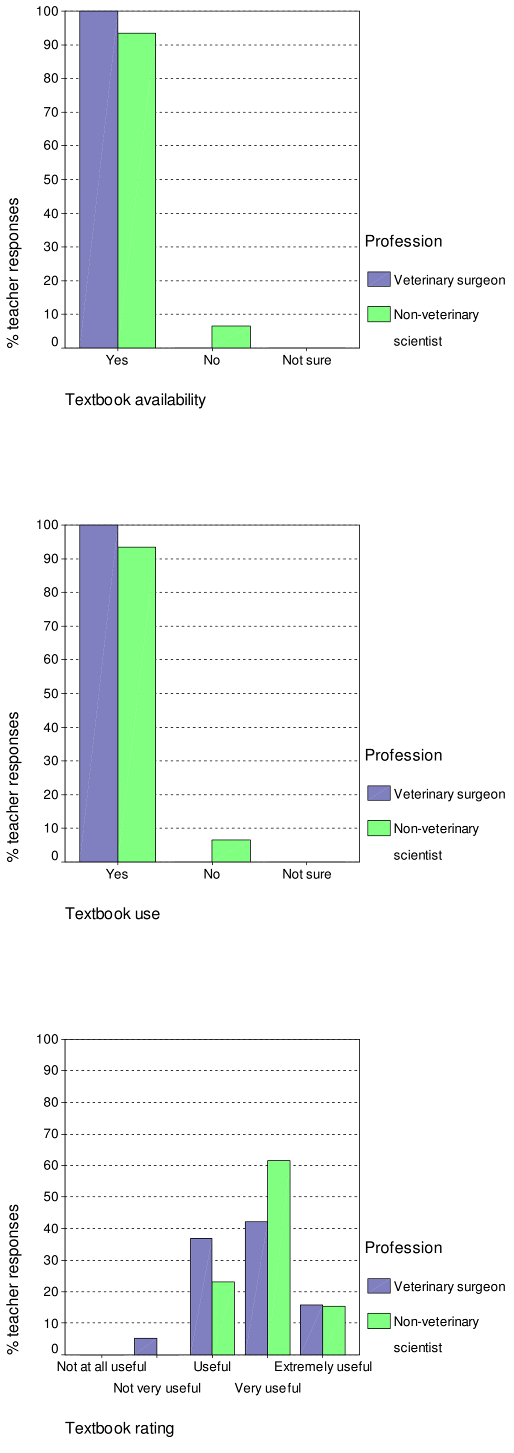

**Availability, use and rating of one-to-one tutorials (including EMS) as perceived by teachers**



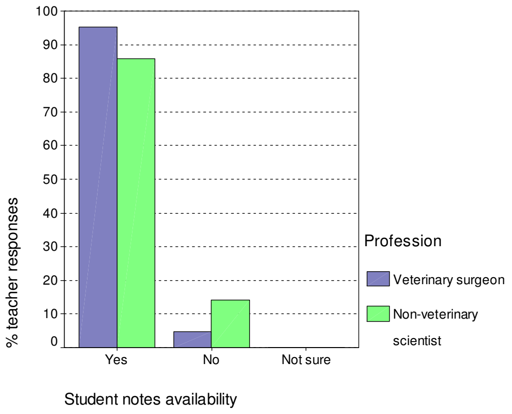

**Availability, use and rating of group tutorials as perceived by teachers**

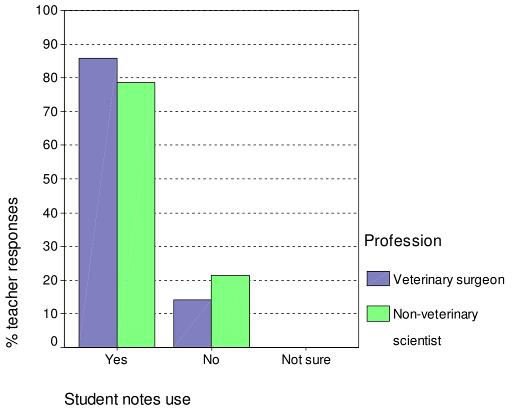


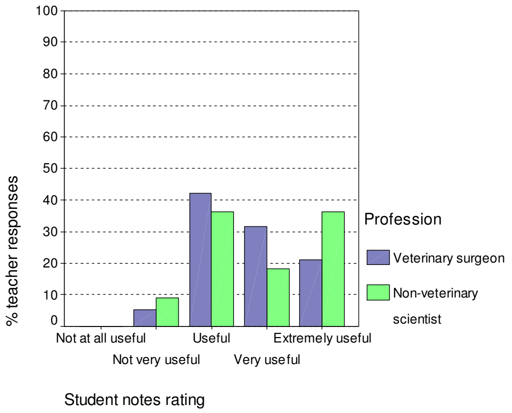

**Availability, use and rating of flipcharts as perceived by teachers**



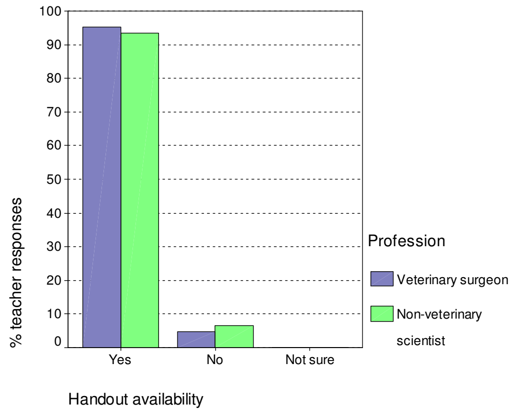

**Availability, use and rating of textbooks as perceived by teachers**

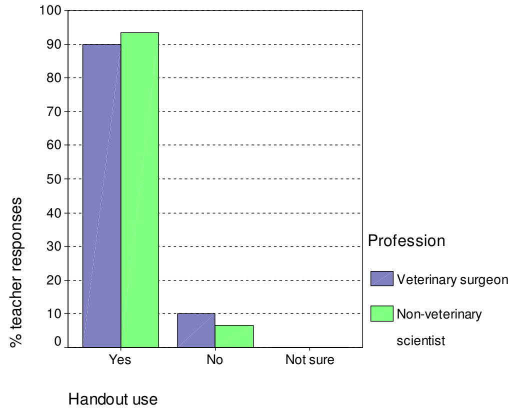


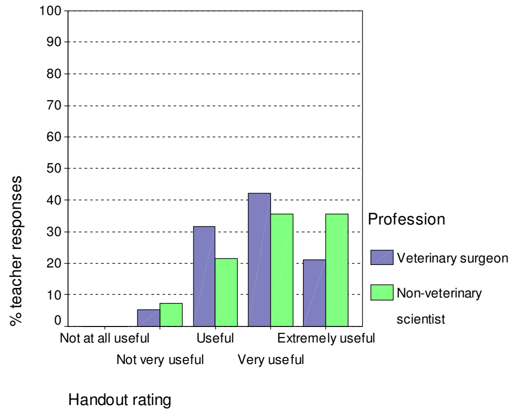



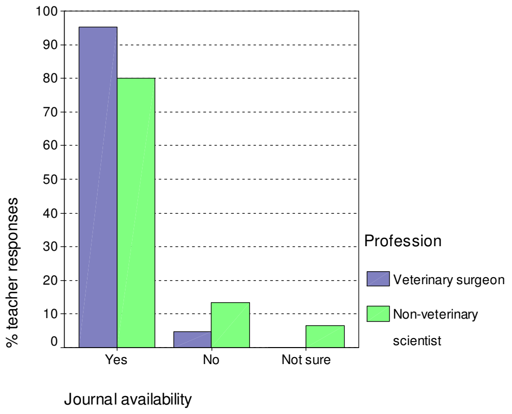

**Availability, use and rating of student notes as perceived by teachers**

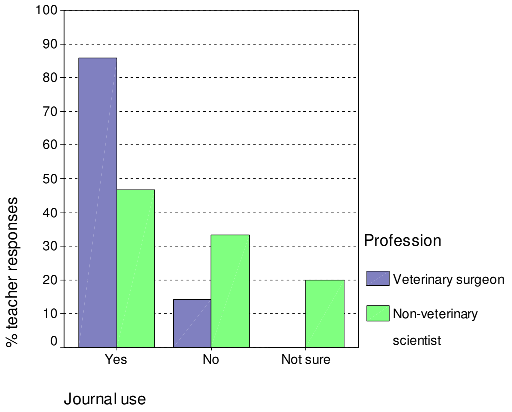


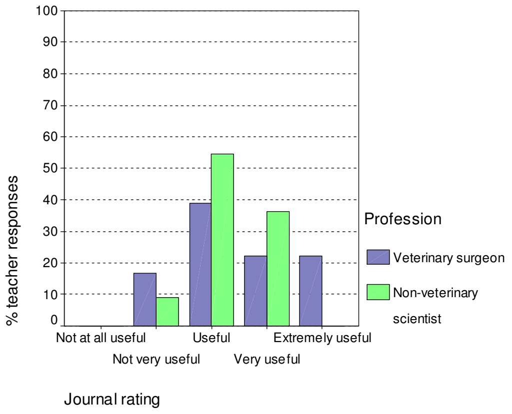



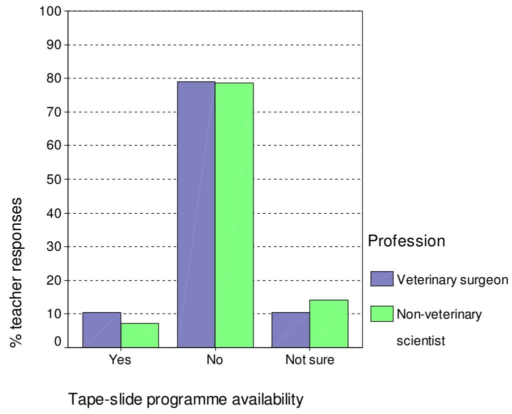

**Availability, use and rating of handouts as perceived by teachers**

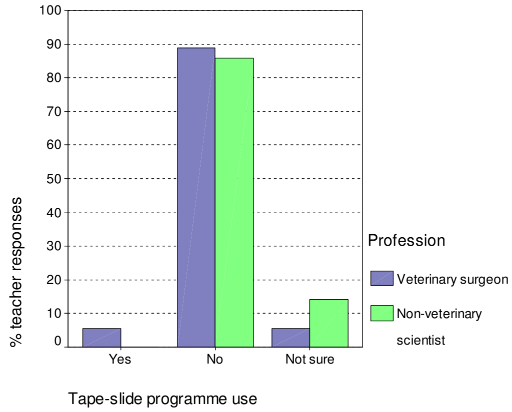


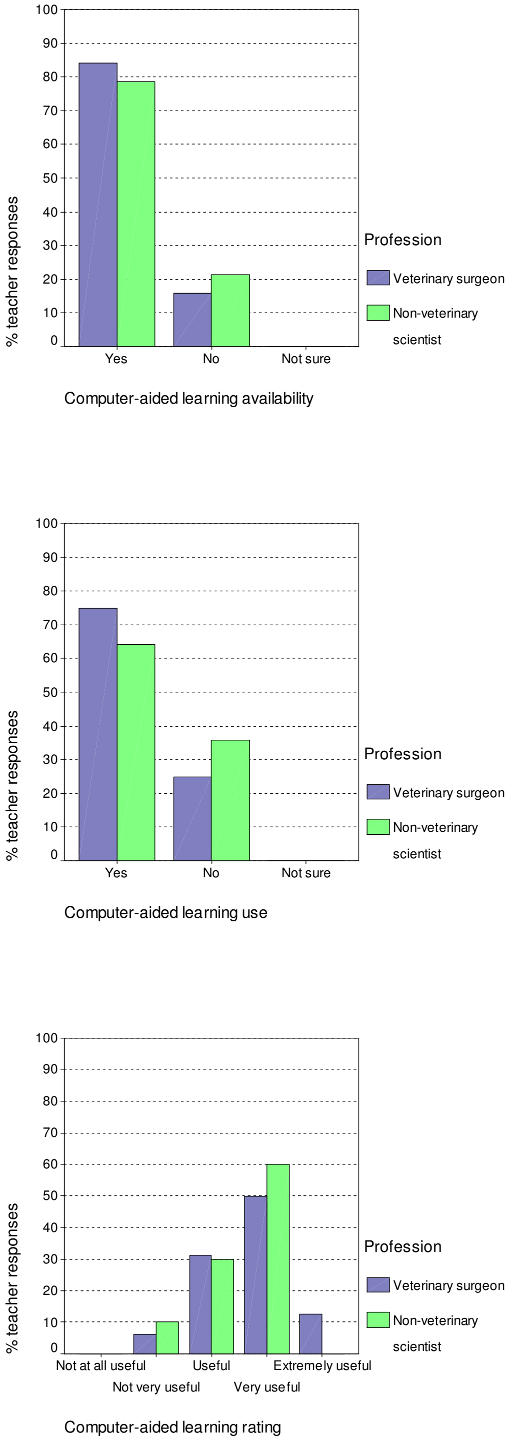




**Availability, use and rating of journals as perceived by teachers**

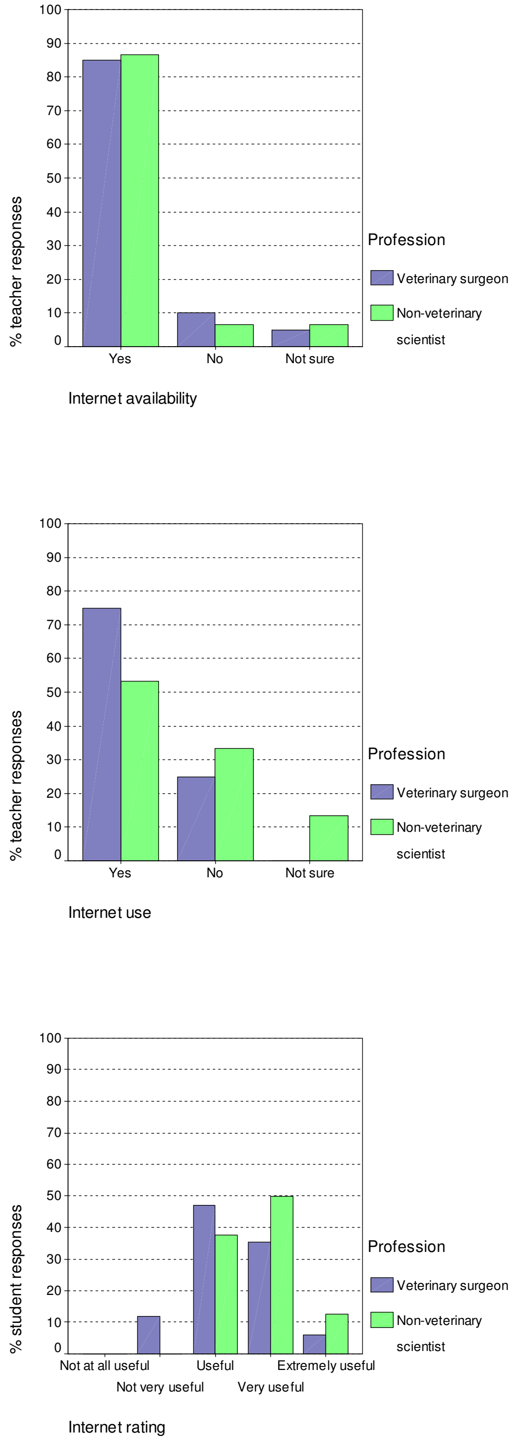


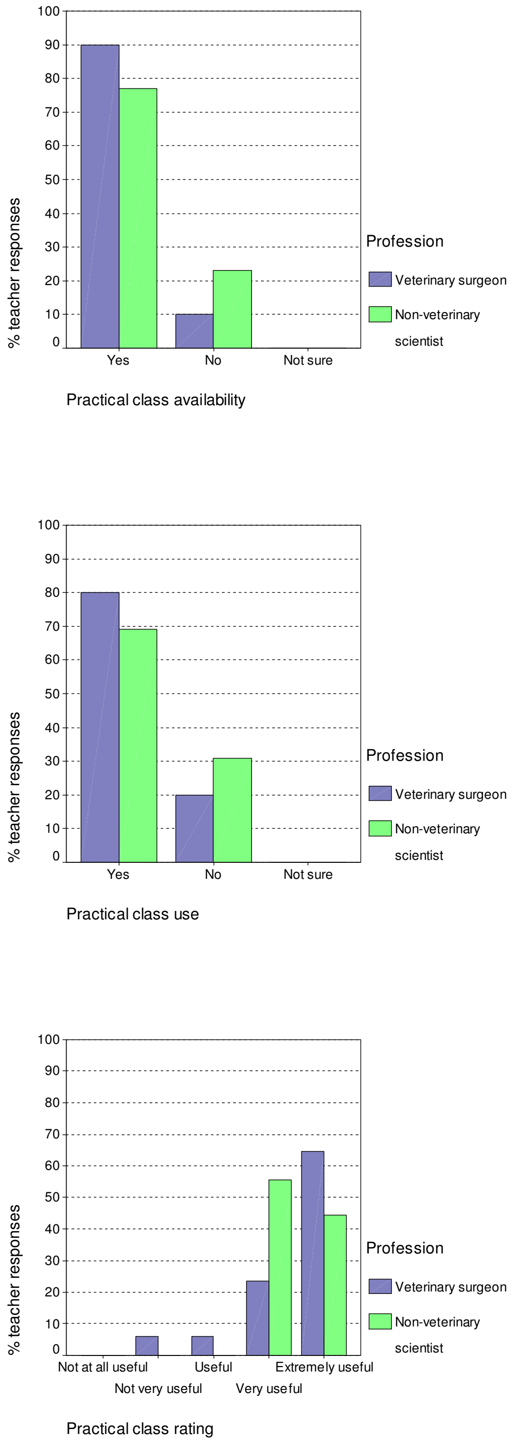

**Availability and use of tape-slide programmes as perceived by teachers**



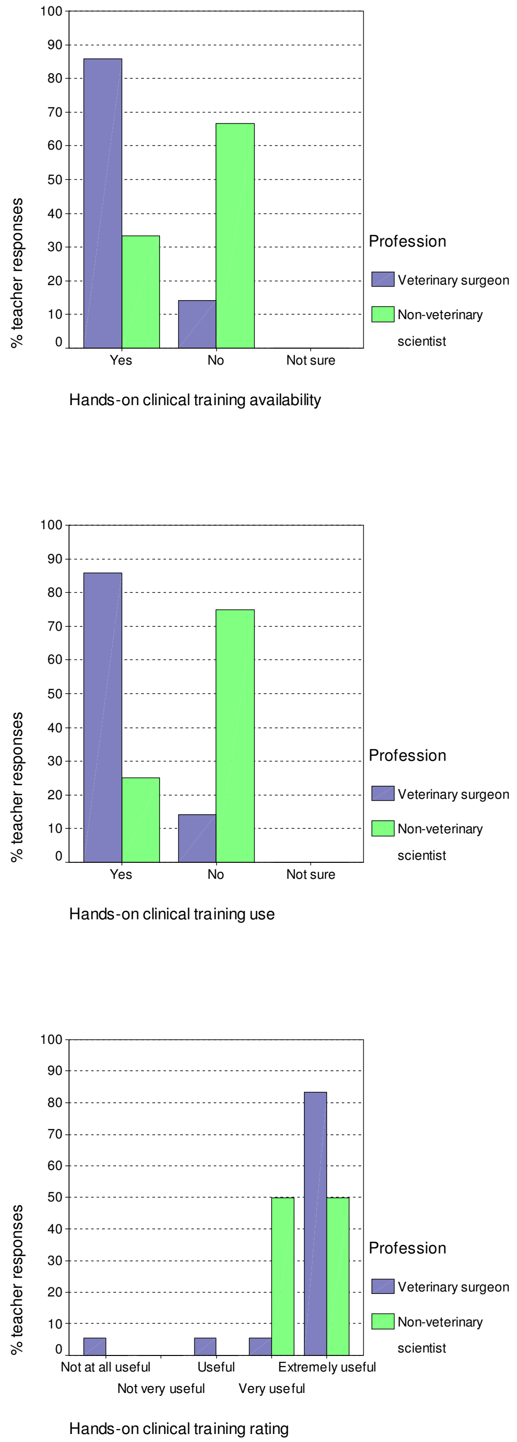

**Availability, use and rating of computer-aided learning as perceived by teachers**



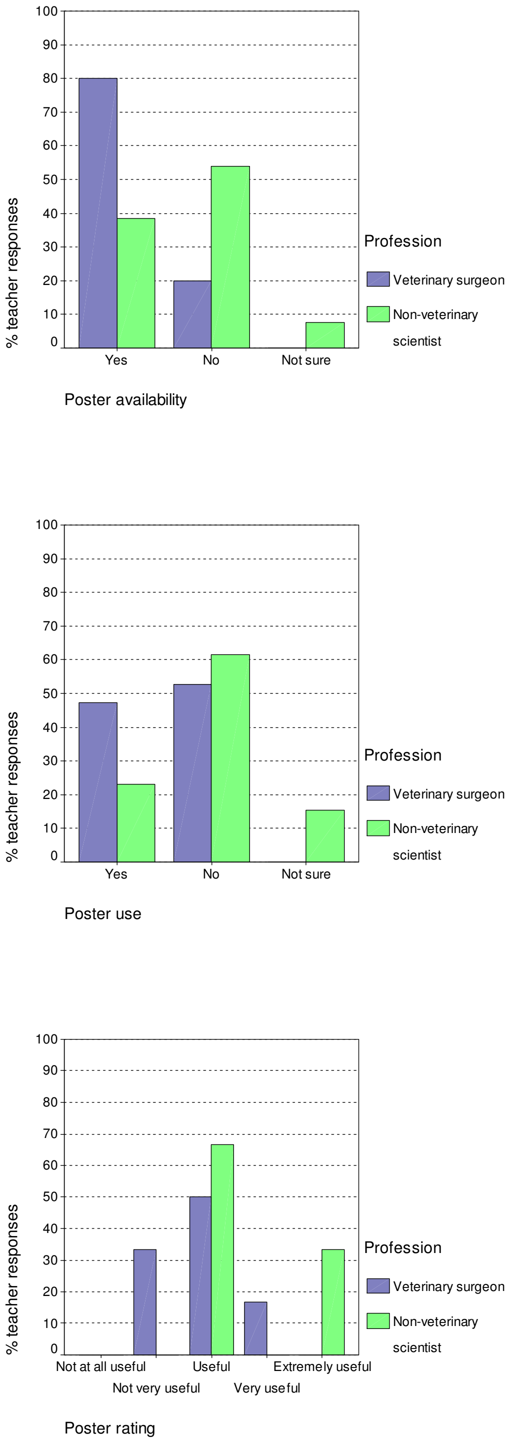

**Availability, use and rating of the Internet as perceived by teachers**



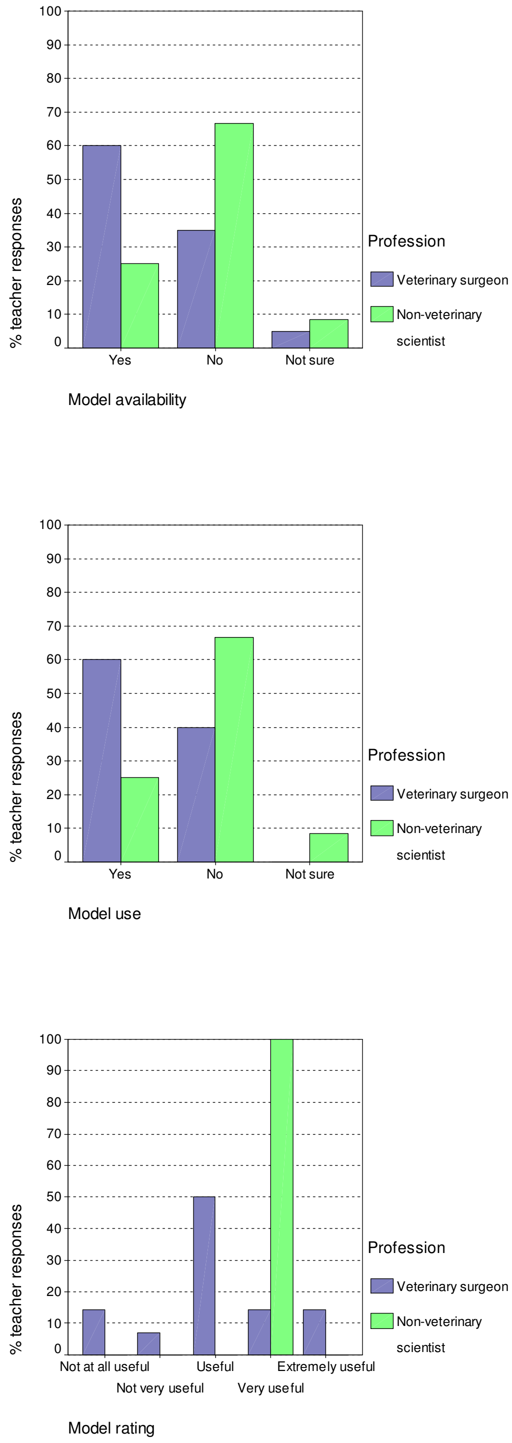

**Availability, use and rating of practical classes as perceived by teachers**



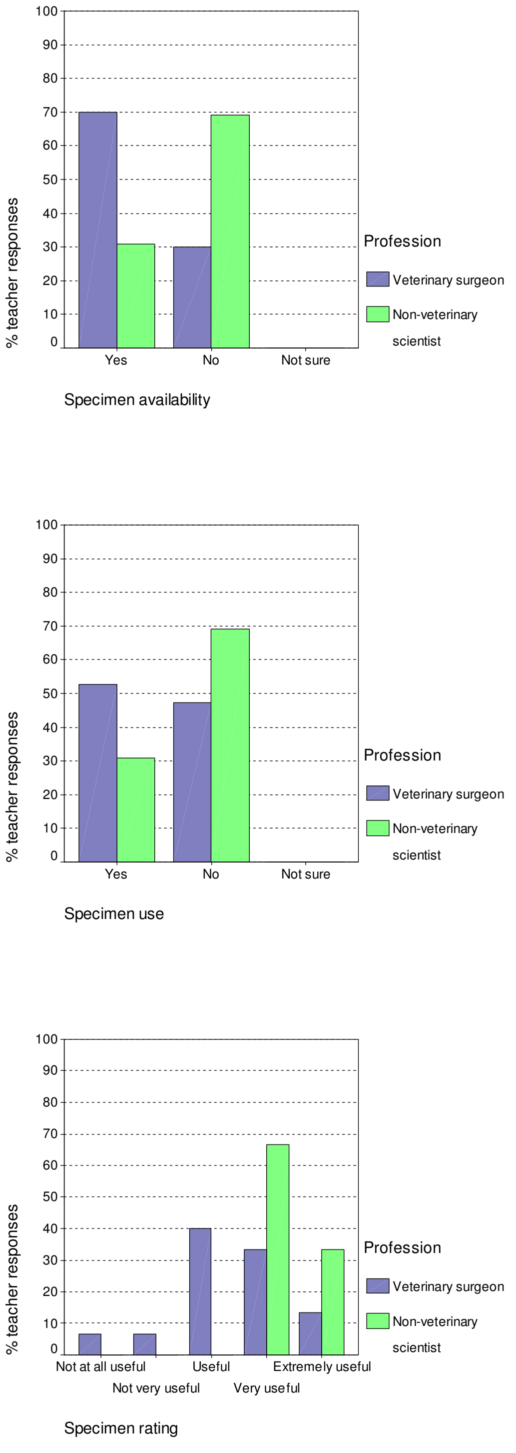

**Availability, use and rating of hands-on clinical training (with live animal) as perceived by teachers**



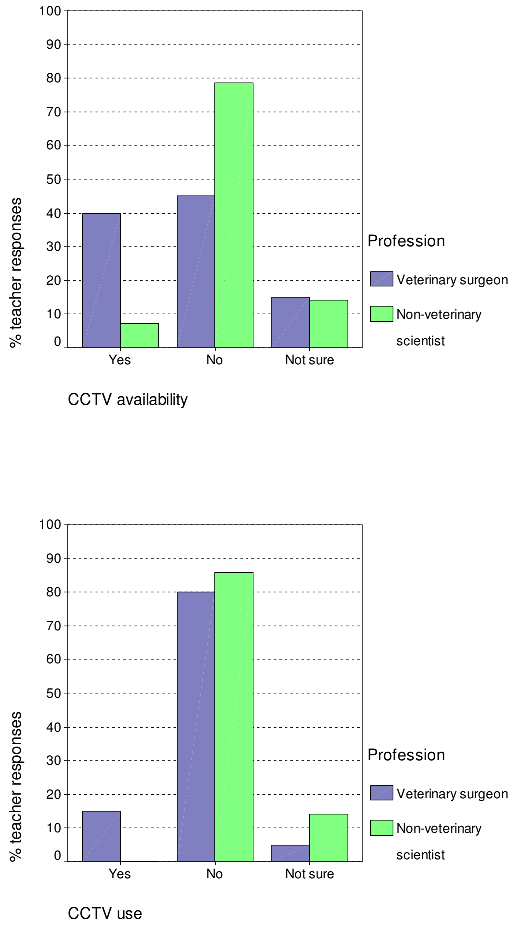

**Availability, use and rating of posters as perceived by teachers**



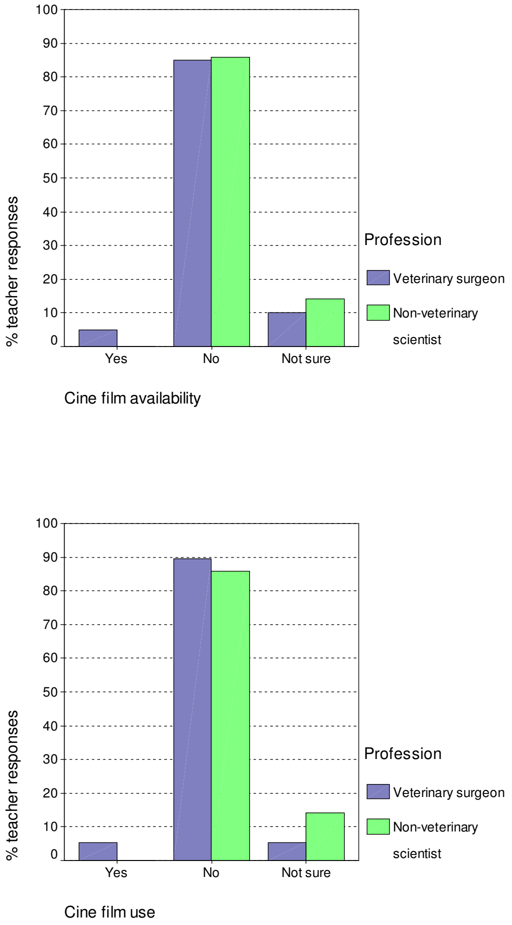

**Availability, use and rating of models as perceived by teachers**



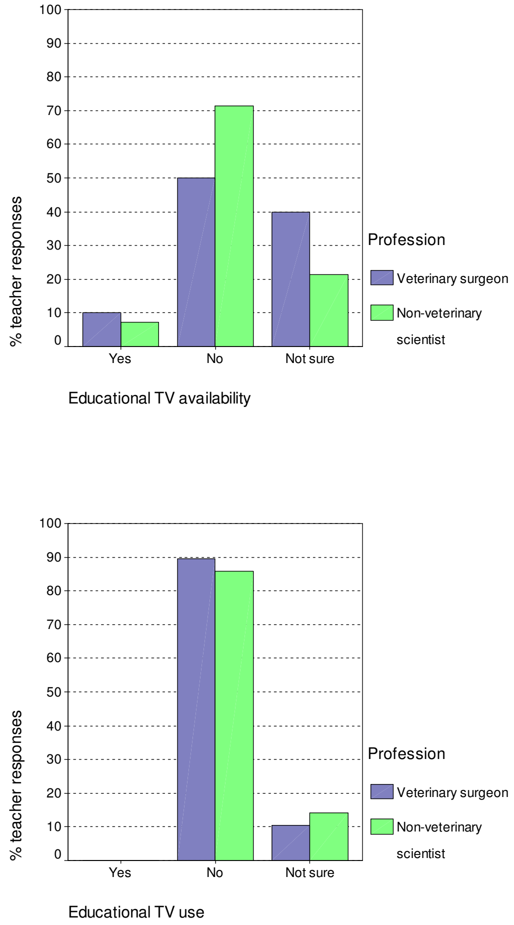

**Availability, use and rating of preserved specimens as perceived by teachers**



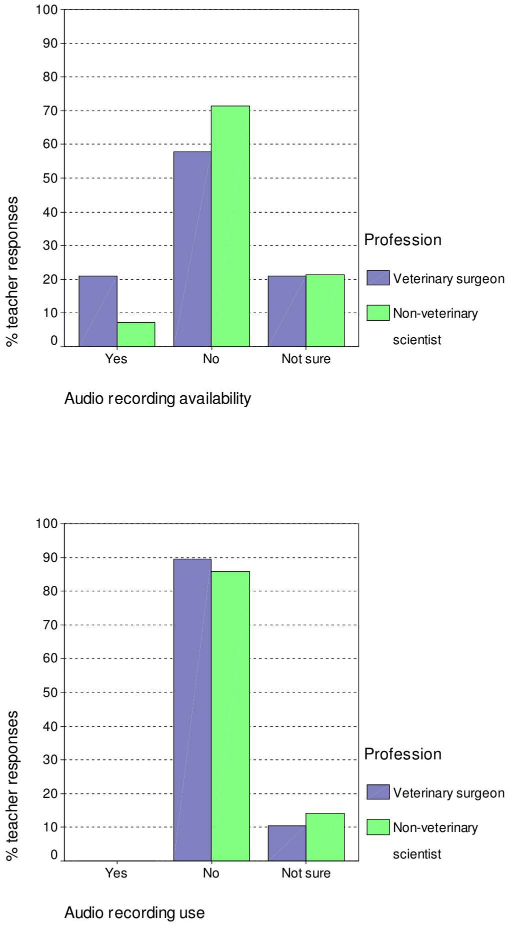

**Availability and use of closed-circuit television as perceived by teachers**



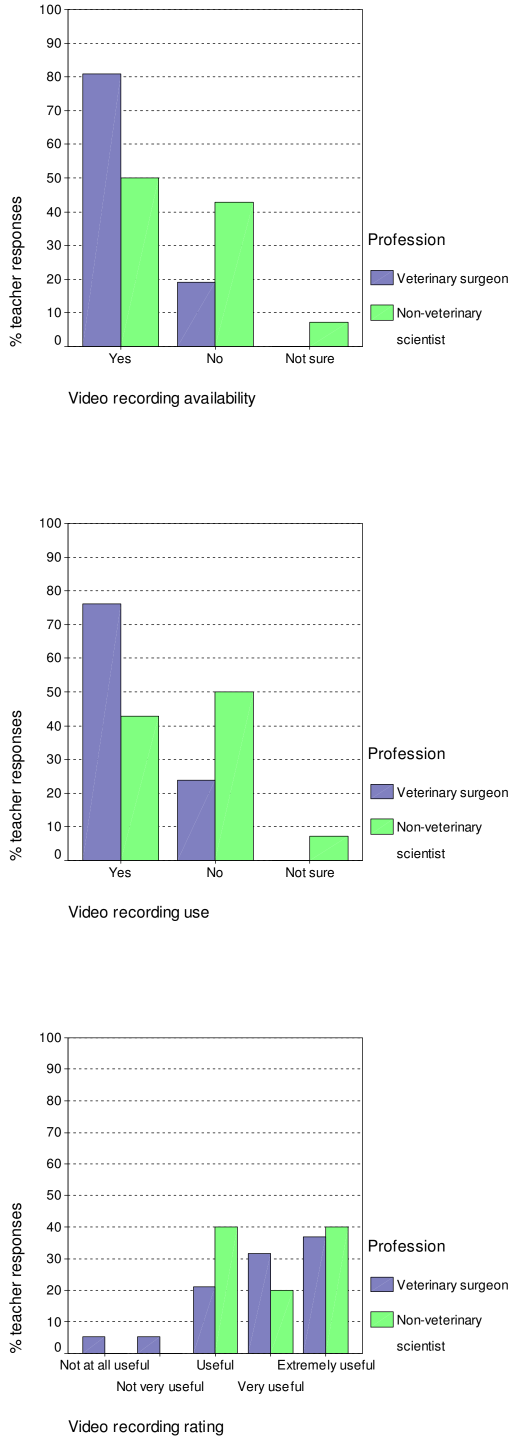

**Availability and use of cine films as perceived by teachers**




**Availability and use of educational television as perceived by teachers**




**Availability and use of audio-recordings as perceived by teachers**




**Availability, use and rating of video-recordings as perceived by teachers**

## *Appendix H: Hierarchical nodes from coding of transcripts of interviews and focus groups*

The levels in the table correspond with the sub-headings in section 6.3. Level 1 represents the major categories that emerged from the qualitative analysis, whilst level 2 categories represent sub-categories. Level 3 sub-headings represent the major characteristics of level 2 categories. For example, lectures were identified by participants as being an efficient teaching method, which served as a guide to important points, that required student attendance for maximum efficiency. As a means of inspiring/enthusing students, lectures were appreciated particularly where there was obvious clinical relevance and when they were interactive.

Rather than numbers of sources (individual transcripts) or references (occurrences), the identification of categories has been presented here as ‘ticks’. This shows the presence of categories identified within transcripts. Because of the relatively unstructured nature of the interviews, absence of a tick does not necessarily mean that a group of participants would not in another situation identify with the levels shown here. Because the interviews were not standardised, absence of a tick may be the result of a category not being specifically raised in the discussion. Therefore the table can only be interpreted as an overview of the issues emerging from the different conversations.

| **Level 1** | **Level 2** | **Level 3** | **1st year students** | **2nd year students** | **3rd year students** | **4th year students** | **5th year students** | **Current teachers** | **Retired/former teachers** |
|---|---|---|---|---|---|---|---|---|---|
| Teaching methods | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Lectures | | | | | ✓ | ✓ | ✓ | ✓ |
| | | Efficiency of didactic teaching | | | | | | ✓ | |
| | | A guide to important points | | | | | | ✓ | ✓ |
| | | Attendance | | | | ✓ | | ✓ | |
| | | Inspiring/enthusing students | | | | | | ✓ | ✓ |
| | | Clinical relevance | | | | | | ✓ | |
| | | Interactive | | | | | | ✓ | |
| | Practical classes | | ✓ | | ✓ | ✓ | | ✓ | ✓ |

| Level 1 | Level 2 | Level 3 | 1st year students | 2nd year students | 3rd year students | 4th year students | 5th year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | | Application of knowledge | ✓ | | | | | ✓ | |
| | | Visualisation of structures | | | | | | ✓ | |
| | | Psychomotor skills | | | | | | ✓ | ✓ |
| | | Access to materials | ✓ | | | | | | |
| | | Interactive | | | | | | ✓ | |
| | | Do-it-yourself | ✓ | | | | | | |
| | | Not enough practical classes | ✓ | | ✓ | | | | |
| | | Resource issues | | | | | | | ✓ |
| | Peer-assisted learning | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | | Formal | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| | | Informal | | ✓ | | | | | |
| | Tutorials | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| | | Valuable discussion | ✓ | | ✓ | | | | |
| | | Not a mini-lecture | ✓ | ✓ | ✓ | | | ✓ | |
| | | To check understanding | | | | | ✓ | | |
| | | Group size | ✓ | ✓ | ✓ | | ✓ | | |
| | Self-directed learning | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| | | Cutting edge research | ✓ | | | ✓ | ✓ | ✓ | |
| | | Clinical relevance | ✓ | | | ✓ | ✓ | | |
| | | Teamwork | ✓ | | | ✓ | ✓ | ✓ | |
| | | Presentation skills | | | | | | ✓ | |
| | | Information-retrieval skills | ✓ | | ✓ | | | ✓ | |
| | | Earlier introduction in course | | | ✓ | | ✓ | ✓ | |
| | | Perceived lack of reward | | | | ✓ | ✓ | | |
| | Problem-based learning | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Intrinsic motivation to learn | | ✓ | ✓ | ✓ | | | |
| | | Real world relevance | | | | ✓ | ✓ | | |
| | | PBL in medicine | | ✓ | ✓ | ✓ | | | |
| | | Engaging the brain | | | ✓ | | | | |
| | | Practicalities | | | | ✓ | | ✓ | |
| | | Rejection of wholesale PBL | | | | | | ✓ | ✓ |
| | | Gaps in knowledge | | | | | | ✓ | ✓ |
| | Post-mortem demonstrations | | | | ✓ | | | | |
| | | Subject integration | | | ✓ | | | | |

| Level 1 | Level 2 | Level 3 | 1st year students | 2nd year students | 3rd year students | 4th year students | 5th year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | | Revision aid | | | ✓ | | | | |
| | | Three-dimensional visualisation | | | ✓ | | | | |
| Visual aids | | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| | Key points | | | ✓ | | | | ✓ | ✓ |
| | Blackboard | | ✓ | ✓ | | | | ✓ | ✓ |
| | | Student-paced | ✓ | | | | | ✓ | ✓ |
| | 35mm slides | | | | | | | ✓ | ✓ |
| | | Impact of good slides | | | | | | | ✓ |
| | | Clinical interest | | | | | | | ✓ |
| | | Diazos | | | | | | ✓ | ✓ |
| | | Soporific | | | | | | | ✓ |
| | | Inflexible | | | | | | | ✓ |
| | | Potential for poor communication | | | | | | | ✓ |
| | Acetates | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| | | The OHP revolution | | | | | | | ✓ |
| | | Diagrams | ✓ | | | | | | ✓ |
| | | Quick to produce | | | | | | ✓ | |
| | | Practical drawbacks | | | | | | ✓ | |
| | PowerPoint | | ✓ | ✓ | | | | ✓ | ✓ |
| | | For designing 35mm slides | | | | | | | ✓ |
| | | Providing structure | ✓ | ✓ | | | | ✓ | |
| | | Makes learning too easy | | | | | | | ✓ |
| | | Too quick | | | | | | ✓ | |
| | Flipchart | | | | | | | | ✓ |
| | Closed-Circuit TV (CCTV) | | | | | | | | ✓ |
| | | Limited use | | | | | | | ✓ |
| | | Rigid timetabling | | | | | | | ✓ |
| | | Unable to engage audience | | | | | | | ✓ |
| | Cine | | | | | | | | ✓ |
| | | Award-winning pioneers | | | | | | | ✓ |
| | | Rare cases | | | | | | | ✓ |
| | | Impractical | | | | | | | ✓ |
| | | Poor quality | | | | | | | ✓ |
| | Video | | ✓ | ✓ | | | | ✓ | ✓ |
| | | Rare cases | | | | | | | ✓ |
| | | Ease of modern technology | | | | | | ✓ | ✓ |

| Level 1 | Level 2 | Level 3 | 1st year students | 2nd year students | 3rd year students | 4th year students | 5th year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | | Illustrating a lecture | | | | | | ✓ | ✓ |
| | | To replay dissections | ✓ | | | | | | ✓ |
| | | Accessibility issues | ✓ | ✓ | | | | | ✓ |
| | | Too long | ✓ | | | | | | ✓ |
| Learning resources | | | | | | | | | |
| | Student notes | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | | Essential | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| | | Tailored to the local course | | | | | | | ✓ |
| | | The 'best' textbook | | | ✓ | | | | |
| | | Reduced note-taking | | | | | | | ✓ |
| | | Up to date information | | | | | | ✓ | ✓ |
| | | Providing a course outline | ✓ | | | | | | ✓ |
| | | For factual information | | | | | | ✓ | |
| | | Spoon-feeding | | ✓ | | | | | |
| | Textbooks | | ✓ | | | | | | |
| | | Varying usefulness | ✓ | | | | | | |
| | Posters | | ✓ | | | | | | |
| | | Animal breeds | ✓ | | | | | | |
| | | Wallpaper | ✓ | | | | | | |
| | Models and specimens | | ✓ | | | | ✓ | ✓ | ✓ |
| | | Embalmed specimens | | | | | | | ✓ |
| | | Fresh specimens | | | | | | ✓ | ✓ |
| | | Relevance throughout course | | | | | ✓ | | |
| | | Visual learners | ✓ | | | | | | |
| | The live animal | | | | | | | ✓ | ✓ |
| | | Programmed learning | | | | | | | ✓ |
| | | Three-dimensional visualisation | | | | | | | ✓ |
| | | Engaging multiple senses | | | | | | | ✓ |
| | | No substitute for the real thing | | | | | | | ✓ |
| | | The new (living) anatomy | | | | | | | ✓ |
| | Tape-slide programmes | | | | | | | | ✓ |
| | Computer-aided learning (CAL) | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Teacher in a box | | | | | | ✓ | |
| | | For facts not concepts | ✓ | | ✓ | | | | |
| | | Self-assessment | ✓ | | | | | ✓ | |

| Level 1 | Level 2 | Level 3 | $1^{st}$ year students | $2^{nd}$ year students | $3^{rd}$ year students | $4^{th}$ year students | $5^{th}$ year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | Adjunct to face to face teaching | ✓ | | | | | ✓ | |
| | | Laboratory replacement | | | | | | ✓ | |
| | | Case-based | | | ✓ | ✓ | ✓ | ✓ | |
| | | Resource-intensive | | | | | | ✓ | ✓ |
| | | Online access | ✓ | | | ✓ | | | |
| | Moodle | | ✓ | ✓ | | | ✓ | ✓ | |
| | | Online revision | ✓ | | | | | ✓ | |
| | | File distribution system | | ✓ | | | | ✓ | |
| | | Quizzes | | ✓ | | | | ✓ | |
| | | Variable caseloads | | | | | | ✓ | |
| | | Transparency across courses | | | | | | ✓ | |
| | | Not infallible | | | | | | ✓ | |
| | | Spoon-feeding | | | | | | ✓ | |
| | Internet | | ✓ | | ✓ | | | ✓ | ✓ |
| | | Information overload | | | | | | | ✓ |
| | | Assessing source quality | ✓ | | | | | | |
| | | Finding useful resources | ✓ | | | | | ✓ | |
| | Podcasting | | ✓ | ✓ | | | | | |
| | | Backup to missed lectures | ✓ | ✓ | | | | | |
| | | For revision | ✓ | ✓ | | | | | |
| | | Can switch on and off | ✓ | ✓ | | | | | |
| Integrated teaching | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Clinical relevance of preclinical subjects | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Earlier in the course | ✓ | | | | | ✓ | ✓ |
| | | Why am I here? | | | ✓ | ✓ | ✓ | | |
| | | Clear clinical emphasis | | | | | ✓ | | ✓ |
| | | Maintaining student interest | ✓ | | | | | | |
| | | Previous attempts to introduce earlier clinical relevance | | | | | | | ✓ |
| | Subject integration | | | | ✓ | ✓ | | | ✓ |
| | | Removing the barriers | | | ✓ | ✓ | | | |
| | | Lecturers working together | | | ✓ | | | | |
| | | To facilitate effective learning | | | ✓ | | | | |

| Level 1 | Level 2 | Level 3 | 1st year students | 2nd year students | 3rd year students | 4th year students | 5th year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | | Integrated pathology / medicine | | | | | | ✓ | ✓ |
| | | Biomolecular sciences | | | | | | | ✓ |
| | | Current mixed views | | | | | | ✓ | |
| Clinical teaching | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Clinical skills | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | | Earlier and regular training | ✓ | ✓ | ✓ | | | | |
| | | Preparation for EMS | | | ✓ | | | | |
| | | Student-led clinical skills training | | | ✓ | ✓ | ✓ | | |
| | | OSCE practice | | | | ✓ | | | |
| | | Best use of resources | | | ✓ | | | | |
| | | Existing clinical skills training | | | | | | ✓ | |
| | Clinical rotations | | | | | ✓ | | | ✓ |
| | | Referral practice | | | | ✓ | | | |
| | | Unrepresentative caseload | | | | ✓ | | | ✓ |
| | | Approach to diagnosis | | | | | | | ✓ |
| | Extra-mural studies | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Luck of the draw | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | | Standardised EMS | | | | | ✓ | | ✓ |
| | Professional skills | | | | ✓ | | | ✓ | ✓ |
| | | Communication skills | | | | | | ✓ | ✓ |
| | | Business skills | | | | | | ✓ | ✓ |
| | | Decision-making | | | | | | ✓ | ✓ |
| | | Integration of skills | | | ✓ | | | ✓ | |
| | Competencies | | | | | | ✓ | ✓ | |
| | Omnicompetence vs. undergraduate specialisation | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Core and electives | ✓ | | ✓ | | | | ✓ |
| | | Undergraduate tracking | | ✓ | ✓ | ✓ | | ✓ | |
| | | Resistance to part with omnicompetence | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Careers | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Veterinary public health | | | ✓ | | | ✓ | | |
| | Research | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | No fully mixed practice | | | | | | | | ✓ |
| | Specialist branches of the profession | | | | | | | ✓ | |
| Quality and scholarship | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | AVMA | | ✓ | | | ✓ | ✓ | | |

| Level 1 | Level 2 | Level 3 | 1st year students | 2nd year students | 3rd year students | 4th year students | 5th year students | Current teachers | Retired/former teachers |
|---|---|---|---|---|---|---|---|---|---|
| | AVTRW | | | | | | | ✓ | |
| | Attributes of a good teacher | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Good communication | | ✓ | | | | ✓ | ✓ |
| | | Clinical/research experience | | | ✓ | ✓ | | ✓ | ✓ |
| | | Friendly/approachable | | | | | ✓ | | |
| | | Interested/enthusiastic | ✓ | | | | | ✓ | ✓ |
| | | Sense of humour/'tricks' | | ✓ | | | | ✓ | ✓ |
| | | Veterinary vs. non-veterinary teachers | | | | | | ✓ | ✓ |
| | Teacher training | | | | | | | ✓ | ✓ |
| | | University training programmes | | | | | | ✓ | ✓ |
| | | Support from mentors | | | | | | ✓ | ✓ |
| | Student feedback on teaching | | | ✓ | ✓ | ✓ | | ✓ | |
| | | QA forms | | ✓ | | ✓ | | ✓ | |
| | Staff rewards | | | | | ✓ | | ✓ | ✓ |
| | Value for money | | ✓ | ✓ | ✓ | | | | |
| | | Award of veterinary degree | ✓ | ✓ | ✓ | | | | |
| | | Postgraduate fees | | | ✓ | | | | |
| | | Widening participation | | | ✓ | | | | |
| Assessment | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Motivator for learning | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Information overload | | ✓ | ✓ | | | | |
| | | Day One | | | | | ✓ | ✓ | ✓ |
| | Different types of assessment | | | | | ✓ | ✓ | ✓ | ✓ |
| | | Traditional forms | | | | | | ✓ | ✓ |
| | | Newer forms | | | | ✓ | ✓ | ✓ | |
| | Integrated assessment | | | | | | | ✓ | ✓ |

## *Appendix I: Conference presentations and papers arising from the study*

Aspects of the PhD were presented at the following conferences:

> *Association for Veterinary Teachers and Research Work (AVTRW) Conference, 2006,* Scarborough – "Staff and students' experiences of educational methods and technologies in undergraduate veterinary medicine at the University of Glasgow" (short communication), V.H.M. Dale, E. McAteer and M. Sullivan
>
> *Association for Medical Education in Europe (AMEE) Conference, 2007,* Trondheim – "Educational Methods and Technologies in Veterinary Education" (short communication), V.H.M. Dale, M. Sullivan and E. McAteer.

Elements of the PhD contributed to the following paper:

> Dale, V.H.M., M. Sullivan and S.A. May (accepted for publication in 2008) "Adult Learning in Veterinary Education: Theory to Practice." Journal of Veterinary Medical Education.