The impact of work placements on the development of transferable skills in engineering

The Impact of Work Placements on the Development of Transferable Skills in Engineering

BY

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linking education with industry

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CERTIFICATE OF ORIGINALITY

This is to certify that I, Yussuf Ahmed, am responsible for the work submitted in this thesis, that the original work is my own except as specified in acknowledgements, or in references, and that neither the thesis or the original work contained therein has been submitted to this or any other institution for a degree.

……(Signed)

……(Date)

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Abstract

This thesis reports a study of the impact of work placements on the transferable skills of engineering students.

The thesis provides a review of the theoretical and empirical literature in the field of student work placements and transferable skills and provides a discussion of the measurement of impact in this field. It also describes the design of the study, methods of data collection and the data analyses used.

The research project was carried out at Loughborough University from 2005 – 2008. The data was collected from 247 students and 5 DIS (Diploma in Industrial Studies) tutors from three engineering departments (Chemical Engineering, Civil Engineering and the Institute of Polymer Technology and Materials Engineering (IPTME)) and 26 line managers from 19 different companies which take students on placements.

The results shows that the overwhelming majority of the students valued work placements as a way of developing transferable skills and identified the transferable skills which work placements were most likely and least likely to develop. There was close agreement on these matters between students who had experienced placements and those that had not. All DIS tutors and 87% of the line managers interviewed considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Triangulation of the responses by students, tutors and line managers revealed close agreement on these matters.

Students, tutors and line managers had mixed opinions whether work placements would improve degree results. In fact, work placement students performed significantly better in degree examinations than non work placement students. The tutors and line managers stressed particularly that work placements increased the confidence and maturity of the students. They suggested holiday work, summer work, team based projects as a part of the University degree courses as alternative ways of helping the students who are not doing work placements to acquire and improve their transferable skills, although they did not think that these suggested

alternatives will be as effective as the one year placement. They considered that the duration of the work experience period is a key factor in improving transferable skills.

Keywords: Work placement, sandwich placement, summer placement, transferable skills, work-based learning, engineering, skills.

Chapter One: Introduction to the Research Project

1.0 Introduction

This thesis is concerned with the impact of work placements on the transferable skills of students in engineering. It considers the theoretical issues, the empirical evidence and reports an investigation into the impact of work placements on the transferable skills of a sample of engineering students.

The sample of students was drawn from three departments (Chemical Engineering, Civil Engineering and the Institute of Polymer Technology and Materials Engineering (IPTME)) at Loughborough University. The tutors were from these three departments and the line managers from 19 engineering companies who accepted work placement students from these departments.

The investigation was divided into three major parts. It explored the views of students before and after work placements and of students who did not go on placements; the views of line managers on the impact of work placements and the views of tutors on this theme. The investigation also considered the relationship between work placements and the degree performance of students.

The three key terms *'impact'*, *'work placements'* and *'transferable skills'* are problematic terms in engineering education and higher education in general. As this thesis shows, impact may be a fashionable term but its meaning outside of physical science is far from clear. It is questionable whether impact of work placements can be directly measured. 'Skills' is a widely used term but the question 'what are skills?' is rarely addressed or answered. 'Transferable skills', what they are and what distinguishes them from other skills is a contentious issue. Because a skill is labelled 'transferable' it does not necessarily follow it is transferable. Indeed what is meant by 'transferable' is open to debate as is whether 'transferable skills' is a useful concept. The question whether so-called 'transferable skills' do actually transfer is an important empirical issue. 'Work placements' and 'work experience' are often used interchangeably. Work placements carry an implication of responsibility of a university to 'place' its students. The duration, frequency, and purpose of work

placements are widely debated. Within this debate is the central question, what is the most appropriate duration and structure of work placements.

All of these issues are considered, reviewed and explored in this thesis. They are necessary not merely as a background to the investigation but to provide a conceptual framework for further investigations in this field.

In the remainder of this chapter the structure of the thesis and its underlying argument is outlined and a thumbnail sketch of impact, transferable skills and work placements is provided as an entrée into the field. The chapter ends with a statement of the research questions investigated in this thesis.

1.1 The structure of the thesis

The interrelationship of the chapters is shown in figure 1.1. This figure is not intended to be a concept map but rather a skeletal outline of the relationships between the chapters. It should be clear from the figure that the research questions given in chapter one form the basis of the review of theory and empirical evidence in chapter two and the discussion of methodology, of ways of studying impact, in chapter three. Together these chapters provide the platform for the empirical investigations of impact, as measured by the views of students, line managers and tutors, carried out by the researcher for this thesis and reported in chapters 5 and 6. These results are discussed in chapter 8 and linked back to the literature in chapter 2. The discussions lead to the conclusion and recommendations which are also contained in chapter 8.

In more detail, the arguments underlying the chapters in the thesis are:
Chapter two considers the various theories and perspectives of learning. Its primary purposes were to consider whether the approach based on skills and transferable skills was the most useful approach available; to provide the theoretical bases of skills and transferable skills and to review empirical investigations on work placements and transferable skills.

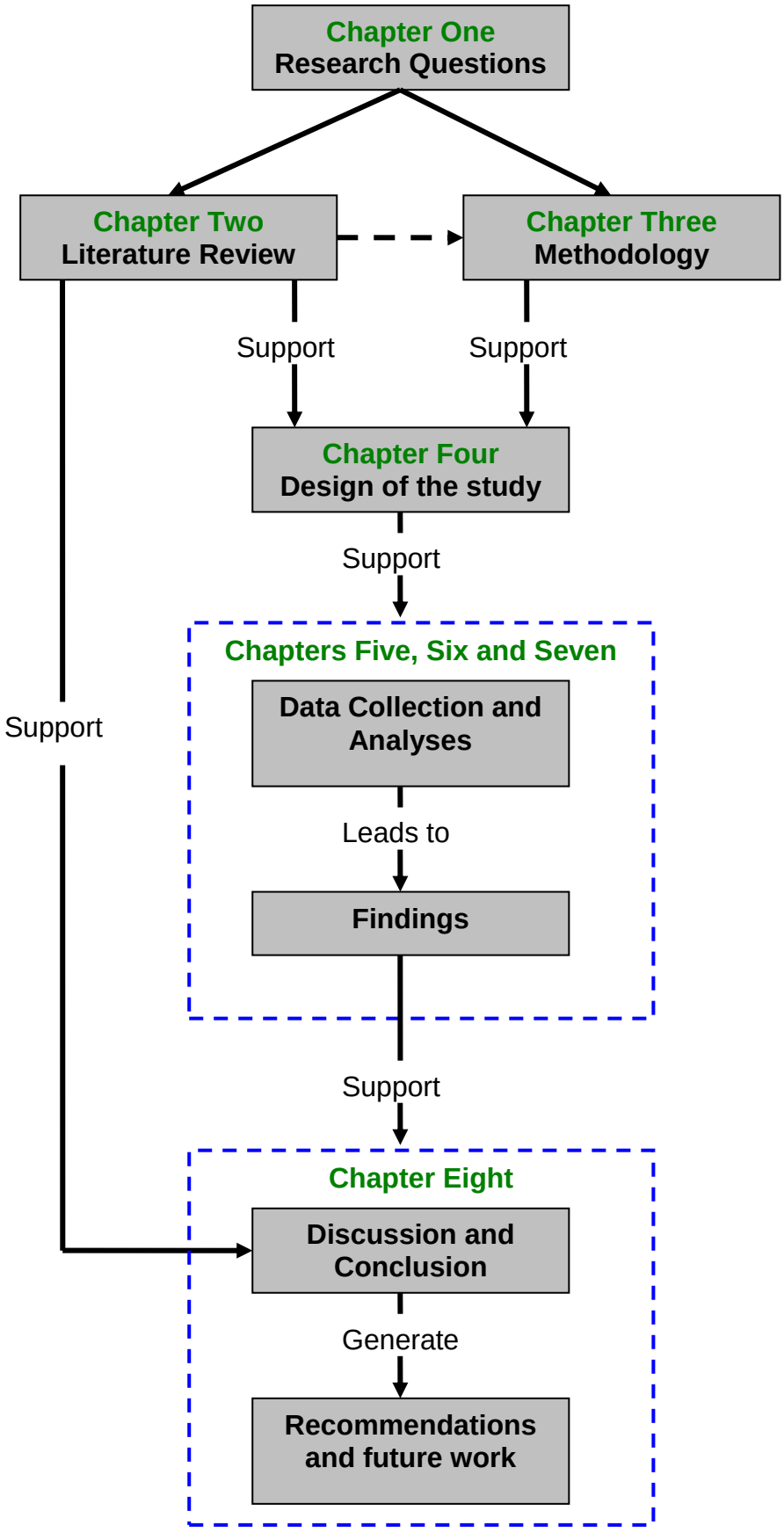
Chapter three considers the fundamental question of how does one measure impact in the study of work placements. It concluded that impact is best estimated from the

views of the major stakeholders; the students, the line managers and the tutors. But that academic performance of placement students (compared with the academic performance of students who had not done placements) would also provide evidence of the impact of placements. These views were obtained from a wide variety of quantitative and qualitative approaches. It was argued that a blend of these methods was more likely to yield a better evidence-base and a more well-rounded conclusion.

Chapter four describes the intended methods of data collection and analysis. Chapter five reports and analyses the student data. Chapter six focuses upon and compares the views of line managers and supervisors on the impact of work placements. Chapter seven reports the documentary analysis of skills taught in a selection of pre and post test modules and compares the degree results of the students who went on placements with those that did not go on work placements. It was hoped that the analysis of this information would yield evidence on the impact of work placements on transferable skills. If work placements have an impact on transferable skills then one might expect to see better academic results from work placement students than from those who do not go on placements.

The culminating chapter eight draws together the findings of the empirical investigations and sets them in the earlier theoretical and empirical review; it indicates the limitations of the research; it offers suggestions for further research and points to the conclusions that can be drawn from this study.

Figure 1.1 – The interrelationship of the chapters



1.2 The basis of impact

The standard method of measuring impact in engineering and in social science is to take measures before and after the impact (see Chapter three for a discussion of the issues). This model of pre-test intervention post-test is used in this thesis for the study of students' perceptions of work placements. However the measurement of impact in the social sciences and education is different from measurement in engineering. Whereas in engineering the measurements include precise instruments, in the social science the measurements rely heavily upon subjective measures such as the perception of students, their University, industrial training tutors and their line managers in industry. A further difference is that students are not like objects which can be taken off a shelf and experimented upon. Students have motives, aspirations and priorities which can affect their willingness to participate in research.

In this thesis, a variety of quantitative and qualitative methods are used to estimate 'impact'. This mixed model of methods included structured and open-ended questions, interviews, focus groups, documentary analysis of curriculum and modules and measures of students' achievement. The core of the study is the students' perception and their levels of achievement. The perceptions of the students were triangulated with the perception of tutors and line managers. A control group of students who have not undertaken placements were surveyed and their results compared with the results of those who had been on work placements.

1.3 An outline of work placements

Work placements are increasingly regarded by policy makers as beneficial to all students. The Dearing Report (1997) and more recently the Leitch report (Leitch, 2006) recommends that, work experience should be made available to a greater number of students. These reports suggest that work experience need not mean only a one year in industry, it can be a three months summer placement, a few months internships (placement in a firm or agency related to a student's major program and/or career plans), a few weeks work-based project or work shadowing (where a student observes a member of staff working in an organisation). The QAA Code of Practice (Section 9) provides a broad definition of placement learning: "A work

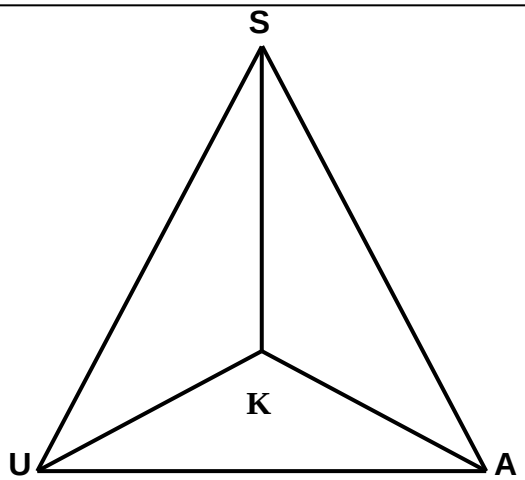
placement is a planned period of learning, normally outside the institution at which the student is enrolled, where the learning outcomes are an intended part of a programme of study."

However in this thesis work placements are defined as one year placements in which the student works in the engineering industry and is supervised by a line manager. Other forms of work placements, for the purpose of this thesis are regarded as non - work placements. Whether work placements are planned, have learning outcomes and are an intended part of a programme of study, is a matter for debate. It may be that not all work placements in the engineering industry fit the QAA's code of practice. Further discussions on work placements are provided in chapter two (Section 2.16) of this thesis.

1.4 An overview of transferable skills

Fallows and Stevens (2000) define "transferable skills" as the skills that someone has acquired and developed through one situation and are useful when transferred into another (next career). The Department for Education and Skills (DfES, 2005) has defined the transferable skills as "essential skills which people need in order to function effectively as members of a flexible and competitive workforce". The DfES, identified six key skills which are: communication, application of number, information technology, working with others, improving own learning and performance, problem solving. The eleven skills used in this study are based upon some skills identified by DfES (1995, 2005) the skills embedded in the modules taught in the departments surveyed (Chemical Engineering, Civil Engineering and IPTME) at Loughborough University and some of the skills which are important to any employer (Brown, personal communication, 2005; Kelly and Dorsman, 1986; Bennett, Dunne and Carré, 2000; Dench, 1997).

It has been suggested that, all the major skills used in higher education are related to each other in complex ways. The tetrahedron (Figure 1.4), presents the relationships between the different skills, (Brown *et al.,* 1997).



S = Self-evaluation including personal value clarification
K = Knowledge **U** = Understanding **A** = Attitudes
SKU = Cognitive skills **SAU** = Social skills **SAK** = Conative skills

Figure 1.4: Relationships between the different skills

Source: Assessing student learning in HE – Brown (1997)

As shown in figure 1.4 above, the use of the skills in different context is based upon the cornerstones of knowledge, understanding and attitudes. The main essential *cognitive* skills identified by the author are information handling, evaluating evidence, critical thinking, problem solving, arguing rationally, creativity and the meta-cognitive skills of learning to learn. The essential *social* skills are working with others in various roles, including as a leader, and communicating with others. Other researches on work placements and transferable skills are given in chapter two.

1.5 The research questions

From the brief introduction in this chapter, it should be clear that much work needs to be done in the area of transferable skills and work placements. Not all the areas of the field can be addressed in a thesis. So this thesis focuses upon: “What is the impact of work placements on the development of transferable skills of a sample of engineering students?”

The specific questions to be addressed are:

1. What is the impact of work placements on the development of transferable skills as perceived by students, line managers and tutors?

2. What are the perceived value of transferable skills by students, line managers and tutors?
3. What skills are the most important to develop in work placements?
4. How do work placements impact upon academic performance?
5. What are the strength and weaknesses of approach to assessing work placements and transferable skills?

Chapter Two: Theoretical perspectives and the empirical investigation of work placements and transferable skills

2.0 Introduction

This chapter explores the various theoretical perspectives relevant to the students' learning as well as reporting empirical investigations on work placements and transferable skills and how work placement good practice can help develop these skills.

This chapter is divided into three major sections: the behavioural and cognitive perspectives which include the review on transferable skills, the humanistic and social perspectives and work placements. Each sub-section of the first two major sections provides a summary of a theory, its limitations, its relevance to studying learning in a work placement and its implications for industrial tutors (academic staff) and line managers (supervisors) in the engineering industry.

BEHAVIOURISTIC AND COGNITIVE PERSPECTIVES

2.1 Behaviourism

External behaviour, what an individual does in response to stimuli and its measurement seems to be the cornerstone of behaviourism. A common definition by psychologists influenced by this perspective is 'the modification of behaviour brought about by experience' (Eysenck, 2004). Immediately one can see in this definition that the learner is regarded as a passive being shaped by his or her environment. This perspective stresses the importance of external prompts, external reinforcement and task analysis. It is the mainstay of Taylorism (Taylor, 1911) and management by objectives (MBO) (Peters *et al*., 1982).

An educationalist who was heavily influenced by this approach and later by cognitive psychology was Gagne (Gagne,1985; Gagne, Briggs and Wager, 1992).

See http://www.e-learningguru.com/articles/art3_3.htm) who initially categorised learning into different levels shown in table 2.1 below:

Table 2.1: Levels of Learning

Signal Learning	The individual learns to make a general, diffuse response to a signal
Stimulus-Response Learning	The learner acquires a precise response to a discriminated stimulus
Chaining	A chain of two or more stimulus-response connections is acquired
Verbal Association	The learning of chains that are verbal
Discrimination Learning	The individual learns to make different identifying responses to many different stimuli which may resemble each other in physical appearance
Concept Learning	The learner acquires a capability of making a common response to a class of stimuli
Rule Learning	A rule is a chain of two or more concepts
Problem Solving	A kind of learning that requires the internal events usually called thinking

He later revised these in the form of instructions for learning:

- gain attention
- tell learners the learning objective
- stimulate recall
- present the stimulus, content
- provide guidance, relevance, and organization
- elicit the learning by demonstrating it
- provide feedback on performance
- assess performance, give feedback and reinforcement
- enhance retention and transfer to other contexts

The mechanical models of learning based on behaviourism, such as the above, do not seem to capture the experience of learning. But, on the positive side, they stress

the importance of providing a structure and sequence of learning in terms of learning outcomes, tasks and targets. The Gagne model has implications for instruction in the workplace and for the role of the line manager. But it is not expressed in a language which either line managers or students customarily use. It tends to neglect explanations of the inner processes of learning, possible intrinsic motivations of the learner, such as interest, and the learner's perception of the task and its meaningfulness or otherwise. And, as Wolf (1993) points out, the concern with task analysis can lead to 'a never ending spiral of specificity'. But perhaps its greatest weaknesses is it assumes learning is something you have done to you rather than something you do in school, University, the workplace and everyday life.

2.2 Cognitive Psychology

The cognitive perspective on learning does focus upon the inner processes. It takes as its starting point that learning consists of encoding, storage and retrieval. Information from the environment which may include texts, readings on instruments, machinery and other people is encoded. The encoded information is then stored in various forms in the long term memory along with other similar memories. The encoded information is then retrieved and used. A simple model of how these processes are related is shown below in figure 2.2. The model is based upon one of Baddeley's texts (Baddeley, 1992) and summary on information processing by an (Educational) Psychologist (Brown, 2004).

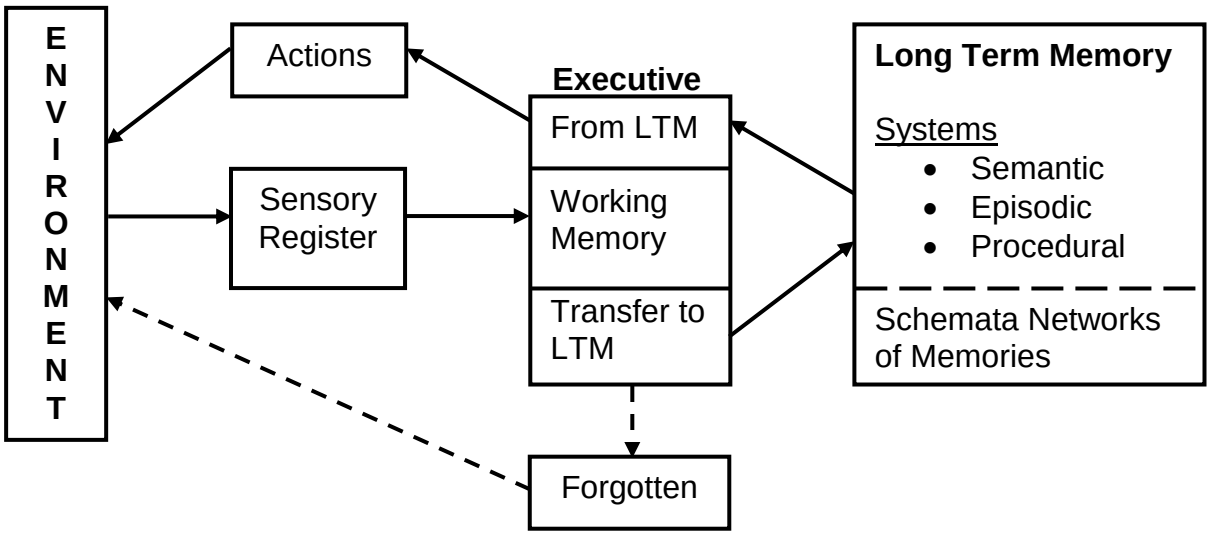


Figure 2.2: Model of the Cognitive Psychology

The sensory register (sometimes known as the sensory memory) registers information from the external world. The information may be sight, smell, taste, hearing and touch. It is only in the register for about two seconds then it is either lost or transmitted to the working memory where it is encoded. The encoding process has a limited channel capacity of about 7+/- chunks of information and coding has to be completed within about 30 seconds or less otherwise it is lost. This process consists of matching the information received from the sensory register with what is already in the long term memory. This is one of the roles of the executive in the active memory. The long term memory consists of three related memory systems. These are:

- The semantic memory which contains ideas and facts.
- The episodic memory that stores incidents and personal experiences.
- The procedural memory, the basis of skills, which is discussed in the next section of this chapter.

These memory systems works together to form schemata (singular schema), networks of knowledge, experiences and procedures. New information from the working memory is stored in existing schemata, they may change the existing schemata or used to create new schemata that are loosely linked to the existing schemata, these schemata may be less stable than existing schemata. The ‘aha’ experience in creative problem solving is interpreted as a sudden conjoining of schemata.

Information is retrieved from the long term memory by the executive in the working memory. The retrieval may be in the form of recognition, recall and ‘tip of the tongue’ phenomena (you know but you can not remember). Routine thinking consists of recall of existing schemata whereas creative thinking consists of the creation of new schemata from a combination of existing schemata and the perception of the problem. Flexibility of thinking comes from frequent retrieval of the information stored in the schemata and its application to new situations. This process then provides more connections within and between the schemata.

This model is rich with implications for learning in the work environment and in academic studies. The model implies the learners should be active in the process of sensing, perceiving (attending to) what is being observed and said. The more

passive the learner, the less likely that he or she is likely to learn. The more the learner knows, the more he or she will see. The more the learner sees, the more he or she will know. The learners should try actively to connect what they are learning to what they already know. There should be a variety of learning tasks so that the learner retrieves and use existing knowledge to create new knowledge. The so-called 'inert knowledge' (Peters *et al*., 1982) acquired in academic study need not be inert. It can be activated by learning in the work place and what is learnt in the workplace can be integrated with subsequent learning in academe.

In academic studies, the model provides some justification for problem–based learning (Savery *et al*., 1995) and project–based learning (Jones *et al*., 1997). In all of these students have to identify the problem, plan, search their existing schemata and through interaction with the problem or situation extend their schemata or develop new schemata. Instead of developing separate schemata of 'theory' and 'practice' as in traditional learning, the approach of problem and project based learning develops schemata in which theory and practice intertwine so that retrieval is not either of 'theory' or 'practical' but an overlapping combination of both.

The cognitive perspective also has implications for line managers and tutors in terms of providing teaching and instruction. Put negatively, information presented too quickly, in a confused way or in ways which do not connect to the students' schemata may not be registered or processed. Learners presented with tasks which are very similar may not develop flexibility or problem solving capabilities. Learners presented with complex tasks well beyond their existing competence may be de-motivated so induction to provide a holistic view, careful design and delineation of learning tasks and explicit guidance and feedback are necessary.

The perspective of cognitive psychology has broad explanatory power but it does have some limitations. The perspective tends to neglect the effects of the context in which the learning takes place. The perspective is 'scientific' rather than 'humanist' (see Section 2.10). It relies heavily upon the formulation and testing of hypotheses based upon quantitative measures of experiments conducted in laboratory settings and generalized to natural settings rather than on qualitative studies in natural

settings. It does not attempt to explain the role of motivation except in the broad sense that motivation, in the form of interest, activates the appropriate schemata.

2.3 Cognitive Ergonomics

Cognitive psychology has been applied to the workplace in the form of cognitive ergonomics. This is concerned with the application of cognitive psychology to understanding how people learn in the work place and to the design of work place based on how people learn. Examples are process control in chemical engineering, air traffic control and the design of in-car satellite-navigation systems. The key features of cognitive ergonomics are 'receiving inputs from the task environment, processing these with knowledge structures stored in the memory and generative actions from this internal process in the form of words, thoughts and actions (Fischer and Boreham, 2004). The role of the learner is to match with increasing accuracy his or her internal representation of the task and the actual task. This is achieved through practice with external or self-feedback. The role of the tutor or trainer is to help learners to do this.

A major part of this area is the comparison of experts and novices ways of doing things such as problem solving or communicating with colleagues so as to help learners to develop their expertise. Another area of interest, the acquisition and performance of skills is discussed on the next section.

2.4 What are skills?

'Skill' is a contestable term. For Lord Leitch, 'skills are capabilities and expertise in a particular occupation or activity' (Leitch, 2006). This description implies that all activities are skill-based. If all activities are skills based, then skills are just a different way of looking at all human activity. Skills can be viewed as an objective individual ability and performance (Martens, Vealey *et al.,* 1990).

Psychologists take a narrower view. For psychologists, 'skills are goal-directed, learnt sequences of actions that once learnt are routinised' (Brown, Bull and Pendlebury, 1997). The important point here is that skills are goal directed. There is always an

intention in using a skill. The intention may not be precisely stated to oneself explicitly as objectives but it guides one's actions.

When learnt, skills have built in feedback mechanisms that enable people to adjust their actions to the task in hand. It is only if the sequence is disrupted that one has to consciously change one's actions. An obvious example of a skill is riding a bicycle. At first riding a bicycle is difficult and conscious then it becomes automatic and then only requires conscious effort when something unusual happens. This simple explanation applies to all skills whether manual (sensori-motor), cognitive or social. The most common measure of skills are qualifications, although it is possible to have skills without qualifications (Leitch, 2006; Beaven *et al*., 2005). Skills can also be measured indirectly in terms of occupation (Beaven *et al*., 2005).

The major characteristics of all skills are *fluency, rapidity, automaticity, simultaneity and knowledge* (FRASK) (Sloboda, 1996). *Fluency* is thought to be about overlapping sequences of action so the performance of the skill is smooth. Brown (2004) gives the example of writing fluently, as one writes a sentence, the next sentence is being formulated in the pre-conscious. *Rapidity* indicates that one becomes quick at performing a skill once it has been learnt. *Simultaneity* refers to the ability to do two things at once such as typing on a PC with both hands, or performing one task automatically whilst doing another task, such as typing whilst talking to a friend. *Knowledge* for skills is concerned with retrieving the appropriate knowledge at the appropriate time in the appropriate context. This sometimes referred to as goal stacking. As one action is being completed, the next action pops up in the working memory as in solving familiar problems. The problem solving is only disrupted when the problem turns out to have an unfamiliar twist.

A model of skilled performance is given in figure 2.4a, 2.4b (Top-down design). The model was initially formulated by this author independently. However, one of my supervisors, Professor Brown pointed out that a similar but more complex model had been devised by Welford (1968).

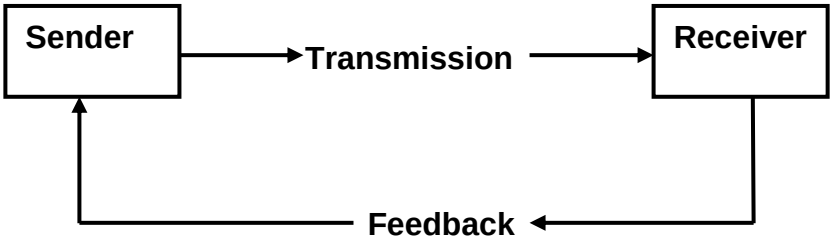


Figure 2.4a: A model of skilled performance (Top level)

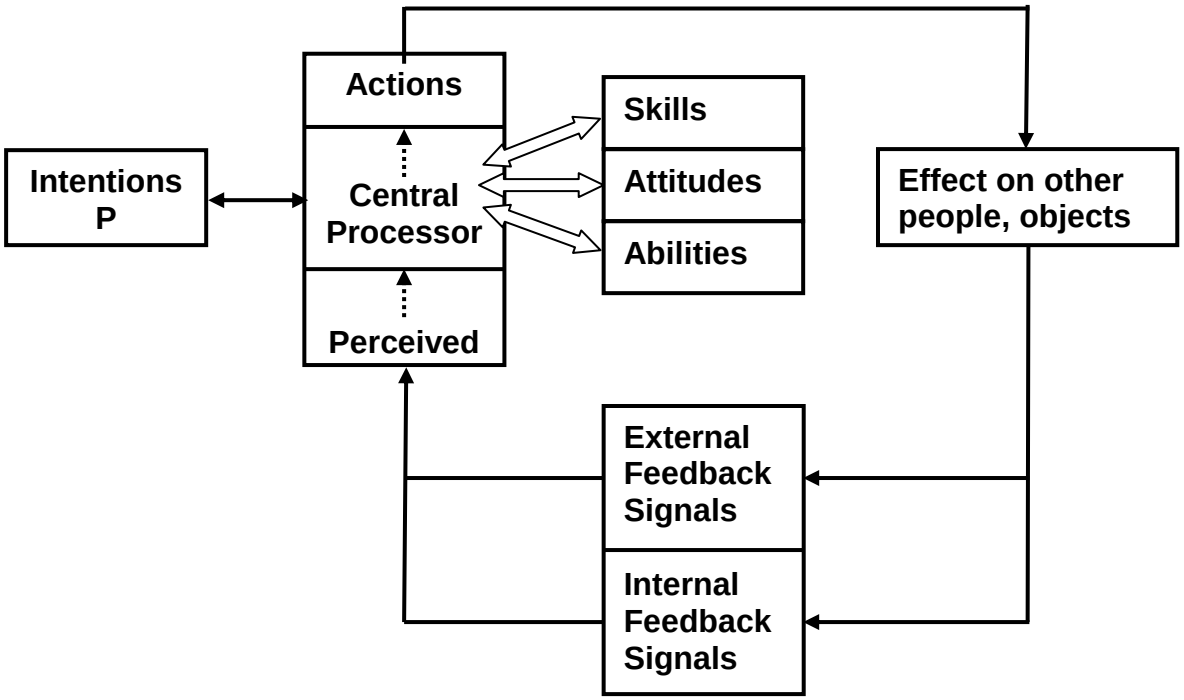


Figure 2.4b: My model of skilled performance (In Details)

The model of skilled performance springs from the simple notion of output – transmission – reception – feedback. It is based on the assumption that that behind a skill there is always an intention. The intention is usually pre-conscious (just outside the working memory) when carrying out the skill. How that skill is executed depends in large measure upon what is stored in the central processor which includes one's attitudes, linguistic capabilities, attitudes, values but particularly what is in the procedural memory.

The sequenced information (goal stack) in the procedural memory is relayed usually directly (not via the conscious working memory). If the goal stack is correct for the task it is translated smoothly into actions. This process is automatic in performance

and requires no conscious effort. The sequence of actions may be sensori-motor (physical), verbal (hesitations, pauses, tone etc) or extra-verbal (face and body language). The actions convey 'information' to the object, environment or person(s). The information has effects on the receiver of the actions. Its effect is partly dependent upon the nature of the object, environment or person(s). This receiver sends out feedback signals which may be perceived by the sender (P). Whether it is perceived and how it is perceived is dependent upon P's sensitivity to the signals and these are dependent upon what is currently in the working memory of P and in his or her long term memory and other central processes. If the effects of P's actions are unexpected, that is, the feedback signals are not as expected then this triggers the working memory and the working memory triggers the long term memory and this may result in a change of intention.

Initially the 'sender' may rely upon external feedback such as from a tutor or line manager. Eventually this external feedback becomes less necessary and internalized so the learner 'knows' when he/she is doing things or interacting correctly. A particularly important form of guidance and feedback is the use of external, holistic cues such as 'keep you eye on the ball'. Attention to this cue produces co-ordination in body movements and perception whereas detailed cues such as 'put your legs in the right position, bend your knees and lift your foot' do not. However external cues do need to be understood otherwise they are of little value. Indeed meaningfulness is one of the important characteristics of external feedback. The others are accuracy, timeliness, encouragement and relevance to the task, (Brown, 2004) need to be based on what the learner already knows.

The Acquisition of Skills

The acquisition of skills involves all the cognitive processes including the sensory register, perception, the working memory and the semantic, episodic and procedural memory systems. Frequent practice, initially with feedback from external sources such as line managers or tutors is often necessary. These particularly involve the memory systems. The extrinsic feedback may include guidance before the activity, concurrent feedback with the activity or terminal feedback after the activity. This extrinsic feedback is eventually not necessary and intrinsic feedback takes its place. The transition from extrinsic to intrinsic feedback is assisted by reflective feedback

(What did you do? How did you do it? How could you do it better?) which may be stimulated by a tutor or line manager. However one's reflections may also need feedback on their accuracy and comprehensiveness.

2.5 Transferable skills

Transferable skills are the skills that are developed within one situation and which are useful when transferred into another situation. Transferable skills are also know as key, generic, core skills. Kelly (2001) describes the key skills as generic transferable skills that contribute to individual effectiveness, flexibility and adaptability within the labour market. The term 'transferable skills' is often used interchangeably with employment-related skills, generic skills and personal transferable skills (Fallows and Stevens, 2000; Chadha, 2005). Bennett, (2002) defines transferable skills as the skills "needed in any job and which enable people to participate in a flexible and adaptable work force". This definition provides a useful basis for identifying a list of important transferable skills and many such lists exist (Bennett, Dunne and Carré, 2000; Dearing Report, 1997; DfES, 2005). In this research we have chosen to use the list of skills derived by DfES (DfES, 2005), National Employers Skills Survey (NESS 2003, 2004, 2005, 2007) and the list of skills embedded on the modules taught in the departments surveyed (Chemical Engineering, Civil Engineering and IPTME) at Loughborough University.

Employers in the labour market have been claiming that, the higher education institutions should produce graduates who are able to cope with the changing complexities of commercial life (Drucker, 1992; Handy, 1987; McCormick *et al*., 1987). Fowler and Tietze (1996), provided evidence that, the transferable skills are more important to employers than subject knowledge, and UK employers are often disappointed by the lack of practical skills among graduates as shown by Ellis (2000). Schofield (1996) noted that an employer would tend to view an undergraduate with a second-class degree more favorably than say a more qualified post graduate without the transferable skills.

The research carried out by the Careers Services in Dublin City University (DCU), Trinity College Dublin (TCD) and Waterford Institute of Technology (WIT) found that

employers value the transferable skills highly than academic records. Other writers have argued that the academic record and work experience may only be considered important in so far as they reveal the transferable skills of students and are not intrinsically valued in and of themselves (Curry, Sherry, and Tunney, 2003). This means, some employers are using the academic performance and the work experience as a way of evaluating the students' transferable skills. Work placements provide a good opportunity for the students to acquire/improve their transferable skills. Students can start to develop personal and professional transferable skills ahead of taking up an industrial placement. *Equipe* suggested various ways in which the university can assist them in this:

- The first and/or second year curriculum could include a compulsory module on communication skills
- In general, every opportunity should be taken to help students improve their oral presentation and report writing skills
- Students also need to be able to produce presentable application forms and CVs, you could arrange visiting lectures by industrial recruitment specialists, to include question-and-answer sessions
- Selected students returning from work placement can be asked to make a presentation to second year students about their experience
- The Careers Advisory Service may be able to run short courses on CV writing and interview technique, students should be encouraged to develop a CV with 'a stamp of personality'; tutors can check draft CVs
- The modern languages department may be able to help students who are taking up a placement overseas
- Companies may be able to give feedback about student performance at interview
- Tutors can brief students about the expectations that employers will have of them
- Role-play and practice interviews can help students develop the relevant skills
- The industrial training tutor can prepare a guide to obtaining a placement
- Returning students might be asked to produce a poster for display in the department relating to their experience on placement (perhaps with a small prize on offer)

Source: *equipe* website (http://equipe.lboro.ac.uk)

Crebert *et al*. (2004), describes the results of the survey carried out at the Griffith University in Australia to determine the students perceptions of the contributions made to the development of their generic skill. The graduates who took part in the survey had experienced work placement during their undergraduate studies. The results showed that generic skills development was closely associated with the degree of responsibility the graduates were given by their supervisors and employers either in a group situation or one-on-one interaction. Only the development of information literacy and written communication skills were felt to be the best developed independently.

The findings of Auburn *et al*. (1993) show that, through the placement, the students gains a qualitatively different experience from that acquired on the academic courses alone; and the difference seemed to arise particularly in the area of co-operation and interaction with others in a work context.

2.6 Are transferable skills transferable?

It is often assumed that, once learned, personal transferable skills will transfer from the context in which they were acquired to another; however this may not happen in practice. Brown, Bull and Pendlebury (1997) suggested that in order for the skills to be transferred, the learner must understand the skills and the context in which the skills are to be transferred. For example, a team player in sports is not necessary a team worker in research. They and other reviewers suggest that the weight of evidence shows that:

- Transfer is most likely to occur when a person understands the underlying principles on which the skill is based.
- Knowledge and understanding of different contexts to which the skill is to be transferred are necessary for transfer to take place.
- The probability of transfer is maximised by providing a wide variety of learning tasks based on the skill or skills (Resnick and Nelson Le-Gall, 1997; Bowden and Marton, 1998).

In his comprehensive view of transfer based on 700 sources, Billing (2007) point out that cognitive psychologists have a relatively narrow view of transfer. Tennant (2005)

comes to a similar conclusion. Cognitive psychologists take the view that genuine transfer can only take place if it is unaided. Their major method of investigating transfer was in tightly controlled laboratory settings, their underlying theory was that transfer only takes place if there are common elements between the initial task and the present 'focus' task. Given this set of constraints, it is not surprising that most of these reviews of transfer have concluded that there is little evidence of transfer.

Perkins and Salomon (1987, 1989) in their extensive reviews of skills make the distinction between low road and high road transfer. Low road transfer occurs when tasks and contexts are closely similar such as driving a Ford or a Vauxhall or solving first order differential equations. If a person learns to drive one type of car, it is probable that he/she will be able to drive most other types of car. If he or she can solve first order differential equations then he/she should be able to solve similar differential equations providing the contexts are similar. High transfer is most likely to occur when learners understand the deep characteristic of the skill and context. This form of transfer may be called a meta-cognitive skill (the knowledge about one's own cognition and the regulation of that cognition) (Simons, 1994) or 'learning to learn' (Peterson, 1997). For example, some students recognise a formula even if a different notation is used. Other students tend only to surface characteristics and so do not transfer their skills. Some students can solve problems and communicate effectively in new contexts. Such students have a deep understanding of the skills and the context (Brown, 2004).

The idea of low road and high road transfer provide explanations of why some students may perform better than other students. If the experience of a work placement is similar to one of the modules which they are doing then they may transfer their skills easily. For example, if on their work placement they have worked on design and then have to do a design in their final year then they are likely to do better than those students who have only done menial tasks on placement. Students who have understood the skills and the new context are also likely to perform better.

The notion of 'low' and 'high' road transfer has been extended by this author as shown in figure 2.6.

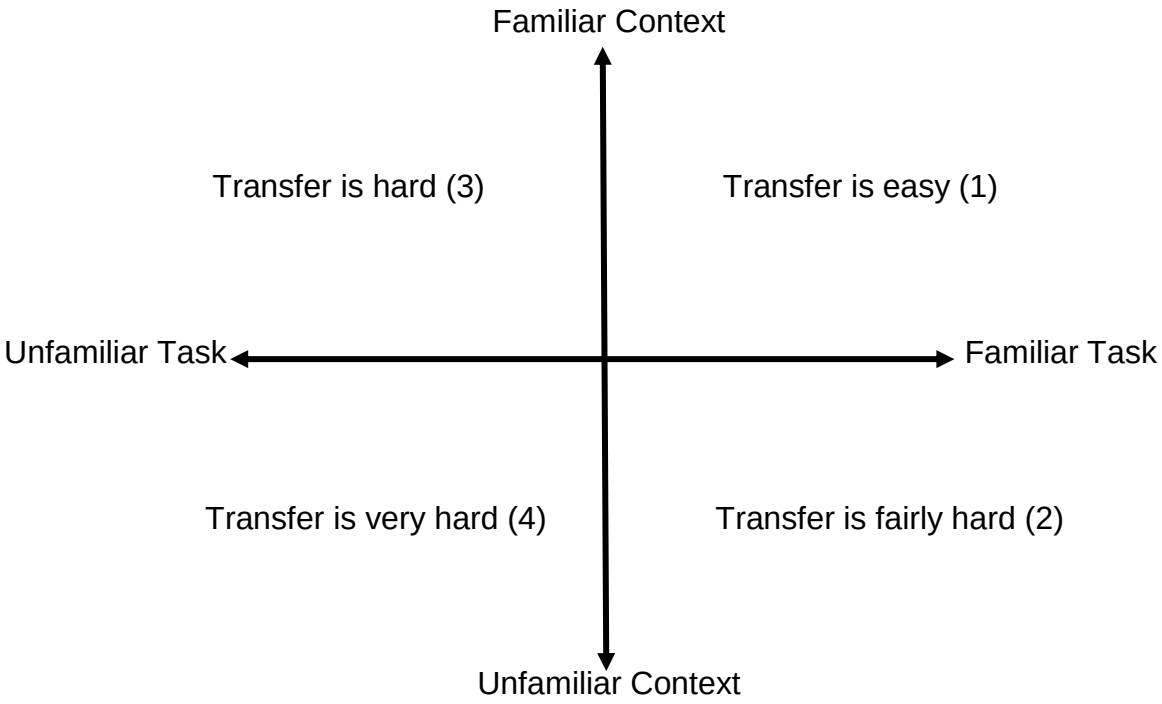


Figure 2.6: Difficulty of Transfer

Singley and Anderson (1989) take a more sophisticated view of transfer based on cognitive theory. They suggest that learning and transferring a skill involves declarative knowledge stored in the semantic memory and procedural knowledge stored in the procedural memory and so is often largely unconscious. In transfer these sets of processes are re-activated with varying degrees of success.

All of these findings have implications for developing transferable skills and the impact of work placements on transferable skills. They imply that preparation in transferable skills for work placement and from work placements to further academic work is important, and that for skills to be transferred effectively, an understanding of the new context is important. This is perhaps one of the reasons why students and employers prefer longer work placements so the student can learn about the context so he/she is more able to transfer the skills required. The third principle suggests that there should be a wide variety of learning tasks in preparation for placement and during placements. A narrow set of tasks during a placement may do little to aid transfer to academic study and so not raise academic performance.

Objections to the idea of 'transfer'

However, not all theorists agree on the nature and possibility of transfer. Detterman (1993), some educationalists (Bennett *et al*., 2000) and a major cognitive situationalist (Lave, 1990; Bossard *et al*., 2008) take the view that transfer is rarely possible, that learning is always context-specific. Detterman stated: 'There is no good evidence that people produce significant amounts of transfer…'

However, Billing points out that Detterman's perspective was based on a limited review of the research and a narrow definition of transfer. He and Tennant (1997), point out that 'transferable skills' are now common currency and that there are several broad definitions of transferable skills. The term 'transferable skills' is often used interchangeably with employment-related skills, generic skills and personal transferable skills (Fallows and Stevens, 2000; Chadha, 2005). Kelly (2001) describes the key skills as generic transferable skills that contribute to individual effectiveness, flexibility and adaptability within the labour market. Bennett (2002) defines transferable skills as the skills "needed in any job and which enable people to participate in a flexible and adaptable work force". This definition provides a useful basis for identifying a list of important transferable skills and many such lists exist (Bennett, Dunne and Carré, 2000; Dearing Report, 1997; DfES, 2005). My own preference is for the definition provided by cognitive psychologists discussed in sections 2.4/2.6, since it describes the key characteristics of skill.

However, because there are different lists merely implies that there are different ways of categorising skills. It does not imply that the skills are not transferable. There are other objections to the use of skills. First, there is the argument put forward is that all learning is new learning so transfer is a redundant concept (Billing, 2007). Such a view seems to miss the point. It is true that all learning is new learning but the question remains how does earlier learning contribute to new learning? A second objection is that, all learning is content-specific, every new context require new learning which may vary. This is a view of social constructivists. It seems to deny the idea that learning is cumulative and it neglects how knowledge is stored in the long term memory and how a new context can trigger memories of earlier learning. For example, a common comment by people who have changed workplaces is 'That is not how we use to do it in my last job'.

A third objection is that, 'transfer' is better considered as problem-solving (Billing, 2007). This view certainly applies to time management and project work and it is possible to apply it to such questions as how can we improve team management and communication. There are no strong objections to this objection except that it implies that every new situation is problematic and so one has to define the term 'problem'.

A fourth objection is that the term 'transferable skills' is redundant. Are not all skills potentially transferable depending upon new content and task and how they are perceived? So 'transferable' is used to indicate a priority of what learning is required in a task. Fifthly, because the skill is labelled as 'transferable', it does not follow it is transferable. Finally, there is the further issue of labels. As Brown, Bull and Pendlebury (1997) pointed out what counts as problem solving in Engineering is different to what counts as problem solving in Education or English literature.

On balance, these objections are not strong enough to reject the notion of transferable skills. The test is 'do they transfer'? Billing (2007) indicates that on the whole there is strong evidence that skills do transfer but that there are few researches on the transfer of communication and team work.

2.7 Embedding transferable skills in the curriculum

As mentioned earlier in section 2.5 of this chapter, embedding transferable skills in the curriculum is one of the methods which can be used by the Universities to help the students acquire and improve their skills, but one of the problems of embedding the transferable skills in the curriculum is knowing what level of the skills should be embedded in order to suit all students. The National levels for the key skills outcomes consists of 5 levels, as level 1 being the lowest (basic skills) and level 5 is the highest. For example the study undertaken in 1997 (Murphy *et al.,* 1997, in Bloy *et al.,* 2000) on the level of the students skills entering the higher education found that the students were not entering the higher education with the levels of skills previously assumed by the Universities. In September, 1999, De Montfort University used the students' self-assessment exercise to gather the information/evidence at the point of transition to higher education rather than assuming the skills levels of the students

(Bloy *et al.,* 1999). The results of this survey showed that most of the students assessed themselves slightly low on their level of communication and application of numbers skills. The level of these skills can be confusing, as the level of competence for each student is not the same, so how can one assume that the first year's students should be taught level 1 or 3 of the skills? How do you measure the level of the students' competence of these skills?

Also when it comes to decide which sets of skills are to be embedded directly and indirectly in the curriculum, it is not clearly what criteria are used to select the skills to be embedded directly and the skills to be embedded indirectly. And as mentioned in chapter three and eight of this thesis, further research is needed in order to identify the effective methods of assessment for assessing the skills outcomes.

2.8 Human Processing: Engineering Control Models

The model of the skilled performance shown in section 2.4 of this chapter (Figure 2.4b) can be related to the Engineering Control System model (A closed-loop control system). As shown in figures 2.8a and 2.8b, a closed-loop control system uses a measurement of the output and feedback of this signal to compare it with the desired output (reference or command), (Dorf, 2008).

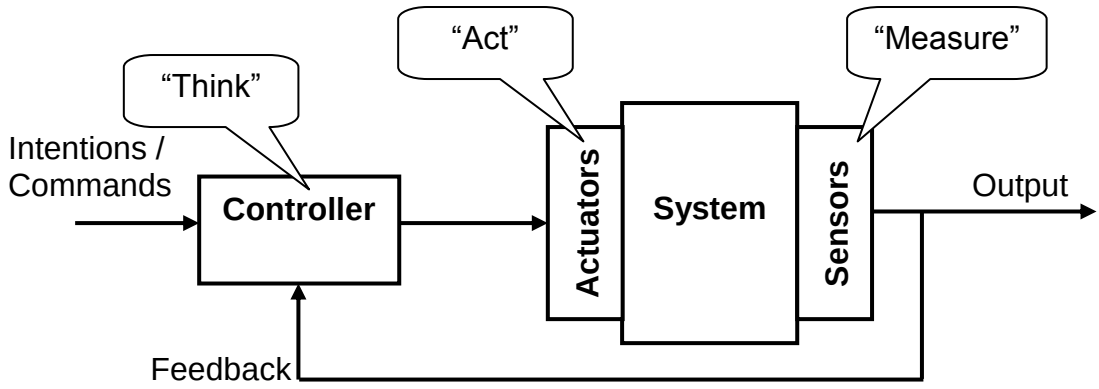


Figure 2.8a: Control system concept

(**Figure 2.8a above**, Source: Control System Design ELB004 – Loughborough University)

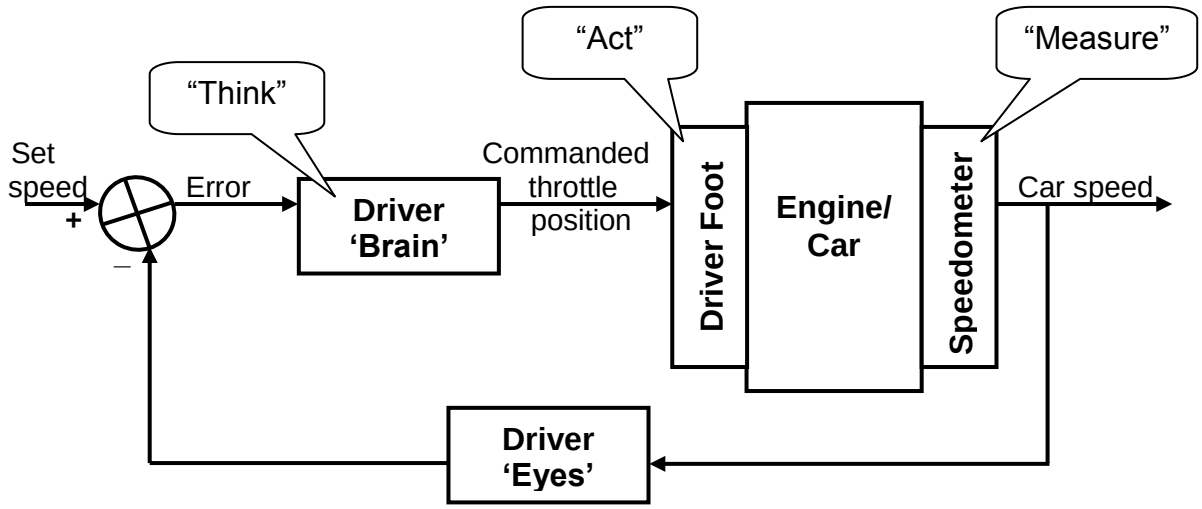


Figure 2.8b: Control system concept of the skills

(**Figure 2.8b above**, Source: Control System Design ELB004 – Loughborough University and Automatic Control – Djaferis, Theodore Euclid, 2000)

As shown on figure 2.8b above, the Control System Engineering model can be applied a person's skills of performing tasks. For example, consider a person who is driving a car. The visual sensing of the driver provides feedback to the driver's brain (for example regarding the speed of the car). The driver's eyes sees the speedometer and fed back the information to the driver's brain which takes the information as well as the intentions (i.e. set speed), which is kept in mind. Then the brain processes the information. The error (feedback/output is subtracted from the input) as shown on figure 2.8a/b above, is used to determine what action to take (input signal) in order to make the error smaller. If the error is zero, which implies that the actual car speed is the same as the desired car speed, no correction action is required. Otherwise the driver acts accordingly from the information received to the brain.

The skilled performance can be disturbed by the external factors which can change the desired output. Using our example of the driver again, the external factors can be wind speed, road surface, etc. which can all affect the car's speed. Internal factors / uncertainty can also change the desired output; these are shown on figure 2.8c on the next page. For example again the driver suddenly feeling unwell, etc. all these factors can have an impact on the desired output.

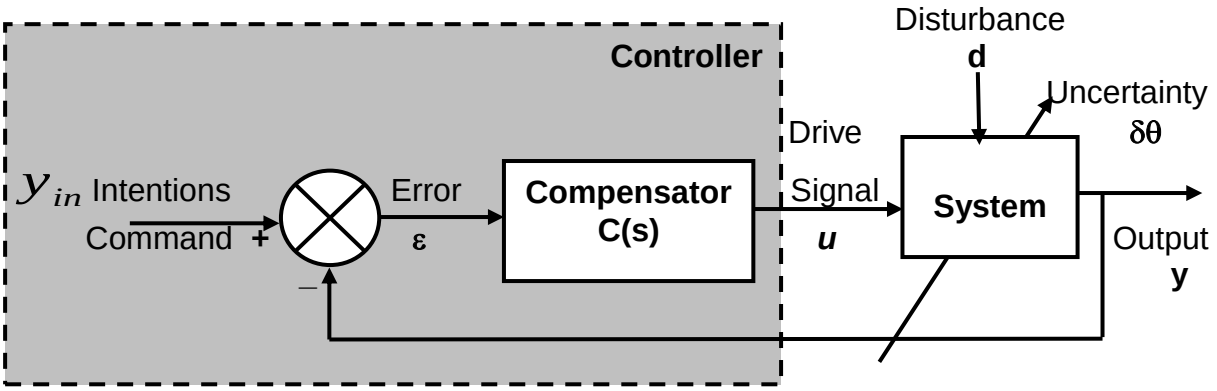


Figure 2.8c: Closed loop system of the skills

(**Figure 2.8c above,** Source: Control System Design ELB004 – Loughborough University)

The approach based on Engineering Control Systems provides another approach to considering skilled performance which most engineers would recognize. However in the study of 'softer skills' such as teamwork or communication skills, it is difficult, if not impossible to assign quantitative measures.

2.9 Guided Learning

A model of guided learning which can be used by workplace experts is cognitive apprenticeships (Brown *et al*., 1988; DeSoi *et al*., 1992; Collins, *et al*., 1989). In the original model the emphasis was upon the idea that learning was always situated in a specific context and most of the learning was informal. This model can be extended to incorporate ideas derived from coaching (Lidor *et al*., 1999). This approach to guided learning includes modelling, coaching, guidance and fading, It seems particularly applicable for use by expert others to make their guidance of workplace learners more potent. The cognitive apprenticeship model aids the development of learners' self-monitoring and self-correction skills, and the integration of the skills and conceptual knowledge required for expertise. This approach to guiding learning, contains six teaching methods:

(i) modelling, (ii) coaching, (iii) scaffolding and fading, (iv) articulation, (v) reflection, and (vi) exploration.

Figure 2.9 below, shows how each stage of the cognitive apprenticeship model links together. The first three stages are aimed to help the students acquire an integrated set of skills through observation and supported practice. Then the next two stages are aimed to focus students' observations of expert problem solving and to manage their own problem solving skills, and finally the last stage is aimed to encourage learner autonomy and problem formulation by the self.

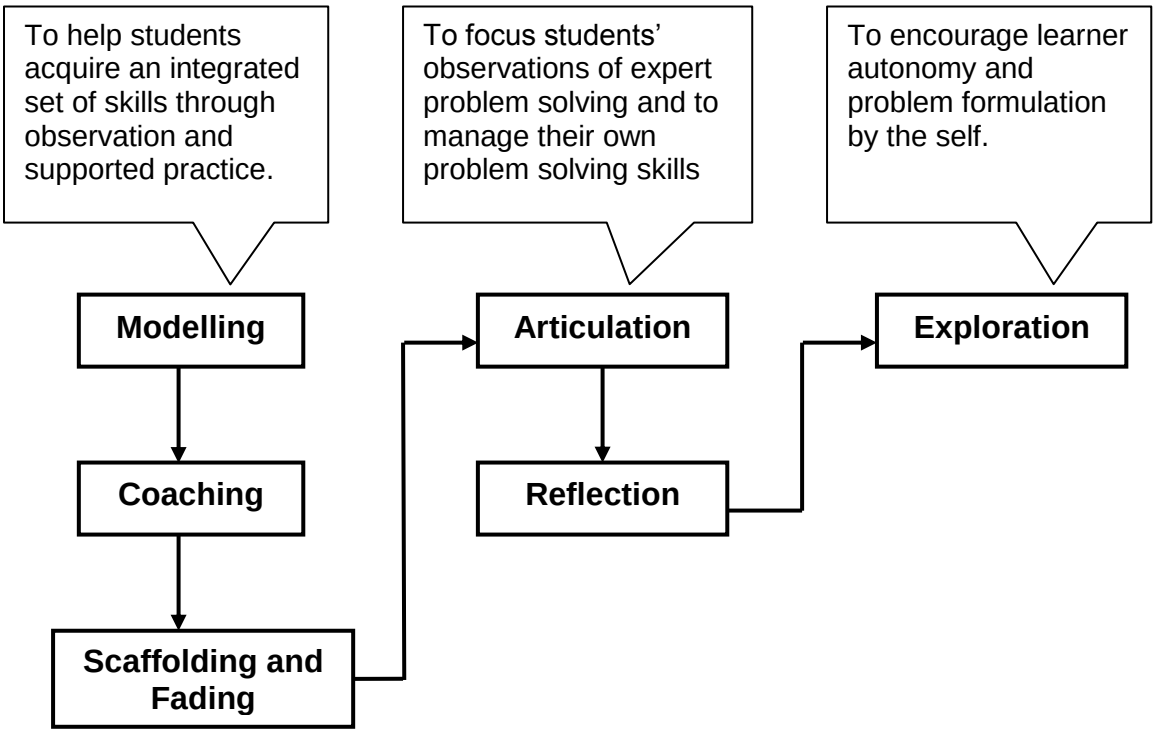


Figure 2.9: Cognitive Apprenticeship Model

Modelling is the process whereby the expert performs a task while the learners observes and build a conceptual model of what has been done by the expert to accomplish the task. Externalisation of the internal cognitive processes that experts use when performing a task may be required.

Coaching is the process of observation and monitoring by the expert as learners engaged in problem solving activities. Experts will provide hints, feedback, clues and demonstrate some tricks to assist learners achieve the intended outcomes. Coaching is made effective by a means of highly interaction and feedback (Chee, 1995). The intended outcome of the coaching process is to guide learners' performance to

become closer to that of the expert so that learners approximation of tasks becomes increasingly mature (Gott, 1989 in Billet, 1996).

The support that experts provides to the students to manage complex tasks is referred to as **scaffolding**. The support provided by the expert takes the form of providing learners with opportunities to acquire knowledge and skills that are within the scope of the learners' ability. In scaffolding, the expert if necessary carries out a part of the overall task that the learner has not yet mastered.

Scaffolding offers a co-operative basis to problem-solving between the expert and the learner in which the express intention is for the learner to take as much of the responsibility for the activity as possible (Billet, 1996). Scaffolding is coupled with **fading**, which consists of gradual removal of the expert's support until learners are able to manage the task independently.

The next level is the **articulation**, in whereby an expert encourages students to explicate their knowledge, reasoning and problem solving strategies (Collins *et al*., 1989, in Chee, 1995). The use of synthetic and design tasks in a producer – critic framework is particularly effective in achieving articulation (Allen, 1992; Pea, 1991). The tasks require a learner to participate in generating knowledge and evaluate the outcomes of knowledge-building activities. Generative and evaluative processes provide a further basis for concept assimilation and internalisation (Lawrence and Valsiner, 1993; Vygotsky, 1978 in Chee, 1995).

In the **reflection** phase, the student / learner is required to compare his/her own problem solving processes with that of the other students/learners, as well as the expert's problem solving processes. The comparison helps student/learner to discover his/her difficulties and the areas which needs to be improved in order to become competent and achieve the goals.

Finally, in the **exploration** phase where the student is supposed to be independent learner, the expert only sets the goals for the student to achieve. As well as setting up the target, the expert encourages the student to identify his/her personal interests

and pursue personal goals. In this exploration phase, a student learns how to manage interesting questions and identifying difficulty problems on his/her own.

A possible weakness in this cognitive apprenticeship model is that experts need to be able to articulate how they do a task and also how they learnt to do it. Otherwise their modelling and scaffolding may not be successful. The research literature on experts and novices indicates that experts take short cuts which are not available to novices until they have well developed schemata.

Bransford *et al*. (1999) summarised their review of experts and novices as:

- Experts see features and meaningful patterns that are not noticed by novices;
- Experts have acquired vast content knowledge, and their organization of it reflects a deep understanding of the subject matter;
- Experts' knowledge is not simply isolated facts or propositions, but reflects contexts of applicability;
- Experts can retrieve important aspects of their knowledge with little effort;
- Though experts know their disciplines thoroughly, this does not guarantee that they can effectively instruct others about the topic;
- Experts vary in the flexibility of their approaches to new situations.

Cited by Billing (2007)

These findings suggest there is more to being a tutor or line manager than having the necessary embedded declarative and procedural knowledge to do the task. They also need to develop declarative and procedural knowledge to utilise the task. As Gonczi (2004) (based on the work of Gott (1995) on USAF methods of training) observes: 'The implications for curricula and training are … there is a need for learning that is *situated, sequenced and supported*'.

This model of guided learning provides a set of guidelines for action but it does not explain how cognitive apprenticeship works. It is also difficult to see how it could be used directly in a study of transferable skills. Long term observational studies based on the six phases would probably yield some interesting qualitative results but these

would require close cooperation with students, line managers and industrial tutors. The process would be lengthy.

2.10 Theories of Cognitive Development

Within the broad perspective of cognitive psychology there are theories of how people develop their capacities to learn (Piaget, 1926; Vygotsky, 1978; Tennant, 1997) and how others may help them to learn (Ausubel, 1968). Piaget's main premise was that: 'all logical thinking arises out of the manipulation of objects' Piaget and Inhelder (1969) (cited by Brown and Wragg (1993)). This view echoes to some extent the statement attributed to the Chinese Philosopher, Confucius: "I hear and I forget, I see and I remember, I do and I understand."

Piaget based his theory on close observation of individual children in experimental situations. He suggested that broadly speaking, children go through various phases of learning shown in figure 2.10a below.

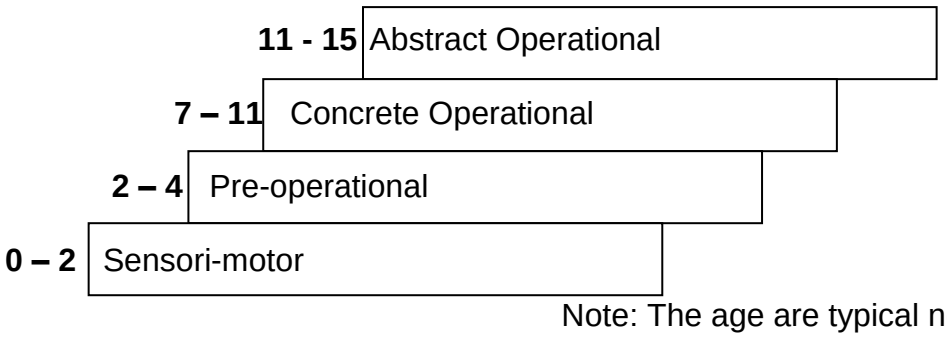


Figure 2.10a: Piaget's model of development stages

At the sensori-motor stage, children play with objects and form their initial ideas of how things work and how people react. This forms the basis of the pre-operational stage where they begin to use language and symbols. For example they know what a car is even if there is not one present. However, they still make mistakes in their reasoning such as the car in front on a racing track is the fastest even though they saw that car had been overtaken.

At the concrete operational stage, they are able to reason accurately in concrete situations. This stage provides the basis for abstract thinking. Later work has

confirmed these broad stages of development. But not all children reach the abstract stage and children can be at one stage in one area of activity, such as science and mathematics, and at a lower stage in another area such as language (Tennant, 1998).

Piaget also used the notions of assimilation, accommodation and schemata. Through the activity of the child, new information is assimilated into existing schemata or the information changes to accommodate the new information or a loosely linked new schemata grows out of the existing schemata. This idea is used by cognitive psychologists and by theorists such as Kolb (1984), Richardson (1989) and Phillips and Soltis (2003). It is also the basis of individual constructivism that is how individuals construct meanings from their experiences.

Piaget's ideas may seem remote from learning in the workplace but the notion of doing practical tasks lays the foundations for more abstract tasks. It provides a theoretical basis for the principle of teaching 'Begin with the concrete and proceed to the abstract'. From personal observation, it seems to be the way some students tackle new computer programs. They play with the program (pre-operational) to see what it can do rather than read the instructions, then they try out various tasks (concrete operational) and if these fail, they read the instructions (abstract operational). Piaget's notion of assimilation and accommodation contributes to an understanding of how learning takes place in the workplace and how a learner's views can change as a result of experience.

Vygotsky's view of learning is also developmental but he stresses the importance of help from an 'expert' other. His main ideas are the Zone of Proximal Development (ZPD) and Social Interaction (Atherton, 2005). In every day terms this can be interpreted as stretching, or extending and lifting the learner to new heights of knowledge. Figure 2.10b summarises his theory of ZPD.

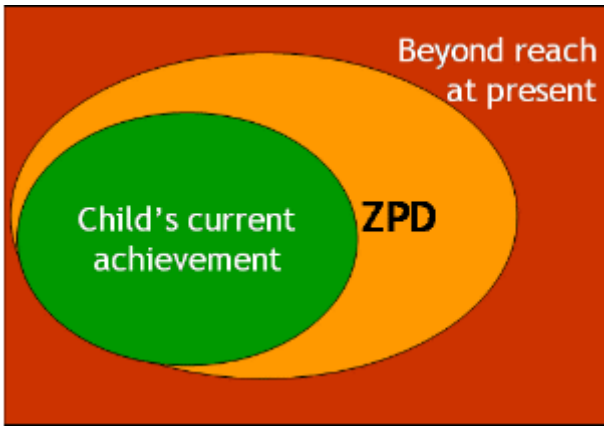


Figure 2.10b: Zone of Proximal Development

(*cited by* Atherton, 2005)

This theory suggests that to help a person to develop and perhaps motivate him or her, one should set tasks well within the ZPD and then tasks closer to the boundary of ZPD. In this way self-confidence could be developed.

Vygotsky's other main theory is that learning is primarily a product of interaction with others in the environment so language has a major role. It is through communication with others in a social context that new knowledge is created in the minds of the learners and in particular, through social interaction with parents, teachers and 'experts'. Within this interaction, the learners may also learn the unspoken culture. This view is at the core of social constructivism which focuses upon how the context creates learning and its cousin, communities of practice which focuses on shared learning (Lave and Wenger, 1999). Thus in learning in the workplace, one may learn to do certain tasks but also learn about the particular culture of that work place.

Ausubel, from his studies of learning in schools (Ausubel, 1968; Calhoun, 1972) also argued that learning involves active construction of knowledge. He made the point that: *'The single most important factor in learning is what the student already knows. Ascertain this, and teach him accordingly'.*

This maxim has powerful implications for teaching in the workplace as well as in Universities particularly if 'knowledge' includes knowledge gained from life experiences as well as academic knowledge. Examples from the student's experience and interest and analogies with other tasks are helpful here.

This view of Ausubel's led him to recommend the use of 'advanced organisers' and 'anchors'. 'Advanced organisers' activate the learner's existing knowledge and orient the learner to the task or to an explanation being given. 'Anchors' are statement which introduce the learners to the new ideas or procedures so they link strongly with the existing knowledge of the learner. Ausubel also stressed the importance of reflection on tasks completed to strengthen schemata.

All of these ideas provide important guidelines for tutors and line managers, they provide an understanding of development but are less useful for the study of skills.

2.11 Theories of Student Learning

At first sight, these theories may not appear to be relevant to learning in the work place but the higher level of learning and skills in the workplace contain much cognitive content. So much so, that some authors suggest that transfer of skills is but another name for problem solving (Billing, 2005).

The earliest work in this field was qualitative and a form of constructivism. Marton and Saljo (1976) set students various learning tasks, interviewed them to explore how they approached the tasks and then analysed the transcripts using thematic analysis. Two broad categories of approaches to learning emerged: 'surface' and 'deep' learning. Brown (2004) briefly describes these broad categories in these words:
"*Deep processing involves integrating new learning tasks with earlier experiences; integrating the various learning tasks into a whole; trying to see the learning tasks in a wider perspective and actively searching for meaning and understanding*.

In contrast, surface processing consists of treating all tasks as memory tasks, not searching for connections between tasks and not reflecting upon various approaches to tasks".

This research prompted Entwistle to develop an inventory (questionnaire) to test whether an individual was a surface or deep learner (Entwistle, 1992). Later he

extended these ideas to ‘reproductive learners, understanders (deep learners) and strategic learners (strategists). This enabled Entwistle and his co-workers (Entwistle and Ramsden, 1983) to produce profiles of students in terms of their preferences for reproductive or deep approaches and their ‘will to succeed’ or strategy (Conation: see Chapter one). Entwistle (1992) and Brown and Atkins (2002) stress that both deep and surface approaches are necessary but students have a preference for one approach. The subject, the department and its mode of assessment can influence their approach (Brown, Bull and Pendlebury, 1987; Ramsden, 2003). For example, in Electrical Engineering there is probably a greater demand for reproductive knowledge than in English Literature and a greater demand for personal understanding in English Literature than in Engineering but both approaches are necessary in both subjects. High level strategists who have developed both approaches will choose the approach which will gain them the most marks. However, Meyer *et al*. (1994) found that engineering students who adopted deep approach in a course were very likely to pass the course (in fact, none of the students in this category failed), while students who adopted a surface approach were very likely to fail. The students who adopted a deep approach also generally expressed greater satisfaction with their instruction (cited by and in Felder and Brent, 2005).

In terms of learning in the workplace, it is likely that similar results would be obtained since reproductive knowledge and understanding are necessary. However the test items in his inventory would need to be changed to test this hypothesis.

Saljo (1976), also explored undergraduates different constructs of learning in a series of qualitative interviews. These are shown in Figure 2.11. They ranged from the relatively primitive ‘learning or memorising’ and to the ‘more sophisticated’ forms of learning. Marton and Booth, on the basis of their review, extended this theory further (Marton and Booth, 1997), (see Figure 2.11 on the next page). It would be interesting to discover how students on work placements conceptualise (construct their ideas) of learning on the work placements.

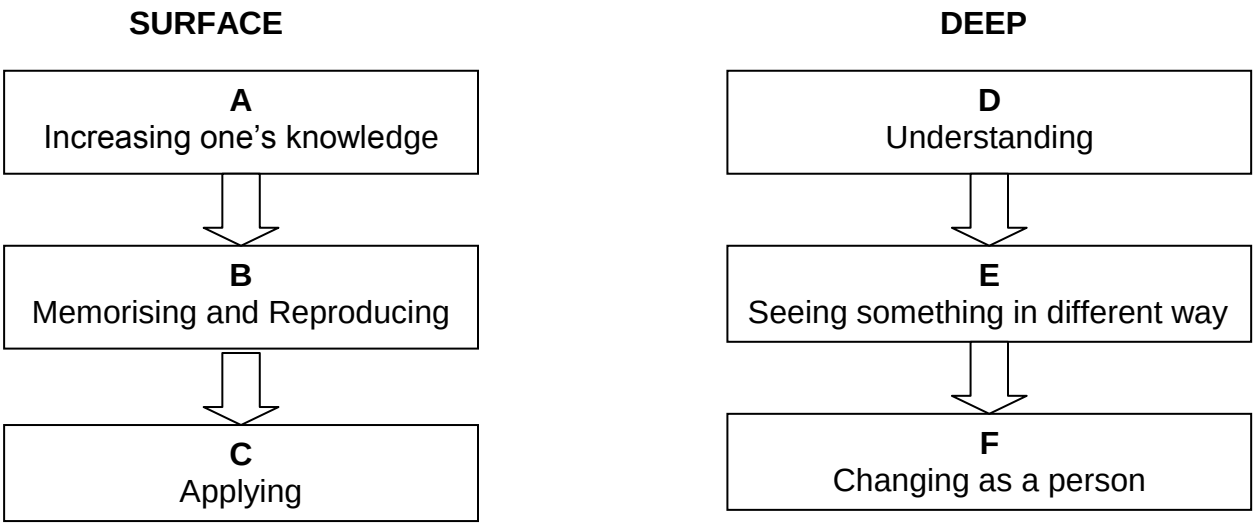


Figure 2.11: Six Levels of Learning

Overall, the approaches based on theories of student learning would provide insight into how students learn and their level of learning in the workplace as well as in University but much work would be needed to develop the learning inventories or to conduct the qualitative research.

HUMANISTIC AND SOCIAL PERSPECTIVES

2.12 Styles of Learning

Styles of learning stands on the boundaries of cognitive perspectives and humanistic perspectives. The approach uses a quantitative measure and this is used to provide an interpretation of an individual's profile or a group's profile.

Styles may be roughly described as an individual's typical approach to learning and interacting with others. The field is vast as demonstrated by Coffield (2004), who identified 3800 references, reviewed critically 838 articles, identified 71 styles and focused upon 13 major styles and by Felder and Brent (2005) who reviewed the major studies of styles in Engineering. In this review, this author has focused upon Kolb's Learning inventory, Honey and Mumford's simplified version of Kolb (Honey and Mumford, 1986), the Myers-Briggs inventory (MBTI), Felder and Silverman's learning inventory which was designed for use with engineering undergraduates and

lecturers and VARK (Visual, Aural, Read/write, and Kinesthetic), a method of measuring modes of learning as described by Fleming, (1992).

A brief overview of styles is provided by the Engineering Subject Centre booklet (Houghton, 2004). Of these, this reviewer focuses upon the most well known ones of Kolb (1984), Honey and Mumford (1986) who simplified Kolb's original questionnaire, the Myers-Briggs (MBTI) (Myers *et al*., 1985), Felder and Silverman's inventory (ILS) (1988) which is based primarily on the MBTI and VARK (Fleming, 1992).

Kolb's theory of styles

Kolb, on the basis initially of his studies of employees and students in Business and Management formulated four styles of learning. These and the corresponding recommendations for teaching are shown in figure 2.12a below:

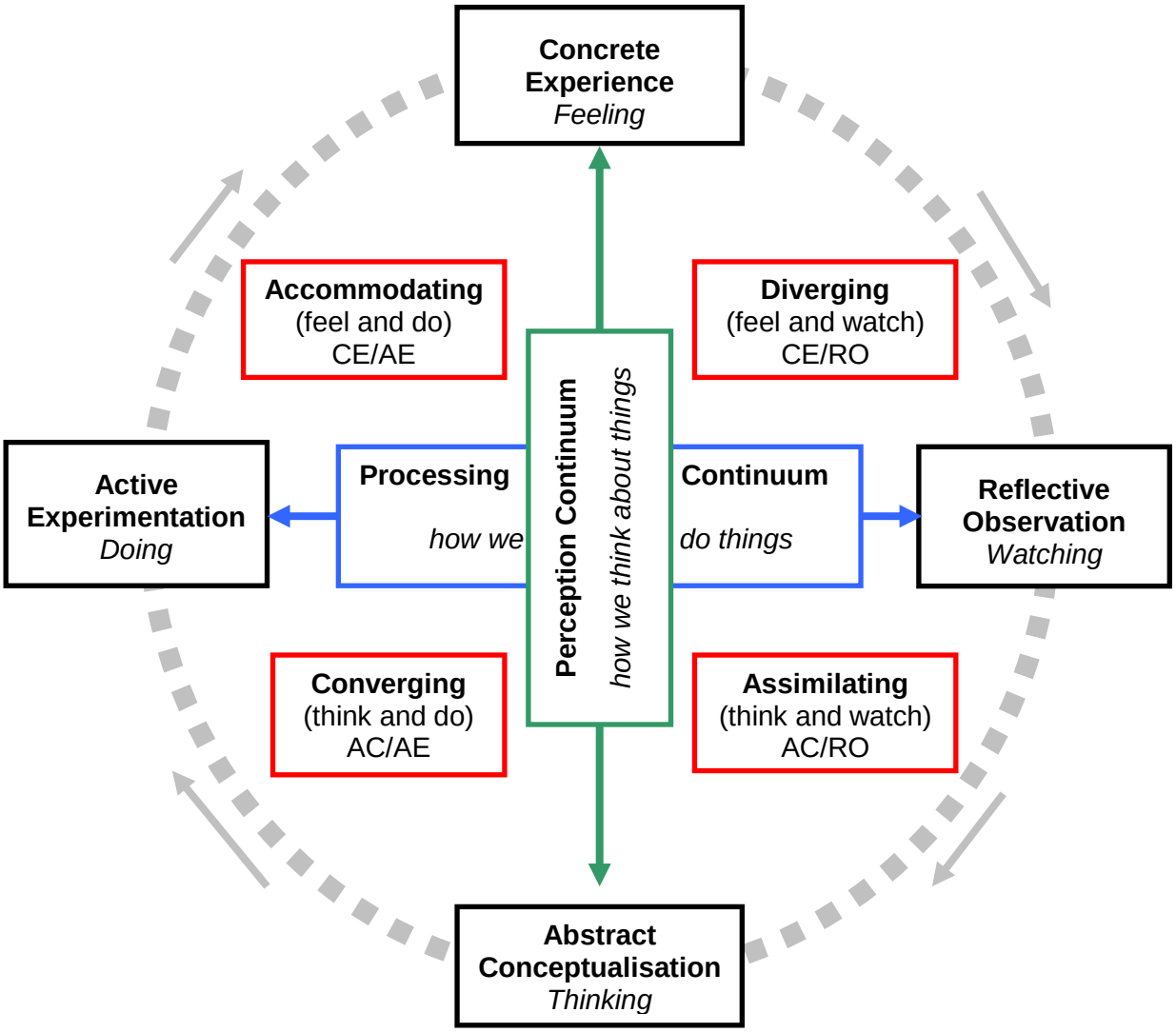


Figure 2.12a: Kolb's Model of Experiential Learning Styles

Type 1 (concrete, reflective) - the *diverger*. Type 1 learners respond well to explanations of how course material relates to their experience, interests, and future careers. Their characteristic question is "*Why*?" To be effective with Type 1 students, the instructor should function as a *motivator*.

Type 2 (abstract, reflective) - the *assimilator*. Type 2 learners respond to information presented in an organized, logical fashion and benefit if they are given time for reflection. Their characteristic question is "*What*?" To be effective, the instructor should function as an *expert*.

Type 3 (abstract, active) - the *converger*. Type 3 learners respond to having opportunities to work actively on well defined tasks and to learn by trial-and-error in an environment that allows them to fail safely. Their characteristic question is "*How?*" To be effective, the instructor should function as a *coach*, providing guided practice and feedback in the methods being taught.

Type 4 (concrete, active) - the *accommodator*. Type 4 learners like applying course material in new situations to solve real problems. Their characteristic question is "*What if?*" To be effective, the instructor should pose open-ended questions and then get out of the way, maximizing opportunities for the students to discover things for themselves. Problem-based learning is an ideal pedagogical strategy for these students.

(This theory is related to his view of learning as a cyclical process. It is discussed briefly in the section 2.13 on 'Experiential Learning').

In engineering, Fielder and Brent (2005) report that most studies of Kolb's styles indicate students are Type 2 and 3. He cites as an example that in a study of over a thousand undergraduates in engineering 40% were Type3, 39% Type 2, 13% Type 4, and 8% Type 1 (Sharp, 2001). Feest and Iwugo (2006) in their study of assessing reflection in courses in Water Engineering showed that training in reflection enhanced achievement in examinations.

The LSQ

Honey and Mumford's Learning Styles Questionnaire (LSQ) measures the same characteristics as Kolb. See figure 2.12b, below.

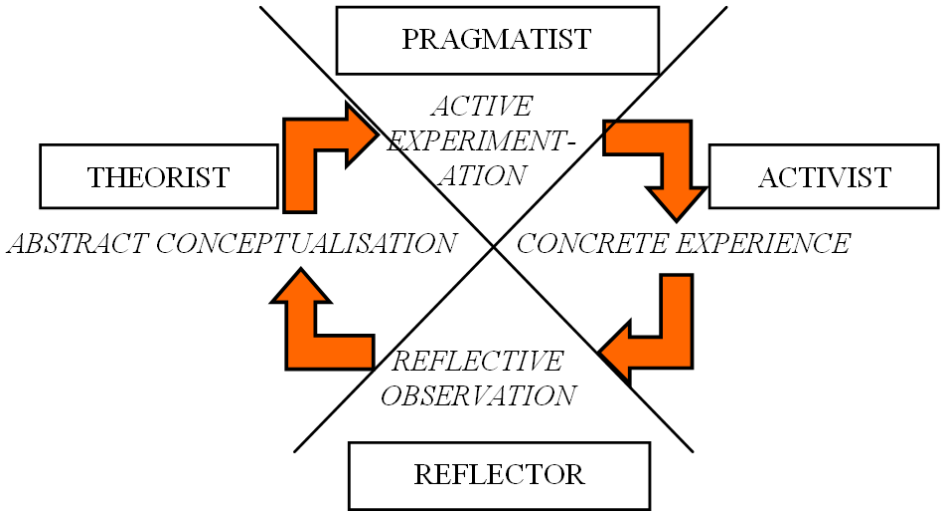


Figure 2.12b: Learning Styles Questionnaires

In response to critics of its reliability and validity (Furnham, Jackson and Miller, 1999), Honey (2002) argued that it was not a psychometric test but:

'The LSQ is simply a checklist that invites people to take stock of how they learn. It is purely designed to stimulate people into thinking about the way they learn from experience (which most people just take for granted). There is nothing remotely sophisticated about it: it is an utterly straightforward, harmless self-developmental tool'. Cited by Coffield (2004).

However despite its wide use by tutors and industrial trainers, research has not yet revealed any significant correlations with learning in work placements (Coffield, 2004) Further the evidence from studies of Engineering students indicates there seems to be no relationship between Honey's learning styles and academic performance. For example, one study of 182 Engineering students yielded no significant relationships between the LSQ and academic performance in engineering (Van Zwanenberg *et al*., 2000).

The Myers-Briggs Type Indicator (MBTI)

The MBTI measures people's preferences along four dimensions which result in 8 types. These are shown in table 2.12.

Table 2.12: The Myers-Briggs Type Indicator (MBTI)

Extraverts	Try things out, focus on the outer world of people
Introverts	Think things through, focus on the inner world of ideas
Sensors	Practical, detail-oriented, focus on facts and procedures
Intuitors	Imaginative, concept-oriented, focus on meanings and possibilities
Thinkers	Skeptical, tend to make decisions based on logic and rules
Feelers	Appreciative, tend to make decisions based on personal and humanistic considerations
Judgers	Set and follow agendas, seek closure even with incomplete data
Perceivers	Adapt to changing circumstances, postpone reaching closure to obtain more data

(Based on Felder and Brent, 2005)

From their review of research on engineering students, these authors conclude that the results were 'remarkably consistent'. Intuitors, thinkers, and judgers consistently outperformed sensors, feelers and perceivers. Extraverts had a higher initial preference for group work than introverts but no difference was detected after the experience of group work. A balanced approach of teaching methods tended to reduce the performance differences between sensors and Intuitors, and between extraverts and introverts. Recently, Shen (Shen *et al*., 2008) have compared the results of the western nations' (UK, USA) engineering students with engineering students in Taiwan. The results showed that Chinese students tend to have stronger preferences for 'Introverted, Sensing, Thinking and Judgment' than the UK and US students. This makes them good in organisation, detailed thinking and control, but not so good in terms of creativity, openness, warmth and perception.

With regard to teaching in engineering, Brent and Felder (2005) argue from their review of the evidence that lecturers in engineering tend to be introverted and so favour lectures and individual assignments rather than active class involvement. Intuitors favour emphasis on fundamental mathematical and scientific concepts rather than engineering applications and operations. Thinkers favour objective analysis rather than interpersonal considerations in decision-making and judgers emphasise following the syllabus and meeting assignment deadlines rather than exploration of ideas and creative problem solving.

The Index of Learning Styles (ILS)

Felder, a Chemical Engineer, and Silverman (1988) developed an inventory especially for the study of engineering teachers and students. The inventory was influenced by the categories of the MBTI and subsequently modified by Felder and Soloman (1992). Its current dimensions are:

- Visual-Verbal Learners
- Sensing-Intuitive Learners
- Active-Reflective Learners
- Sequential-Global Learners

The sequential-global dimension refers to people's preferences for holistic learning (understanding the broad picture first) or for building up their knowledge in sequential steps (doing it bit by bit). Both styles are necessary in engineering and design. Engineering students have a preference for active rather than reflective learning, sensing rather than intuitive learning and for visual learning rather than verbal learning. Engineering students are heavily oriented to sequential learning rather than global learning. These characteristics did not match well with the characteristics of lecturers who tended to be intuitors and so emphasise theory and modelling (mathematical) and verbal who emphasise explanations and foundations based on physics and mathematics rather than practical applications (Felder and Brent, 2005). This mismatch seems to reflect in part the nature of learning engineering in a University and its conflict with what the student's interest in engineering is based on.

VARK

VARK is a questionnaire that provides a user with a profile of their learning preferences, developed by Neil Fleming in 1987. VARK stands for Visual, Aural/Auditory, Read/Write, and Kinesthetic.

Visual – Visual learner prefer to learn from pictures, diagrams, figures, charts, graphs, flow charts, but not learning from PowerPoint, movies, videos according to Fleming and Mills (1992).

Aural/Auditory – This is a preference for information that is heard or spoken. These learners, reports they learn best from discussion, tutorials and lectures, and they

have a preference for sorting out their thoughts through talking rather sorting things out and then speaking.

Read/Write – This is a preference for words as text based inputs (reading) and text based output (writing). A learners with this preference likes PowerPoint, internet, reference books, etc. This is academic mode of learning.

Kinesthetic – Learners who prefer this mode prefer concrete samples, personal experiences, practical tasks or simulation.

Multimodal – Fleming divides these into two types: those choose a single mode to suit their contexts and those who prefer to use all their modes. The latter he claims often have a deeper understanding. Again this is related to the Chinese proverb, "I hear and I forget, I see and I remember, I do and I understand."

It is also related to Stice's (1987) report of research that, retention has 10 per cent for being alone and for seeing 30%. For both 50%, for talking about the topic, 70% and for talking and doing, the retention rate was 90%. Fleming developed a learning preferences questionnaire (VARK) based on the above categories which has been used by school children, students and the general population.

The results published so far are confusing since he does not state fully the results of the students who have a mixture of styles; however his results do show that engineering students are much more visual and less reading/writing oriented than humanities students (Fleming, 1992). The VARK questionnaire would be useful for line managers working with individual students and the DIS tutors who are working with individuals or groups of students. The information has been used in the design of a Mechanical Engineering course (Jensen and Wood, 2000). It could be used by users if there was a change in learning preferences after work placements, but it would have not been feasible in this study.

2.13 Experiential Learning and Related Theories

Two closely related theories of experiential learning were those of Kolb (1984) and Honey and Mumford (1982). Both these theories are cyclised, more precisely they are helical. As one goes through the cycle, one gains new knowledge and expertise which becomes the basis of the next cycle. This process can be interpreted in terms of cognitive theory (Section 2.10).

2.13.1 Active Learning

The description of active learning is usually framed in terms of conditions of effective learning such as learning by doing; 'engagement in learning'. It is usually contrasted with passive learning such as learning from lectures and reading. But as cognitive theory explains, effective learning from these methods also involves the learner in active processing. The theory it seems to this author, provides important guidelines for tutors and line managers. These are neatly summarised in Wankat and Oreovicz (1993).

Principles of good teaching ensure:

- The student is active.
- Students must actively grapple with the material, this can be done internally or externally.

This view may be related to Piaget's theory of individual constructivism (Section 2.10). The efficacy of active learning in many educational contexts may be found in Hattie, Biggs and Purdie, (1996), in Engineering (Prince, 2004), and example from experience in Wankat and Oreovicz's chapter on theories of teaching and learning (Wankat and Oreovicz, 1993). Shekar (2007) in a recent paper reports that an active learning course in product development supported active real-life learning and reflection. However his views were largely based upon student opinions.

2.13.2 Reflective Learning

Schon (1983) argued that professionals need to reflect *on* action, *in* action and *for* action. He based his argument on studies of learning in law and theories of earlier placement students (Higgins and Schon, 1983). However reflection in action is not always possible in a rapidly changing situation. In so doing, Schon argues that practitioners should make connections between academic knowledge and the practitioner's current experience and help practitioner to move from 'novice' to 'expert'.

This view has strongly influenced other researchers (e.g. Kolb, 1984; Moon, 1999, Moon, 2000). The overall evidence for reflection in learning was reviewed earlier in sections 2.7, 2.10. But there seems to be few studies which have tested the experimental hypothesis that reflection actually improves achievement although it seems obvious that it should. However it may be that reflection may change inner processes but not be evident in behaviours which were tested.

2.13.3 Self-Directed Learning (SDL)

Self-directed learning (SDL) could be regarded as a conative skill, and so to be a self-directed learner one has to learn to be self-directed (Billing, 2005). Not surprisingly there are different views of what self-directed learning is (Candy, 1991). Silen and Uhlin (2008) point out that it is used as synonymous with self study, self teaching or students' responsibility and independence in learning. They argue that these definitions are important but they also point out that one needs to consider feelings of being in charge and understanding the demands of the learning context. Wilen and Silen (2007) used their description in their qualitative study of the students learning in Problem Based Learning. This is a specific form of learning which requires self-directed learning. The main finding reported in their study was that students who were involved in self directed learning returned to the problem with 'new information eyes'. The idea of self directed learning was developed by Knowles (1975) as part of his theory of learning (andragogy). This theory was influenced by Rogers (1969). These theories are discussed in the next section of this review.

Direct empirical evidence for self-directed learning in engineering is hard to find although there are plenty of advocates of its use (For example, see references Wankat and Oreovicz, 1993 and Moore, 1986). Two empirical studies were found based on small samples, (Stewart, 2007) investigated the self-directed of 22 students in the final year of Civil Engineering (37% of cohort) using a Self Directed Learning Readiness Scale (SDLRS) (Guglielmino, 1977). This inventory consisted of three scales, desire to learn, self management and self control. The students had a high desire for learning but scored low on self management which included time management, project planning and managing approaches to learning and self evaluation (reflection). Their readiness scores and their grade point averages were strongly correlated. The results were slightly disappointing. One would expect final year students to be more self-directed, but the findings did show a strong link between self-directness and academic achievement. It should be noted that all these students had work experience in Civil Engineering. However the sample is small so we should treat the results cautiously.

A study is reported by Litzinger *et al*. (2003) of the self-directed learning of a sample of engineering students in each year of study. This cross-sectional study was of 174 students (174/600). The results showed a gradual but not significant increase in SDL scores from the first year to the fifth. There were no differences between males and females, nor were there any significant correlations between SDL scores and GPA (grade point average), or between students tested before and after a final year course. It would seem on the basis of this small sample in the study by Litzinger *et al*. (2003) that undergraduate courses in engineering do not develop sufficiently self-directed learning, but those students who are self-directed do achieve better results.

Would experiential learning and related approaches be appropriate?

Studies based upon experiential learning and other approaches have merits in both quantitative and qualitative approaches to the study of the impact of work placements on transferable skills. The qualitative approach would give insight into the processes of learning and quantitative approach tells us more about the outcomes of experiential approaches. However approaches based on experiential learning suffer from the same disadvantages of the research in this thesis (see Chapter 7), and it would require some ingenuity to design and make feasible a study which focussed

upon the impact of work placement on transferable skills based on these perspectives. However a question concerned with reflection were included in the study reported in this thesis.

2.14 Earlier Humanistic Perspectives

The most influential humanistic theorist is probably Roger (1969). In marked contrast to behaviourist approaches, he stressed the importance of inner motivation and the freedom to learn and he provided a set of principles of teaching such as:

1. Significant learning takes place when the subject matter is relevant to the personal interests of the student.

2. Learning which is threatening to the self (e.g., new attitudes or perspectives) is more easily assimilated when external threats are at a minimum.

3. Learning proceeds faster when the threat to the self is low.

4. Self-initiated learning is the most lasting and pervasive.

(Rogers, 1969).

This view influenced many later writers on theories of learning and teaching such as Knowles 1990; Boud and Garrick 1999; Moon and Cowan, 1998. Rogers argued that people are more likely to succeed when they are committed to learning and they have some choice of what they learn and how they learn. This view has been confirmed by Ramsden (1992) who in a study based on over 5000 Australian undergraduate students, showed that departments which gave more choice of what and how to learn were perceived as friendly and supportive, and the students were more likely to develop deep learning. Unfortunately, Engineering and Mathematics departments were not in this category. Arts departments did better. This finding, suggests that the nature of the disciplines and teaching methods and perhaps the size of the intake (Engineering departments are usually large) influenced these results.

Knowles (1990) was influenced by Rogers. He proposed principles of adult learning (andragogy), which also stress freedom to learn. Amongst his principles are that learning should be active, self directed, based on problems, related to the learners experience, perceived as relevant to their need and intrinsically motivated (summarised by Brown, 2004). A review by Tennant (1997) reports that Knowles theory has been broadly confirmed but he noted that the studies were based largely upon middle class learners attending adult education classes. Further a study by Choy and Delahaye (2002) on vocational education students, found that students in their 17 – 24 age range, preferred a mixture of lecture directed and student directed approaches.

The humanistic perspective is a useful corrective to purely behaviouristic approaches. It stresses that choice, freedom to learn, inner motivation, including curiosity, are important features of learning. All of these have implications for learning in the workplace, for teaching and on the job training. But these have to be set in the context of the goals of learning. Complete freedom in designing a bridge could lead to disaster.

This approach based on a questionnaire or focus groups could have been used to assess impact. But this author's suspicions are that studies based on humanistic principles would merely confirm that there are few opportunities in Engineering departments and Engineering companies for freedom to flourish.

2.15 Social Theories

This section briefly considers the theories of learning organisations and the notions of 'communities of practice' (Lave and Wenger, 1999) and situated cognitive theory (Brown *et al*., 1989). The core idea of learning organisations is that an organisation which learns from its experience of its members is likely to be more successful than the one which does not (Brown, 2008). The core idea of 'communities of practice' is that communities have shared ideas, views and practice, which a new member would enter and attempt to acquire the sociocultural practices of the community and gradually as a member becomes more competent, he/she will move from the

periphery to the ‘centre’ of the community and incorporate fully in the community ideas and practiced knowledge.

Both sets of authors claim that much of the knowledge is tacit and learnt through social interaction and as such is not easily articulated. This knowledge can be referred to as craft knowledge which is learnt in context. As indicated in section 2.7, the learner is a ‘cognitive apprentice’ and his or her learning is always ‘cognitively situated’, so transfer is not a useful concept.

Both of these perspectives focuses upon group processes and consequently do not appear to consider how knowledge is encoded, stored and applied (transferred) by an individual from one organisation or community to another. As such these theories have only marginal value in considering the impact of work placements on transferable skills. Although they do have value in exploring group processes (Boreham *et al*., 2004) which may lead to new perspective on work placements in engineering.

WORK PLACEMENTS

2.16 Work placements

Work placements are any activities outside or within an educational programme that involves working on a paid or unpaid basis for an employer. The employment may be full-time or part-time work during the University vacations or term time. As indicated in chapter 1, there are many different types of work placements including sandwich placement (paid work in industry which is part of some degree courses), work-based project (a specific piece of assessed work for a course, undertaken at an employer’s premises), work shadowing (where the students observe a member of staff working in an organisation), vacation work (paid or unpaid work undertaken during University holidays), voluntary work etc.

Work placements have been part of engineering education in the United Kingdom since the 1950’s (Brennan and Little, 1996). They are usually in the form of a ‘thick sandwich’ of a year in industry in which, it is claimed, students gain valuable work

experience and employers and industry in general benefit from the contributions made by students in the short and long term (Blackwell *et al*., 2001; Morris, 2002). In 1971 and 1976, HM Governments of different political complexions called for greater emphasis on sandwich courses in Engineering and Science (Davies, 1990)

During the early years of implementing placements, it was not thought necessary to integrate the work experience into the degree courses. There was little emphasis on preparation for work experience, on supervising work placements or using the experience in courses after returning to University. Subsequently there have been attempts to justify and integrate work placements into the structure of degrees, not wholly with success (Pickles, 1999; Ryan *et al*., 1996). The issues surrounding work placements have become more pressing now that the Bologna Agreement (1999; Micallef, 2005) is being implemented. In the UK undergraduate students can do a Bachelor of Engineering degree (BEng) in three years or four years including a one year placement. A Master of Engineering degree (MEng) in four years or five years including a one year placement.

2.16.1 The purposes and benefits of work placements

The purpose of the work based learning gained in placements has been variously described as gaining ‘employability’, ‘transferable’ or ‘generic’ skills, developing an understanding of world and work organisations, and understanding the ‘real world’ application of skills (Ryan *et al*., 1996; Kerawala *et al*., 1998; Pickles, 1999; Baird, 2005). Placement-based learning also provides students with an experiential learning experience (Kolb, 1984 cited in Hall *et al*., 2000). The sandwich principle has been characterised as founded upon ‘the interaction of academic study and practical applications such that each serves to illuminate and stimulate the other’ (Crick Report cited in Nixon, 1990).

Of these arguments perhaps the most persuasive is the role of work placements in developing ‘transferable skills’ since these are arguably the basis of applying knowledge and understanding of work and of the work place. The transferable skills developed on work placements, may feed back to academic study and provide a foundation for the transfer of these skills when the students enter the engineering or

other professions. However as can be seen from earlier sections of this chapter, the precise nature of transferable skills is open to dispute.

Other writers (Bourner and Ellerker, 1993; Leslie and Richardson, 1999) argue that if placement experience is properly structured and managed then a beneficial effect on academic achievement should be seen on a return to the final year, but Ryan et al. (1996) warn that a poorly structured work placement can have a negative impact. Poorly structured work placements can also have negative impact on the students' employability when they graduate. The study carried out at CHERI (Centre for Higher Education Research and Information) in 2002 found out that, students who did a large amount of work experience unrelated to their studies had negative effect on their employability after they have graduated (HEFCE, 2002).

Pickles (1999) mentioned some of the benefits of work placements i.e. the gaining of 'employability' skills in numerous ways; developing an understanding of the world of work, of work organizations and of the manner in which a particular employing organizations is organized and managed and to understand the real-world application of skills. He pointed out that, in the context of the present discussions concerning sandwich placements (course embedded work experience), there is an opportunity for students to put theory into practice and thus create the opportunity to improve their academic performance; and improve their chances of permanent employment when they graduate.

Little and Harvey (2006) in their qualitative study of social science and students' views of placements give some of the reasons why students go on placements. These are: to get an insight into an industry or type of work, to see how the theory that they were learning on their degree courses was applicable in the workplace and to supplement their learning with practical experience, to enhance their employability skills as well as to possibly improve their academic grades and a break from an academic career. Au Yeung *et al*. (1993) found that engineering students did not believe that their placement helped them integrate theory and practice, the application of knowledge learnt and the preparation for the final year of the course were considered least accomplished by the students who did work placements.

Other literature mentioned the benefit of work placements to both employers and students. Morris (2002), mentioned some of the benefits for the companies are getting for taking students on work placements schemes within the company as well as the benefits students gets from these schemes. Some of the benefits mentioned are as follows:

1. Good quality students that support senior engineers do improve the way projects are run as well as giving the student real industrial experience.
2. Placement students form a significant part of the companies full-time recruitment programme. A six/twelve month placement allows the student to demonstrate all his/her design capability in a realistic working environment. Students are generally given real tasks and significant levels of responsibilities and should they wish to return to the company on graduation, both student and employer can make informed decisions as to whether full time employment is desirable.
3. Student placements carry out real work and are part of a productive team. Placements are an opportunity for the student to learn about themselves and their attitude and ability in a commercial environment. For the companies is an opportunity to gain access to new thinking and fresh minds. If both work, the relationship may continue in the future.

Source: Morris (2002)

Also as mentioned in the findings of the survey conducted by the National Council for Work Experience (NCWE, 2003) on the employer's attitudes and practices regarding the work placements, the results showed that the reasons for the employers to take work placement students is to find a permanent staff, a gesture to the community/local student population, to undertake a specific project, to cover busy periods and to meet an immediate need as well as to promote the awareness of their companies' opportunities.

Other employers/organisations reported that they offered work experience as it was a tradition at their companies, as a part of commitments to their workforce or to the community at large, as a management development scheme as well as because of the enthusiasm, commitment and work ethic of the students, particularly

undergraduates and of the fresh skills and perspectives they bring to the business as a result. (Ball, *et al*., 2006).

Apart from the students and companies, Universities also benefits from work placements by an improved standard of course work from the students and takes credit for producing a better workforce (Kerawala *et al*., 1998). Baird (2005), mentioned the best practice tips for firms on organising work experience. According to this author, well-structured work experience scheme should provide candidates with an opportunity to do some real work. Students should feel at the end of the scheme that they have contributed something and helped, even in a small way. They should never feel under-used or like a *'spare-part'*. According to Baird, students should sit with a senior associate and be involved in the following kinds of tasks:

- Research;
- Drafting documents;
- Attending internal and external meetings (where appropriate);
- Preparing notes following meetings.

Some further education (FE) colleges used work experience as a means of social education and development for their students, who were younger and less experienced than their University counterparts, (Ball *et al*., 2006). Other literature mentioned the number of issues which should be considered by the human resources (HR) in different companies in order to get the maximum benefit from student's work placements. McIntyre *et al*. (2002), mentioned some of these issues which includes:

1. Having a detailed project specification in order to confirm that there is actually a role for a placement student, as there is nothing more demotivating for a placement student than finding out that the marketing assistant's role they signed up for consists of little more than filing and photocopying in the office. Also, although the placement may involve working on a particular project, the student will want to learn as many as they can, so an element of flexibility should be built into the role. Wherever possible, they should be given the opportunity to experience as many roles as possible, shadowing key people and gaining a broad understanding of the business.

2. Recruitment of students from all over the world may provide a unique opportunity for the company to acquire language skills or knowledge of an overseas market.
3. By providing students with a mentor and maintaining a regular communications between mentors and students will ensure that the students are able to develop their skills.

Regarding the best time to introduce a work placement to the young people, Lucas (2005), mentioned that from the research conducted at the Institute for Employment Studies they have found that, young people's attitudes towards things like the arts and sciences are developed at an early age – so by the time they start making career interventions at age 14 – 16, people have often already made big decisions and started on a path which becomes increasingly difficult to go back on. For the University students, he suggested that placements during the early stages of their degree course might be aimed at helping students familiarise with the industry while during the late stages of their degree courses might be aimed at finding employment.

2.16.2 Models of Placement

There are different models of placement; Duignan (2002) mentioned two of them:

a) *laissez-faire* model: whereby the student is given an indication of what he / she is expected to derive from placement; it may include guidance on the compilation of a log book or diary. The tasks given to the student in the work environment is at the discretion of the host.

b) *formal-structure* model: whereby the whole placement environment, from initial information sessions, preparation of the CV, instruction and practice in interview techniques, through to the interview and selection by the host firm and the work experience itself, is systematically controlled to achieve pre-determined outcomes. This model will also include some or all of the following:
   i) appraisal of performance in the workplace by host and university;
   ii) a formal tri-partite learning contract;
   iii) assessment for academic credit;
   iv) post-placement activities such as seminars and de-briefing sessions.

Wilson (1997) cited in Coll *et al*. (2000) classified organisational models as centralised, decentralised and centralised-decentralised. A centralised model functions in a single department or group that is responsible for all the students across subject disciplines. A decentralised model is organised as a part of an academic department and functions totally within it. Centralised-decentralised model consists of coordinators housed within their departments, but the program is overseen by a central group that serves to set policy that applies throughout the institution. These models represent a continuum of degree of interaction between the DIS tutors, placements coordinators and the students, the employers and the faculty. The placement coordinators' role varies significantly according to the model.

2.16.3 Work placements, expectations and degree performance

While many papers published suggest that work placements can be of benefit to the students and employers, it is not always clear to what exactly students are expected to learn from the work placements, and how long should these placements be, i.e. is six months or a year enough? The results chapters of this thesis report that 12 months was the preferred mode for line managers, tutors and students.

Duignan (2002) has pointed out that, insufficient attention has been paid to the effects of placement on academic performance. He argues that, "it is sometimes asserted that placement enhances academic achievement: as well as enhanced professional and employability skills". Undergraduates who have taken, say, one year in industry, will be higher academic achievers than had they not done so and the students who have not done placements will underperform academically. There was no significant difference in academic performance, found from his research on the students who have done work placement and who have not. Another research conducted by Au Yeung and his colleagues at Hong Kong Polytechnic found that more than 45% of the students and graduates considered that sandwich placement did not help them much academically in the subsequent year of study. Lecturers and employers shared similar views. They considered that most of the objectives of industrial training could be realised by students, except for the application of knowledge learnt and regarding the duration of the placement, all parties preferred

nine to twelve months (Au Yeung *et al*., 1993). All these findings do not mean that the placement students failed to learn from their experience. They suggest, rather the full potential of work placements has not been realised.

Degree Performance

A study of Civil Engineering graduates at Loughborough University from 1977 – 1984 conducted by Mayo and Jones (1985), examined the degree classifications of 446 students. 282 students are the ones who did work placements and 164 students did not go on placements. They found that the percentage of sandwich students gaining first or upper-second class degree awards were over twice that of the students who did not go on placements, in fact the ratio of first–class degree awards were nearly 3:1, they also found that those students choosing / planning at the start of their second year to do work placements were also better in the examinations at the end of that year (i.e. before supervised work experience). Gomez *et al*. (2004) on their research on the performance of Bioscience undergraduates at the University of West of England in Bristol, also found that students taking a sandwich placement exhibit improved academic performance in their final year results by gaining nearly 4% advantage compared to those students who did not do work placements. These results prompt some more questions which need to be investigated: Do better students (more motivated students) choose to do work placements? Or are those better students are the ones who succeed in the interviews for the place to do placements in industries?

Also Davies (1990), mentioned other research conducted by Davie and his colleagues in Australia over several years, which found similar effect of the work placements on academic performance, i.e. the examinations pass rates of sandwich students were statistically significantly better after industrial training compared to the pass rates of the students who did not go on placements which became significantly worse with time.

The research conducted by Bourner and Hamed (Davies, 1990), which analysed the 1983 graduation list from CNAA full time and sandwich degree courses (16,667 graduates) examined the relationship between entry qualifications and degree performance as well as the impact of other factors including the mode of attendance,

found that in general students who had completed sandwich placements obtained better degree results than those who did not. All students had similar GCE 'A' level results. The interpretation of this results given by the authors were that, the placements increases the motivation of the students, as a results it helps them to get more out of the later parts of their courses.

Using the data from the University of Surrey's Economics department, Mandilaras (2004) found that the professional placement program is beneficial to the students in different ways. Apart from the benefits of work placements on the employability of the graduates, it also seems to improve significantly the academic performances of the students to achieve good grades. Therefore, if this is the case, clearly there is a need of research to be done in order to identify what is deterring the students from applying for the placements.

Obstacles to obtaining placements

An issue in work placements is the obstacles which hinder some students obtaining placements even though they regard placements as desirable. This theme was discussed at the ASET annual conference (ASET, 2007). The main points raised by the delegates of the conference were:

- Competition between all Universities for employers willing to take their students.
- Some employers do not take International students or disabled students. This might be due to different reasons.
- There is a high expectation from the employers on the students on placements; this is putting off some of the students. Students are not finished products (practitioners), they are still learning.
- Complicated online applications procedures.
- Employers want best students, sometimes there is not enough best students. There is no bad student/good student or bad company/good company; there is only a good matching.

However, there are lots of ways for the Universities to help the students find work placements, for example, by using Chambers of Commerce to search for companies which might be willing to take the students on placements, careers fairs, involving the

employers in designing/preparing relevant projects for the student and the assessment, trying to contact the employers who are willing to sponsor the courses or the students, employers presentations, lectures etc.

2.17 Summary

This chapter has reviewed the major perspectives on learning and explored the relevant literature in the field of work placements and transferable skills. It has examined the strengths and weaknesses of transferable skills and work placements as well as providing the review on learning. The conclusions to be drawn from the review is that despite many researchers mentioning the benefits of work placements to the students, Universities and employers it is not clear how long these placements should be in order to be beneficial to the students, and what skills are developed on placements. Also from the review there are mixed findings regarding the impact of work placements on the students' academic performance.

This chapter also showed that cognitive theory provides a stronger base on students learning, since it has greater explanatory power and many of the theories such as experiential learning and reflective learning could be incorporated into it. Many of the theories are principles and guidelines for learning and teaching. They are theories which offer predictions but which do not explain why these principles work. The broader social theories are more concerned with organisations and communities of practice and with exploring group processes than explaining how learning in groups or communities are encoded, stored and transferred to new situations by individuals.

However, each perspective or theory can contribute to our understanding of skills and learning in the workplace. But as Boud and Garrick (1999) point out 'there is no universal method', nor is there any universal theory. Each theory is an attempt to explain and perhaps advocate a different facet of learning.

The notion of transferable skills can be explained clearly in terms of cognitive theory. It has some weaknesses such as there is no broad agreement about what precisely are the transferable skills and do they transfer? But the theoretical foundation of transferable skills is sufficiently strong to justify a study of the impact of work

placements on the development of transferable skills. The next chapter will discuss the methodologies for measuring and judging impact.

Chapter Three: The Methodology of Measuring and Judging Impact

3.0 Introduction

This chapter describes the underlying reasons for choosing the methods used in this thesis for measuring and judging impact. As indicated in chapter one, in social science, projects concerning impact cannot be done precisely, as in engineering. Indeed, social scientists use a variety of methods and compare their results to see if they are in agreement. This process is called *consensual validation* and it is usually based upon the triangulation of views.

Perhaps, because there are a wide variety of methods in social sciences, methodological issues are more widely debated than in engineering. In engineering the methods in most cases are taken for granted. In social science the methods are questioned (Cohen, Manion and Morrison, 2000). This has led to the importance of methodology which can be described as the study of different methods of collecting, organising, analysing and presenting information (Brown, personal communication, 2008).

Impact is currently a fashionable term but its meaning is far from clear. As Wainwright (2006) observes "Impact is a widely used but rarely defined term in evaluation literature. Everyone wants to know how to measure their organisation's impact but without knowing quite what they mean by the term".
She defines impact as:
"*Impact is any change resulting from an activity, project, or organisation. It includes intended as well as unintended effects, negative as well as positive, and long-term as well as short-term*".

In the context of engineering education, impact is also concerned with changes. One can distinguish:
'Outputs' which may be intended or unintended consequences of actions taken. For example, an attempt to improve a module, might lead to more failures in that module.
'Intended Learning Outcomes' which may or may not be fulfilled, for example, these may be stated in the module documents but not all students might fulfil them.

- The extent to which the objectives and targets of a company or organisation are met.
- The extent to which experiences improve skills and learning.
- The extent to which experiences are valued.
- All of the above.

In short, impact is a generic term for changes brought about by actions.

In this research, impact is used in three ways. First, it considers impact in terms of the values which students, line managers and industrial tutors have because of their experience or knowledge of work placements. Secondly, their views on whether work placements impact upon transferable skills of students and its other benefits to students, tutors and companies. Thirdly, impact is considered in terms of the extent to which intended learning outcomes are met. Clearly the latter implies that learning outcomes are specified and assessed.

Impact in these senses is the theme of this chapter and of the research in this study. This chapter considers the strength and weaknesses of various methods for measuring impact will be considered. These methods include: surveys (questionnaire and interviews), focus groups, and documentary analysis. Beneath these methods are two perspectives: the quantitative and qualitative approaches to research. These, together with their underlying ontological and epistemological assumptions and my own views are discussed in the next section.

3.1 Qualitative and Quantitative Modes of Research

Brown (2005) lists the main differences between qualitative and quantitative modes of research. These are shown in table 3.1.

In essence, quantitative measures studies focus upon hypothesis testing, careful control and statistical analysis of data. Quantitative methods are primarily concerned with measurement. Usually in social research, this is in the form of rating scales. These scales are based on assigning a number to a particular judgement or value. e.g. 1 = my work experience was a waste of time, 6 = my work experience was extremely valuable. These numbers are not ‘real’ numbers which have an absolute

zero and equal intervals between numbers. The gap between one and two may or may not be the same as the gap between a four and a five. Further, my four may be your five. These weaknesses indicate that at best, rating scales are a form of rank order, or in more technical terms, at the ordinal level of measurement.

In contrast, qualitative methods are more concerned with judgements usually expressed in words. These judgements operate at two levels: the judgements of the participants in the research and the summary judgements or conclusions of the researcher. Qualitative methods explore thoughts, feeling and people's different ways of seeing the world. The focus is upon exploration of what people say or do and perhaps the gap between what they say and do.

These differences between the modes of qualitative and quantitative research are not only differences in methods and methodologies but also differences in their ontologies and epistemologies. Put simply, ontology considers whether there is a 'real' world independent of our perceptions and knowledge of it; epistemology is concerned with the questions of 'How do we know?' and 'What is knowledge?' The quantitative scientific mode has its roots in positivism and post-positivism. The interpretive or qualitative humanistic mode has its roots in constructivism (Stainton Rogers, 2006).

Often in social and educational research, it is important to use both quantitative methods and qualitative approaches. This is known as the little 'q' approach (Willig, 2001). The quantitative approaches provide a way of measuring impact and the qualitative approaches provide a way of judging impact. They also provide additional information of the participant's own thoughts and not just their responses to set questions. If the results from different forms of quantitative and qualitative approaches agree, then there is consensual validation about the impact of work placements on transferable skills.

Table 3.1: The major differences between Quantitative and Qualitative methods (Source: Doing Pedagogical Research in Engineering. Brown, 2005)

Quantitative – 'Scientific'	Qualitative – 'Humanistic'
Set in the context of scientific theories	Set in the context of understanding the subjective world of human experience
Quantitative methods are the *only* approaches to truth	Qualitative methods provide the approaches to different truths
Objective	Emphasises inter-subjective meaning
Emphasises on measurements	Emphasises on judgement
Prediction based on statistics	Cautious about prediction. Emphasis is on how it seems to the participants in their situation. Generalisations are based on accumulation of data from different contexts.
Statistical reliability	Linguistic consistency, triangulation
Statistical validity	Validity determined by agreement with participants (consensual validation/triangulation) and success in transfer to other contexts (ecological validity)
Aims to validate and advance scientific theories	Aims to deepen personal understanding theories, insights and perspectives
Hypothesis driven	Hypothesis emergent or illuminating
Preferably laboratory based	Preferably in naturalistic setting
Responses controlled by researchers	Responses controlled by participants
Observer detached	Observer *may* participate
Research pathway is structured by specific objectives and accepted theory	Research pathway is determined by what emerges from the data. Theories may emerge from the data
Reports written in third person passive voice	Reports often written in active voices
Well accepted in the scientific community	Seen as *avant-garde* in the scientific community
More likely to receive funding	Less likely to receive funding
More likely to be published	Less likely to be published

3.1.1 Classical Positivism

Positivism is the basis of science and engineering and it is dominant in the social sciences, including pedagogy. Positivism assumes ontologically there is a 'real' world which is independent of observers. Kvale (1996) uses the metaphor of 'mining' the knowledge of this real word. Observation and experiment enable us to obtain facts about this real world and through the processes of deduction and induction we can identify regularities and laws which can be used to explain, predict and control the behaviour of particles or people. The primary purpose of positivism seems to be to search for causes which can explain how the world works. In classical positivism, one observed and experimented and searched for verification of one's theories.

3.1.2 Post–positivism

It became increasingly recognised in the 20th Century that the original formulation of positivism was not adequate. Although it was accepted there is a 'real' world which can be objectively known, many of the so-called 'facts' were not observed but inferred such as sub-atomic particles or electricity. Neither are 'real' in the sense that a table is real and can be seen. Explaining the real world in terms of simple cause-effect was replaced by probabilities. 'Nothing is certain' as Heisenberg is reputed to have said. Heisenberg also pointed out that the presence of the observer changed the behaviour of sub-atomic particles. In other words one might never be able to obtain truly objective measurements. Further the verification principle was replaced by the falsification principle. Instead of seeking confirmation (verification) of one's hypotheses or theories, Popper (1963) cited in Stainton Rogers, 2006) argued that we should set up experimental situations which would allow the hypothesis to be disproved. A common example of this is the hypothesis 'All swans are white'. No amount of observation of white swans could confirm fully this hypothesis but the discovery of one black swan would destroy the hypothesis. If the hypothesis can not be destroyed by observation or experiment, according to Popper, then the hypothesis is not 'scientific'.

The underlying ontology of post-positivism perspective is there a real world relatively independent of observers but it is complex and multi-causal and there are limits on

what we can know about it. Brown (2005) suggests that scientific truth is like an asymptote, which one should search for but recognise that one can never completely reach it.

3.1.3 Constructivism

Constructivism seems to be a much more complex, diffuse perspective than positivism and post-positivism. Its epistemology seems to be that knowledge is constructed by our observations of the world. We, the observers, create our own meanings of the world and its objects, and those meanings are shaped by our experience, culture and religious backgrounds. How I see and make meaning of the world may be different from how someone else interprets the world.

3.1.4 My position

For me, constructivism presents difficulties. On one hand I recognise that we might have different views and perspectives and that instead of explaining and generalising, we need also to explicate; to look for and recognise differences in perspectives and personal understanding (Stainton Rogers, 2006). On the other hand, there does seem to be some features of behaviour and some procedures which are universally agreed as right or wrong, such as the method of solving algebraic equations. My way out of this difficulty is to distinguish between the extrinsic, cultural meanings which are constructed by an individual and the intrinsic meanings which remain personal. Algebra has extrinsic meaning and its own universally agreed laws and procedures but for some people, algebra has also the intrinsic meaning of a hateful chore. Transferable skills are on the extrinsic/intrinsic border. They are constructs. One can not see ‘transferable skills’ and they are not the only ways of looking at learning or performance (see Chapter three).

So what is my position on these perspectives? As indicated in my ‘Afterword discussion’, I have oscillated between the extremes of positivism and constructivism. My ontological view is that the physical world is real, in the sense we can observe, experiment and construct meaning of it. Post positivistic methods can be used on the social world but the methods have limitations. There seems to be more diffuse

constructs in the social world which are not universally agreed. Further, one should consider individual; different perspectives and understandings as well as general laws, so one has a well-rounded understanding of the world and how it is perceived by different people. When different groups of people agree then one has consensual validation, which provides an approximation of the truth. Such is the case when line managers, tutors and students agree on the value of work placements for developing transferable skills.

So, with regard to whether one should use only qualitative or quantitative methods, in my view both are necessary. This position is different from Guba and Lincoln's (1994) views. Guba and Lincoln (1994) argue that different ontologies and epistemologies require different methods. My view is closer to that of Cresswell (2003) and Willig (2001) who argue that the links between ontologies, epistemologies methods are not as strong as often proposed and that the methods are complementary. In summary, I am currently a post-positivist with constructivist leanings.

3.2 Questionnaires

There are three types of questions used in surveys. These are structured questions, semi structured questions and open questions (Brown 2005).

Structured questions provide alternative choices (like multiple choice questions) for the respondent to choose from. More often these are based upon the likert scale (Bell, 2005) such as strongly agree, agree etc. if there are an odd number of points on a scale, then respondent can give neutral answers. If there are an even number of points on a scale, then a respondent are forced to choose positively or negatively. This approach probably gives a more accurate picture and it enables the researcher to collect the data for simpler analysis by splitting it into 'positives' and 'negatives'.

Semi-structured questions and questionnaires are half way between structured questions and open questions. The questions asked are specific and the respondent writes a short answer in response to the questions. One example of the semi-structured question from the pre-placement and post-placement questionnaires used in this study is: "In your view, is a degree course which includes a work placement

more effective for the development of transferable skills than a degree course without?"

(*Please tick one box only*) Yes ☐ No ☐

(structured)

If Yes, why? If No, why not? Give some reasons.

(semi-structured)

The advantages of semi-structured questions are they can capture ideas, thoughts or views which the researcher may not have thought of and the respondent can express more freely their considered views. The disadvantages are the answers to the questions take longer to complete, participant often ignore them and they are difficult to analyse because of their qualitative nature.

Open questions give even greater freedom to the respondent. The respondents have a free choice of what they say. An example of an open question is: "Please give your honest opinion of the value (or otherwise) of work placements for developing transferable skills".

The advantages of open questions and questionnaires are similar to those of semi-structured questions with the added opportunity to write in detail or depth. The disadvantages are also similar to those of semi-structured questions. They are very time consuming to complete and to analyse and responses rates to these questions can be low.

Some of the advantages of questionnaires in generally are as follows; the data is collected in organised way, it is quick and cheap way of collecting information and the information can be collected from a large portion of group. Some of the disadvantages are; students may not be willing to answer some of the questions, open-ended questions can generate large amounts of data that can take a long time to code (Geer, 1991).

3.2.1 Questionnaires design: piloting and refinement

It was decided to use mostly structured questions in the pre/post-placement student questionnaires and other questionnaires which were used in this research since these are more efficient and could be related closely to the research questions. These are also easier to analyse than semi-structured or open questions and permit statistical analysis and tentative generalisations. They also enabled a benchmark of self assessment by the students to be obtained so any changes could be measured. Some semi-structured questions and open questions were also used to obtain additional information from line managers and tutors. This information was compared with the quantitative information obtained from their questionnaires and those of the students.

Before the questionnaires were administered to the students, line managers and tutors, pilot studies were conducted. The pilot studies were principally to eliminate any errors or confusions in the questions, instructions and layout of the questionnaire (Burns, 2000) and to increase the validity and practicability of the questionnaires (Oppenheim, 1992; Morrison, 1993; Wilson and McLean, 1994 – cited by Cohen, Manion and Morrison, 2006). Reliability measures in the form used for tests and scales (such as test-retest, alternate forms or split half) were not carried out. As Bell (2006) states, "…these methods are not always feasible or necessary … unless your supervisor advises otherwise such mechanisms are not necessary unless you are attempting to produce a test or scale". This view was checked with the supervisor who advised that the important points were that the questionnaires and schedules were understood by the participants and the questions were related closely to the research questions (validity of the questionnaire).

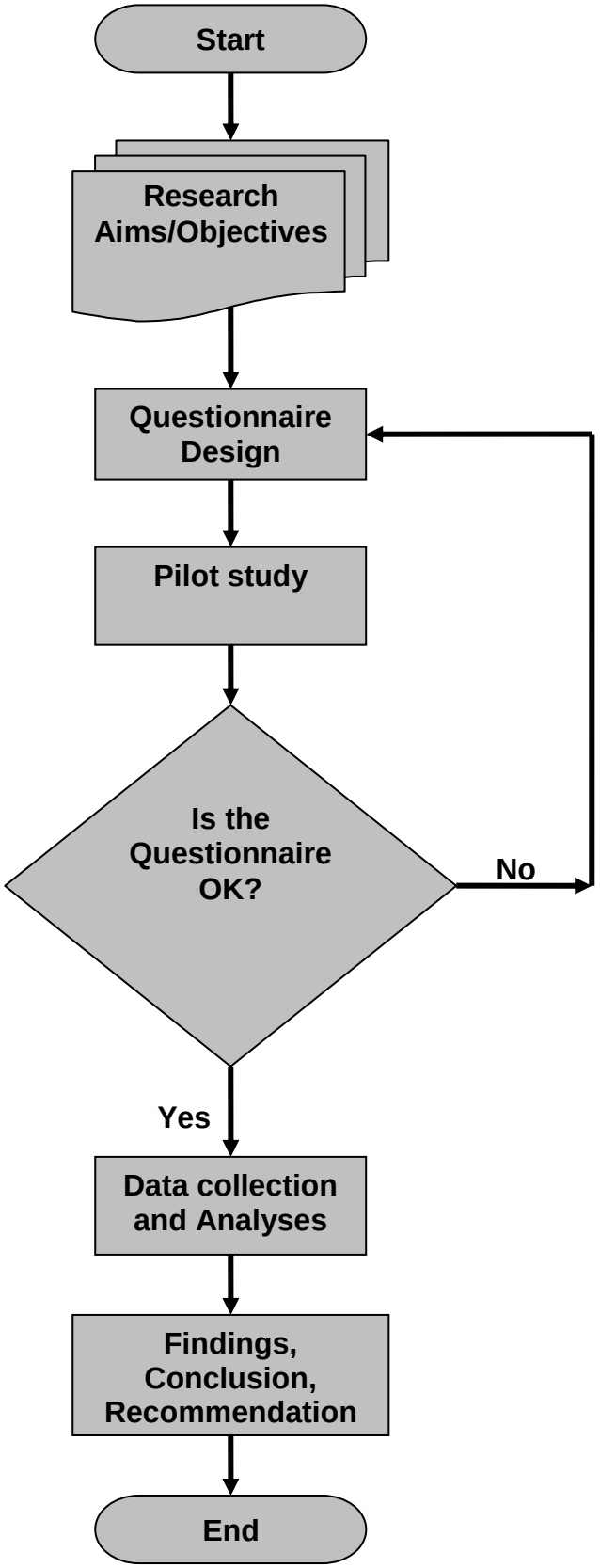
The student questionnaires were read and completed by five postgraduate Engineers who had been on work placements, five members of engCETL staff at Loughborough University and by the three supervisors. They were informed of the purpose of the questionnaires and asked to indicate the time taken, whether the questionnaire was easy to complete and whether any important items were missing. A similar procedure was used for the questionnaires/schedules for the line managers and tutors but in these cases only the views of one supervisor, one tutor and one line manager were

obtained. All the pilot student representatives agreed that the questionnaire was easy to complete, they thought it would take no more than twenty minutes to complete and there were no significant omissions. Two of the pilot thought that the semi-structured questions were repetitious but these were retained to provide a cross-check (internal consistency) of the responses of the students. Three participants suggested that I should increase the spaces especially for the open ended questions and one suggested I should split the questionnaire into clearer sections. The pilot of the line manager/tutors all agreed that the questionnaire/schedule was clear and relevant. A practice run of the interview schedule was undertaken with one of the supervisors. It was audio-recorded and studied by the researcher who eliminated the repetitions and interruptions in his interviews in the main study.

After analysing the feedback received from the pilot studies, the questionnaires were updated and then approved by all the research supervisors. The updated questionnaires and schedules were then administered to the students, line managers and the DIS tutors. All participants were told the purpose of the research, why I was conducting it and how their contributions would be used. Consent was obtained from them prior to commencement of the administration of the questionnaire or schedule, they were informed that the information would be anonymised and that they could withdraw from the research at any time and their data would be destroyed (see Section 4.4).

The Flowchart (Figure 3.2.1) below summarises the procedures from designing the questionnaires, data collection, data analyses to the conclusion and recommendation.

Figure 3.2.1: Flowchart of the questionnaires design, data collection/analyses to the conclusion and recommendation



3.2.2 Response rates and anonymity

A particular problem of questionnaires is response rates. If they are high, one can generalise to similar samples or population. Three approaches are possible: direct mail, email (online survey) and class participation. The first two of these are likely to have low response rates unless the topic is of strong concern to the respondents or rewards are offered (Cohen, Manion and Morrison, 2000). In this study it was decided to use class participation. The questionnaires were completed in lectures. This guaranteed a large sample but not a complete sample, since not all students attended the lectures. For the students who went on placements, the post-placement questionnaire was sent to them by emails. Anonymity is thought to provide more honest answers and remove any threats to an individual who express unfavourable views. Its great disadvantage is that, it does not permit follow up studies which measure accurately pre-test, post-test changes of individuals.

There was some disagreement amongst my supervisors on this issue. One wanted the students to give their names on the questionnaire so their performances and changes in attitude could be tracked. The other supervisors were concerned that this approach raised ethical and legal issues. A compromise was reached; students were invited to volunteer their University ID numbers. If they did, they were entered into a prize draw for a MP3 player. Similar approaches based on payment or prizes have been advocated for increasing response rates (Cohen, Manion and Morrison, 2000). The response rate was poor so subsequently class participation was used at the beginning of samples' final year.

3.3 Interviews

Interviews were one of the methods used to collect data for this research. Interview may be defined simply as a conversation with purpose. Specifically to gather information, Berg (2007) cites numerous studies which advocate having a clear purpose for the interview, conducting the interview in a non-threatening environment, paying particular attention to opening and closing moves. These include Denzin (1978); Spradley (1979); Patton (2001); Salkind (2003); Frankfort-Nachmias and

Nachmias (2000); Babbie (2001, 2003); Leedy and Ormrod (2004); and Bogdan and Knopp Biklen (2002).

Four types of interviews are possible: face to face interviews, video conferencing interviews, telephone interviews and interactive email interviews. As one moves from face to face interviews through to interactive email conversations, cost is reduced but information is decreased. The most expensive type of interview, face to face interviews provide a rich source of body language data and speech. Email conversations lose all of this.

As well as types of interviews, there are also methods of interviews. These follow the same structure of questionnaires of closed questions or interview schedule, semi-structured which are narrow questions or consist of an interview schedule which contains routine of closed and open questions and open or in-depth interviews. As one moves through these methods, the degree of control passes from the interviewer to the interviewee. The advantages of each type of interviews are similar to those of questionnaires.

Each of these types of interviews requires a different method of analysis. Structured interviews require statistical analysis and are part of the quantitative perspective. Semi structured questions and in-depth interviews require qualitative analysis. These forms of analysis include thematic analysis, conversational analysis, discourse analysis and interpretive phenomenological analysis (IPA). Some of these forms of analysis are extremely time-consuming. For example conversational analysis has a 20xfactor (Brown, 2005). A one hour interview may take 20 hours to transcribe and analyse. In contrast thematic analysis requires about a 4xfactor including transcription.

In this thesis, a mixture of closed and semi-structured and few in-depth questions were used. Statistical and thematic analyses were used to analyse the data. Interviews with line managers were conducted face to face and by telephone for some line managers. In both cases the interviewee were sent the questions prior to the interview. These approaches appeared to be the most feasible and fitted closely to the research questions being addressed.

3.4 Focus Groups

Focus groups are as their name suggests, group discussions which focus upon particular themes. The interaction between the participants, it is hoped will generate ideas and insights which cannot be captured by questionnaires, structured interviews or group interviews in which each member of the group tend to interact directly to the group leader. Figure 3.4 below shows the difference between a group interview and a focus group.

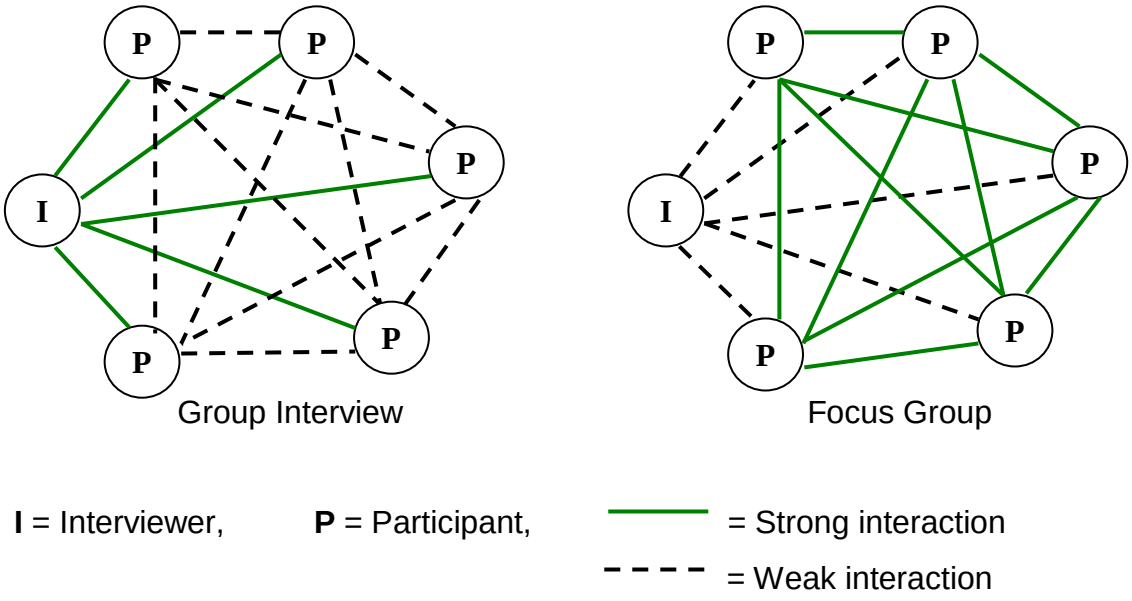


Figure 3.4: Differences between Group Interview and Focus Group

The role of the leader of a focus group is to act as a 'moderator'. That is the leader should facilitate and stimulate discussion, eavesdrop, reflect and summarise and probe, yet remain detached (Willig, 2001).

Brown (2005) recommends that methods in focus groups include the use of open questions, and the use of questions to explore what group participants think that other people outside the group might think. Usually a focus group consists of 6 ± 2 members. With more that 8 it is difficult to ensure active interactions or take roles or transcribe discussion. The focus group may be homogeneous, or heterogeneous, expert or naïve well established or new (Brown, 2005).

Data collected from a focus group can be analysed using the standard methods of qualitative data analyses but the primary purpose of the analysis is to attain the focal themes which emerge from the discussions. Both Brown (2005) and Willig (2001) point out that the data obtained from focus groups are open to manipulation by a moderator and they may not be appropriate for dealing with very sensitive issues.

In this study, it was intended to use focus groups with students to explore their experiences of work placements. The structure of the focus group was prepared. The initial foci (focal questions) were derived from the results of the questionnaire analysis and the research questions. The focus groups were to be homogeneous drawn from each of the three departments (Civil Engineering, Chemical Engineering and IPTME). The guidelines for organising a focus groups provided by Brown (2005) were used to structure the focus group. Unfortunately, after three invitations, only two students agreed to attend a focus group and lunch so the idea was discarded. One focus group was conducted with line managers but the tutors preferred to be interviewed privately.

3.5 Thematic and Framework Analysis

Thematic analysis is a generic term for the methods of identifying, analysing and reporting patterns (themes) within data (Braun and Clarke, 2006). The basis of all the methods of thematic analysis is data reduction: the mass of qualitative data is reduced to themes. Where the differences in thematic methods arise is how those themes are arrived at (Willig, 2001; Braun and Clarke, 2006).

There seems to be two broad approaches for identifying and analysing themes. The first approach is open-ended. The information in the transcripts is coded in segments and then collapsed into themes. This approach is used in studies based on grounded theory (Glaser and Strauss, 1967 cited by Illing, 2007) in which theories emerge from the data. There are no pre-determined categories. This approach is time consuming and labour intensive. ‘Pure’ qualitative research of this kind (including doctoral theses) is often based solely on very few participants. The purpose of the research is not to make tentative generalisations. The second approach is sometimes described as ‘framework’ analysis (Ritchie and Spencer, 1994). In this approach themes are

identified in the research literature and through observation and experience. The data is examined to determine if these themes are present and whether other unexpected themes are also present. The purpose of this approach to thematic analysis is to illuminate, support and verify data obtained by other means (Braun and Clarke, 2006; Ritchie and Spence, 1994). This approach does not require detailed coding of every utterance (Willig, 2001).

The reports of thematic analysis can take different form. The qualitative data can be transformed into quantitative data by counting the number of times the themes are found in the data. The summary of the data can be shown as a diagram of themes, the themes can be shown in a table with comments and discussion or the themes can be discussed at length, linked and used to form a theory.

In this study, the specific method of framework analysis was used. The themes are:

- The perceived value of work placements
- Benefits of placements to students and employers
- Preparation for placements
- Students awareness of the value of work placements
- The importance of developing transferable skills in work placements
- The impact of work placements on academic performance
- Alternatives to work placements

These themes were identified in the literature and through discussion and observation. The data from the interviews with line managers and the DIS tutors on the open-ended questions in the questionnaires for students were transcribed, read (and re-read) to ascertain the views within and between these groups of participants. Unfortunately very few students responded to the open-ended questions so the main comparison is between the views of the line managers and the DIS tutors.

This method of thematic analysis was chosen because it was economical and efficient, it could provide illumination, support and verification, and it could provide consensual validation (it did). However, it is recognised that this method (framework analysis) does not have the same degree of rigorous analysis or theory building

potential as approaches based on grounded theory. Nonetheless it proved to be an informative approach (see Chapter 6).

3.6 Statistical analyses of questionnaires

In this study, SPSS (Statistical Package for the Social Sciences) versions 14 and 16 were used to analyse the quantitative data obtained from the questionnaires designed for this research project. 't-tests', Spearman's rho, Chi-squared, the Wilcoxon test and the Kolmogorov-Smirnov test were used to analyse the data. These methods are regarded as suitable for small sample work such as in this thesis (see Appendix 5). The Coefficients of Variation (CV), which are the ratios of standard deviations to means, were used to rank the scores on the rating schedules.

3.7 Documentary analysis

Documents may be divided into primary and secondary sources. An example of a primary source is a module handbook and of a secondary source is a report based on a module handbook. Both these sources may contain explicit evidence and implicit evidence which needs to be drawn out. The task of the documentary analyst is to identify consistencies and inconsistencies in a document (internal critique) and examine the extent to which the document portrays what occurred or is occurring (external critique) (Duffey in Bell, 2005).

In this study, documentary analysis was applied to course and module documents, examinations results and to documents concerned with work placements within the departments of Civil Engineering, Chemical Engineering and IPTME. The purpose of the analysis was to find out if there is any differences between the students who did work placements and those who did not in terms of their academic performance, to determine the extent to which the documents consider transferable skills, whether the learning outcomes are assessed and include explicitly or implicitly these skills, and whether they contribute to the preparation for work placements or build on work placement experiences.

3.8 Triangulation

Various qualitative and quantitative data-gathering methods were used in this research for collection of data from the students, line managers and the DIS tutors. This technique of using more than one approach to the investigation of a research in order to enhance confidence in the ensuing findings (Bryman and Bell, 2003) is known as triangulation. Borman, LeCompte, and Goetz (1986) and LeCompte and Preissle (1993) also stressed that triangulation allows researchers to offer varied perspectives other than their own.

Denzin (1970) (In Bryman and Bell, 2003), explained the idea of triangulation beyond its conventional association with research methods and designs, he distinguished four forms of triangulation:

1. *Data triangulation*, which entails gathering data through several sampling strategies, so that slices of data at different times and social situations, as well as on a variety of people, are gathered.
2. *Investigator triangulation*, which refers to the use of more than one researcher in the field to gather and interpret data.
3. *Theoretical triangulation*, which refers to the use of more than one theoretical position in interpreting data.
4. *Methodological triangulation*, which refers to the use of more than one method for gathering data.

Data, theoretical and methodological triangulations were used in this research as a confirmation of measures and validation of findings. This procedure is recommended by several authors (Jick, 1983; Knafl and Breitmayer, 1989; Leedy, 2001; Mitchel, 1986; Sohier, 1988; Webb *et al*., 1981) as well as a means of refining, broadening, and strengthening conceptual linkages Goetz and LeCompte (1985). Also, Frankfort-Nachmias and Nachmias (1996) suggested that researchers can minimize the degree of specificity of certain methods to particular bodies of knowledge by using two or more methods of data collection to test hypotheses and measure variables.

By combining different methods of collecting and analysis of the data were more appropriate in this research, since each method were appropriate in different

situations/sample during the data collection/analysis phase of this research. Not only data-gathering methods were triangulated, but also the source of data (samples) surveyed were also combined and related to the relevant literature reviewed, so as to get a clear picture of the results obtained.

3.9 Assessing learning on work placements and transferable skills

There are vast number of texts, chapters and articles on the assessment of students learning (e.g. Brown, Bull & Pendlebury 1997; Moore, Heywood, 2000; Edward *et. al*., 2007; Moore and Williamson, 2008). This section only considers the issues surrounding the assessment of learning on work placements and of transferable skills. These issues are partly conceptual and partly practical and there is an overlap between the problems of assessing work placements and of transferable skills.

3.9.1 Assessment of workplace learning

Intended learning outcomes must be deducible from the aim(s) but different sets of learning outcomes may fit some aims. The learning outcome chosen may be dependent on the measures available (time, space, equipment and the expertise of the teachers and assessors). Similarly the content and skills to be learnt are dependent on the resources available but also on the context. For example, a module for preparing student for a work placement on a Newspaper may require different context and skills than one preparing for a placement in an Electrical Engineering company although similar general principles may apply.

The methods of assessment chosen should match the content, skills and intended learning outcomes so that one can demonstrate that learning has taken place. According to Davies (2003) and Gray (2001), the most common methods used on work placements are reports by industrial supervisors, line managers, students log books/diaries, projects, assignments, self and peer assessment, memorandum (Two page report) presentations. Amongst the least used were rating scales, profiles, viva based projects, case studies and written examinations.

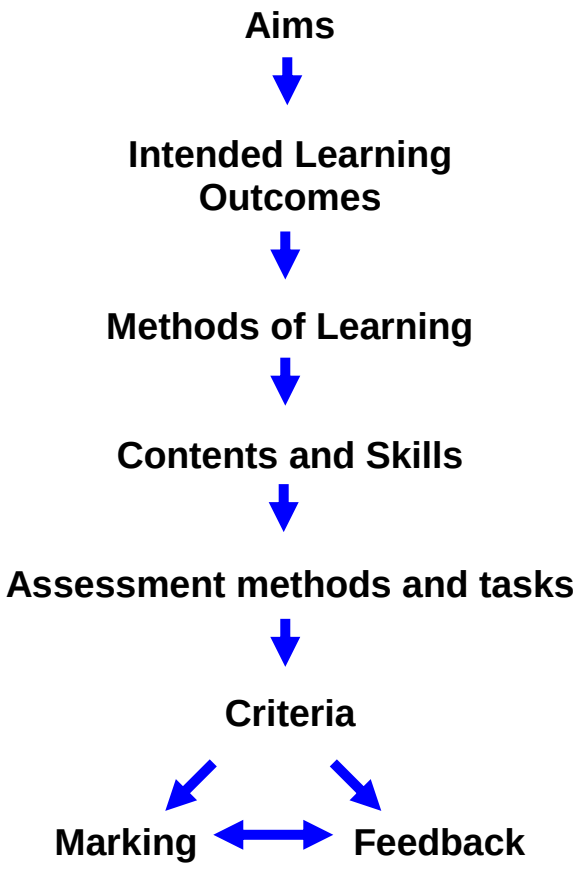


Figure 3.9.1: Aligning Assessment

These lists confuse sources of assessments, method of assessments and criteria for assessment (Brown, Bull and Pendlebury, 1997). The sources may be line managers, tutors, peers or self. The methods might include reports or projects and the instruments may be rating scales, checklists or marking. The broad criteria may be pass/fail or perhaps degree classifications or profiles. Yorke and Knight (2001), Winters (1996), points out that the assessment of work placements is complex because of the diversity of work placements and that precise measurement of work placement learning would be resource-expensive, perhaps impossible. For these reasons, they prefer pass/fail and the use of judgement.

Yorke and Knight (2001), make the distinction between:

- Those that can be readily assessed for high-stakes purposes – recall of the information, routine application of formulae and procedures.

- Those that, for a variety of practical, theoretical and ethical reasons, virtually defy high-stakes assessment, legitimate self-confidence, taking responsibility, willingness to learn (conation).
- Those which can be judged in a tolerably-reliable way *if* sufficient time and money is invested in them, assessments of workplace competence, portfolios, performance in groups.

As well as broad criteria, there is the issue of the specific instruments to use. These include checklists, rating-schedules, guidelines or open-ended verbal reports used by students, line managers or tutors, who are the official University examiners. Of these guidelines for assessments which include reflections on work experience may be the most useful for a student's development. The Appendices of Davies (2003) contain some examples of rating scales and guidelines. The marking based on these criteria may be done by any of the sources of assessment (self, peer, tutors, etc.), but few would recommend that the grades awarded should be decided only by the students. The usual approach is for the industrial tutors (either singly or as a team) to agree on the grades achieved by the students (Ashworth and Saxton, 1992).

The feedback may also be provided by different sources such as the line managers or industrial tutors. It may be informal, formative feedback or summative feedback based on verbal reports, rating scales etc. However the most useful for improving learning is likely to be formative, verbal feedback (Black and Williams, 1998).

The curriculum model may be applied to modules and to work placements, but there are practical difficulties in applying the model to work placements. These are mostly resource constraints such as the limitations on opportunities for 'teaching' and for students to learn and the expense and expertise required for an assessment system based on measurement and precise criteria which have high reliability and validity. In addition, there is potentially a conflict between the objectives of a company concerned with efficiency and profit-making and the education of students on work placements. This conflict is revealed in the comments by line managers given in chapter six.

3.9.2 The special problems of assessing transferable skills

Perhaps the easiest way of assessing transferable skills is to translate these into intended learning outcomes and then follow the alignment model in figure 3.9.1. But again there are resource constraints but also conceptual difficulties in this approach. Some of these were discussed in chapter 2. Here only the implications of these difficulties for assessment are discussed.

No Universal agreement on the lists of transferable skills

As indicated in chapter two, Dearing (1997) recommends 4 key skills areas: (communication, numeracy, use of information technology, and learning how to learn), Allen (1993) recommends 104 key skills. Each University and sometimes each University department has its own lists of skills (Jenkins, 1996). Consequently there can be no way of comparing skills.

The meaning of the term skills

What one person means by a skill such 'personal effectiveness' may not agree with what another person means. The content in which a person works can influence his or her construct of meaning. As Hirsh and Bevan (1988) discovered on their study of employers there was a high level of agreement on the use of the different skills required, but there was not agreement on what the terms meant (cited by Holmes, 2000). Holmes also points out that the implementation of key skills "shows little indication of being based on a rigorous application of cognitive psychology principles". Consequently, much discussion and negotiation is required for assessing transferable skills in work placements or modules. The alternative is to accept that rigorous reliable measurement is only not possible except perhaps at great expense. So instead assessors should opt for judgement.

The inter-connectedness of skills

Skills can not be easily separated into distinct non over-lapping entities. Take for example, the eleven transferable skills used in this study, team working is a skill but in the learning of how to communicate effectively, planning and organisation is necessary. Planning and organising is a skill but it also involves time management. Problem solving is a skill, but it may involve team working. Personal effectiveness

may be primarily concerned with reflecting and learning to learn, but it also involves time management, planning and organising. Consequently rather than attempt to measure precisely a specific skills, it may be better (and more feasible) to obtain a holistic impressions of a set of skills. The items on rating scales then become broad guidelines rather than the assessment specific of unique skills. Again, one is relying upon judgement of the assessors rather than precise measurements.

The same skills may be assessed by different methods

Take for example, the skills of communication. This may be assessed orally through presentations or a viva or it may be assessed in written tasks, such as writing an essay, project or progress report. It would be foolish to assume that a 'good' oral presenter was also a 'good' communicator in writing. Even within writing, one can not guarantee that a good essay writer would be a 'good' at writing research reports although there may be a higher level of probability than between oral and written communication skills.

These examples show that the different tasks have their own clusters of skills. Consequently one needs to use a variety of assessment tasks to determine the quality of the skills performance and whether the skills have 'transferred' from one context to another. Again, there are practical, resource-constraints difficulties in modules and work placements, and it may be necessary to accept the limitations of systems of assessing work placements or transferable skills.

The 'transferability' of transferable skills needs assessing

Strictly speaking, to demonstrate that transfer has occurred then the skills have to be assessed at least twice in different tasks and contexts. Furthermore, the more reliable one wants the measure to be, the more frequent the assessment must be (Brown, Bull and Pendlebury, 1997). Such an approach requires careful planning, a rich variety of assessment tasks and clear agreed criteria. All of these require intensive resources which may not be available on work placements or in Engineering departments. Once again, it may be necessary to use more modest approaches and treat cautiously the results of the assessment of transferable skills.

All of the above present practical difficulties but all can be overcome through close negotiation, agreement and close cooperation within module teams, students and for work placements between line managers and tutors and students. However it is important that a department (or University) is not over-ambitious about standardisation and accreditation. Such an approach would be expensive and perhaps impossible. Even more difficulties may arise when trying to derive national framework based on precise measurement (Yorke and Knight, 2001). At this level too an approach based on judgement is more practicable than one based on precise measurements.

3.10 Summary

This chapter has outlined and discussed the different methods of data collection and analysis which might be used to measure and judge 'impact'. Of these methods, structured questionnaire, semi-structured interviews and focus groups appear to be the most practicable and appropriate for obtaining evidence on the impact of work placements on the development of transferable skills in engineering from students, line managers and industrial tutors. These methods are incorporated into the design of the study which is described in chapter five.

Consideration was also given to ways of assessing students learning of transferable skills and whilst on work placements, since these may be a powerful measures of impact. It was pointed out that such assessments are difficult and seriously constrained by the resources available (time, space, equipments and expertise). It was suggested that, given these constraints, it is better to adopt a 'local' rather that national system and recognise a local system's limitations. This theme is again discussed in chapter 7 and 8.

Chapter Four: The Design of the Study

4.0 The research problem

This chapter restates the research problems and questions. It describes the design, methods of data collection and analysis as well as providing the time line of design and data collection activities. As mentioned in chapter one, the main research question is to identify the impact of work placements on the development of transferable skills in engineering. The empirical questions which it was proposed to investigate were:

1. What are the perceived value of transferable skills by students, line managers and tutors?
2. What is the impact of work placements on the development of transferable skills as perceived by students, line managers and tutors?
3. What skills are the most important to develop in work placements?
4. How do work placements impact upon academic performance?
5. What are the strength and weaknesses of approaches to assessing work placements and transferable skills?

It was hoped that the findings of this study will identify whether work placements significantly contribute to the acquisition of transferable skills by work placements students when compared with non work placements students (students who do not undertake a placement).

The rationale for the use of perceptual data and measures of academic performance were discussed in chapter three. In essence, it is that if there is consensual validation between the stakeholders (students, line managers and DIS tutors) then it is safe to assume that work placements do have an impact on transferable skills and if students who go on placements have higher levels of academic achievement then this provides further evidence of the impact of work placements on the development of transferable skills.

The map shown in figure 4.0 below, shows the areas of investigation for this research:

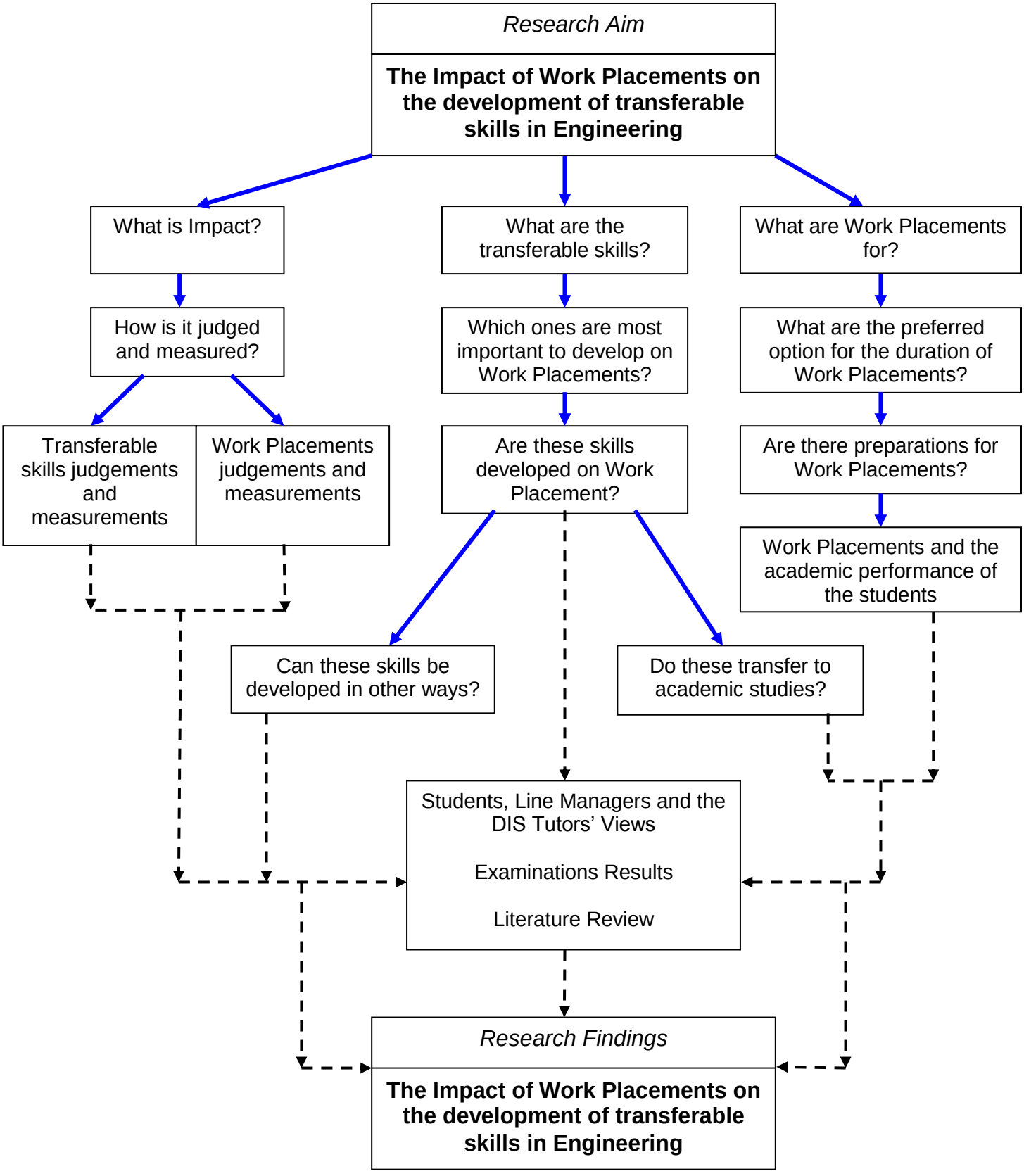


Figure 4.0: Areas of investigation for this research project

4.1 The basic design

The core of the design of the student survey is shown in table 4.1. It is based on the pre-test – intervention – post-test design (Cresswell, 2003). The model permitted the statistical comparisons of:

- Pre-tests of work placements (wp) and non work placements (nwp) students.
- Post tests of wp students & nwp students.
- Post tests of wp1 students at the end of their placements and wp2 students at the end of their final year.
- Changes in nwp and wp students from pre-test to post test.

The students who took part in this study were from three departments at Loughborough University, Chemical Engineering, Civil Engineering and IPTME (Institute of Polymer Technology and Materials Engineering), 2003/04 & 2004/05 intake cohorts.

Table 4.1: The basic design

	Pre-test	**Interaction**	**Post-test**
Work placement students (BEng / MEng)	Questionnaire 1	Work placement	Questionnaire 2
Non work placement students (BEng / MEng)	Questionnaire 1	Final year study	Questionnaire 2
Additional work placement students (MEng)	None	Work placements + final year of study	Questionnaire 2

The rationale for this design is that if there are no significant differences between work placement (wp) and non work placement (nwp) students in the pre-test then they are at a common base-line. Then, if there is a significant difference in the post test one can safely assume that the differences are due to the impact of work placements. It is also possible to use this design to examine the changes within the wp group and nwp group and to compare these changes.

The use of an additional experimental group who have experience of work placements and further studying their final year has two functions. First, it controls for the effects of the pre-test which might have sensitised the students to what is expected of work placements. The approach adopted in this design eliminates this sensitising effect so the effect of the work placements can be measured by comparing this group's results with those of the pre-placement students. Secondly, it provides an opportunity to explore whether a more reflective perspective on work placements is provided by students who are using transferable skills developed during placements. This point is further discussed in chapter nine.

The views of line managers and industrial tutors were to be explored through questionnaires, interviews and focus groups. These results were compared with the students' views so that consensual validation through triangulation could be estimated.

4.2 Methods of data collection

As indicated in chapter three, measuring impact requires the use of variety of methods of data collection and analysis. Table 4.2 on the next page, provides a summary of the planned data collection and the source of data and figure 4.2 shows the relationship between the literature review and the data collection. (Chapter three contains the justification for the choice of those methods). Together it was hoped, the measures would provide a profile of measures of impact upon students' transferable skills which yielded answers to the research questions.

Table 4.2: The methods of data collection

Source of Data	Methods of data collection
Students	• Questionnaires – Pre & Post placements • Focus groups • Interviews
Line managers	• Interviews • Focus Group • Questionnaires
DIS Tutors	• Interviews • Questionnaires
Curriculum documents (e.g. course outlines, examination results).	• Documentary analysis. Analysis of learning outcomes, assessments and the degree results of work placement and non work placement students

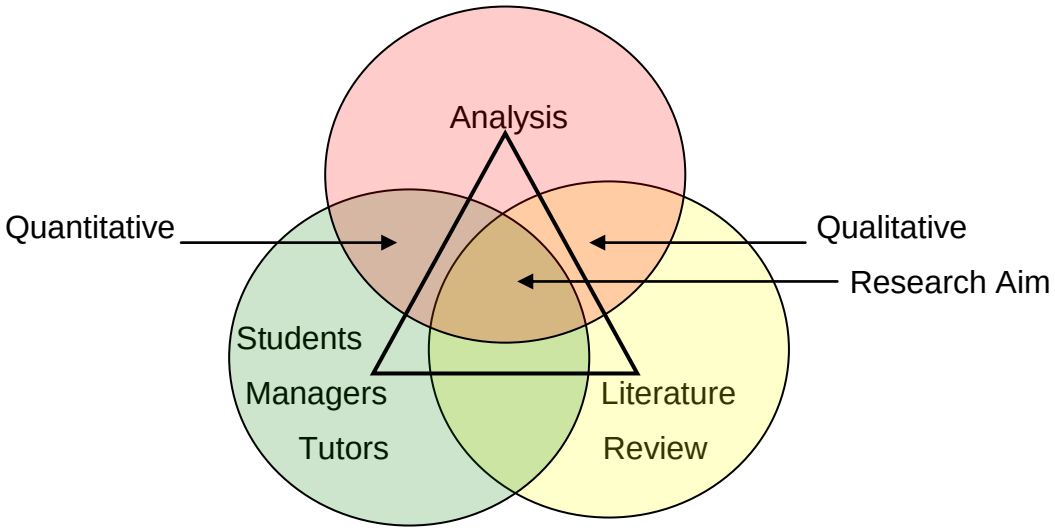


Figure 4.2: Model of the research methods and sources of data

Pre and post-placement questionnaires were designed, piloted and amended. The pre-test data was collected in classes of students prior to placement. For those completing their placements the second questionnaire (post-placement) was emailed to them at their work place. The students who had already completed their work placements and were in their final year (May, 2007) completed questionnaire 2 in the class. The data actually obtained from the pre and post placement questionnaires were analysed and the results are presented and discussed in chapter five of this

thesis. The pre-placement and post-placement questionnaires are given in Appendix 1 and 2a/2b respectively.

The first questionnaire (pre-placement) enabled measures to be taken of the perceived values, the importance of developing transferable skills on placements, self assessment of students of their transferable skills, their expectations of placement and their general views on work placements. The second questionnaire (post-placement) contained similar items on these topics.

The questionnaire for line managers was designed on the basis of the original questionnaire and sent to line managers in 19 different Engineering companies which take students on placements. This questionnaire is given in Appendix 3. The results of the line managers' questionnaire, interviews, and focus groups are discussed in chapter six of this thesis. The interviews and questionnaires were similarly designed for the DIS tutors. The questionnaires were completed by the DIS tutors during the interviews with them. The results and analysis are given in chapter six and the interview questions used are given in Appendix 4. The literature review and analysis of curriculum documents were undertaken in parallel with these activities in the academic years of 2005/2006, 2006/2007 and 2007/2008.

4.3 Methods of data analysis

As mentioned in chapter 3, the structural responses to the questionnaires were analysed with 't' tests and spearman's correlation coefficient, chi-squared, Kolmogorov-Smirnov tests. The analyses were conducted by SPSS version 14.0 and 16.0 (Statistical Package for the Social Sciences). The open ended questions in the interviews and focus groups were analysed qualitatively using thematic analysis.

The total set of data were compared to estimate the degree of agreement between the different sources of the data (students, tutors, line managers and where appropriate, curriculum documents).

Table 4.3, shows the timeline followed for design and data collection activities for this research:

Table 4.3: The timeline used for the design and data collection activities for this research

Source of Data	Methods of data collection	Time
Students	• Questionnaire 1 • Questionnaire 2 and Interviews • Questionnaire 3	May, 2006 for nwp and wp1 May, 2007 for nwp and for wp1 July/Aug, 2007 May, 2007 for wp2
Line managers	• Interviews, Focus Groups • Questionnaire	Feb/March, 2007 July, 2007
DIS Tutors	• Questionnaire, Interviews (DIS tutors from Civil Eng., Chemical Eng., & IPTME departments)	September, 2007
Curriculum documents (e.g. modules specifications, exams results)	• Documentary analysis. Analysis of learning outcomes and assessments / Examinations results	July/August/Sept, 2008

To ensure consistency and provide triangulation across the main data collection, the pre-placement questionnaire was used as the basis for other subsequent questionnaires although each of these also contains questions targeted on the specific source of data. For example, the core questions on transferable skills asked to the students were also asked to the line managers and the industrial supervisors (DIS tutors). Line managers were also asked in their questionnaire of the value of placements to their organisations and what preliminary courses would help students on work placements. Industrial supervisors were also asked this question. Further details of the questionnaires and responses are provided in the chapters on the results (Chapters five and six).

4.4 Ethical Considerations in this Research

The previous sections of this thesis have raised issues which might be considered under the umbrella title of 'Ethical Considerations in this Research'. A consideration of these matters involves an overview of ethical frameworks which guide local University Research Ethics Committees (REC's) including the REC of Loughborough University. The general principles underlying these considerations appear to be:

1. Do no harm to the participants during the research and as a consequence of the research.
2. Preferably, benefit the target population of the research.

Clearly, these principles are particularly appropriate to research on human beings. They imply that the research design is sufficiently sound, that the confidentiality and personal security of the participants is safeguarded and the research is useful and beneficial. In the case of this research it could be argued if work placements appear to have no impact on transferable skills then one should consider whether work placements are worth using. If work placements do have an impact then they are worth using and developing further.

However before considering the ethical frameworks for research, it is worth considering briefly the meaning of the term 'research'. There are several discussions of these issues in the literature such as Brew (2001), Cohen, Manion and Morrison (2006) and Moron-Garcia and Willis (2009). For the purpose of this thesis, the succinct definition by Oates (2006) is most appropriate:

Research on humans is *'An activity that aims to generate knowledge that can be trusted and valued by the researcher and others'*.

Knowledge in this definition includes the findings of the research, explanations, personal understanding and explication. Explanations are part of the scientific – quantitative paradigm. Personal understanding and explication are part of the qualitative paradigm (Stainton Rogers, 2006), (see also Table 3.1).

4.4.1 Ethical Frameworks in Human Research

These may be considered at the international, national and local level. At the international level the drive for the ethical frameworks for research on human beings, not surprisingly, came from Medicine where research could cause harm to patients This led to the formulation of policy by the 1997 Council of Europe Convention on Human Rights and Bio-medicine
(http://conventions.coe.int/Treaty/EN/Treaties/Html/164.htm)
and the 2001/20/EC European Clinical Trials Directive
http://www.wctn.org.uk/downloads/EU_Directive/Directive.pdf.

At the national level, a Central Office for Research Ethics Committees (COREC) was established in the National Health Service (NHS). The British Psychological Society (BPS) has issued ethical guidance (http://www.bps.org.uk/the-society/code-of-conduct/) and the British Educational Research Association (BERA) has formulated its guidelines on ethics:
(http://www.bera.ac.uk/blog/category/publications/guidelines/). All these stress 'do not harm', consent, confidentiality and whenever possible absence of deception.

The right to confidentiality of personal information is also stressed in the Freedom of Information Act. (http://www.opsi.gov.uk/Acts/acts2000/ukpga_20000036_en_1). As indicated earlier, this law restricted the data on academic performance which could be collected and resulted in difficulties in obtaining post work placement results.

Higher Educational Institutes (HEIs) follow the national frameworks for ethics but each HEI is free to determine its own policy. Consequently there are variations in the requirements and emphases of HEIs (Tinker and Coomber, 2004 cited by Oates, 2006). The policy and procedures at Loughborough University are outlined in the next section. Also see the Appendix 8 for further documentation.

4.4.2 Loughborough University Procedures

There are two procedures at Loughborough University involved in obtaining ethical approval for research on humans. First the research proposal has to be submitted and approved by the Ethical Advisory Committee and then the Ethical Clearance Checklist completed, submitted and approved by the Ethics Advisory Committee. The research proposal and the 'Ethical Clearance Checklist' form are submitted by the research supervisors and students. The 'Ethical Clearance Checklist' form is included in Appendix 8. The form is generic and is designed to cover Bio-medical, Psychological and Sociological research. The relevant parts of the form for the Ethical Advisory Committee for this research are shown in table 4.4.3 in the next section.

4.4.3 Conformance with Loughborough University Procedures

The research project was approved by the Ethical Advisory Committee and archived. No recommendations for changes in the research proposal were made nor were any ethical issues raised by the Committee. Further confirmation of the acceptability of the project was given by the Chairman of the Ethics Advisory Committee to me, the research student. Table 4.4.3 shows the conformance of this research to the requirements of the Loughborough Ethics Committee.

Table 4.4.3 – Ethical conformance for this research

Topic	Response
Observation / Recording consent	Consent for audio recording obtained from line managers and tutors.
Consent	Participants were able to opt out of completing the questionnaires. Line managers and DIS tutors gave their consent freely. All participants were informed of the purpose of the research. There was no deception and participants were informed of the rights to withdraw from the research at any time and require their data to be destroyed.
Storage of data and Confidentiality	All information from the questionnaires and interviews was anonymised. The audio recordings are stored in a secure PC and will be destroyed when the thesis is completed.
Incentives	All participants had the rights to opt out of giving their names or ID numbers. Those that opted in were included in a prize draw for an MP3 Player. This was not considered to be an 'incentive' by the Ethical Advisory Committee.

Chapter Five: Analysis of Students' Perceptions

5.0 Introduction

This chapter reports the analyses of the students' perceptions of transferable skills and work placements. It is divided into three main sections:

- The pre-placement survey – this section reports the results of the pre-placement survey including the comparison of the results.
- The post-placement survey 1 – this section reports the results obtained from the sample of students who took part in both pre-placement and post-placement surveys only. Comparison of their views is also mentioned in this section.
- The post-placement survey 2 – this section reports the results obtained from all students who took part in post-placement survey. Majority (90%) of the students who completed the post-placement questionnaires did not take part in the pre-placement survey. This section also summarises the comparison of their views (post-placement survey comparison, pre-placement versus post-placement comparison).
- Summary of results.

Within each of the three sections, comparisons are made of the perceptions of work placement students (wp) and non work placement students (nwp). For the purposes of these surveys, work placement students are defined as those who undertake a one year full time placement in the Engineering industry. Non work placement students are those who did not do any work placements or only brief work placements during parts of vacations.

As indicated in chapter four, the original design for the analysis of students' results was a pre-test – post-test model which would enable one to track individual students quantitative results and qualitative results. It was not possible to follow this design precisely because of the difficulties of obtaining the students ID numbers or names, their willingness to participate in focus groups or interviews or to respond to the questionnaires – despite the several attempts of the researcher and his supervisors. Consequently it was necessary to modify the approach to analysis of the data.

Microsoft Excel and SPSS version 14.0 and 16.0 (Statistical Package for the Social Sciences) were used for the compilations and major statistical analyses.

Some non-parametric statistical analyse were carried out using the Vassar website (http://faculty.vassar.edu/lowry/VassarStats.html). There were insufficient responses to the open ended questions in the surveys to conduct a thematic analyses. So instead, quotations were used to illustrate the topics discussed.

5.1 The pre – placement survey

This section provides the profile of the students who participated in the pre-placement survey, their perceptions of the importance of transferable skills, the value of work placements in developing transferable skills, their self assessment of those skills prior to placements and the frequency of their reflections on their transferable skills.

5.1.1 Profile of the students who took part in the pre – placement survey

One hundred and seven pre-placement questionnaires were completed by students from three departments: Civil Engineering, Chemical Engineering and IPTME. Students who completed the pre-placement questionnaires were 84 males and 20 females and 3 did not indicate their gender, the age range of the sample was from 19 to over 23 years of age. The majority (59) were 20. Twelve of the students were international, 91 reported they were UK/EU students and 4 did not respond.

One hundred and three students were second years, 1 was an Erasmus student and three did not complete this question. Forty nine of the students were from Civil Engineering department, 33 from Chemical Engineering and 25 from IPTME (Materials Engineering).

Eighty nine students expected to do work placements and 18 reported they are not doing work placements. All the students who went on placements did one year long work placements. They went on placements after their second year.

Thirty three students had an experience of work in engineering prior to their courses, the remaining students did not. Seventy nine students had other work experience, 24 did not and 4 did not respond to this question.

When asked about the factors which would (or has) influenced their choice of company, 58 students were not concerned about the size of the company, 18 preferred to work in a large company, 26 in a medium company, 2 in a small company and 1 preferred to work in a small company in the UK. Thirty six students preferred to work near their families. Seventy eight percent of the students gave their ID numbers; this helped in following them up during the post placements survey.

5.1.2 The importance of developing transferable skills

The students were asked give their views on the importance of developing transferable skills. The students were asked this question in order to find out about their awareness of the importance of developing the transferable skills at this stage of their career and see which set of skills they will rank highly than other skills.

CV (coefficient of variation) was used to rank the results in order and compare the consistency and variability of the data. The higher the CV, the higher the variability of the data. The lower the CV the higher is the consistency of the data. CV is presented in percentage as shown on the tables of pre-placement survey results below, and other tables of results in this thesis.

It is the ratio of the standard deviation to its mean $$CV = \frac{\sigma x}{\bar{x}} \times 100$$

In descending order, the top four transferable skills, as shown in table 5.1.2 below, were ‘communication skills’, ‘working as a team member’, ‘problem-solving’ and ‘planning and organising’. The lowest ratings in ascending order were given to ‘management skills’, ‘research skills’ and ‘technical skills’.

There were no significant differences between males and females, students from different departments or those going or not going on placements. Table 5.1.2 below summarises the students' views on the importance of developing transferable skills. Most of the students thought that these transferable skills were important to develop on placements.

Table 5.1.2: The importance of developing transferable skills

Transferable Skills	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	3	0	0	3	26	74	5.56	0.94	16.9
Ability to solve problems	3	1	3	11	47	41	5.08	1.07	21.06
Ability to work as a team member	3	1	1	6	35	60	5.35	1.04	19.4
Planning and organising skills	2	3	0	13	56	33	5.03	1	19.9
Management skills	2	5	5	31	44	20	4.59	1.11	24.2
Technical skills	2	2	7	22	55	19	4.71	1.02	21.66
Personal effectiveness skills	3	1	3	20	48	32	4.92	1.07	21.75
Research skills	2	6	13	35	36	15	4.33	1.15	26.6
Information Technology skills	3	0	2	18	45	22	4.87	1.03	21.15
Decision making skills	4	0	4	22	53	24	4.79	1.07	22.3
Time management	5	0	2	17	44	38	4.97	1.17	23.5

(Sample size n = 106, wp = 89, nwp = 18)
1 = very unimportant, **2** = unimportant, **3** = slightly unimportant
4 = slightly important, **5** = important, **6** = very important

5.1.3 The perceived value of work placements

Ninety per cent of the students agreed or strongly agreed that work placements would help them develop their transferable skills but, again, taking agree and strongly agree as a measure, only 35.5% thought it would improve their grades on return to University, whilst about 65% thought that it would have little effect upon their academic performance.

Two further questions in different parts of the questionnaire were asked concerning the specific value of work placement for developing transferable skills. In response to the question 'is a degree which includes a work placement more effective for the development of transferable skills than a degree course without?' Ninety four percent

of the placement students said ‘Yes’ compared with only 67% of the non-placement students. Not surprisingly, there was a significant difference between students going on placements and those who were not (chi-squared $\chi^2 = 10.0$, $p < 0.02$). As a cross-check, the second question asked was “if you were to do (or are doing) a work placement, would you expect it to improve your transferable skills?” Again 94% thought that work placements would help them improve their transferable skills, while 3% did not agree and another 3% did not answer this question. Again, there was a significant difference between placement and non-placement students ($\chi^2 = 15.6$, $p < 0.02$). One hundred percent of the placement students agreed with this statement compared with 82% of the non-placement students.

There were no significant differences between placement and non-placement students, between genders or between engineering disciplines on these issues. The concordance between these sets of results confirms that students value highly work placements as a means of developing transferable skills.

Students particularly valued work placements for the experience to improve their chances of ‘getting a job when they finish University’ and ‘to give them an idea of what industry is really like’. Lowest values were given to the items ‘because it is a part of the course’, ‘they need a break from education’ and ‘because they need money’. But, not surprisingly, there were significant differences between placement and non-placement students on the value of placements. Overall, placement students valued placements more than non-placement students (Placement mean (P x) = 54.39, non-Placement mean (nonP x) = 50.38, $p < 0.05$). Placement students differed from non-placement students in their views on: ‘to improve their chances of getting a job’ (P x = 5.48, nonP x = 4.78, $p < 0.001$), ‘to give them an idea of what industry is really like’ (P x = 5.27, nonP x = 4.78, $p < 0.05$) and ‘the year in industry counts towards getting their Chartership’ (P x = 4.70, non P x = 4.11, $p < 0.05$). Females were less likely to report that ‘they needed a break from education’ (F x = 3.50, M x = 4.20 , $p < 0.05$) or ‘because it is part of the course (F x = 2.50, M x = 3.46, $p < 0.01$), more likely for ‘Personal Development (F x = 5.35, M x = 4.71, $p < 0.05$), ‘it will be an opportunity to apply theory’ (F x = 4.85, M x = 3.95, $p < 0.05$), and ‘it will help them to choose what to do in their final project’ (F x = 4.50, M x = 3.95, $p < 0.05$).

There were some differences between the views of students from different disciplines. Compared with Chemical Engineering students, Civil Engineering students seemed to 'need more money' (Civil Eng. $x = 4.41$, Chemical Eng. $x = 3.52$, $p < 0.01$, 'a break from education' (Civil Eng. $x = 4.27$, Chemical Eng. $x = 3.48$, $p < 0.01$), 'to improve their grades on returning to university (Civil Eng. $x = 4.14$, Chemical Eng. $x = 3.58$, $p < 0.05$) but were less concerned about improving their chances to get a job (Civil Eng. $x = 5.12$, Chemical Eng. $x = 5.55$, $p < 0.05$). But compared with IPTME students, they were less concerned about getting a job (Civil Eng. $x = 5.12$, IPTME $x = 5.60$, $p < 0.05$). IPTME students compared with Chemical Eng. students thought they needed 'a break from education' (IPTME $x = 4.32$, Chemical Eng. $x = 3.48$, $p < 0.05$), and 'to improve their grades on return to university' (IPTME $x = 4.28$, Chemical Eng. $x = 3.58$, $p < 0.05$).

5.1.4 Students' self assessment of their transferable skills

Students were asked to assess themselves on their level of transferable skills prior to placements (wp) or further study (nwp). Table 5.1.4 below shows the overall results of the students' self assessment of their level of transferable skills.

The top four self-assessments were, in descending order: working as a team member, information technology skills, planning and organising, and communication skills. The skills which the students considered were their weakest were, in ascending order, management skills, research skills and technical skills. These results imply the students feel they are fairly competent but they consider they will need some support whilst on placement. The three transferable skills the students self-assessed lowest were: management skills, information technology skills and time management. From these results one may conclude, that in the opinion of this sample of students, their experiences at university and earlier had laid a fairly solid foundation for the development of transferable skills which they expected work placements would improve further.

Table 5.1.4: Self assessment of transferable skills

Transferable Skills	1	2	3	4	5	6	7	8	9	Mean	Standard Deviation	%CV
Communication skills	2	0	2	10	12	19	32	26	4	6.46	1.60	24.8
Ability to solve problems	0	2	3	6	24	26	30	13	3	6.11	1.42	23.2
Ability to work as a team member	1	2	0	3	3	16	38	38	6	7.03	1.39	19.8
Planning and organizing skills	0	4	3	3	12	20	41	19	5	6.48	1.54	23.8
Management skills	1	6	10	5	19	27	25	10	4	5.71	1.80	31.5
Technical skills	0	2	7	8	23	24	28	11	3	5.92	1.54	26.0
Personal effectiveness skills	1	3	3	5	13	26	38	15	2	6.24	1.52	24.4
Research skills	2	2	10	10	9	40	23	5	5	5.73	1.70	29.7
Information Technology skills	2	2	3	5	5	19	34	27	10	6.71	1.72	25.6
Decision making skills	2	1	3	8	11	22	41	14	5	6.32	1.59	25.2
Time management	2	2	4	4	16	18	30	25	5	6.39	1.72	27.0

(Sample size n = 107, wp = 89, nwp = 18)
1 = Aware of this skill, **2** = Know about this skill,
3 = Not yet competent in the practice of this skill in the workplace,
4 = Fairly competent at this skill in the workplace but need strong support,
5 = Fairly competent at this skill in the workplace but need support,
6 = Fairly competent at this skill in the workplace but need occasional support,
7 = Competent in routine work situations, **8** = Competent in most work situations,
9 = Expert.

There were no significant differences between Placement and non-Placement students in their self assessments and only one significant difference between Females and Males (Research skills: F $\bar{x}$ = 6.37, M $\bar{x}$ = 5.55, $p < 0.05$). There were however some differences between disciplines. Compared with Chemical Engineering students, Civil Engineering students self-assessed their 'ability to solve problems' and their technical skills higher (Civil Eng. $\bar{x}$ = 7.14, Chemical Eng. $\bar{x}$ = 6.67, $p < 0.01$: Civil Eng. $\bar{x}$ = 6.19, Chemical Eng. $\bar{x}$ = 5.42, $p < 0.05$). There were no significant differences between Civil Engineering and IPTME students but IPTME students rated their ability to solve problems considerably higher than Chemical Engineering students (IPTME $\bar{x}$ = 6.52, Chemical Eng. $\bar{x}$ = 5.48, $p < 0.001$).

5.1.5 Students' reflection on their transferable skills

Students were also asked whether and how often they reflected upon their transferable skills. This question was asked to provide a measure of their willingness to reflect, since reflection is the key factor in developing transferable skills (Boud and Solomon, 2001; Blackwell *et al*., 2001).

Table 5.1.5 below, shows the frequency of students' reflection on transferable skills.

Table 5.1.5: Frequency of students' reflection on transferable skills

Transferable Skills	1	2	3	4	5	6	7	Mean	Standard Deviation	%CV
Communication skills	5	13	5	20	28	21	12	4.58	1.67	36.5
Ability to solve problems	4	6	8	12	28	28	18	5.02	1.60	31.9
Ability to work as a team member	4	5	8	21	38	16	11	4.71	1.45	30.8
Planning and organizing skills	3	5	12	10	29	26	19	5.03	1.57	31.2
Management skills	10	11	13	18	31	18	3	4.11	1.64	40.0
Technical skills	6	6	10	13	31	29	8	4.71	1.59	33.8
Personal effectiveness skills	5	11	11	13	26	32	6	4.58	1.63	35.6
Research skills	7	11	13	21	27	19	6	4.26	1.62	38.0
Information Technology skills	8	5	5	12	25	25	24	5.04	1.78	35.3
Decision making skills	5	8	8	15	28	28	11	4.76	1.61	33.8
Time management	2	5	8	18	24	24	21	5.09	1.52	29.9

(Sample size n = 107, wp = 89, nwp = 18)
1 = Not at all, **2** = Once in the year, **3** = Twice in the year, **4** = About every three months, **5** = About every month, **6** = Once a week, **7** = More than once a week.

As can be seen from the table 5.1.5 above, most of the students reflected most frequently upon time management, information technology skills, planning and organising, and problem solving and least frequently on management skills, research skills and personal effectiveness skills. It should be noted that there was wide variation in the frequency of students' reflection on their transferable skills.

There were no significant differences between Placement and non-Placement students or between genders on reports of time spent on reflecting on their transferable skills. Chemical Engineering students reported spending more time than

Civil Engineering students on 'ability to solve problems' (Chemical Eng. x = 5.64, Civil Eng. x = 4.50, $p < 0.05$), planning and organising skills (Chemical Eng. x = 5.42, Civil Eng. x = 4.54, $p < 0.05$) and decision making skills (Chemical Eng. x = 5.25, Civil Eng. x = 4.39, $p < 0.05$).

Overall, there were highly significant differences between IPTME students and Civil Engineering students (Civil Eng. x = 44.65, IPTME x = 54.60, $p < 0.01$). The differences were in Communication skills (IPTME x = 5.32, Civil Eng. x = 4.07, $p < 0.05$), ability to work as a team member (IPTME x = 5.33, Civil Eng. x = 4.28, $p < 0.01$), planning and organising skills (IPTME x = 5.40, Civil Eng. x = 4.54, $p < 0.05$), and Information Technology (IPTME x = 5.60, Civil Eng. x = 4.57, $p < 0.05$). These differences may reflect differences in curriculum and assessment demands.

5.1.6 Comparison of the pre – placement survey's results

Table 5.1.6: Comparison of the pre – placement survey's results

Transferable Skills	Importance	Self Assessment	Frequency of Reflection
Communication skills	5.56 (1)	6.46 (4)	4.58 (9)
Ability to solve problems	5.08 (3)	6.11 (8)	5.02 (4)
Ability to work as a team member	5.35 (2)	7.03 (1)	4.71 (7)
Planning and organising skills	5.03 (4)	6.48 (3)	5.03 (3)
Management skills	4.59 (10)	5.71 (10)	4.11 (11)
Technical skills	4.71 (9)	5.92 (9)	4.71 (6)
Personal effectiveness skills	4.92 (6)	6.24 (7)	4.58 (8)
Research skills	4.33 (11)	5.73 (11)	4.26 (10)
Information Technology skills	4.87 (7)	6.71 (2)	5.04 (2)
Decision making skills	4.79 (8)	6.32 (6)	4.76 (5)
Time management	4.97 (5)	6.39 (5)	5.09 (1)

Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.
Rank orders in brackets.

Table 5.1.6 above, presents a summary of the scores for importance, self assessment and frequency of reflection of the transferable skills. The rank orders are shown in brackets. Where the mean scores are identical, the score with the lowest CV is given the higher rank. There was a significant correlation between the importance of the skill and their self-assessment of their competence (rho (ρ) = 0.69, $p < 0.05$). There were no significant correlations between self-assessments and frequency of reflection (rho (ρ) = 0.2, $p = 0.35$) or between self assessment and

frequency of reflection (rho (ρ) = 0.58, p = 0.06) although the latter was approaching significance at the 0.05 level.

5.1.7 Summary of the pre – placement survey's results

Overall, the above results show that the work placement and non work placement students had closely similar perceptions of the importance of transferable skills and the value of work placement for developing those skills. Their self assessments were similar as were their reported time spent on reflection although were some differences between students from different engineering subjects. One may therefore conclude that the work placement and non work placements were sufficiently similar to provide a base line for comparing the impact of work placement upon transferable skills.

5.2 The post – placement survey 1

The sample for this survey should ideally have been the same as that of the pre-placement survey so individual changes could be tracked using the paired t test. Unfortunately, the response rate in the post placement survey was only 10 for the work placement students and four for the non placement students. No students participated in focus groups or interviews. These outcomes were all the more disappointing given the frequent attempts by the researcher and his supervisors to encourage participation. Encouragement, cajolement, frequent emails and offers of free lunches or gifts had no effect. Of the ten work placement students, 8 were male, 2 were female, 3 were from IPTME, 4 from Civil Engineering department and 3 from Chemical Engineering department. Of the non work placements 2 were from Civil Engineering department, 1 from Chemical Engineering department and 1 from IPTME, 3 were males and 1 female.

5.2.1 Pre-test – Intervention – Post-test: (sample)

The views / feedbacks obtained from the sample of the work placements students who took part on both surveys, 10 students (pre-placement and post-placement surveys), regarding the importance of developing the transferable skills and their self

assessment of the same set of skills were analysed using Wilcoxon test and the summary of the analysis is shown in tables 5.2.1a and 5.2.1b below.

Table 5.2.1a: Importance of developing transferable skills

Transferable skills	p value	Comments
Communication skills	0.48	No changes in ratings for both surveys
Ability to solve problems	0.317	No changes in ratings for both surveys
Ability to work as a team member	0.603	No significant different on the ratings for both surveys
Planning and organising skills	0.705	No significant different on the ratings for both surveys
Management skills	0.792	No significant different on the ratings for both surveys
Technical skills	0.317	No significant different on the ratings for both surveys
Personal effectiveness skills	0.271	No significant different on the ratings for both surveys
Research skills	0.83	No significant different on the ratings for both surveys
Information Technology skills	0.059	Work Placements students lowered their rating slightly more on the second survey
Decision making skills	0.257	No significant different on the ratings for both surveys
Time management	0.096	No significant different on the ratings for both surveys

Table 5.2.1b: Self Assessment of transferable skills

Transferable skills	p value	Comments
Communication skills	0.07	Work Placements students assessment themselves slightly lower on the second survey.
Ability to solve problems	0.19	Work Placements students assessment themselves slightly lower on the second survey.
Ability to work as a team member	0.234	No significant different on the self assessment ratings for both surveys
Planning and organising skills	0.518	No significant different on the self assessment ratings for both surveys
Management skills	0.026	Work Placements students assessment themselves slightly lower on the second survey.
Technical skills	1.00	Work Placements students assessed themselves exactly the same on both surveys.
Personal effectiveness skills	0.068	Work Placements students assessment themselves slightly lower on the second survey.
Research skills	0.887	No significant different on the self assessment ratings for both surveys.
Information technology skills	0.942	No significant different on the self assessment ratings for both surveys
Decision making skills	0.063	Work Placements students assessment themselves slightly lower on the second survey.
Time management	0.187	No significant different on the self assessment ratings for both surveys.

As shown on the table 5.2.1a and 5.2.1b above, the ratings of the students who went on placements (sample students / who completed both questionnaires), on the importance of the transferable skills mentioned above and their self assessment on the same set of skills did not differ very much, but the main result emerged after the thematic analysis shows that, these students assessed their transferable skills lower after their work placements, compared to what they have assessed themselves before they went on placements. This is probably because they have realised that they are not that very competent/experts as they thought, after meeting and working with other colleagues who are more experienced/experts in different fields.

Regarding the importance of developing transferable skills, these students who went on work placements rated the same set of skills slightly high on the second survey compared to their first survey. This is probably because after doing their work placements, they have realised how important these skills can be at work place in order to achieve the goals set at work.

The sample of four students who did not go on work placements was too small to analyse in order to get any meaningful results.

5.3 The post – placement survey 2

This section reports the comparison of the perceptions of the work placement and non work placement students on the importance of transferable skill, the value of work placements for developing skills and their self assessment of skills. One hundred and forty post-placement questionnaires in total were completed by students from three departments: Civil Engineering, Chemical Engineering and IPTME. 25 of the students who completed the questionnaires were the ones who did their work placements in industries during the 2006/2007 academic year, 39 of the students were the ones who did their work placements in 2005/06, and seventy six of the students did not go on work placements (Final year students in 2006/07 academic year). Students who completed the questionnaires were 118 males and 20 females and 2 did not indicate their gender. The age range of the sample was from 20 to over 24 years of age. 13 of the students were international, 125 reported they were UK/EU students and 2 did not respond. 105 of the students were from Civil Engineering

department, 21 from Chemical Engineering and 15 from IPTME (Institute of Polymer Technology and Materials Engineering).

5.3.1 The importance of developing transferable skills

Students were asked to give their views on the importance of having the transferable skills (shown in table 5.3.1a, 5.3.1b, and 5.3.1c) in work placement / when they start their first job after graduating. The top five were 'communication skills', 'time management', 'working as a team member', 'problem-solving' and 'planning and organising'. The lowest ratings in were given to 'management skills' and 'information technology skills'. There were no differences between males and females, students from different departments or those went on placements and those who did not go on work placements. Tables 5.3.1a, 5.3.1b, 5.3.1c below summarises the students' views on the importance of the transferable skills listed in the post – placement survey.

The importance of the following transferable skills

Table 5.3.1a: Students who did not go on work placements

(Final Year Students 2006/07)

Transferable Skills	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	2	3	1	2	23	45	5.32	1.169	21.97
Ability to solve problems	2	1	3	9	32	28	5.03	1.102	21.90
Ability to work as a team member	3	1	2	5	25	40	5.21	1.192	22.89
Planning and organising skills	2	3	0	9	30	31	5.07	1.155	22.78
Management skills	1	4	4	23	27	16	4.59	1.128	24.58
Technical skills	1	1	6	23	30	14	4.63	1.010	21.81
Personal effectiveness skills	1	1	3	13	36	20	4.92	0.976	19.84
Research skills	2	1	14	32	18	9	4.18	1.080	25.84
Information Technology skills	0	5	5	14	30	22	4.78	1.138	23.81
Decision making skills	1	3	1	14	27	30	5.01	1.101	21.98
Time management	3	1	0	6	23	42	5.28	1.157	21.91

(Sample size = 76 students)

1 = very unimportant, **2** = unimportant, **3** = slightly unimportant,
4 = slightly important, **5** = important, **6** = very important

The importance of the following transferable skills

Table 5.3.1b: Students who went on work placements (2006/07)

Transferable Skills	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	0	0	0	1	9	15	5.56	0.583	10.49
Ability to solve problems	0	0	1	10	8	6	4.76	0.879	18.47
Ability to work as a team member	0	0	0	4	11	10	5.24	0.723	13.78
Planning and organising skills	0	1	2	5	12	5	4.72	1.021	21.63
Management skills	0	1	4	13	3	4	4.20	1.041	24.79
Technical skills	0	0	4	12	7	2	4.28	0.843	19.7
Personal effectiveness skills	0	1	1	8	12	3	4.60	0.913	19.85
Research skills	0	5	9	6	4	1	3.48	1.122	32.24
Information Technology skills	0	0	2	11	8	4	4.56	0.870	19.08
Decision making skills	0	1	0	8	11	5	4.76	0.926	19.45
Time management	0	0	0	3	13	9	5.24	0.663	12.65

(Sample size = 25 students)
1 = very unimportant, **2** = unimportant, **3** = slightly unimportant,
4 = slightly important, **5** = important, **6** = very important

The importance of the following transferable skills

Table 5.3.1c: Students who went on work placements (2005/06)

Transferable Skills	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	2	0	0	4	8	25	5.33	1.221	22.91
Ability to solve problems	0	2	2	10	14	11	4.77	1.087	22.79
Ability to work as a team member	1	1	2	5	14	16	5.00	1.192	23.84
Planning and organising skills	0	1	2	10	17	9	4.79	0.951	19.85
Management skills	1	3	4	9	16	6	4.38	1.248	28.49
Technical skills	0	0	9	12	12	5	4.34	0.994	22.90
Personal effectiveness skills	0	0	6	11	15	6	4.55	0.950	20.88
Research skills	4	8	7	12	8	0	3.31	1.301	39.31
Information Technology skills	0	3	4	9	16	7	4.51	1.144	25.37
Decision making skills	1	0	2	12	12	12	4.79	1.105	23.07
Time management	1	1	1	4	16	16	5.08	1.133	22.30

(Sample size = 39 students)
1 = very unimportant, **2** = unimportant, **3** = slightly unimportant,
4 = slightly important, **5** = important, **6** = very important

The results shown on tables 5.3.1a/b/c were then compared to see if there was any significant differences between the views of the students who went on work placements and the students who did not go on placements on the importance of developing the transferable skills mentioned in the survey.

Uncorrelated t test were used in the analyses to find if there is any significant differences. Tables 5.3.1d/e shows the summary of the results of the analyses:

Comparison of the students' ratings on the importance of the following transferable skills – all students who took part in the post-placement survey

Table 5.3.1d: Students who went on work placements (2006/07) Vs. Students who did not go on placements

Transferable Skills	Cohort	Mean	Standard Deviation	%CV	Sig. level p value
Communication skills	nwp wp 2006/07	5.32 5.56	1.169 0.583	21.97 10.49	0.319
Ability to solve problems	nwp wp 2006/07	5.03 4.76	1.102 0.879	21.90 18.47	0.215
Ability to work as a team member	nwp wp 2006/07	5.21 5.24	1.192 0.723	22.89 13.78	0.967
Planning and organising skills	nwp wp 2006/07	5.07 4.72	1.155 1.021	22.78 21.63	0.107
Management skills	nwp wp 2006/07	4.59 4.20	1.128 1.041	24.58 24.79	0.134
Technical skills	nwp wp 2006/07	4.63 4.28	1.010 0.843	21.81 19.7	0.126
Personal effectiveness skills	nwp wp 2006/07	4.92 4.60	0.976 0.913	19.84 19.85	0.154
Research skills	nwp wp 2006/07	4.18 3.48	1.080 1.122	25.84 32.24	0.006
Information Technology skills	nwp wp 2006/07	4.78 4.56	1.138 0.870	23.81 19.08	0.387
Decision making skills	nwp wp 2006/07	5.01 4.76	1.101 0.926	21.98 19.45	0.303
Time management	nwp wp 2006/07	5.28 5.24	1.157 0.663	21.91 12.65	0.870

(Sample size: nwp = 76 students, wp 2006/07 = 25 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Table 5.3.1e: Students who went on work placements (2005/06) Vs. Students who did not go on placements

Transferable Skills	Cohort	Mean	Standard Deviation	%CV	Sig. level p value
Communication skills	nwp wp 2005/06	5.32 5.33	1.169 1.221	21.97 22.91	0.940
Ability to solve problems	nwp wp 2005/06	5.03 4.77	1.102 1.087	21.90 22.79	0.237
Ability to work as a team member	nwp wp 2005/06	5.21 5.00	1.192 1.192	22.89 23.84	0.373
Planning and organising skills	nwp wp 2005/06	5.07 4.79	1.155 0.951	22.78 19.85	0.209
Management skills	nwp wp 2005/06	4.59 4.38	1.128 1.248	24.58 28.49	0.384
Technical skills	nwp wp 2005/06	4.63 4.34	1.010 0.994	21.81 22.90	0.158
Personal effectiveness skills	nwp wp 2005/06	4.92 4.55	0.976 0.950	19.84 20.88	0.060
Research skills	nwp wp 2005/06	4.18 3.31	1.080 1.301	25.84 39.31	< 0.001
Information Technology skills	nwp wp 2005/06	4.78 4.51	1.138 1.144	23.81 25.37	0.243
Decision making skills	nwp wp 2005/06	5.01 4.79	1.101 1.105	21.98 23.07	0.317
Time management	nwp wp 2005/06	5.28 5.08	1.157 1.133	21.91 22.30	0.373

(Sample size: nwp = 76 students, wp 2005/07 = 39 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

As we can see from tables 5.3.1e/d, there is no significant differences on the views of the students who went on placements and those who did not. They all considered that most of the transferable skills mentioned in the surveys were important to develop. The only significant difference was in research skills. The students who did not go on placements rated research slightly higher compared to the students who went on placements, the reason for this is probably because final year students (those who did not go on placements) had to use this skill more especially in their final year projects compared to the students who were in industry (who at the time of the survey, were still yet to start their final year of degree courses in the University).

Comparison of the Civil Engineering students' ratings on the importance of the following transferable skills:

pre-placement survey vs. post-placement survey

Below is the comparison of the Civil Engineering department students on the importance of developing the transferable skills. The comparison is between their views obtained from the pre-placement and post-placement surveys. Table 5.3.1f summarises the results of the independent t-test between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) and post-placement survey (The views of the Civil Engineering department students who went on placements during the 2005/06 academic year, and completed post-placement questionnaire when they came back from their placements).

Table 5.3.1f: Civil Engineering Students: Pre-placement survey (All Civil Eng. Students) Vs. Post-placement survey (Civil Eng Placement Students 2005/06)

Transferable Skills	Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (wp 2005/06)	5.39 5.33	1.239 1.221	0.837
Ability to solve problems	pre-placement post-placement (wp 2005/06)	5.06 4.77	1.232 1.087	0.241
Ability to work as a team member	pre-placement post-placement (wp 2005/06)	5.29 5.00	1.242 1.192	0.278
Planning and organising skills	pre-placement post-placement (wp 2005/06)	5.10 4.79	1.104 0.951	0.165
Management skills	pre-placement post-placement (wp 2005/06)	4.71 4.38	1.155 1.248	0.203
Technical skills	pre-placement post-placement (wp 2005/06)	4.80 4.34	1.099 0.994	0.050
Personal effectiveness skills	pre-placement post-placement (wp 2005/06)	4.90 4.55	1.195 0.950	0.137
Research skills	pre-placement post-placement (wp 2005/06)	4.16 3.31	1.297 1.301	0.003
Information Technology skills	pre-placement post-placement (wp 2005/06)	4.85 4.51	1.312 1.144	0.228
Decision making skills	pre-placement post-placement (wp 2005/06)	4.78 4.79	1.246 1.105	0.939
Time management	pre-placement post-placement (wp 2005/06)	4.90 5.08	1.387 1.133	0.513

(Sample size: pre-placement survey = 107 students,
post-placement survey (wp 2005/06) = 39 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Table 5.3.1g below summarises the results of the independent t-test analysis between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) and post-placement survey (The views of the Civil Engineering department students who went on placements during the 2006/07 academic year, and completed post-placement questionnaire when they came back from their placements), regarding the importance of developing transferable skills.

Table 5.3.1g: Civil Engineering Students: Pre-placement survey (All Civil Eng. Students) Vs. Post-placement survey (Civil Eng Placement Students 2006/07)

Transferable Skills	Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (wp 2006/07)	5.39 5.53	1.239 0.516	0.660
Ability to solve problems	pre-placement post-placement (wp 2006/07)	5.06 4.53	1.232 0.915	0.131
Ability to work as a team member	pre-placement post-placement (wp 2006/07)	5.29 5.13	1.242 0.743	0.654
Planning and organising skills	pre-placement post-placement (wp 2006/07)	5.10 4.60	1.104 1.183	0.135
Management skills	pre-placement post-placement (wp 2006/07)	4.71 4.13	1.155 1.187	0.095
Technical skills	pre-placement post-placement (wp 2006/07)	4.80 4.20	1.099 1.014	0.066
Personal effectiveness skills	pre-placement post-placement (wp 2006/07)	4.90 4.60	1.195 1.056	0.363
Research skills	pre-placement post-placement (wp 2006/07)	4.16 3.07	1.297 0.961	0.004
Information Technology skills	pre-placement post-placement (wp 2006/07)	4.85 4.47	1.312 0.990	0.253
Decision making skills	pre-placement post-placement (wp 2006/07)	4.78 4.73	1.246 1.100	0.901
Time management	pre-placement post-placement (wp 2006/07)	4.90 5.20	1.387 0.676	0.418

(Sample size: pre-placement survey = 107 students,
post-placement survey (wp 2006/07) = 25 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Table 5.3.1h below summarises the results of the independent t-test analysis between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) versus post-placement survey (The views of the Civil Engineering department students who did not go on placements – Final year students who completed post-placement

questionnaire during the 2006/07 academic year), regarding the importance of developing transferable skills.

Table 5.3.1h: Civil Engineering Students: Pre-placement survey (All Civil Eng. Students) Vs. Post-placement survey (Civil Eng. Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	5.39 5.35	1.239 1.055	0.880
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	5.06 5.08	1.232 0.944	0.932
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	5.29 5.22	1.242 1.101	0.766
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	5.10 5.14	1.104 1.107	0.865
Management skills	pre-placement post-placement (nwp 2006/07)	4.71 4.75	1.155 1.111	0.892
Technical skills	pre-placement post-placement (nwp 2006/07)	4.80 4.70	1.099 0.931	0.641
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	4.90 5.08	1.195 0.812	0.376
Research skills	pre-placement post-placement (nwp 2006/07)	4.16 4.20	1.297 1.184	0.895
Information Technology skills	pre-placement post-placement (nwp 2006/07)	4.85 4.92	1.312 1.093	0.777
Decision making skills	pre-placement post-placement (nwp 2006/07)	4.78 5.16	1.246 1.027	0.098
Time management	pre-placement post-placement (nwp 2006/07)	4.90 5.39	1.387 1.002	0.043

(Sample size: pre-placement survey = 49 students,
post-placement survey (nwp 2006/07) = 51 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

As we can see from tables 5.3.1f/g/h, there was no significant difference on the views of the students from Civil Engineering department regarding the importance of developing most of the transferable skills mentioned above. They rated the importance of the transferable skills mentioned in the tables above almost similar in both surveys. The only significant different again was in one of the transferable skills – research skills. Students who went on placements rated research skills slightly lower compared to the students who did not go on placement, the reason for this as mentioned earlier in this section is because the students who went on placements did not have to use much of this skill compared to those who were in their final year of

their studies (who had to use research skills much more especially in their final year projects).

The results obtained from the students from other departments (Chemical Engineering and IPTME) showed that there was no significant differences, regarding the importance of the transferable skills. Tables 5.3.1i/j below summarises the results of the t-tests analyses of the views of the students from Chemical Engineering students and IPTME students.

Table 5.3.1i: Chemical Engineering Students: Pre-placement survey (All Chemical Eng. Students) Vs. Post-placement survey (Chemical Eng. Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	5.79 5.40	0.485 1.298	0.137
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	5.06 4.73	0.840 1.280	0.297
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	5.56 5.27	0.504 1.335	0.274
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	4.97 5.07	0.770 1.335	0.751
Management skills	pre-placement post-placement (nwp 2006/07)	4.39 4.40	1.029 1.183	0.986
Technical skills	pre-placement post-placement (nwp 2006/07)	4.52 4.33	0.972 1.291	0.591
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	5.00 4.73	0.866 1.223	0.391
Research skills	pre-placement post-placement (nwp 2006/07)	4.48 4.07	1.004 0.799	0.163
Information Technology skills	pre-placement post-placement (nwp 2006/07)	4.90 4.40	0.651 1.242	0.077
Decision making skills	pre-placement post-placement (nwp 2006/07)	4.91 4.73	0.723 1.280	0.546
Time management	pre-placement post-placement (nwp 2006/07)	5.15 5.40	0.870 1.298	0.438

(Sample size: pre-placement survey = 33 students,
post-placement survey (nwp 2006/07) = 15 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Table 5.3.1j: IPTME Students: Pre-placement survey (All IPTME Students) Vs. Post-placement survey (IPTME Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	5.58 5.00	0.584 1.563	0.118
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	5.16 5.20	1.028 1.549	0.929
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	5.20 5.10	1.118 1.524	0.831
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	4.96 4.70	1.060 1.160	0.527
Management skills	pre-placement post-placement (nwp 2006/07)	4.60 4.00	1.118 1.000	0.166
Technical skills	pre-placement post-placement (nwp 2006/07)	4.80 4.70	0.913 0.949	0.774
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	4.84 4.40	1.068 1.174	0.292
Research skills	pre-placement post-placement (nwp 2006/07)	4.44 4.30	1.003 0.949	0.708
Information Technology skills	pre-placement post-placement (nwp 2006/07)	4.84 4.60	0.898 1.174	0.540
Decision making skills	pre-placement post-placement (nwp 2006/07)	4.68 4.70	1.108 1.160	0.963
Time management	pre-placement post-placement (nwp 2006/07)	4.88 4.44	1.054 1.509	0.351

(Sample size: pre-placement survey = 25 students,
post-placement survey (nwp 2006/07) = 10 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

5.3.2 The perceived value of work placements

Ninety six percent of the students who did work placements in 2006/07 agreed or strongly agreed that work placements have helped them to develop their transferable skills.

CV03 – “learning and working in real world is far more beneficial than anything that can be taught at University. You get honours in your degree but that does not mean you will excel out with University. I feel that doing a year out has prepared me significantly for when I do leave University”.

But, again, they rated very low their work placement experience with regards to improving their academic performance on return to University. Table 5.3.2a below

shows the work experience ratings of the students (who did work placements in 2006/07) with regards to future employability, improving transferable skills and with regards to improving academic performance.

Students who did work placement in 2006/07

Table 5.3.2a: Work experience ratings with regards to:

	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Future employability	0	0	0	3	8	14	5.44	0.712	13.09
Improving transferable skills	0	0	1	2	15	7	5.12	0.726	14.18
Improving academic performance	0	2	5	4	11	3	4.32	1.180	27.31

(Sample size = 25 students)
1 = very unimportant, **2** = unimportant, **3** = slightly unimportant.
4 = slightly important, **5** = important, **6** = very important.

Ninety seven percent of the students who did work placements in 2005/06 agreed or strongly agreed that work placements have helped them to develop their transferable skills. Examples from the qualitative data are:
CEM16 – "Skills learnt at work can be transferred to other jobs, industries + general life". But, again similar to the student who did their work placements in 2006/07, they rated very lowly their work placement experience with regards to improving their academic performance on return to University.

Table 5.3.2b below shows the work experience ratings of the students (who did work placements in 2005/06) with regards to future employability, improving transferable skills and with regards to improving academic performance.

Students who did work placement in 2005/06

Table 5.3.2b: Work experience ratings with regards to:

	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Future employability	0	2	1	3	17	15	5.11	1.034	20.23
Improving transferable skills	0	3	3	10	12	10	4.61	1.198	25.99
Improving academic performance	2	1	8	16	7	4	3.97	1.197	30.15

(Sample size = 38 students)
1 = very unimportant, **2** = unimportant, **3** = slightly unimportant.
4 = slightly important, **5** = important, **6** = very important.

Ninety two percent of the students who did not go on work placements, agreed/strongly agreed that the modules in their final year of their degree courses have helped them to improve their transferable skills.

Two further questions in different parts of the questionnaire were asked concerning the specific value of work placement for developing transferable skills. In response to the question ‘is a degree which includes a work placement more effective for the development of transferable skills than a degree course without?’ All students who did work placements in 2005/06 and those who did their placements in 2006/07 said ‘Yes’ / ‘Definitely Yes’. 94.7 percent of the non-placement (final year students 2006/07), also agreed.

As a cross-check, the second question asked the students for their views “if work placements have strong or not much impact on transferable skills” All the students surveyed agreed that work placements have/would have an impact on transferable skills. Again, there was no difference between opinions of the placement and non-placement students, between genders or between engineering disciplines on these issues. These results confirms that the students surveyed value highly work placements as a means of developing transferable skills.

Although students surveyed valued highly work placements as a means of developing transferable skills, there were mixed feelings among the students who went on placements when they were asked if their expectations have been met.
CG02 – “(Definitely Yes), I have enjoyed all aspects of my work placement thoroughly”.

CV04 – “(No), I have only been involved in just small section of the business”.

CG03 – “(Yes), I feel that I could have achieved a lot more within the year, but I have learned a considerable amount about the Oil & Gas industry”.

CV35 – “(Yes), would have enjoyed a wider range and less repetitive type of work”.

CEM_01 – "(No), employer was not interested in developing me in line with my abilities".

CEM_16 – "(Definitely Yes), placements offer good opportunity for personal progression".

CEM_21 – "(No), often staff are too busy/apathetic for effective supervision and mentoring".

5.3.3 Students' self assessment of their transferable skills

Tables 5.3.3a, 5.3.3b, 5.3.3c below, shows the students' self assessment on their level of transferable skills after they have returned from work placements and self assessment of the students who did not go on placements.

Self assessment of transferable skills

Table 5.3.3a: Students who did not go on work placements

Transferable Skills	1	2	3	4	5	6	7	8	9	Mean	Standard Deviation	%CV
Communication skills	0	1	1	5	13	10	23	21	2	6.54	1.465	22.40
Ability to solve problems	0	1	2	1	8	25	26	11	1	6.41	1.231	19.20
Ability to work as a team member	0	1	1	0	4	14	18	31	4	7.11	1.275	17.93
Planning and organizing skills	0	1	1	3	7	16	27	19	2	6.67	1.320	19.79
Management skills	1	2	2	7	17	12	22	11	1	5.96	1.623	27.23
Technical skills	0	0	2	6	13	21	20	12	2	6.25	1.348	21.57
Personal effectiveness skills	0	1	3	2	8	19	25	17	1	6.49	1.381	21.28
Research skills	1	1	4	7	15	13	23	10	2	5.99	1.637	27.33
Information Technology skills	1	2	2	1	9	12	22	23	3	6.63	1.642	24.77
Decision making skills	0	2	1	2	6	15	30	16	4	6.70	1.405	20.97
Time management	0	2	1	2	5	12	23	25	6	6.93	1.482	21.39

(Sample size: 76 students) **1** = Aware of this skill → **9** = Expert

Table 5.3.3b: Students who went on work placements (2006/07)

Transferable Skills	1	2	3	4	5	6	7	8	9	Mean	Std. Dev	%CV
Communication skills	0	0	0	1	3	5	12	4	0	6.60	1.041	15.77
Ability to solve problems	0	0	0	1	3	11	7	2	1	6.36	1.075	16.9
Ability to work as a team member	0	0	0	0	2	4	6	11	2	7.28	1.100	15.11
Planning and organizing skills	0	0	1	0	5	5	6	6	2	6.64	1.469	22.12
Management skills	0	0	2	3	9	5	3	2	0	5.42	1.349	24.89
Technical skills	0	0	0	2	5	7	8	2	1	6.24	1.234	19.78
Personal effectiveness skills	0	0	0	1	5	7	8	4	0	6.36	1.114	17.52
Research skills	0	0	0	2	7	5	6	5	0	6.20	1.291	20.82
Information Technology skills	0	0	0	0	3	5	5	9	3	7.16	1.248	17.43
Decision making skills	0	0	0	0	5	6	9	4	0	6.50	1.022	15.72
Time management	0	0	0	1	1	8	7	7	1	6.84	1.143	16.71

(Sample size: 25 students) **1** = Aware of this skill → **9** = Expert

Table 5.3.3c – students who went on work placements (2005/06)

Transferable Skills	1	2	3	4	5	6	7	8	9	Mean	Standard Deviation	%CV
Communication skills	0	0	2	0	5	13	6	12	0	6.50	1.351	20.78
Ability to solve problems	0	0	0	2	4	16	13	3	0	6.29	0.956	15.2
Ability to work as a team member	0	0	1	0	8	2	11	15	1	6.87	1.359	19.78
Planning and organizing skills	0	0	0	2	7	10	11	7	1	6.45	1.224	18.98
Management skills	0	1	2	4	5	10	9	7	0	6.00	1.577	26.28
Technical skills	1	0	0	5	13	7	8	3	0	5.66	1.419	25.07
Personal effectiveness skills	0	0	0	4	12	6	11	4	0	5.97	1.236	20.7
Research skills	2	0	2	9	9	6	6	1	2	5.22	1.813	34.73
Information Technology skills	0	1	1	4	8	7	10	2	5	6.16	1.732	28.12
Decision making skills	0	0	0	3	6	10	11	7	1	6.42	1.266	19.72
Time management	0	0	0	3	3	8	11	11	2	6.79	1.318	19.41

(Sample size: 38 students) **1** = Aware of this skill → **9** = Expert

The top two skills which students rated themselves highly/competent were: working as a team member and problem solving. The skills which the students considered

were their weakest were: management skills, research skills. These results imply the students feel they are fairly competent but they consider they will need some support whilst on placement or when they start their graduate jobs. Some students assessed themselves very highly/very competent on the skills shown in tables 6.3.3a/b/c, but when they came back after their work experiences, they rated themselves slightly lower/average on the same skills.

From these results one may conclude that, students who went on placements, seems to have improved their transferable skills, but also they realised that their transferable skills were not that high compared to their colleagues / professionals they met/work with in workplace. For those students who did not go on placements, their final year modules had also improved their transferable skills.

The results shown on tables 5.3.3a/b/c were then compared to see if there was any significant differences between the views of the students who went on work placements and the students who did not go on placements on their competence on the transferable skills mentioned in the survey.

Uncorrelated t test were used in the analyses to find if there was any significant differences. Table 5.3.3d & 5.3.3e shows the summary of the results of the analyses:

Comparison of the students' self assessments of their transferable skills' competency – all students who took part in the post-placement survey

From the comparison shown below in tables 5.3.3d/e, there was no significant differences on the self assessment of the students who went on placements and those who did not go on placement. Independent t-test and thematic analysis methods were used to analyse the data. Both groups of students assessed themselves slightly higher on team working skills, communication skills and decision making skills and they assessed themselves slightly lower on research skills and management skills.

But as mentioned in earlier analyses in section 5.2.1 of this chapter, the ratings of the students who went on placements (sample students / who completed both questionnaires) on their self assessment on the same set of skills shows that, these

students assessed their transferable skills lower after their work placements, compared to what they have assessed themselves before they went on placements. This is probably because they have realised that they are not that very competent / experts as they thought before they went on placements, this is probably because after meeting and working with other colleagues who are more experienced / experts in different fields during their work placements they realised their level of competence in different transferable skills mentioned in the surveys.

Table 5.3.3d: Students who went on work placements (2006/07) Vs. Students who did not go on placements

Transferable Skills	Cohort	Mean	Standard Deviation	%CV	Sig. level p value
Communication skills	nwp wp 2006/07	6.54 6.60	1.465 1.041	22.40 15.77	0.849
Ability to solve problems	nwp wp 2006/07	6.41 6.36	1.231 1.075	19.20 16.9	0.847
Ability to work as a team member	nwp wp 2006/07	7.11 7.28	1.275 1.100	17.93 15.11	0.553
Planning and organising skills	nwp wp 2006/07	6.67 6.64	1.320 1.469	19.79 22.12	0.921
Management skills	nwp wp 2006/07	5.96 5.42	1.623 1.349	27.23 24.89	0.141
Technical skills	nwp wp 2006/07	6.25 6.24	1.348 1.234	21.57 19.78	0.974
Personal effectiveness skills	nwp wp 2006/07	6.49 6.36	1.381 1.114	21.28 17.52	0.678
Research skills	nwp wp 2006/07	5.99 6.20	1.637 1.291	27.33 20.82	0.555
Information Technology skills	nwp wp 2006/07	6.63 7.16	1.642 1.248	24.77 17.43	0.141
Decision making skills	nwp wp 2006/07	6.70 6.50	1.405 1.022	20.97 15.72	0.526
Time management	nwp wp 2006/07	6.93 6.84	1.482 1.143	21.39 16.71	0.772

(Sample size: nwp = 76 students, wp 2006/07 = 25 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Table 5.3.3e: Students who went on work placements (2005/06) Vs. Students who did not go on placements

Transferable Skills	Cohort	Mean	Standard Deviation	%CV	Sig. level
Communication skills	nwp wp 2005/06	6.54 6.50	1.465 1.351	22.40 20.78	0.890
Ability to solve problems	nwp wp 2005/06	6.41 6.29	1.231 0.956	19.20 15.2	0.589
Ability to work as a team member	nwp wp 2005/06	7.11 6.87	1.275 1.359	17.93 19.78	0.357
Planning and organising skills	nwp wp 2005/06	6.67 6.45	1.320 1.224	19.79 18.98	0.373
Management skills	nwp wp 2005/06	5.96 6.00	1.623 1.577	27.23 26.28	0.901
Technical skills	nwp wp 2005/06	6.25 5.66	1.348 1.419	21.57 25.07	0.032
Personal effectiveness skills	nwp wp 2005/06	6.49 5.97	1.381 1.236	21.28 20.7	0.050
Research skills	nwp wp 2005/06	5.99 5.22	1.637 1.813	27.33 34.73	0.025
Information Technology skills	nwp wp 2005/06	6.63 6.16	1.642 1.732	24.77 28.12	0.162
Decision making skills	nwp wp 2005/06	6.70 6.42	1.405 1.266	20.97 19.72	0.293
Time management	nwp wp 2005/06	6.93 6.79	1.482 1.318	21.39 19.41	0.598

(Sample size: nwp = 76 students, wp 2005/06 = 39 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Comparison of the Civil Engineering students' self assessment on their competency in transferable skills mentioned on the surveys:

pre-placement survey vs. post-placement survey

Below is the comparison of the Civil Engineering department students on their self assessment on the transferable skills. The comparison is between their views obtained from the pre-placement and post-placement surveys. Table 5.3.3f below summarises the results of the independent t-test between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) and post-placement survey (The views of the Civil Engineering department students who went on placements during the 2005/06 academic year, and completed post-placement questionnaire when they came back from their placements).

Table 5.3.3f: Students who went on work placements (2005/06) Vs. Students who did not go on placements

Transferable Skills	Survey / Cohort	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (wp 2005/06)	6.61 6.50	1.552 1.351	0.720
Ability to solve problems	pre-placement post-placement (wp 2005/06)	6.33 6.29	1.463 0.956	0.893
Ability to work as a team member	pre-placement post-placement (wp 2005/06)	7.14 6.87	1.472 1.359	0.375
Planning and organising skills	pre-placement post-placement (wp 2005/06)	6.63 6.45	1.577 1.224	0.552
Management skills	pre-placement post-placement (wp 2005/06)	5.96 6.00	1.767 1.557	0.911
Technical skills	pre-placement post-placement (wp 2005/06)	6.19 5.66	1.620 1.419	0.116
Personal effectiveness skills	pre-placement post-placement (wp 2005/06)	6.33 5.97	1.492 1.236	0.238
Research skills	pre-placement post-placement (wp 2005/06)	5.71 5.22	1.989 1.813	0.243
Information Technology skills	pre-placement post-placement (wp 2005/06)	6.76 6.16	1.995 1.732	0.146
Decision making skills	pre-placement post-placement (wp 2005/06)	6.43 6.42	1.780 1.266	0.982
Time management	pre-placement post-placement (wp 2005/06)	6.27 6.79	1.759 1.318	0.134

(Sample size: pre-placement survey = 107 students,
post-placement survey (wp 2005/06) = 39 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

The results of the t test as shown on table 5.3.3f above shows that there is no differences on the self assessment of the students from Civil Engineering department who went on placements during the 2005/06 academic year and the students who did not go on placements.

Table 5.3.3g below summarises the results of the independent t-test analysis between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) and post-placement survey (The views of the Civil Engineering department students who went on placements during the 2006/07 academic year, and completed post-placement questionnaire when they came back from their placements), on their self assessment of their competence in the transferable skills mentioned below.

Table 5.3.3g: Students who went on work placements (2006/07) Vs. Students who did not go on placements

Transferable Skills	Survey / Cohort	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (wp 2006/07)	6.61 6.67	1.552 0.816	0.897
Ability to solve problems	pre-placement post-placement (wp 2006/07)	6.33 6.27	1.463 0.799	0.880
Ability to work as a team member	pre-placement post-placement (wp 2006/07)	7.14 7.27	1.472 1.033	0.763
Planning and organising skills	pre-placement post-placement (wp 2006/07)	6.63 6.60	1.577 1.183	0.941
Management skills	pre-placement post-placement (wp 2006/07)	5.96 5.33	1.767 1.234	0.207
Technical skills	pre-placement post-placement (wp 2006/07)	6.19 6.20	1.620 1.207	0.978
Personal effectiveness skills	pre-placement post-placement (wp 2006/07)	6.33 6.40	1.492 0.986	0.872
Research skills	pre-placement post-placement (wp 2006/07)	5.71 5.73	1.989 1.223	0.964
Information Technology skills	pre-placement post-placement (wp 2006/07)	6.76 7.00	1.995 1.195	0.954
Decision making skills	pre-placement post-placement (wp 2006/07)	6.43 6.53	1.780 1.060	0.830
Time management	pre-placement post-placement (wp 2006/07)	6.27 6.80	1.759 1.014	0.274

(Sample size: pre-placement survey = 107 students,
post-placement survey (wp 2006/07) = 25 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Similar to the results obtained from the previous table (Table 5.3.3g), there was no difference between the self assessments of the students who went on placements during the academic year 2006/07 and the students who did not go on placement (final year students 2006/07 – Civil Engineering department).

Table 5.3.1h below summarises the results of the independent t-test analysis between the pre-placement survey (The views of all the students from Civil Engineering department who completed pre-placement questionnaire) versus post-placement survey (The views of the Civil Engineering department students who did not go on placements – Final year students who completed post-placement questionnaire during the 2006/07 academic year), on their self assessment of their competence in the transferable skills.

Table 5.3.3h: Civil Engineering Students: Pre-placement survey (All Civil Eng. Students) Vs. Post-placement survey (Civil Eng. Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Cohort	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	6.61 6.51	1.552 1.541	0.741
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	6.33 6.46	1.463 1.199	0.620
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	7.14 6.98	1.472 1.391	0.575
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	6.63 6.69	1.577 1.393	0.857
Management skills	pre-placement post-placement (nwp 2006/07)	5.96 6.18	1.767 1.521	0.507
Technical skills	pre-placement post-placement (nwp 2006/07)	6.19 6.33	1.620 1.306	0.622
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	6.33 6.47	1.492 1.447	0.644
Research skills	pre-placement post-placement (nwp 2006/07)	5.71 6.00	1.989 1.766	0.442
Information Technology skills	pre-placement post-placement (nwp 2006/07)	6.76 6.56	1.995 1.692	0.601
Decision making skills	pre-placement post-placement (nwp 2006/07)	6.43 6.82	1.780 1.452	0.226
Time management	pre-placement post-placement (nwp 2006/07)	6.27 6.84	1.759 1.629	0.096

(Sample size: pre-placement survey = 49 students,
post-placement survey (nwp 2006/07) = 51 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

Similar to the results obtained from the two previous tables, there was no difference on the self assessment of the student from Civil Engineering department who completed pre placement survey and the students who completed post placement survey (those who did not go on placement).

Comparison of the Chemical Engineering students' self assessment on their competency in transferable skills mentioned on the surveys:
pre-placement survey vs. post-placement survey

Below is the comparison of the Chemical Engineering department students on their self assessment on the transferable skills. The comparison is between their views obtained from the pre-placement and post-placement surveys. Table 5.3.3i below summarises the results of the independent t-test between the pre-placement survey

(The views of all the students from Chemical Engineering department who completed pre-placement questionnaire) and post-placement survey (The views of the Chemical Engineering department students who did not go on placements, final year students during the 2005/06 academic year).

Table 5.3.3i: Chemical Engineering Students: Pre-placement survey (All Chemical Eng. Students) Vs. Post-placement survey (Chemical Eng. Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Cohort / Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	6.61 6.51	1.552 1.541	0.036
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	6.33 6.46	1.463 1.199	0.060
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	7.14 6.98	1.472 1.391	0.018
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	6.63 6.69	1.577 1.393	0.199
Management skills	pre-placement post-placement (nwp 2006/07)	5.96 6.18	1.767 1.521	0.158
Technical skills	pre-placement post-placement (nwp 2006/07)	6.19 6.33	1.620 1.306	0.059
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	6.33 6.47	1.492 1.447	0.050
Research skills	pre-placement post-placement (nwp 2006/07)	5.71 6.00	1.989 1.766	0.520
Information Technology skills	pre-placement post-placement (nwp 2006/07)	6.76 6.56	1.995 1.692	0.135
Decision making skills	pre-placement post-placement (nwp 2006/07)	6.43 6.82	1.780 1.452	0.046
Time management	pre-placement post-placement (nwp 2006/07)	6.27 6.84	1.759 1.629	0.026

(Sample size: pre-placement survey = 33 students,
post-placement survey (nwp 2006/07) = 15 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

From the above comparison shown on table 5.3.3i between the pre placement self assessment and the post placement self assessment of the students (who did not go on placement – final year students 2006/07 academic year) from Chemical Engineering department, shows that there was some significant differences in some of the skills i.e. during the pre placement survey, these students assessed themselves slightly higher on ability to work as a team member, communication skills compared to what they have assessed themselves on post placement survey in the

same skill. This shows that as the students progress during their studies and as they get involved more in some of the skills they realise that they are not that experts as they first thought. But in some transferable skills (i.e. time management, personal effectiveness, technical skills, decision making and ability to solve problems skills), they have assessed themselves slightly higher in the second survey.

Comparison of the IPTME students' self assessment on their competency in transferable skills mentioned on the surveys:

pre-placement survey vs. post-placement survey

Below is the comparison of the IPTME department students on their self assessment on the transferable skills. The comparison is between their views obtained from the pre-placement and post-placement surveys. Table 5.3.3j below summarises the results of the independent t-test between the pre-placement survey (The views of all the students from IPTME department who completed pre-placement questionnaire) and post-placement survey (The views of the IPTME department students who did not go on placements, final year students during the 2005/06 academic year). The results show that there are no significant differences on their assessments.

Table 5.3.3j: IPTME Students: Pre-placement survey (All IPTME Students) Vs. Post-placement survey (IPTME Students who did not go on placements – Final year students 2006/07)

Transferable Skills	Cohort / Survey	Mean	Std. Dev.	Sig. level p value
Communication skills	pre-placement post-placement (nwp 2006/07)	6.61 6.51	1.552 1.541	0.134
Ability to solve problems	pre-placement post-placement (nwp 2006/07)	6.33 6.46	1.463 1.199	0.607
Ability to work as a team member	pre-placement post-placement (nwp 2006/07)	7.14 6.98	1.472 1.391	0.698
Planning and organising skills	pre-placement post-placement (nwp 2006/07)	6.63 6.69	1.577 1.393	0.860
Management skills	pre-placement post-placement (nwp 2006/07)	5.96 6.18	1.767 1.521	0.171
Technical skills	pre-placement post-placement (nwp 2006/07)	6.19 6.33	1.620 1.306	0.818
Personal effectiveness skills	pre-placement post-placement (nwp 2006/07)	6.33 6.47	1.492 1.447	0.767
Research skills	pre-placement post-placement (nwp 2006/07)	5.71 6.00	1.989 1.766	0.784
Information Technology skills	pre-placement post-placement (nwp 2006/07)	6.76 6.56	1.995 1.692	0.240
Decision making skills	pre-placement post-placement (nwp 2006/07)	6.43 6.82	1.780 1.452	0.285
Time management	pre-placement post-placement (nwp 2006/07)	6.27 6.84	1.759 1.629	0.878

(Sample size: pre-placement survey = 25 students,
post-placement survey (nwp 2006/07) = 10 students)
Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.

5.3.4 Comparison of the students' overall post – placement survey's results

Below is the comparison of the students' overall post – placement results. Table 5.3.4a, presents a summary of the scores for importance and self assessment of the transferable skills from the post placements survey's data obtained from the final year students (2006/07 academic year) / students who did not go on work placements. The rank orders are shown in brackets. The results of the analysis showed that there was a significant correlation between the importance of the skill and their self-assessment of their competence (rho (ρ) = 0.74, p = 0.01).

Table 5.3.4a: Students who did not go on work placements

(Final Year Students 2006/07)

Transferable Skills	Importance	Self Assessment
Communication skills	5.32 (5)	6.54 (8)
Ability to solve problems	5.03 (3)	6.41 (2)
Ability to work as a team member	5.21 (8)	7.11 (1)
Planning and organising skills	5.07 (7)	6.67 (3)
Management skills	4.59 (10)	5.96 (10)
Technical skills	4.63 (2)	6.25 (7)
Personal effectiveness skills	4.92 (1)	6.49 (5)
Research skills	4.18 (11)	5.99 (11)
Information Technology skills	4.78 (9)	6.63 (9)
Decision making skills	5.01 (6)	6.70 (4)
Time management	5.28 (4)	6.93 (3)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important
Rank orders in brackets.

Table 5.3.4b below, presents a summary of the scores for importance and self assessment of the transferable skills from the post placements survey's data obtained from the students who did their work placements in 2005/06. The rank orders are shown in brackets. The results of the analysis showed that there was a high significant correlation between the importance of the skill and their self assessment of their competence (rho (ρ) = 0.93, $p < 0.01$).

Table 5.3.4b: Students who went on work placements (2005/06)

Transferable Skills	Importance	Self Assessment
Communication skills	5.33 (6)	6.50 (7)
Ability to solve problems	4.77 (4)	6.29 (1)
Ability to work as a team member	5.00 (8)	6.87 (5)
Planning and organising skills	4.79 (1)	6.45 (2)
Management skills	4.38 (10)	6.00 (9)
Technical skills	4.34 (5)	5.66 (8)
Personal effectiveness skills	4.55 (2)	5.97 (6)
Research skills	3.31 (11)	5.22 (11)
Information Technology skills	4.51 (9)	6.16 (10)
Decision making skills	4.79 (7)	6.42 (4)
Time management	5.08 (3)	6.79 (3)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.
Rank orders in brackets.

Table 5.3.4c: Students who went on work placements (2006/07)

Transferable Skills	Importance	Self Assessment
Communication skills	5.56 (1)	6.60 (3)
Ability to solve problems	4.76 (4)	6.36 (5)
Ability to work as a team member	5.24 (3)	7.28 (1)
Planning and organizing skills	4.72 (9)	6.64 (10)
Management skills	4.20 (10)	5.42 (11)
Technical skills	4.28 (7)	6.24 (8)
Personal effectiveness skills	4.60 (8)	6.36 (7)
Research skills	3.48 (11)	6.20 (9)
Information Technology skills	4.56 (5)	7.16 (6)
Decision making skills	4.76 (6)	6.50 (2)
Time management	5.24 (2)	6.84 (4)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.
Rank orders in brackets.

Table 5.3.4c above, presents a summary of the scores for importance and self assessment of the transferable skills from the post placements survey's data obtained from the students who did their work placements in 2006/07. The rank orders are shown in brackets. The results of the analysis showed that there was a significant correlation between the importance of the skill and their self assessment of their competence (rho (ρ) = 0.67, p = 0.24).

5.4 Summary

In general, the majority of students (more than 90%) valued work placements highly as a means of developing transferable skills but they had less confidence that work placements would assist them to obtain better degrees. Academic performances of the students from three departments (Civil Engineering, Chemical Engineering and IPTME) are discussed on chapter 7 of this thesis. The students who went on placements assessed their competence of their transferable skills slightly lower after their work placements compared to what they have assessed themselves before they went on placements, this is probably because they have realised that they are not experts in some skills as they thought, after comparing themselves with their colleagues at work.

Chapter Six: Analysis of Line Managers and DIS Tutors' Perceptions

6.0 Introduction

This chapter reports the views of line managers and DIS (Diploma in Industrial Studies) tutors on the impact of work placements on the development of transferable skills. As mentioned earlier in chapter three, the method used to analyse the qualitative data was 'framework analysis' (Ritchie and Spencer, 2004). In this approach themes were identified from the data obtained from the questionnaires, interviews and focus group. The data were examined to determine if the themes were present and whether other unexpected themes were also present. This method was used by Little and Harvey (2006) in their study of students' views of work placements in which they list several quotations to illustrate their views.

The themes used in the framework analysis are:

- The perceived value of work placements
- Benefits of placements to students and employers
- Preparation for placements
- Students awareness of the value of work placements
- The importance of work placements for developing transferable skill
- The impact of work placements on academic performance
- Alternatives to work placements

It should be noted that the content of these themes overlap.

6.1 Data collection and analysis

The line managers were from 19 different Engineering companies which takes students on placements from three departments (Chemical Engineering, Civil Engineering and IPTME) at Loughborough University. Twenty six line managers took part in the surveys (interviews, focus group and questionnaires), eight in one to one interviews in their companies, three line managers from one company requested to have a focus group, 1 interview took place in the Civil Engineering department, 3 telephone interviews and 11 line managers completed the questionnaires by email.

The line managers were from the following companies: Lubrizol Ltd., Tyco Electronics, BP, Balfour Beatty, Interserve, British Sugar, Diageo, Rolls Royce, Cytec Engineering Material Ltd., Smiths Medical International, Johnson Matthey Catalysts, GE Infrastructure, British Nuclear Group, Lucite International, Perenco, BS Motorsport Ltd., Avon Technical Products, Perkins Engines, and Audi.

Five (DIS) tutors from Loughborough University also participated in interviews. The lecturers were from Chemical Engineering, Civil Engineering and IPTME departments. The lecturers who took part in the interview had experience in supervising students who did work placements in different companies.

A semi-structured interview schedule for use with the line managers and the DIS tutors was designed and piloted. The schedule was based upon the key questions in the students' pre and post – placement questionnaires and a series of open questions (see Appendices 3 and 4). A pilot interview was audio recorded with a member of engCETL. Its purpose was to check the understandability of the questions, to time the interview and to obtain feedback on interviewing techniques.

The discussions with the pilot interviewees confirmed the questions were appropriate and understood. A member of CETL suggested that the interviewer (me) should allow time for interviewees to respond, to not interrupt the interviewees and to reduce the number of repetition of what I said. The line managers and tutors' interviews took about fifteen minutes. The line manager's questionnaire, completed by those who could not be interviewed, took about 20 minutes to complete.

The interviews were recorded, transcribed and analysed by the researcher. An independent observer checked the categories and carried out a blind analysis of a sample of the transcripts and the data obtained from the questionnaires and interviews. The degree of agreement between the researcher and the observer gave a high degree of inter-rater reliability.

6.1.1 The perceived value of work placements

Most of the line managers and all the DIS tutors interviewed valued work placements highly. They considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Most of the line managers and all five tutors stressed that work placements increased the confidence and maturity of the students. Communication skills, particularly presentation and report writing, were thought to be important and did improve on work placements as did technical skills, practical problem solving, team working and time management. It was thought that the students also gained knowledge of how companies operate and these experiences help them to decide on their careers. Both Line managers and the DIS tutors believe that most students gain an appreciation of how things work or 'get done' in industry. They develop in self-confidence, learn how to work in teams, and learn about how to get their ideas across. At the same time the students are able to develop some ideas about how they want their career to develop. Some line managers pointed to the particular benefits for foreign students. They believe that work placements enable the foreign students to improve their English language skills as well as their engineering abilities.

All line managers and tutors valued particularly the work placement of one year. The line managers stressed that one year gives the student enough time to learn and demonstrate their capabilities in a realistic working environment. Students on placements are given real tasks and often significant levels of responsibilities and these help them to decide whether they wish to work in engineering when they graduate. The one year placement provides the companies with enough time to benefit from the students' contributions and a longer time to assess the students, should they wish to offer them full time employment after they have graduated.

In contrast, shorter placement do not benefit companies sufficiently as it takes at least three months for the students to understand the systems, procedures and processes before they can contribute useful work. Line managers also consider that summer placements are not practicable because during this period there is never enough experienced staff to supervise the students. They pointed out that companies have to spend more time and money on training, particularly because of health and

safety legislation, so a three month placement is not enough to recoup the value that they have invested. One line manager pointed to the difficulty of accommodating students from universities who not follow the conventional system of work placements.

The tutors also valued highly a work placement of one year. They pointed out that a one year placement is much better for the professional and personal development of students. They considered it improved the transferable skills of students, provided them with a rich experience, gave them an opportunity to take more responsibility and better equipped them for their future careers. Some students, towards the end of their one year work placements, are in charge of contracts or are leading projects. In contrast, students on shorter placements are often given low grade jobs which do not further their development. Even if their jobs are challenging, the students barely have time in three month placements to develop and apply their transferable skills. They often are just beginning to acquire expertise when they have to return to University.

Table 6.1.1a – Summary of the themes and quotations for section 6.1.1

Perceived value of work placements • *Knowledge of the company* • *Confidence and maturity of the students.* • *Transferable skills and experience are all thought to improve*	
Line managers quotations	***DIS tutors quotations***
LM8 *– "They are learning to apply their Chemistry knowledge in commercial environment, they usually almost all of them are becoming less shy, and lot more open, and a lot more happier to deal with people, obviously they are used to deal with the people of their ages but probably not that much dealing with adults or whatever, you see their communication improving a lot both written and oral and you see them gaining more confidence".* ***LM10*** *– "For foreign student is language,*	***T003*** *– "Because the degree course only, you do not relate anything. Also the degree course which include work placement helps the students maturity".* ***T004*** *– "There is nothing like the impact at real deadlines and the financial impact at mistakes or tardiness".* ***T005*** *– "Evidence: demonstration of maturity in academic life in final year, which often shows itself as getting a grade better than predicted. Also the confidence built probably*

technical knowledge as well improve across for any other student and also their dexterity, their ability to handle materials and confidence is much higher".	*stands students in good stead for job interview / employment".*

As we can see from the line managers and tutors' quotations on tables 6.1.1a and b, they are very supportive of the idea of work placements for the students in order to help them acquire and improve their transferable skills, as indicated above the duration of the work placements they prefer is one year. These findings are in line with the views of work placements identified in the literature review (Chapter 2, section 2.16.1).

Table 6.1.1b – Summary of the themes and quotations for section 6.1.1

Duration of the placement: one year placement is preferred • *One year placement is better for helping the students to develop their transferable skills, gain experience and increase their maturity and build their confidence* • *Benefit for the companies* • *Benefit for the students* • *Obstacles*	
Line managers quotations	***DIS tutors quotations***
LM15 *– "It gives the student a decent length of time to learn from the experience and also gives our company a chance to benefit from the placement".* ***LM10*** *– "The students benefits the most from having a year placement, their contribution is much higher in the last 6 months compared to the first 6 months. So its much more valuable to both parties and it can take about 6 months before they really start to positively contribute".* ***LM9*** *– "Our industry sector requires close supervision for the first six months and its only in the second six months we regain the*	***T001*** *– "Length of Placement and again talking to Industrial supervisors, they do like overlap so the students from the previous year can help the new students to climatise".* ***T002*** *– "Longer placements are better i.e. 45 weeks, than doing shorter placements, because they".* ***T004*** *– "Thin/thick sandwiches. Time to be trained and participate in great, 6 months each".* ***T002*** *– "What we tend to find is that, the students who go out in industry, come back significantly more mature than when they left, there is a noticeable different when they go out till when they come back, in terms they*

cost of supervision and training". ***LM3*** *– "A one-year placement is very useful. However, we have taken fewer students on one-year placements in recent years because there have been fewer candidates with the abilities we look for, with most students only available for summer vacation placements. In general, Universities which look for placements on a radically different timetable to the others (i.e. not summer or not one year (July-June)) are much more difficult for us to deal with".*	*have all grown up and they are more sensible than before they went out, maturity, time management, decision making skills, perhaps bit more common sense, those sort of things they are more effective when they come back".*

6.1.2 Benefits of placements to students and employers

Most of the line managers and tutors stressed that work placements helped students to make sensible career choices and improve their employability. The students can either confirm (or otherwise) that they have chosen the right field of work for them. This benefit was in addition to the development of their transferable skills, confidence, and maturity as mentioned in section 6.1.1. It was also suggested by both line managers and tutors that work placements provide the opportunity for students to apply their knowledge gained in University to a real work environment and this helps the students to have a deeper understanding and more enthusiasm for the subjects they are studying because they see the relevance of study to the work they will be doing as engineers.

When the tutors were asked what they thought employers gained most from work placements, most of them said that employers regard the placement as a recruitment process, 'a year long job interview' of the student. Some mentioned that employers benefited from the students' enthusiasm for work in engineering. Others pointed out that although, initially, a student might not be the best person for doing the job the company wants, by the end of the year placement, the company have usually trained an Engineer whom they may want to employ after his/her graduation. The tutors

reported that some employers who visited the University to interview their students for work placements vacancies openly stated that work placement was for job recruitment purposes. This finding is in line with the survey conducted by the National Council for Work Experience (NCWE, 2003) which showed that one of the reasons for the employers to provide work placements for students was to recruit permanent staff.

However both tutors and line managers also think work placements helps the profession and industry by providing training, contributing to the education of students and developing links between the industries and Universities.

Table 6.1.2 – Summary of the themes and quotations for section 6.1.2

<table>
<tr><td colspan="2">Benefits of placements
• Helps the profession
• Confidence and maturity of the students
• Improvement of the students' transferable skills
• Improves the students careers choice and employability
• Better chance of getting a job after they have finish their degree course
• Recruitment process of good students, also provides one year 'interview'</td></tr>
<tr><td>Line managers quotations</td><td>DIS tutors quotations</td></tr>
<tr><td>LM1 – "Permanent job after graduating, confirming career choice".

LM6 – "Practical application of their degree and becoming used to the working environment and culture",.

LM9 – "Specific technical skills are developed".</td><td>T001 – "Experience, probably the personal effectiveness again, because they learn to use their knowledge and personal effectiveness in order to gain the best experience."

T002 – "Whether they realise or not, I think what they get out of it, they get work experience, good practical knowledge, they get responsibility which improves their personal skills and the ability to get on with people, so they develop as a people and they become more mature, I think the other thing they get out of it is they get better chance of getting the job + also most of them who are working at the moment have got job</td></tr>
</table>

	offers by the time they come back, so it does improve their employability, there is no doubt about that". ***T004*** *– "Partly trained Engineers who in general can quickly fit into a defined role. Training in a company which can hopefully lead to a permanent job. The opportunity for a 12 months interview".*

6.1.3 Preparation for placements

Line managers were asked what would they like students to be able to do before they go on work placements. This question was asked in order to identify the employers' expectations and to help the students prepare for work placements. Three themes emerged from the responses to this question: some technical knowledge, transferable skills, expectation/job roles and willingness to learn. With hindsight, this question should also have been asked of DIS tutors.

LM6 *– "No. 1 - have a good grasp of the Engineering subject they have been studying. No. 2 - be willing to learn".*

LM4 *– "Be technically proficient and have a high bias for action".*

LM11 *– "I think they need to be able to understand the basics of the job role. The expectations of what are they going to do".*

One manager also stressed that students should be willing to learn to work independently,

LM3 *– "The biggest issue for me is the ability to handle substantial pieces of work without needing intervention on a frequent basis. This is mainly about planning, making best use of inadequate data, and having confidence in their own ability".*

And another line manager added that, the students have already proved that they work hard.

LM7 *– "There are so many different industrial environments that it would be quite difficult to identify anything specifically. I suppose that working hard on their academic studies is the most obvious one".*

Other line managers looked for team skills and enthusiasm,

Focus Group (LM12, LM13, LM14) *– "We tend to look students from different background, more recently we actually being doing a lot of selection, based on personality that fits in the group, if we can find people who can fit in the group, because we know they have got a science background. As long as they are enthusiastic".*

Table 6.1.3 – Summary of the themes for section 6.1.3

Main theme	***Sub-themes***
Preparation for placements.	• *Technical knowledge.* • *Transferable skills.* • *Expectation and willingness to learn.*

6.1.4 Students' awareness of the value of work placements

Most line managers and all five tutors agreed that most students are aware of the value of work placements in their degree curriculum. They report that many students comment that work placements provide them with opportunities to apply some of their academic learning to a work environment, that students consider work placements improve their transferable skills whilst at the same time enabling them to earn salaries. Line managers and tutors also mentioned that students are aware that work placements motivated and helped them to make career choices (see also Section 6.1.2).

But some line managers had mixed feelings about students' awareness of work placements. They thought that some students either did not value or were not aware of the benefits of the work placements. A few thought that some students probably do not want to do work placements because the additional year on the degree course can delay the repayment of their student loans. A few pointed out that foreign

students were aware of the value of work placements for improving their English as well as their engineering skills.

Table 6.1.4 – Summary of the themes and quotations for section 6.1.4

Perception of the students' awareness of the values of work placements • *Opportunity to earn salary* • *Opportunity for students to gain experience* • *Improvement of the students transferable skills* • *For foreign students, it improves their English language* • *Opportunity for students to apply academic knowledge to a work environment*	
Line managers quotations	***DIS tutors quotations***
LM5 *– "It breaks up what would otherwise be 3 - 4 academic years and provides an opportunity to practice some of the academic teachings in a work environment. Chance to earn some money part way through a degree".* ***LM10*** *– "I have seen students who have not valued it and wondered why they wanted to do it in the first place. But in particularly foreign students for example French students, do seem to value the opportunity more, I think because they develop their language skills as well".* ***LM3*** *– "Yes - though if it extends the length of degree it is becoming a more difficult decision now that student finances are more challenging. The extra year on work placement delays the start of repayment of their loans, and I am seeing many students from universities which traditionally encourage students to do 'thick sandwich' courses opting not to do their year in industry".*	***T001*** *– "Definitely. We do survey out students at the end, and when it comes to what is the best part of the course, undoubtedly it's the industrial training which comes as being the best bit. So yes, they do value highly".* ***T003*** *– "Yes, actually they learn a lot".* ***T004*** *– "They value the opportunity to gain experience and a salary".*

6.1.5 The importance of work placements for developing transferable skills

DIS tutors and line managers all agreed that work placements were important for developing transferable skills. There was close agreement on which skills were most important to develop on work placements (see Table 6.1.5a). The top three of the DIS tutors were 'communication skills', 'personal effectiveness', and 'team working'. The lowest ratings were given to 'management skills' and 'information technology skills'. For line managers the top three were 'communication skills', 'team working' and 'technical skills', the lowest ratings were for 'management skills', 'information technology skills' and 'research skills'.

Table 6.1.5a: The importance of work placements for developing transferable skills

Transferable Skills	DIS Tutors	Line Managers
Communication skills	5.80 (1)	5.53 (1)
Ability to solve problems	5.20 (6)	5.00 (4)
Ability to work as a team member	5.60 (3)	5.20 (2)
Planning and organising skills	4.80 (8)	4.67 (7)
Management skills	3.60 (11)	3.27 (11)
Technical skills	5.20 (5)	5.07 (3)
Personal effectiveness skills	5.60 (2)	4.87 (6)
Research skills	4.20 (9)	4.13 (9)
Information Technology skills	4.00 (10)	4.07 (10)
Decision making skills	5.00 (7)	4.13 (8)
Time management	5.40 (4)	4.93 (5)

Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.
Rank orders in brackets

All line managers and tutors agreed that work placements were important for developing transferable skills and that some transferable skills can be developed better in a work place than in an academic environment. One tutor pointed out that transferable skills are often learnt informally on work placements, almost as a bi-product of doing technical work. Another pointed out that students are more likely to receive regular feedback on their skills from line managers than they might from their tutors. A line manager thought that work experience usually reveals what skills the students already have rather than actually developing them. Another line manager

pointed out that work experience is only important in the development of transferable skills if the quality of supervision is high.

When the line managers were asked if a degree course which includes a work placement is more effective for the development of transferable skills than a degree course without, all of them agreed. They considered that work placements give students experiences and opportunities to develop transferable skills which are not possible in an academic environment. But one line manager believes that, whilst work placements were probably the best approach, many of the skills could be developed reasonably effectively during a degree course.

Table 6.1.5b – Summary of the themes and quotations for section 6.1.5

The importance of work placements for developing transferable skills • *Opportunity to work in real work environment* • *Students gets feedbacks from their line managers* • *Level of supervision for the students has to be high*	
Line managers quotations	***DIS tutors quotations***
LM5 *– "Opportunity to work in a team in a real work environment. Communication and presentation at all levels. May be opportunities for formal training in time management, influencing skills, negotiating skills etc".* ***LM15*** *– "The student is placed in a situation where he/she is using these skills daily and getting coaching and feedback on a regular basis".* ***LM7*** *– "Yes. However, the level of supervision that the student receives has to be rather high. One major danger is the apathy of certain students towards their personal developments. If the student does not get pushed and stimulated by his/her industrial supervisor, there could be a lack of*	***T001*** *– "Yes, all the skills (on table 6.2 above), apart from the IT because they are probably already pretty good on that and time management. We are more relaxed about time management in the University whereas in the company they are very keen on it".* ***T003*** *– "Because they get feedback from their line managers, also report writing helps them".* ***T004*** *– "By a process of osmosis. The transferable skills probably came as a bi-product of carrying out the 'technical' job, whether if is design, construction, manufacturing or project management".*

development during that time. Had a student decided to stay at University rather than doing a placement, he would have been stimulated by project/examinations deadlines etc". ***LM3*** *– "There should normally be opportunities to work in teams, solve problems, present conclusions, and recommend courses of action. But, ultimately, I think the work placement more usually reveals what skills the student already has, more than actually developing them".* ***LM6*** *– "This gives the person experience of the working environment, the expectations and the culture. It also provides an environment where the knowledge they have gained form University can be practically applied".* ***LM3*** *– "A work placement clearly has some value in the development of transferable skills, though it is not clear to me (i) whether a formal/official placement is entirely necessary, and (ii) how long it needs to be. Many of the skills above could be developed reasonably effectively during the degree course".*	

6.1.6 The impact of work placements on academic performance

There was a divided opinion amongst the line managers and tutors whether work placements impacted on students' academic performance. About 50% of the line managers did not think that work placements would help students to obtain a better

degree. Many of the DIS tutors were not convinced that work placements necessary help students to obtain a better degree. They pointed out that work placements can have a differential effect. Work placements can sometimes motivate some students to study and sometimes work placements get some students out of the study habit. But the main theme which emerged from the discussions with line managers and tutors was that the more academic students gained most from work placements.

These mixed views reflect the conflicting findings in the literature (see Chapter 2). Some writers (Bourner and Ellerker, 1993; Leslie and Richardson, 1999) argue that if placement experience is properly structured and managed then a beneficial effect on academic achievement should be seen on a return to the final year. Ryan *et al*. (1996) warn that a poorly structured work placement can have a negative impact. Poorly structured work placements can also have negative impact on the students' degree and employability when they graduate. The study carried out at CHERI (Centre for Higher Education Research and Information) in 2002 found out that, students who did a large amount of work experience unrelated to their studies had negative effect on their employability after they have graduated (cited by HEFCE, 2002). Gomez *et al.* (2004) claimed that students taking a sandwich placement exhibit improved academic performance in their final year results compared to those students who did not do work placements. Duignan (2002) found no significant differences. Chapter seven of this thesis reports and discusses the findings that students in this research who did go on work placements usually obtained better degrees.

T001 *– "Yes, definitely. One reason might be because of maturity, and another reason behind that is the development of personal effectiveness skills, because if you develop your personal effectiveness in the year out, the likelihood is when you come back, its going to help you and of course having a year experience/practical experience related to your subject should help"*

T002 *– "I think that, it does make a difference and the students gets better results, if you have got a student who is on the borderline between two degree classifications, having work and understanding of what they have done in the first two years of the course, realising bit more of the industry, they become more motivated, they are better at time management, they are more focused and matured towards their studies and consequently they tends to work bit*

harder, which means they can tip the boundary, I would not say that it will move everyones' degree class but it makes difference to some, in terms if they are on the boundary it will push them over the boundary".

T003 *– "Sometimes. It motivate some students and it can get the students out of the study habit".*

T004 *– "No idea. Do students get better degrees because of work placement or do the better (& more interested students) choose to do work placements".*

Table 6.1.6 – Summary of the themes for section 6.1.6

Main theme	***Sub-themes***
Impact of work placements on academic performance.	• *Development of their personal effective skills which spills over into their final year.* • *May be better students go on placements.* • *May become more motivated to study, but some students can get out of study habit.*

6.1.7 Alternatives to work placements

When the line managers and the DIS tutors were asked about their suggestions for the alternatives ways of helping the students who are not doing work placements to acquire the same skills as those who have done placement, there were again mixed views. Some suggested team-based design projects as part of a University course, holiday work, summer work. But many believed that there is no effective substitute to one year work placements and did not think that the students can acquire the same skills and experience as they would on doing a placement. The DIS tutors and line managers also thought that the length of the work experience period is a key factor in improving transferable skills. The short work placements or other alternatives were not considered as effective as one year placements.

Table 6.1.7– Summary of the themes and quotations for section 6.1.7

Alternatives for work placements • *Duration of work placement is a key factor* • *Holiday work, summer work, University projects* • *But short work placements might not be as effective as the one year placement*	
Line managers quotations	***DIS tutors quotations***
LM_01Q2 *– "If students wish to enter Engineering / Manufacturing careers, I find it difficult to think of alternatives. The important thing is that they learn the ups and downs of business, and experience an environment where you have to work and think in your job, and not to be spoon fed with too easy tasks. The interaction with people in a working environment, rather than a learning environment is essential".* ***LM_03Q2*** *– "Involvement in team based design projects as part of University course, large / pilot scale laboratory projects as part of course".* ***LM_04Q2*** *– "I believe there are no alternatives to a year in industry. I would always recommend such a placement. No other University based course can give the same realism and conditions of a work based placement. (This is not a reflection on the University backings, however!)".* ***LM_05Q2*** *– "Recommend summer vacation work in a supermarket or other blue chip retail outfit to understand and experience team work and communications".* ***LM_06Q2*** *– "Placements are essential to*	***T001*** *– "I think would have to be something where the students will have to work as a part of the team, but not a team they are use to work with, they will have to sort shuffle people around, and expect that person to operate in the same sort of environment in terms of time management and motivation, in other word you will be creating another work placement I think, in all but different name, but you can do it. You can have voluntary service overseas, that will do it, any environment where the student works individually away from their colleagues but as a part of a team/another team they are unaware of. I think would probably cover most of those key skills, because IT skills is irrelevant, because its already quite well achieved before they go, so its these personal effectiveness, planning etc"* ***T002*** *– "I think the only way to do it if they are not going to do a full year out work placement, would be to do some holiday/vacation work, summer holidays work, but would be no way as effective because they just do not get the duration of employment, you could possibly consider things like maybe doing a year before they come to university or voluntary work, but I do not think there is anything like a placement in*

gain the real world experience". ***LM_09Q2*** *– "Developing accountability appears important".* ***LM_10Q2*** *– "They need to experience 'workplace' activity, this could involve 3-4 hours slot once per week, working in another area of the University so they learn / experience time management, customer interface, variety team involvement skills".* ***LM_11Q2*** *– "There is no effective substitute. Role plays, scenarios and simulated environment do not teach the life skills typically acquired in a real work environment".*	*terms of within their particular topic, because they understand more about the subject when they go out to the work, so they are more useful to people when they get to work and they start hit the ground and running".* ***T003*** *– "The problems set by academics they do not take it seriously".* ***T004*** *– "Relevant vacation work. Simulated work placements are not a suitable alternative although the 'constructed' ones are close".* ***T005*** *– "We encourage 2x6 weeks in related industry during 1/2 & 2/3 summer breaks. However, 6 weeks is too short for students to be given amount of responsibility a full DIS student is likely to get".*

6.2 Summary and comment

All the DIS tutors and the majority of the line managers' surveyed agreed that degree courses which include work placements have a strong impact upon transferable skills and degree courses which included work placements were much more effective for the development of the students' transferable skills than degree courses without placements. Line managers and DIS tutors thought that one year work placements had greater impact and were preferable to shorter work placements. Both line managers and tutors considered that alternatives such as vacation work, voluntary work, short placements or project work in Universities were not as effective as one year placements. However it was pointed out that the impact of work placements on transferable skills was dependent upon the tasks given to students on work placements and the quality of supervision which they received.

There were mixed views on whether work placements had an impact upon degree performance or whether the better degree results were because better students chose to do work placements. The ability of students, their motivation and the opportunities provided on work placements to develop transferable skills are all likely to have an impact on degree performance. The evidence from these discussions with line managers and tutors, the evidence of the students' degree performance (Chapter 7) and the review of the literature (Chapter 2) all strongly suggest that work placements have an impact on degree performance. Further and more comprehensive research is required to disentangle the complex variables involved.

Both line managers and industrial tutors pointed out that, apart from the impact of work placements and their benefits for the students, the companies and the Universities also benefit from these placements. Work placements, particularly one year work placements, provide companies with extra human resources but more importantly provide an in-depth recruitment process. For the Universities it is a way of establishing closer links and partnerships with industries. These closer links are likely to increase the employability of the students of Universities, bring undergraduate engineering closer to the realities of work situations and may lead to greater involvement in joint research and development. In general, work placements are a 'win-win situation'. Work placements are likely to have impact not only on the transferable skills of students but also on many other aspects of the university–industry relationship.

Chapter Seven: Documentary Analyses

7.0 Introduction

This chapter is divided into two sections. The first section reports the analyses and comparison of the degree results of non work placement students and work placement students from three departments at Loughborough University. The examination results data were from the 2006/07 and 2007/08 academic years. These analyses of the students' examinations results will provide answers to the research question concerned with the effects of work placements on academic performance as measured by degree results.

The second section is based on an analysis of specifications of the modules which were taken by undergraduates prior to placement or their final year (non-placement students). The documentary analysis of these modules specifications revealed more questions than answers.

7.1 Profile of the students

The examinations results of 423 students in total were obtained from three departments: Civil Engineering, Chemical Engineering and IPTME. 111 of the students graduated from Civil Engineering department in 2007 and 178 students in 2008. 39 students graduated from Chemical Engineering in 2007 and 28 students graduated in 2008. 33 students graduated from IPTME (Institute of Polymer Technology and Materials Engineering) in 2007 and 34 students graduated in 2008.

In 2006/07 academic year examinations results, 110 of the students were the ones who did their work placements in industries during the 2005/06 academic year and 73 students were the ones who did not go on work placements.

In 2007/08 academic year examination results, 144 of the students were the ones who did their work placements in industries during the 2006/07 academic year and 96 of the students were the ones who did not go on work placements.

7.2 Comparison of the examinations results of work placements and non work placements students

Tables 7.2a to 7.2h show the comparison of the examination's results of the students from Civil Engineering, Chemical Engineering and IPTME. The methods used to analyse the data are chi-squared test, the Fisher exact probability test and inspection of the data. The chi-squared test (2x2 contingency table) was used to check the data for any significant differences. To do this test, the data was collapsed into first and upper second versus lower second and lower results for work placement and non work placement students. The Fisher Exact probability test was only used when the data did not fulfil the conditions for the chi-squared test. These conditions are: no expected cell frequency of 5 or less and the use of Yates continuity correction for 2x2 tables. The inspection of the data was used to aid the interpretation of the data.

The data was obtained from the documents published by the three departments. Tables 7.2a and 7.2b shows that the students who went on work placements, achieved high grades (First or Upper-Second) compared to the students who did not go on placements. Tables 7.2c – 7.2h shows this result in departments. These results should be treated with caution as the final degrees grades results only, are not enough to prove whether work placements helps the students improve their academic performance or not. Other factors need to be taken into consideration when interpreting these sorts of studies. These factors will be discussed later in this chapter.

Table 7.2a: Overall Examination Results 2006/07

(Chemical Eng., Civil Eng. and IPTME)

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	24 21.82%	68 61.82%	18 16.36%			
Non Placement Students	6 8.22%	30 41.1%	25 34.25%	2 2.74%	3 4.11%	7 9.59%

Chi-squared Test Chi-squared = 25.667, df =2, $p < 0.0004$

(The chi-squared test was based on a 2x2 table of first class and upper second results versus lower second and lower results)

Figure 7.2a – Overall Examination Results 2006/07

(Chemical Engineering, Civil Engineering and IPTME Departments)

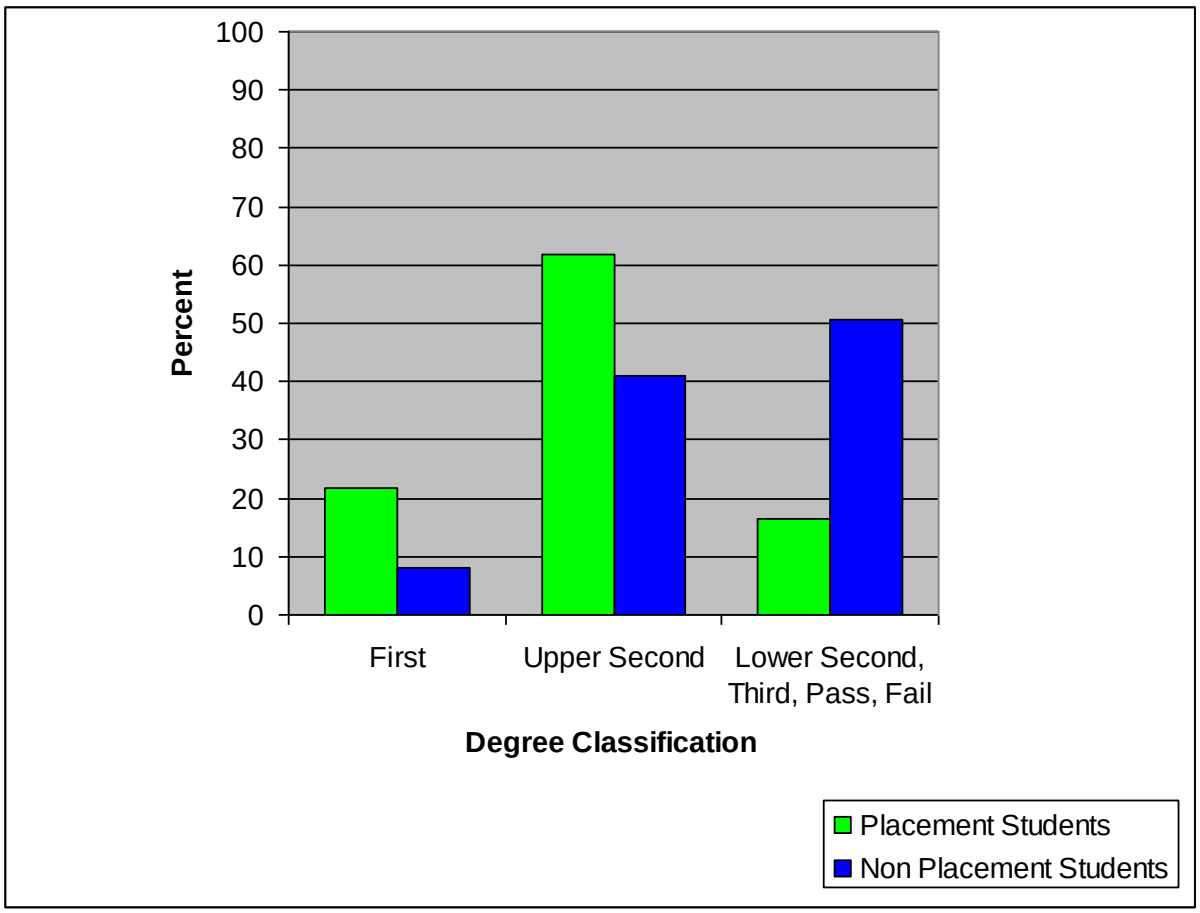


Table 7.2b: Overall Examination Results 2007/08

(Chemical Eng., Civil Eng. and IPTME)

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	41 28.47%	72 50%	30 20.83%	1 0.7%		
Non Placement Students	10 10.42%	38 39.58%	42 43.75%	4 4.17%		2 2.08%

Chi-squared Test Chi-squared = 24.386, df =2, $p < 0.0004$

(The chi-squared test was based on a 2x2 table of first class and upper second results versus lower second and lower results)

Figure 7.2b – Overall Examination Results 2007/08

(Chemical Engineering, Civil Engineering and IPTME Departments)

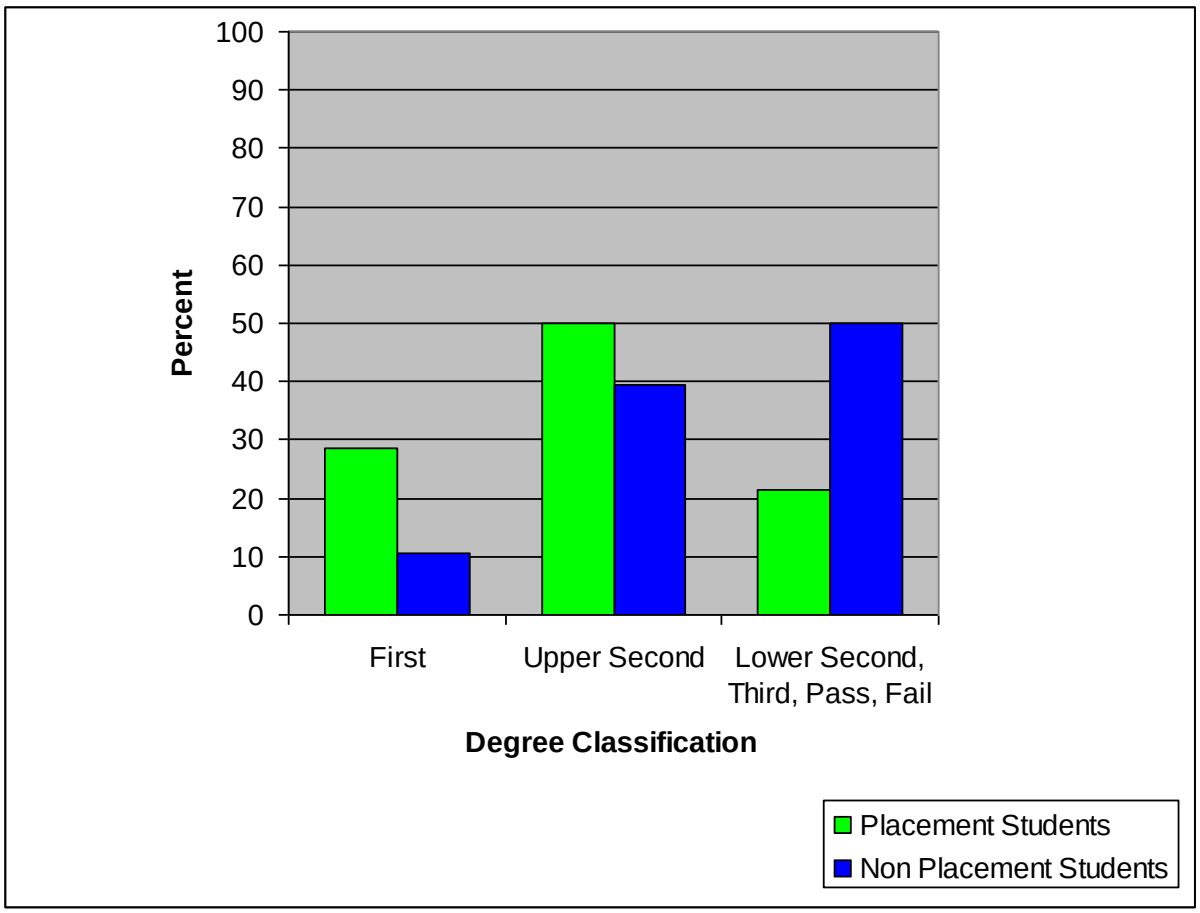


Table 7.2c: Civil Engineering Examination Results 2006/07

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	**13** **16.89%**	**52** **67.53%**	**12** **15.58%**			
Non Placement Students	**4** **11.76%**	**16** **47.06%**	**6** **17.65%**		**2** **5.89%**	**6** **17.65%**

Chi-squared Test: Chi-squared = 8.612, df = 2, p = 0.013
(The chi-squared test was based on a 2x2 table of first class and upper second results versus lower second and lower results)

Figure 7.2c – Civil Engineering Examination Results 2006/07

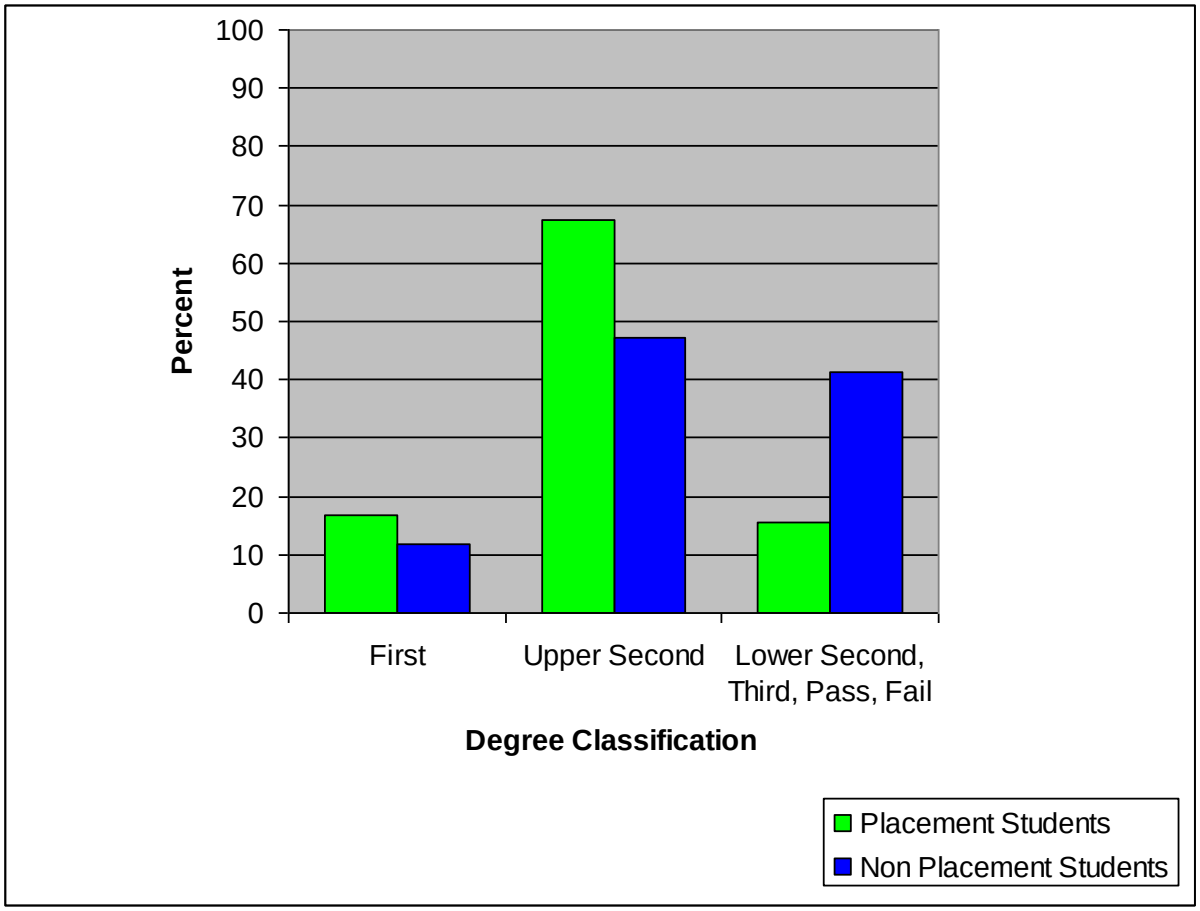


Table 7.2d: Civil Engineering Examination Results 2007/08

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	**31** **25.83%**	**61** **50.83%**	**27** **22.53%**	**1** **0.83%**		
Non Placement Students	**7** **12.07%**	**22** **37.93%**	**27** **46.55%**	**2** **3.45%**		

Chi-squared Test: Chi-squared = 13.549, df = 2, p = 0.001
(The chi-squared test was based on a 2x2 table of first class and upper second results versus lower second, third, pass, fail results)

Figure 7.2d – Civil Engineering Examination Results 2007/08

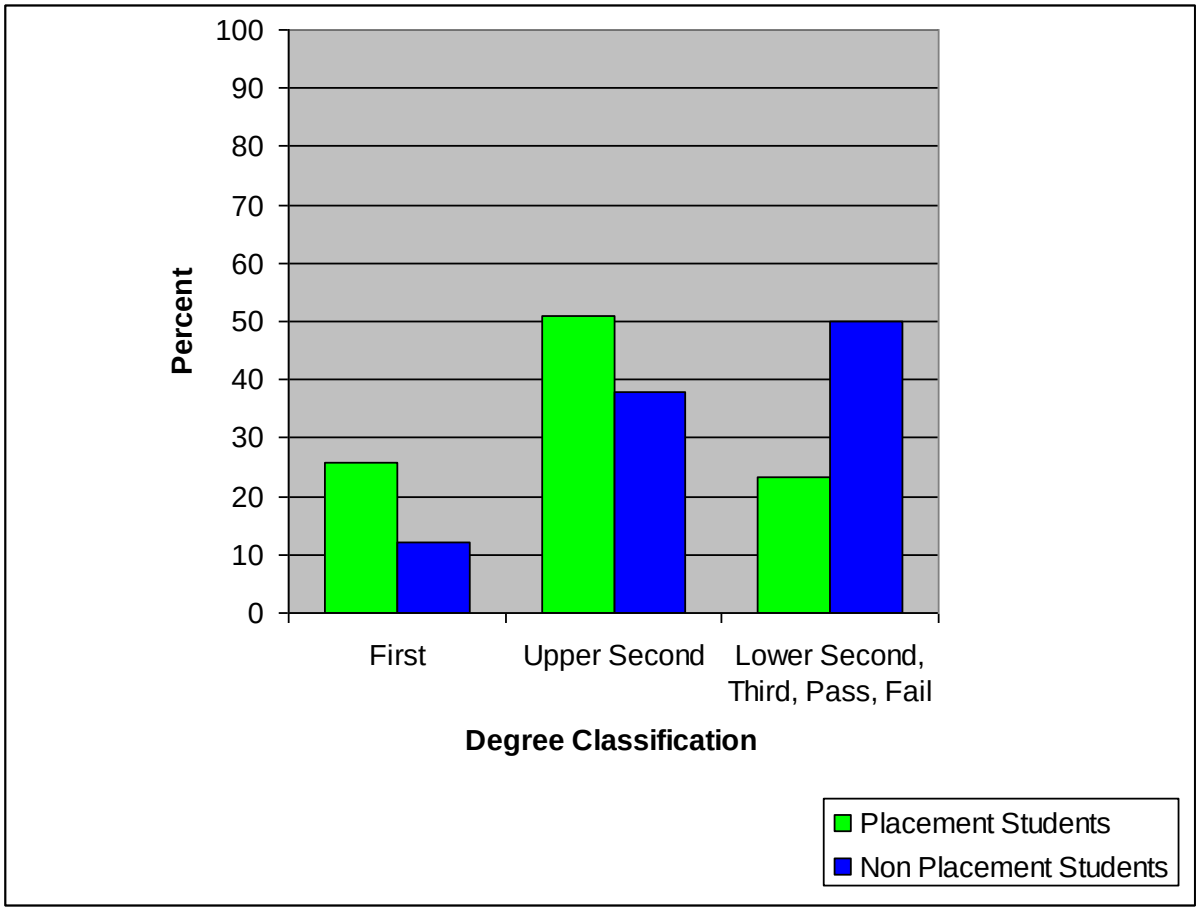


Table 7.2e: Chemical Engineering Examination Results 2006/07

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	**10** **38.46%**	**14** **53.85%**	**2** **7.69%**			
Non Placement Students	**2** **15.38%**	**3** **23.08%**	**6** **46.15%**	**2** **15.38%**		

Chi-squared Test: Chi-squared = 13.182, df = 2, p = 0.001
(The chi-squared test was based on a 2x2 table of first class and upper second results versus lower second and other lower results)

Figure 7.2e – Chemical Engineering Examination Results 2006/07

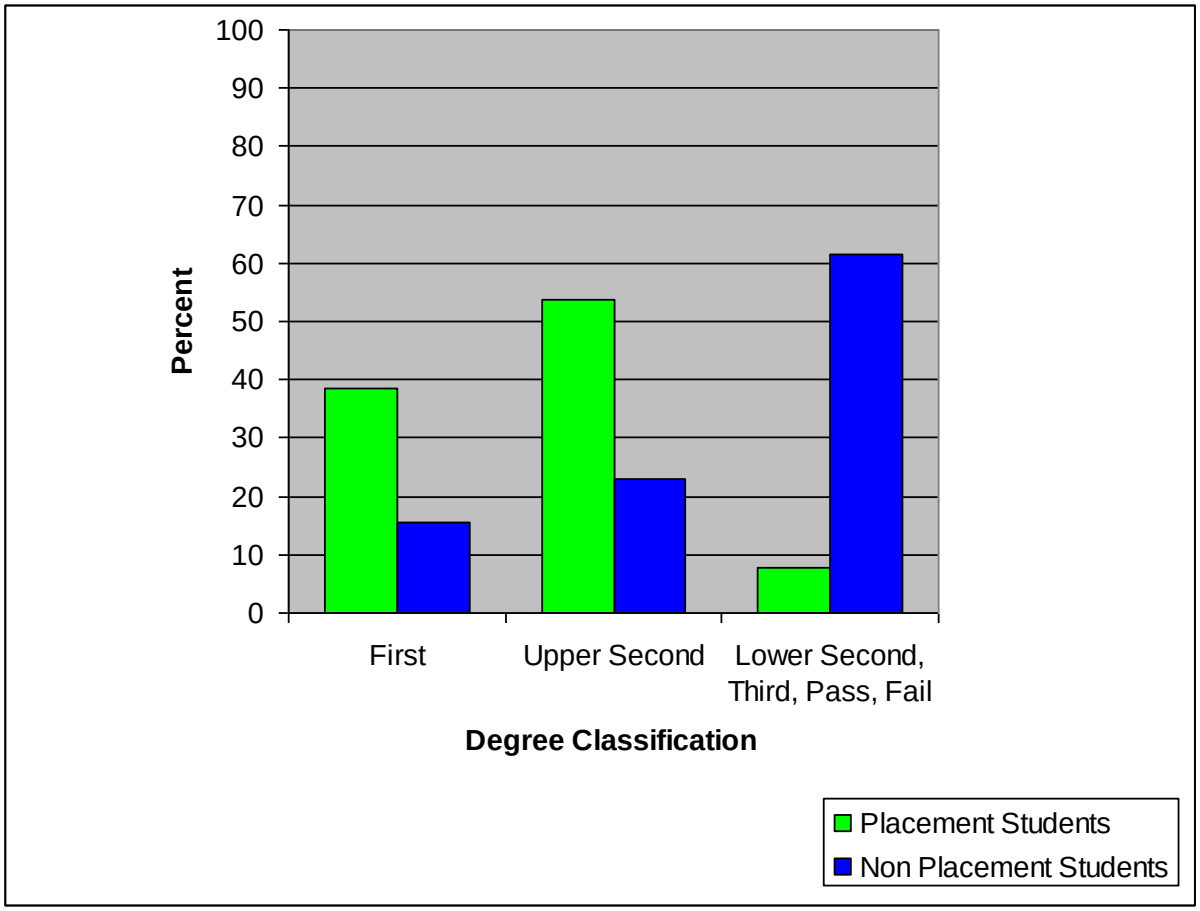


Table 7.2f: Chemical Engineering Examination Results 2007/08

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	**8** **57.14%**	**6** **42.86%**				
Non Placement Students	**1** **7.14%**	**7** **50%**	**4** **28.57%**			**2** **14.29%**

Chi-squared Test: Chi-squared = 7.418, df = 1, p = 0.006
Fisher's exact test: p = 0.013
(The chi-squared test was based on a 2x2 table of first class versus upper second and lower results)

Figure 7.2f – Chemical Engineering Examination Results 2007/08

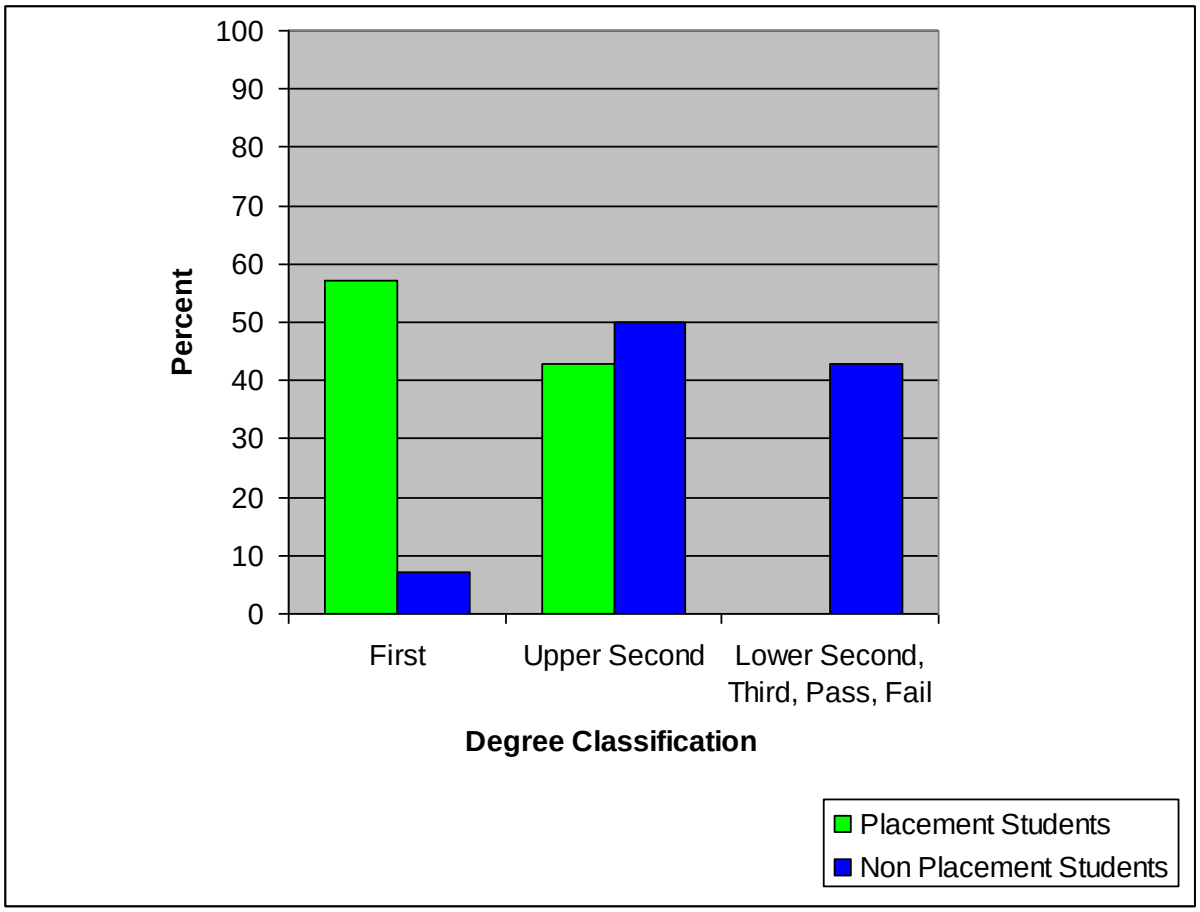
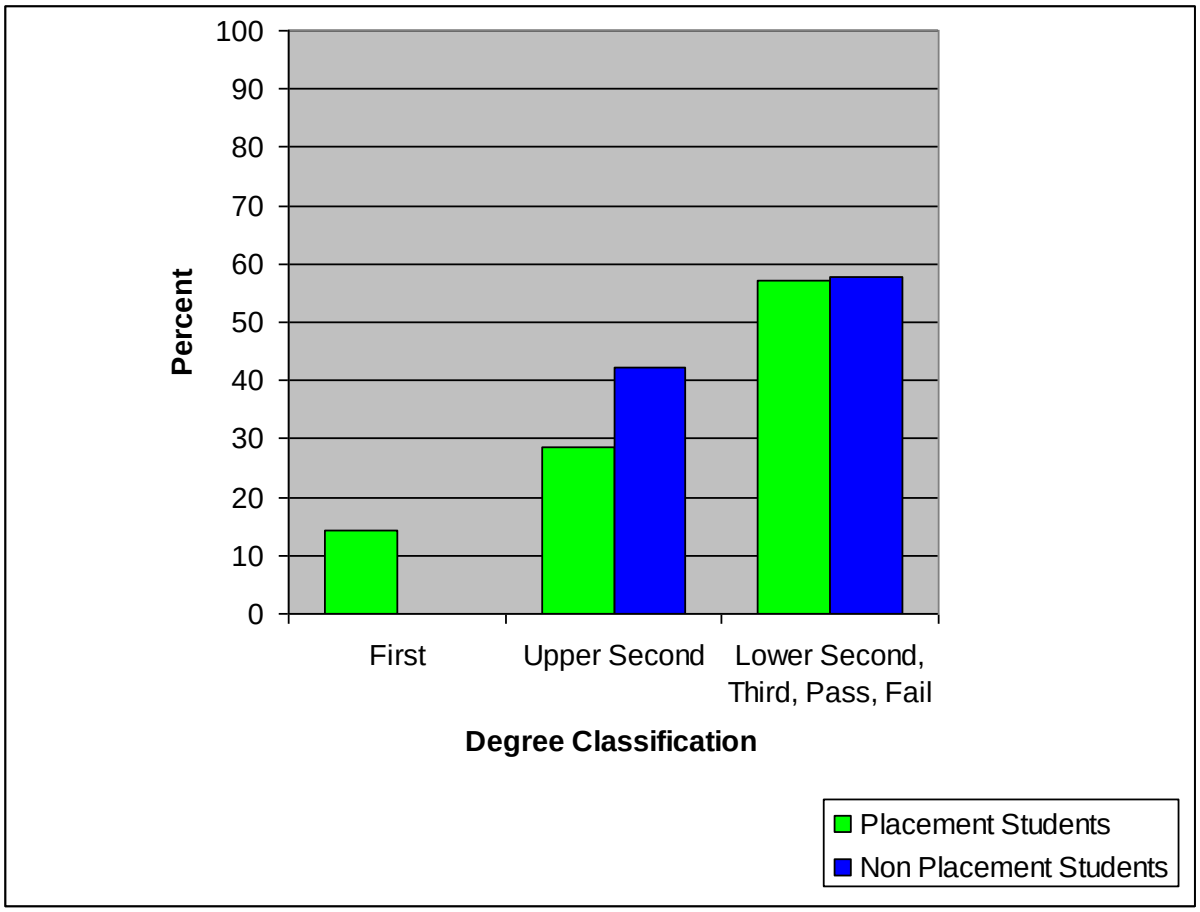


Table 7.2g: IPTME Examination Results 2006/07

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	**1** **14.29%**	**2** **28.57%**	**4** **57.14%**			
Non Placement Students		**11** **42.31%**	**13** **50%**		**1** **3.85%**	**1** **3.85%**

Chi-squared Test: Chi-squared = 0.001, df = 1, p = 0.979
Fisher's exact test: p = 1.000
(The chi-squared test was based on a 2x2 table of first class & upper second class versus lower second and other lower results)

Figure 7.2g – IPTME Examination Results 2006/07



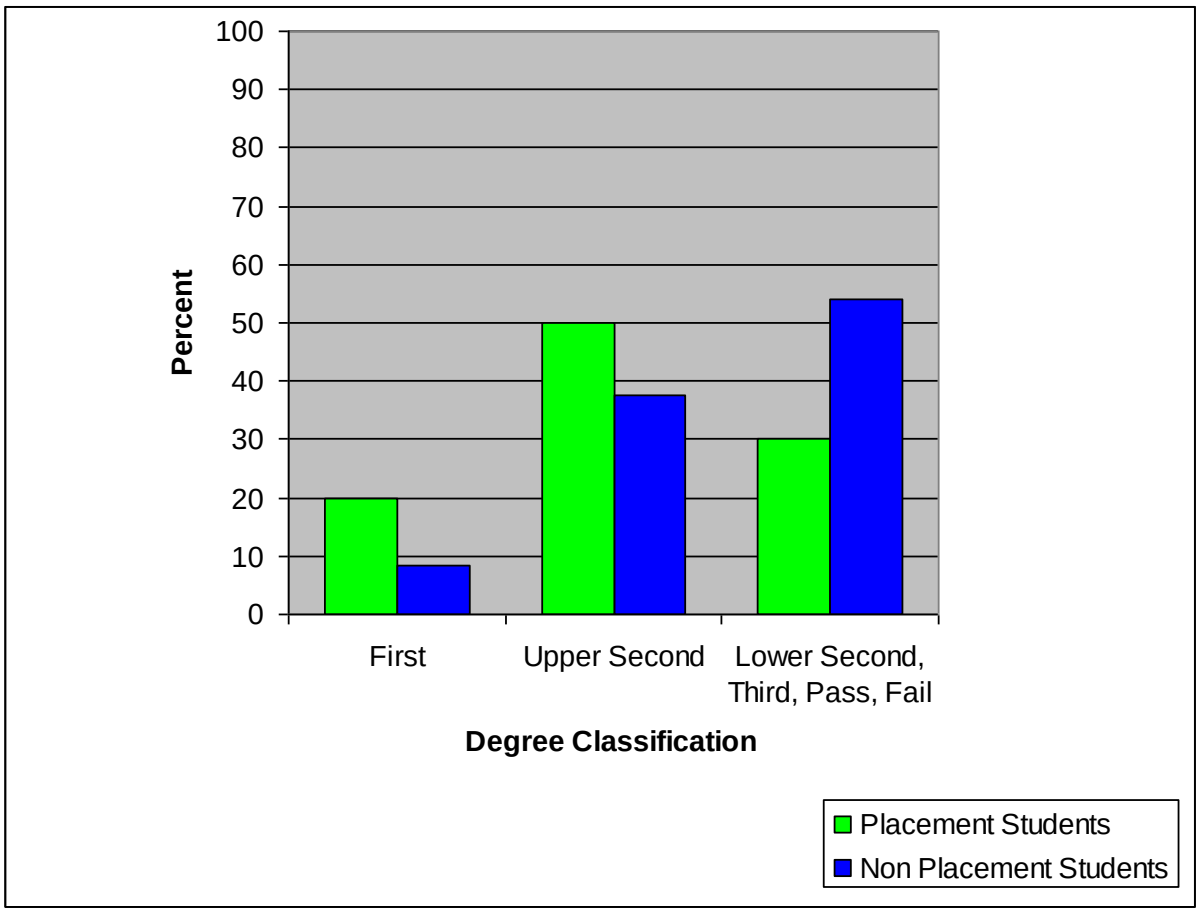
As we can see from the analysis of the IPTME examination results 2006/07 (Table 7.2g), there was not enough data to provide any significant results.

Table 7.2h: IPTME Examination Results 2007/08

	1st	2nd Upper	2nd Lower	3rd	Pass	Fail
Placement Students	2 20%	5 50%	3 30%			
Non Placement Students	2 8.33%	9 37.5%	11 45.83%	2 8.33%		

Chi-squared Test: Chi-squared = 1.961, df = 2, p = 0.375
(The chi-squared test was based on a 2x2 table of first class & upper second class versus lower second and other lower results)

Figure 7.2h – IPTME Examination Results 2007/08



From the analysis of the students' examinations results, we can see that the majority of the students who went on work placements obtained significantly better grades compared to the students who did not go on work placements.

7.2.1 Discussion of the results

As indicated above, the results obtained in this study are in line with much of the literature reviewed in chapter two, such as the research conducted in the Civil Engineering department at Loughborough University from 1977 to 1984 (Mayo *et al*., 1985). However Mayo *et al*. did not conduct statistical analysis of their data and only reported percentages and total numbers in each degree category. Earlier work by Bourner and Hamed (1987) also found in a study of 16,662 CNAA (Council for National Academic Awards) graduates that students who had had similar GCE 'A' level results but who had completed sandwich placements obtained better degree results than those who did not. Similar results were found in Australian studies (Davies, 1990).

Although these results show that the students who went on work placements were the ones who obtained high grades compared to those who did not do work placements, there are other factors which need to be taken into consideration when drawing firm conclusions. Firstly it was not possible to obtain the students marks for each subject / modules they took from their first year of their degree programmes. This was due to the restrictions on information of students imposed by the Data Protection Act of 1998. Secondly, it was not possible to obtain their 'A' levels grades due to the same reason. Therefore there was no way of finding out if better students were the ones who went on placements or not, as we did not have their examination results from their first year, (The data obtained about the students degrees classifications were published and posted on the notice boards in the departments, so there was no restrictions on these results).

Thirdly, there is the question of maturity. The students who went on placement had a further year in which to mature and experience work as an engineer. Whilst it would be difficult to assign a quantitative measure to this factor, it is likely to have had some effect. However it should be pointed out that 'maturity' is a complex issue. Maturity does not have a one to one correspondence with chronological age. It depends on the opportunities for learning, the learners' capabilities and the richness of their experiences. In cognitive terms, maturity is dependent on the ability to make inter-connections of the schemata (see Chapter two) not birth date. Measuring maturity in

terms of the age of entry to university is a crude measure since in any one year there are likely to be direct entry students who are barely 18, some who have been on a gap year and some who are relatively older. Their ages will overlap with the ages of the second and perhaps third year. All of the above make it difficult to define precisely maturity and measure its impact upon academic performance and transferable skills.

Fourthly, there is a curious contradiction in the overall results reported in this thesis. The majority of students in this study doubted whether work placements contribute to their degree results whereas lecturers and employers have more mixed views. The evidence from this documentary analysis clearly shows that work placements do appear to influence degree results despite the opinions of the students and some of their tutors and employers. This finding is in line with the theoretical perspective that practice gained in transferable skills in the context of the workplace do transfer to academic contexts. This is a powerful measure of the impact of work placements on transferable skills and it answers the research question concerned with the academic performance of work placement and non-work placement students.

Fifthly, there is a further and more subtle contradiction in the views of students, tutors and the line managers and the effects of work placements on degree results. Many of these did not consider work placements helped students to obtain better degree results but they also thought that work placements do improve transferable skills. If transferable skill are developed better on work placements than in other forms of experience then one would expect that students with better transferable skills would perform better in academic study too. This contradiction in the findings suggests that students, tutors and line mangers are not fully aware of the nature of transfer and transferable skills. Further, the students' lack of understanding of the nature of transferable skills can perhaps be traced to these skills not being made explicit in the modules. This theme is returned to in the next section of this chapter.

However, overall, these results are very satisfying but they do have limitations and further research is required. As discussed in chapters two and three of this thesis, the issues surrounding the impact of work placements on transferable skills are complex. There is no simple causal relationship between experience gained on work

placements and academic performance. We do not have measures of skills prior to work placements except those obtained by self assessment. We have no measures of motivation, readiness to learn or the specific experiences of the students on placement in different workplaces. Consequently, one has to rely upon judgement not measurement (as indicated in Chapter three). With this in mind, one can conclude cautiously that experience gained of transferable skills on work placements do make a significant contribution to degree performance but other factors may contribute directly to degree performance and indirectly to the development of transferable skills on work placements.

7.3 Modules Specifications

The research questions addressed in this section were:

- What set of transferable skills are embedded directly and indirectly in the undergraduate modules in Chemical Engineering, Civil Engineering and IPTME departments?
- How are these skills assessed?

The method used was the analysis of the module specification of all the second year and the final year modules which could be studied by the undergraduates in Chemical Engineering, Civil Engineering and IPTME departments at Loughborough University. 264 module specifications were downloaded and examined (85 from Chemical Engineering, 135 from Civil Engineering and 44 from IPTME). A template was created and each module was examined to determine what transferable skills were taught or learnt and how the module was assessed. Examples of a module specification and of the results of the analysis are shown in tables 7.3a and 7.3b below.

Table 7.3a: Example of a module specification

MODULE: CGI001
Aims To contribute to the student's preparation for a worthwhile career in chemical engineering from appropriate experience in a working environment. Where a student is a member of an appropriate professional body, the DIS placement allows students

to begin acquiring evidence of skills and experience to support a subsequent application for Chartered Engineer status.

Intended Learning Outcomes

1. Knowledge and Understanding

At the end of the placement in industry, students should have knowledge and understanding of:

- management and business practices
- the responsibilities of a professional engineer
- team working issues
- ethical issues.

2. Skills and Attributes

On completion of the module the student should be able to:

i) Intellectual

Manage and carry out a technical project to a constrained budget and timescale. Identify the factors that determine the success or otherwise of a technical project.

ii) Practical

Apply knowledge of specific codes of practice relating to hazards and operational safety. Develop a project plan, identifying the resources required and timescales involved. Analyse the outcomes of a project.

iii) Transferable

Manage time and resources. Work as part of a team and individually. Develop a personal plan of work to meet deadlines. Identify and record ongoing training and professional development.

Content

The student is allocated an industrial supervisor, who is normally their line manager during the placement. In addition, a visiting academic tutor is appointed by the university, who provides ongoing support to both student and industrial supervisor as required.

The training programme encompasses as broad a range of activities as possible with the student taking a gradually increasing responsibility for his/her own work. The tutor visits typically two times during the training period to ensure that training objectives are being met and that progress is satisfactory. They remain accessible to offer

advice/support as required outside these formal review meetings. The format for the review meetings and assessment are mutually agreed between the company and the university.

Method of Teaching, Learning and Assessment

There are no mandatory formal teaching arrangements for this module, however it is normally expected that the host company will provide training as may be required to support the student during their work. Students are expected to demonstrate quantifiable understanding and personal development both during and at the conclusion of the placement.

Assessment of a student's performance during the placement (over the minimum period of 45 working weeks) is carried out jointly by the Industrial supervisor in co-operation with the Departmental Academic Tutor. The tutor monitors ongoing student progress during the placement and provides support to the industrial supervisor with regard to progress assessment. The principal method for monitoring is a monthly report provided by the student and distributed to the academic tutor and industrial supervisor. The DIS is awarded on the successful fulfilment (as agreed by both industrial supervisor and academic tutor) of three criteria:

- Completion of an academic Dissertation of 10,000 - 15,000 words written by the student on a subject or subjects given by the Department in the first instance. The student initially selects 3 options from a prepared list and is allocated a title which can subsequently be changed after the placement has begun by mutual agreement between the student's academic tutor and industrial supervisor. The marking criteria is determined by the internal examiner and notified to the student.

- The submission of a final report (5 to 10 pages) on his/her period of industrial experience and the skills and knowledge acquired and demonstrated during the placement. The company is also required to submit an additional report assessing the student's placement.

- Assessment based on the IChemE Training & Experience headings including Health, Safety and Environmental aspects of professional practice; Process

and Plant aspects; Other aspects of Chemical Engineering practice.

Interim progress is assessed at the formal review meetings between the student, academic tutor and supervisor, on the basis of presentations, discussions and the monthly reports. Where appropriate these meetings will also attempt to remedy or identify strategies to deal with any problems or difficulties identified by student, industrial supervisor or academic tutor.

Table 7.3b Example of the summary of the set of skills which students are expected to gain/improve at the completion of the modules mentioned below

	Transferable Skills											
Module	**Communications**	**Problem solving**	**Team working**	**Planning / Organising**	**Management**	**Technical**	**Personal effectiveness**	**Research**	**Information Technology**	**Decision making**	**Time management**	**Methods of Assessment**
CVB054	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Coursework
CVC003	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Coursework
CVD002	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Coursework
CVI001	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Presentation
CVI002	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Presentation
CGA001	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Examination, Coursework
CGC011	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Coursework
CGI001	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Presentation
MPA105	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Examination, Coursework
MPB202	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Examination, Coursework
MPC010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Presentation, Report

The task of analysing these documents was onerous. Two approaches were possible. One could simply list the transferable skills listed by the module leader in the module specification and ignore the remainder of the specifications. This 'literal' approach yielded little useful information since some module tutors listed only one or two transferable skills yet the transferable skills were evident in other parts of their specifications or could be inferred from the module specification. Thus the researcher used what could be called an 'inferential' approach. This consisted of searching for direct evidence or indirect evidence that the students continue to learn transferable skills before and after the placements.

The results of the analysis showed that, in terms of the module specifications, all students had to take some modules concerned with the development of all transferable skills, either to prepare them for their projects or for the work placements. Similarly, it can be ascertained that from modules taken in the final year by work placements and non-work placements students continued to develop their skills.

Also apart from the students acquiring and improving their transferable skills through their degree course modules, Loughborough University supports the students to improve their transferable skills through various workshops, seminars, drop in sessions, leaflets, websites run by the Professional Development, Learning and Teaching offices, Library, Careers office. Please see their websites on the references section of this thesis for more information.

7.3.1 Discussion of the results

It would seem from this analysis that the students were prepared for placements and they continued to develop their skills during the second year and final year whether they went on placements or not. The transferable skills have been embedded in the modules and the assessment of these skills contributes towards the grade obtained in the module. The methods of assessments include presentations, coursework reports, written examinations as well as RAPID (Recording Academic, Professional and Individual Development) assessment which in some modules is used as a formative assessment tool. Some of the skills are indirectly embedded in the modules

(e.g. time management) are not mentioned directly on the module specifications, but coursework deadline requires time management.

However during the process of analysing the module specification, several questions and issues emerged, or more precisely, prompted this researcher to think of the limitations of this aspect of the research.

First, the modules documents provide only a summary of the 'written' curriculum. To examine the effects of the curriculum on transferable skills, this is insufficient. To do this one should, as Kelly (1999) argues also look at the evidence for the curriculum as taught, the curriculum as learnt and assessed and the 'hidden' curriculum of unintentional learning. This is a vast undertaking beyond the scope of one PhD student.

Secondly, the module specifications revealed a very wide range of what module tutors considered to be transferable skills, the tutors did not indicate which assessments assessed which transferable skills and at what level these skills were assessed. This theme is returned to in chapter eight (see also Chapter three).

Thirdly, and related to the level of skills, is the level of learning of the students. One can distinguish different cognitive levels as indicated in chapter two. Here it is worth pointing out that students may unknowingly learn skills from observation and modelling their tutor or line manager. They may also learn skills indirectly through attempting tasks such as solving a problem or giving a presentation, and they may learn skills directly when these are made explicit by their tutors or line managers.

Fourthly, these different levels of learning make the task of documentary analysis difficulty. At lower levels of observation, modelling and task demands one can infer these skills as being developed in all the undergraduate modules. At the highest level of explicit learning outcomes, it is difficult, if not impossible, to judge from module specifications and the mode of assessment whether these skills have been taught explicitly, learnt or assessed.

7.4 Summary

This chapter has shown that work placements do have a strong influence upon academic performance as measured by degree results. It is likely that this influence is due to the richer experience of learning transferable skills in the work place but other factors such as the abilities and maturities of the students need to be taken into account. The second section of the chapter provides evidence that transferable skills, as judged by the analyses of the module specifications, are developed throughout the undergraduate courses. But there are some limitations in the use of module specifications as a measure of whether and how transferable skills are taught, learnt and assessed.

Chapter Eight: Discussion and Conclusion

8.0 Introduction

This chapter provides a summary and discussion of the overall results which are linked to the research questions and set in the literature reviewed earlier in chapter two of this thesis. This chapter also discusses the strengths and weaknesses of the thesis; it offers suggestions for further research for improving the impact of work placements on the development of transferable skills in engineering.

8.1 Discussion of the students' views

The overall majority of students valued work placements highly as a means of developing transferable skills regardless of gender, discipline or if they went on work placement or not. They agreed that it was important to develop transferable skills and, of these skills, the most important to develop were communication, team working, problem solving and planning and organizing, they rated fairly highly their competences in these four skills and reflected most frequently on two of these skills: planning and organizing and problem solving.

Table 8.1: Comparison of the students views on the importance of developing the following transferable skills

Transferable Skills	Pre	Post-Placement			Grand Mean
	05/06	nWP	WP 05/06	WP 06/07	
Communication skills	5.56	5.32	5.33	5.56	5.45
Ability to solve problems	5.08	5.03	4.77	4.76	4.98
Team working	5.35	5.21	5.00	5.24	5.24
Planning and organizing	5.03	5.07	4.79	4.72	4.97
Management skills	4.59	4.59	4.38	4.20	4.52
Technical skills	4.71	4.63	4.34	4.28	4.58
Personal effectiveness	4.92	4.92	4.55	4.60	4.83
Research skills	4.33	4.18	3.31	3.48	4.04
Information Technology	4.87	4.78	4.51	4.56	4.75
Decision making skills	4.79	5.01	4.79	4.76	4.85
Time management	4.97	5.28	5.08	5.24	5.11

Mean score on 1 – 6 scale: **1** = very unimportant, **6** = very important.
nWP = Students who did not go on placements
WP = Students who did work placements

The students also reflected frequently upon time management and IT skills. These are skills which are necessary for their current academic achievement.

The skills which students thought were least important at this stage in their careers were research skills, management skills and technical skills. These were also the skills they regarded as their weakest and were amongst the skills least reflected upon. These skills do not figure largely in the first two years of their undergraduate courses but students may find they become more important during their work experience. These skills had high coefficients of variation which indicate a wide spectrum of views on the importance, self-assessment and frequency of assessment of these skills.

For the students who went on placements, the level of supervision by their University tutors were good, 48 percent of the students who did work placements in 2005/06 & 2006/07 said that their University tutors had visited them in industry twice, three times or more.

The students had less confidence that work placements would assist them to obtain better degrees even though it is sometimes argued that work placements do enhance transferable skills and therefore feedback into academic performance (Blackwell *et al.,* 2001). Perhaps the students' views are realistic. It is likely that their experience in the workplace will develop their transferable skills and understanding of work and work organisations (Ryan *et al.,* 1996). But whether these experiences and skills will transfer depends, in part on the nature of the placement and the existing capabilities of the students. A student who does an IT project on a placement is obviously better equipped in the final year to do a similar project than one whose experience has been confined to shop floor management. The variability of work placements is a vexing problem in the assessment of the impact of placements on transferable skills. Further, if work placements have a relatively uniform effect upon transferable skills relevant to academic performance, this effect would not necessarily change the rank order of performance in the final year of the degree (Brown, Bull and Pendlebury, 1997).

In general, the students, line managers and tutors valued highly the work experience as a means of developing their transferable skills as well as a way of gaining the advantage to the future employability. This shows a high positive correlation between the views of the students, line managers and the University tutors regarding the benefits of work placements to the students.

Insofar as this sample is typical of other Engineering/Science students, it would seem that, regardless of gender or discipline, most students value work placements very highly and regard transferable skills as very important to develop. They regard themselves as fairly competent in transferable skills but in need of further support and development during work placements. They do reflect upon transferable skills which are relevant to their immediate tasks and, by induction, one can assume they will continue to do so. In short, the students had high expectations of work placements and their impact upon transferable skills.

8.2 Discussion of the line managers' views

The overall majority of the line managers (87%) considered that work placements had a strong or very strong impact upon the transferable skills of the students. They believe that work placements increases the confidence and maturity of the students, and when line managers were asked to give their overall assessment of the students they supervised over the last few years, in terms of their transferable skills improvement, they ranked highly the following transferable skills: communication skills, technical and problem solving, team working and time management. The skills ranked low were management skills, decision making skills and planning and organising.

Table 8.2a below shows the line managers' overall assessment of the students at the end of their placements, and table 8.2b shows the comparison of the results obtained from line managers and the students on the importance of developing transferable skills.

Table 8.2a: Overall improvement of the students at the end of their placement

Transferable Skills	1	2	3	4	5	6	7	8	9	Mean	Standard Deviation	%CV
Communication skills	0	0	0	0	3	2	4	1	0	6.30	1.059	16.81
Ability to solve problems	0	0	0	2	1	4	2	1	0	5.90	1.287	21.81
Ability to work as a team member	0	0	0	1	1	2	5	1	0	6.40	1.174	18.34
Planning and organising skills	0	0	0	3	2	2	2	1	0	5.60	1.430	25.54
Management skills	1	1	3	2	0	0	2	0	0	4.44	1.878	42.3
Technical skills	0	0	0	1	1	5	1	2	0	6.20	1.229	19.82
Personal effectiveness	0	0	0	0	8	0	1	1	0	5.50	1.080	19.64
Research skills	0	0	0	2	1	3	3	1	0	6.00	1.333	22.22
Information Technology skills	0	0	0	0	1	1	4	4	0	7.10	0.994	14
Decision making	0	0	1	2	2	3	1	1	0	5.40	1.506	27.89
Time management	0	0	0	4	3	1	2	0	0	5.10	1.197	23.47

Sample size = 10 students
1 – 9 scale: **1** = aware of the skill, **9** = expert.

Table 8.2b: Comparison between line managers and students' feedbacks on the importance of developing the following transferable skills

Transferable Skills	Students	Line Managers
Communication skills	5.44 (1)	5.53 (1)
Ability to solve problems	4.91 (4)	5.00 (4)
Ability to work as a team member	5.2 (2)	5.20 (2)
Planning and organising skills	4.9 (5)	4.67 (7)
Management skills	4.44 (11)	3.27 (11)
Technical skills	4.49 (10)	5.07 (3)
Personal effectiveness skills	4.75 (8)	4.87 (6)
Research skills	3.83 (7)	4.13 (9)
Information Technology skills	4.68 (9)	4.07 (10)
Decision making skills	4.84 (6)	4.13 (8)
Time management	5.14 (3)	4.93 (5)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.
Rank orders in brackets.

There was a strong positive correlation between the views of line managers and the students on the importance of developing transferable skills, ($r_s = 0.72$, $p < 0.01$). According to the line managers' overall assessments of the students at the end of their placements, the students who completed their work placements had improved

considerably in their Information Technology skills, communication skills and team working skills. However, it should be noted that the sample size was small.

Both line managers and the students agreed that, the top two skills which are very important for the students at this stage of their careers are communication skills and team working. Management skills and research skills were the skills rated low by both groups (line managers and the students).

93% of the line managers surveyed considered that transferable skills can be developed better at the workplace. But they believe that the level of supervision of the students in industries and the duration of the work experience can be a key factor for the students to acquire and develop their transferable skills. All line managers surveyed, preferred work placements of one year as it gives the student sufficient time to learn from their experiences and also gives their companies a chance to benefit from the placement. They suggested it takes at least 3 months for the students to understand the systems, procedures and processes before they are able to contribute useful work.

When the line managers were asked of their views on the impact of work placements on the academic performance, there was a divided opinion among them. About 50% of the line managers thought that work placements will help students get better degrees.

Earlier researchers have different views on this issue, some found that the students who did work placements obtained higher degrees and some researchers did not find enough evidence to support this assumption. Chapters 2 mentioned the researches conducted on the issue of work placements and academic performance and chapter 7 of this thesis presented the data and the analysis of the results of the students academic performance in order to ascertain whether the students who did work placements obtained higher grades than those who did not. Clearly the data and the results of the analysis of the students examination results mentioned in chapter 7 shows that most of the students who did work placements did obtain better degrees grades (First, Upper Second class), but this finding was based only on the final year results (degrees classifications) of the students. Further research is needed in order

to support these findings. It might be those better students were the ones who went on placements and therefore in future a research of this kind will have to obtain all the examination and course works results of the individual students from their first year for each module until when the students graduates as well as the 'A' level or equivalent results and then compare these results to confirm if work placements really does improve the overall academic performance of the students. However, there might be some obstacles in obtaining the individual student examinations / course work results from their first year (e.g. Data Protection Act 1998). It is clear that without this data from each student from their first year until when they graduate, this issue will remain open for debate.

When the line managers were asked to suggest the alternatives for the students who are not doing work placements to acquire and improve their transferable skills. Most of them did not think that the other alternatives can be as effective as the one year placement in industry. They suggested holiday work, voluntary work, and large/pilot scale projects as a part of the University course.

In general, the line managers valued the students' work placements highly and even more important than academic grades especially for recruiting their graduates. They believe that students' transferable skills can be developed better at the workplace than in the University.

8.3 Discussion of the DIS tutors' views

All the DIS tutors interviewed agreed that a degree courses which include a work placements are more effective for development of the students' transferable skills than a degree course without. They believe that a degree course which includes a work placement increases the maturity of the students, and thought that the students values work placements as the opportunity to acquire and/or improve their transferable skills, gaining experience and a salary.

When the tutors were asked about the benefits of work placements to the employers, they thought that the employers regard work placements as a recruitment process. According to the tutors, the transferable skills which work placements have most

impact on to the students were communication skills, team working, decision making and time management. Tutors thought that work placements have least impact on management skills, research skills and Information Technology of the students. Similar results were obtained from the students and the line managers' surveys as shown in the previous chapters: Chapters five and six.

Table 8.3 below shows the comparison between the views of the DIS tutors and the students on the importance of developing transferable skills.

Table 8.3: Comparison between DIS tutors' and students' feedbacks on the importance of developing the following transferable skills

Transferable Skills	Students	DIS Tutors
Communication skills	5.44 (1)	5.80 (1)
Ability to solve problems	4.91 (4)	5.20 (6)
Ability to work as a team member	5.2 (2)	5.60 (3)
Planning and organising skills	4.9 (5)	4.80 (8)
Management skills	4.44 (11)	3.60 (11)
Technical skills	4.49 (10)	5.20 (5)
Personal effectiveness skills	4.75 (8)	5.60 (2)
Research skills	3.83 (7)	4.20 (9)
Information Technology skills	4.68 (9)	4.00 (10)
Decision making skills	4.84 (6)	5.00 (7)
Time management	5.14 (3)	5.40 (4)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.
Rank orders in brackets.

Table 8.3 above, shows that there is a close agreement between the DIS tutors and the students' views on the importance of transferable skills ($r_s = 0.75$, $p < 0.01$). DIS tutors rated communication skills, team working and personal effectiveness skills highly while the students rated highly the following skills: team working, communication skills and time management. Both groups (DIS tutors and the students) rated management skills, research skills among the lowest skills which are important for the students at this stage of their career.

Similar to the line managers' views, all the DIS tutors preferred the work placements of one year as it gives the student a more time to learn from their experiences. But again, there were mixed feelings about the assumption that work placements will help students to obtain better degrees. Some tutors agreed that work placements will

help students to obtain better degrees and some did not agree. Some tutors were not sure if the students who did work placements obtained better degrees or the better and more interested students choose to do work placements. Both views are supported by the literature reviewed in chapter 2 of this thesis.

When the tutors were asked to suggest the alternatives for the students who are not doing work placements to acquire and improve their transferable skills, they expressed similar views obtained from the line managers' surveys. Most of the tutors did not think that the other alternatives can be as effective as the one year long placement in industry. They also suggested holiday works, voluntary works, team based projects as a part of the University course (but not a team that the students are use to work in). In general, all the tutors valued work placements as very important as a means of developing the students' transferable skills.

8.4 Triangulation of the students, line managers and the DIS tutors' views

The results of the students, line managers and tutors' surveys demonstrates that work placements are very important in helping students developing their transferable skills and the preferred duration for work experience is one year. The reason for this is because the students gets enough time to learn, acquire and practise their skills as well as giving the students enough time to contribute to the company. They all thought the level of supervision during the work placements is the main ingredient in helping the students to improve their skills. From the surveys, as shown in table 8.4a below, it is clear that the management skills and research skills are not regarded as very important to the students at this stage of their careers, although these skills may become very important to the students when they start their jobs after graduating.

Table 8.4a: Comparison between line managers, DIS tutors and students' feedbacks on the importance of developing the following transferable skills

Transferable Skills	Students	Line Managers	DIS Tutors
Communication skills	5.44 (1)	5.53 (1)	5.80 (1)
Ability to solve problems	4.91 (4)	5.00 (4)	5.20 (6)
Ability to work as a team member	5.2 (2)	5.20 (2)	5.60 (3)
Planning and organising skills	4.9 (5)	4.67 (7)	4.80 (8)
Management skills	4.44 (11)	3.27 (11)	3.60 (11)
Technical skills	4.49 (10)	5.07 (3)	5.20 (5)
Personal effectiveness skills	4.75 (8)	4.87 (6)	5.60 (2)
Research skills	3.83 (7)	4.13 (9)	4.20 (9)
Information Technology skills	4.68 (9)	4.07 (10)	4.00 (10)
Decision making skills	4.84 (6)	4.13 (8)	5.00 (7)
Time management	5.14 (3)	4.93 (5)	5.40 (4)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.
Rank orders in brackets.

As shown on table 8.4a above, there is a close agreement from line managers, DIS tutors and the students' views on the importance of developing the transferable skills shown above. There was a slight disagreement between the students and the line managers and the tutors regarding the importance of developing technical skills and personal effectiveness skills. Students, line managers and tutors regarded communications skills as the most important skill to develop followed by teamwork. Management skills were not thought to be important (for the students especially during their work placements), by either group. The results of the correlation test revealed that overall there was close agreement between line managers, the DIS tutors and the students on the importance of developing transferable skills (see Table 8.4b).

Table 8.4b: Correlation coefficient results of the line managers vs. DIS tutors vs. students' feedbacks on the importance of developing the transferable skills

Correlations	
Students vs. DIS tutors	
Correlation coefficient	.749**
Significance, p value	.008
Students vs. Line Managers	
Correlation coefficient	.715*
Significance, p value	.013
DIS tutors vs. Line Managers	
Correlation coefficient	.883**
Significance, p value	.000
**. Correlation is significant at the 0.01 level	
*. Correlation is significant at the 0.05 level	

Summary

From the results of the surveys in this research project, it is clear that work placements do have an impact on students. It is the view of line managers, tutors and the students themselves that work placements help students to raise their level of competence in different transferable skills.

The students who went on work placements assessed themselves slightly but not significantly lower compared to how they had assessed themselves before they went on placements. This finding indicates that these students that after working and comparing themselves with different professional people/colleagues in industries, they realised they were not as expert in some skills as they thought. By realising the skills which they need to improve on, it helps these students work in the areas to be improved. However, the results also point to the limitations of using only self assessment as a means of assessing impact even though this method is used widely in research in this field.

Line managers and the tutors suggested few alternatives in order to help those who are not doing work placements to acquire and improve their transferable skills, but clearly they did not think that these alternatives will be as effective as doing a one year long work placement in industry.

Regarding the impact of work placements in academic performance of the students, there were mixed opinions. As indicated above, some students, line managers and tutors thought that work placements do not help students to obtain better degrees, while others thought work placement experience helps students improve their degree grades.

The overall picture obtained from the surveys clearly shows that there is a high expectation and support of the idea that work placements are the most effective way for students to develop and improve their transferable skills.

8.5 Answering the Research Questions

From the analyses of the data obtained from the students, line managers, tutors' surveys as well as the relevant literature reviewed, the results were compiled to provide the answers to the research questions addressed earlier in chapters one and four.

What are the perceived value of transferable skills by students, line managers and the DIS tutors?

Students, line managers and the DIS tutors considered that most of the transferable skills mentioned in the surveys were important to develop. They rated communication skills and team working as the most important skills for the students to develop in at this stage of their career while management skills was rated low by both participants who completed the surveys. However, management skills become important for the students when they start their graduate jobs. From the results of the surveys, the students who went on placements rated research skills slightly higher, but not significantly higher compared to the students who did not go on placements. The reason for this is probably because final year students (those who did not go on

placements) had to use this skill rather more, especially in their final year projects, compared to the students who were in industry (who at the time of the survey, were still yet to start their final year of degree courses in the University).

What is the impact of work placements on the development of transferable skills as perceived by students, line managers and the DIS tutors?

In general, there was a very strong agreement between all participants of this research (students, line managers and the DIS tutors) regarding the impact of work placements in developing the students' transferable skills. They both agreed and insisted that work placements are the only effective way of helping the students to improve their transferable skills and they did not consider that the other alternatives could be as effective. Even the students who did not go on work placements agreed that transferable skills can be improved better in work placements than University courses. But there was a mixed opinion regarding the impact of work placements on the academic performance of the students. Some participants thought that work placements helps the students obtain better degrees, and some did not agree with this assumption. Therefore, from the views of the students, line managers and the DIS tutors we can conclude that:

- Work placement is an effective way of improving the students' transferable skills,
- Work placements can help the students to improve their academic performance or can not help the students improve their academic performance. The improvement depends on the nature of the placement and the existing capabilities of the students.

What skills are the most important to develop in work placements?

As indicated above, the most important skills developed on work placements were communication skills, technical and problem solving, team working and time management. There was close agreement between students, tutors and line managers on the importance of their development on work placements.

How do work placements impact upon academic performance?

Analysis of the final year students examination results, found that the majority of the students who did work placements obtained high degree classifications i.e. firsts or

upper seconds. However, some caution is needed in interpreting these results (see section 7.2.1).

What are the strength and weaknesses of approaches to assessing work placements and transferable skills?

As indicated in chapter three and five, the current method of assessing work placements is the Diploma in Industrial Studies. This award is separate from the degree award, thereby implying that the experience and skills developed on work placements is not an integrated part of the degree - even though the placement year constitutes one year of the course (20% or 25% depending on whether a BEng or MEng). If work placements, and their impact upon transferable skills, are important (and they are) then they should be recognised and assessed as part of the degree. This of course raises problems and issues which would require profound changes in curriculum design and assessment.

In the mean time it would be better if the Diploma in Industrial Studies award was classified as 'Distinction', 'Merit', 'Pass', 'Fail' rather than 'Pass' or 'Fail'. This new system would motivate the students who are doing work placements to work harder to achieve the highest classification for the DIS award. Also it would help employers and recruiters to distinguish the students' level of experience and achievement on their work placements.

A further and deeper set of difficulties in assessing transferable skills were reviewed in chapter three. In summary these were:

- No universal agreement on the list of transferable skills
- The meaning of the term skills
- The inter-connectedness of skills
- The same skills may be assessed by different methods
- The 'transferability' of transferable skills needs assessing

8.6 Recommendation and Further Work

The sample of students and tutors who took part in the surveys for this research were from only three departments (Civil Engineering, Chemical Engineering and IPTME) at Loughborough University. In future research similar to this study should be carried out to extend the research in other departments in order to find out if there are any different views from the individuals from different departments. Apart from surveying different departments in the same University, it would also be interesting to collect data from different Universities in order to find out if there are any different approaches in the design of the undergraduate curriculum (which includes methods of teaching, learning, assessments etc.) and includes the views of the students and members of staff from those Universities.

The Data Protection Act. 1998 was one of the obstacles in obtaining the data for this research. Some of the students decided to opt out of publishing their examination results publicly; therefore it was not possible to obtain these data. Also despite encouraging the students to give their identification numbers or names during the surveys, there were some who completed the questionnaires without giving this information. This made it impossible to trace them in order to conduct the follow up study. In future also, in researches similar to this study, more data of the students' academic performance from their first year onwards would strengthen the investigation of the question whether the better students were the ones who went on placements or not.

From the views of students, line managers and the University tutors as mentioned in earlier chapters of this thesis (Chapters 5 and 6), work placement are regarded as the most effective way for the students to develop and improve their transferable skills. Further research is needed in order to find out exactly how the students who are not doing work placements can improve their transferable skills. There were few suggestions given by the line managers and the tutors i.e. vacation work, voluntary work etc. From the documentary analyses of the modules specifications, it seems that some elements of different transferable skills are embedded in these modules. But what is not clear is what set of skills exactly should be embedded in the undergraduate modules and what criteria should be used in order to choose which

set of skills are to be embedded directly and indirectly in these modules. Further there is a question of what level of competence in these skills should the undergraduate students have at the end of their final year of their degrees and before they start their graduate jobs. In addition to this issue of helping the students develop and improve their transferable skills, there is an issue of assessing these skills, as some of these skills are embedded directly and some indirectly to the modules. Some of these skills can probably be assessed easily. For example, students learning of one of the software packages can be asked to demonstrate how to use that software in the University laboratory while the examiner (tutor) observes if the student has followed all the steps correctly and has managed to achieve the outcome required for within the time set for that task. Here the student would have demonstrated his/her competence in different skills such as IT and time management and problem solving.

But there are other skills, for example team working and personal effectiveness which may be more difficult to asses. Further, the context can influence the development and the transferability of skills. Some students might not be actively involved in team work in the academic environment but the same students might be excellent in team working when involved in a different context which requiring team working i.e. when playing football or other sports. Further research on transferable skills in different contexts is needed to determine the most effective methods of assessing these skills set within the curriculum specifications.

Final Conclusion

So do work placements have an impact upon transferable skills? The answer is a qualified Yes. There is close agreement on this view by three stakeholders, students, line managers and DIS tutors. All regard work placements as the most valuable way of developing transferable skills and despite their reservation, the results show that these transferable skills which are measurable in academic performance do show that work placements have an impact. But some caution is necessary. Transferable skills and their transferability remains a controversial issue. The measurement of impact in this field is more a matter of judgement than precise measurement. The curriculum and work placements may vary in their contributions to the development of transferable skills.

Afterword: My Journey

As indicated in section 8.6, the process of researching the impact of work placements on the development of transferable skills led me to suggest recommendations for further research and development in this area in particular, I would have tried to obtain the full academic records of all the students, all their students ID numbers and organised with the cooperation of my internal supervisors, special sessions in which all of the work placements and non work placements students completed the appropriate questionnaires including the open questions.

But reflection on how one might improve one's thesis is only one aspect of one's life journey. Qualitative researchers often include a commentary on the process of doing a PhD. Examples of the commentaries are given in Potter (2006). Although I am not a pure qualitative researcher (see Section 4.4), it seemed appropriate to provide a brief account of my own journey for two reasons. First, to help me to continue to develop my personal understanding and research skills and second, to provide readers of this thesis with an understanding of one research student's experiences. It is not claimed that this experience is typical; indeed, it is as you will see not. But by reading the reflexions of several students, it will be possible to build a composite picture which aides understanding and perhaps the supervision of research students.

My journey is an intertwines of personal and intellectual discoveries. Some of these are discoveries of the outside world such as increasing my knowledge and expertise and some are inner discoveries of what I think and value, these are sometimes referred to as epistemology reflectivity and personal reflectivity (Willig, 2001).

My Higher Educational journey began in 2001 when I gained a place at Loughborough University for the MEng degree course in Electronics and Software Engineering. The course gave me personal security and (although I did not know this at a time) intellectual security since Electronics and Software Engineering at least at undergraduate level, has well defined procedures for designing and solving problems. Put simply, it is a black and white subject. Whilst doing my undergraduate degree, I went on three months placements (2002, 2003 and 2004) to a technology company in Cambridge. These experiences were 'cultural shocks'. Working as an

Engineer was different from studying Engineering. But the work placements were frustrating since I began learning about Electronics/Software Engineering and the 'soft skills' of team work and communications and then had to return to study. These experiences led me to consider the value of work placements in the education of Engineers, the subject of my research.

After completing my undergraduate degree, I was fortunate in gaining a scholarship to do a Doctoral thesis on "The impact of work placements on the development of transferable skills in Engineering". Frankly, the first six months were a nightmare, I received very little help from the former research associate who was very committed to qualitative research and at least to me seemed very dogmatic and unhelpful. She was good at same what was bad but not that good at saying how it better. Fortunately, Professor John Dickens and Dr. Adam Crawford (from the engCETL) and my other two University supervisors suggested that Professor Brown should be my main supervisor since he had broad experience of supervising doctoral students in Psychology and Higher Education.

The first six months with Professor Brown was hard work. He pointed out that our (he did say 'our') first task was to write the first year report. This 'psychological' approach of supervision worked very well compared to the 'classical' model of supervision which some supervisors prefer. He taught me to analyse the key themes in my research title (impact, work placements, transferable skills), to identify the research questions I wanted to study, and how to design the survey and questionnaires so they matched the research questions. He also suggested ways of reading and making my English more 'academic'.

The last three years have been a mixture of ups and downs in feelings, excitements and disappointments and recognition of the strength and limitations of my thesis. The chapter on students learning was very difficult, but it opened my eyes to how there were different ways of looking at learning. 'Transferable skills' is not the only way and although it is as useful way, it does have weaknesses. I was particularly pleased to find the connection between Control Systems Engineering and the skills model of psychologists. The reading and writing of this chapter (chapter two) and chapter three was very difficult. I learnt more but also my views changed. I had thought that

either there was a ‘right’ or a ‘wrong’ answer to a question as in Physics and Electronics Engineering. Then I thought that there are no right answers in pedagogy, it is all a matter of opinion. Now I am beginning to think that there are no perfectly right answers, but some answers are better than others but one can not ‘prove’ they are as one can in Mathematics.

This view grew out of my study of learning of impact and out of my analysis of the data. I taught myself how to use SPSS and I expected the statistics to give me clear cut answers, they did not. I expected the qualitative research to be not very informative, it was. Both now seem to be necessary, but even together they can not provide absolute certainty. One has to settle for judgement based on measurements and reports.

This is the endpoint of my thesis but not of my journey. I know more, but I recognise there is more to know. I need to develop my capacities to read, think, write, and do research. I’m more technical language, I need to continue to develop my personal and epistemological reflectivity.

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Appendices to thesis:

Appendices
Appendix 1: Students Pre-placement questionnaire
Appendix 2a: Students Post-placement questionnaire – nwp
Appendix 2b: Students Post-placement questionnaire – wp
Appendix 3: Line managers' questionnaire 1 & 2
Appendix 4: DIS Tutors' questionnaire
Appendix 5: Methods of data analyses
Appendix 6: Paper published on the ASET Annual Conference 2006 Proceedings
Appendix 7: Paper published on the ASET Annual Conference 2007 Proceedings
Appendix 8: Ethical Clearance Checklist Form – Loughborough University
Appendix 9: Professional Development Training & Conferences Attended

Students Pre-Work Placement Questionnaire

This questionnaire aims to find out about your views on work placements and the transferable skills you expect to develop during your course and, if you do one, your placement. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Dr Richard Holdich, Dr Barry Haworth and Yussuf Ahmed, Engineering Centre for Excellence in Teaching and Learning.

Section A - About Work Placement and Transferable Skills:

1. (a) What type of work placement related to your degree, are you expecting to do whilst at university? *Please tick the relevant item(s)*:

☐ Sandwich placement (Paid work in industry which is part of your course)
If you tick the above box, please indicate the duration of the placement
☐ Up to 3 months ☐ 3-6 months ☐ 6 months to a year

☐ Work-based project (A specific piece of assessed work for a course, undertaken at an employer's premises)
If you tick the above box, please indicate the duration of the project
☐ Up to 3 months ☐ 3-6 months ☐ 6 months to a year

☐ Not intending to undertake a Work Placement

☐ Not intending to do a Work-based project

(b) What other type of work, not related to your degree, are you expecting to do whilst at university?

☐ Part-time work (Paid or unpaid work undertaken during term-time)
☐ Full-time or part-time work (paid or unpaid during vacation)
☐ Work shadowing (Where you observe a member of staff working in an organisation)

2. In general, how important do you feel it is to develop the following transferable skills in work placements? *Please tick the box closest to your view*:
1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant.
4 = Slightly important, **5** = Important, **6** = Very important.

		1	**2**	**3**	**4**	**5**	**6**
a.	Communication skills	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐

i.	Information Technology skills						
j.	Decision making skills	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

3. Here are some reasons why students go on placement. *Please tick the box closest to your own opinion for each of the items:*

   1 = Strongly disagree, **2** = Disagree, **3** = Slightly disagree.
   4 = Slightly agree, **5** = Agree, **6** = Strongly agree.

		1	**2**	**3**	**4**	**5**	**6**
a.	For the work experience	☐	☐	☐	☐	☐	☐
b.	Because they need the money	☐	☐	☐	☐	☐	☐
c.	They need a break from education.	☐	☐	☐	☐	☐	☐
d.	To improve their chances of getting a job when they finish university	☐	☐	☐	☐	☐	☐
e.	To help them decide what to do when they finish university	☐	☐	☐	☐	☐	☐
f.	To give them an idea of what industry is really like	☐	☐	☐	☐	☐	☐
g.	Personal development (e.g. to increase confidence and independence)	☐	☐	☐	☐	☐	☐
h.	To improve their grades when they return to university	☐	☐	☐	☐	☐	☐
i.	It will be an opportunity to apply the theory they have learnt at university	☐	☐	☐	☐	☐	☐
j.	It will help them decide what to do for their final year project	☐	☐	☐	☐	☐	☐
k.	The year in industry counts towards getting their Chartership	☐	☐	☐	☐	☐	☐
l.	Because it is part of the course	☐	☐	☐	☐	☐	☐
m.	Other *(please state)*						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

4. Please assess your current level of transferable skills to *engineering work placements* using the following scale. Please read the scale carefully. Tick the box closest to your view*:*

   1 = Aware of this skill, **2** = Know about this skill, **3** = Not yet competent in the practice of this skill in the workplace.

   4 = Fairly competent at this skill in the workplace but need *strong support*, **5** = Fairly competent at this skill in the workplace but need *support*, **6** = Fairly competent at this skill in the workplace but need *occasional support*.

   7 = Competent in routine work situations **8 =** Competent in most work situations, **9** = Expert

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
a.	Communication skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐	☐	☐	☐

c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)									
		☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐

5. In your view, is a degree course which includes a work placement more effective for the development of transferable skills than a degree course without?
(*Please tick one box only*) Yes ☐ No ☐

   If Yes, why? If No, why not?

6. Please give the titles or codes of any modules/training courses which you think help students to prepare for a work placement.

7. How often have you reflected upon your transferable skills in the past year?
Please tick the relevant box for each statement listed in the table below:
   1 = Not at all, **2** = Once in the year, **3** = Twice in the year
   4 = About every three months, **5** = About every month
   6 = Once a week, **7** = More than once a week

		1	**2**	**3**	**4**	**5**	**6**	**7**
a.	Communication skills	☐	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐	☐

k.	Time management	☐	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)							
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐

8. If you were to do (or are doing) a work placement, would you expect it to improve your transferable skills?
(*Please tick one box only*) Yes ☐ No ☐

9. If you were to do (or are doing) a work placement, would you keep a record of the skills that you developed whilst on placement?
(*Please tick one box only*) Yes ☐ No ☐

10. Do you know of a tool called RAPID that is designed to help you with the above?
(*Please tick one box only*) Yes ☐ No ☐

11. Do you know of any other tools for recording and planning skills development?
(Please tick one box only) Yes ☐ No ☐
If Yes, *please give their names*:

Section B - About the Company

12. (a) How many companies have you applied to?
(*Please tick one box only*)
0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ More than 5 ☐
Answer '0' if you are not going on a placement.

(b) Which of the following factors would (or has) influenced your choice of company?
Put in rank order with **1** *being the most important and* **4** *being the least important*

A. Size of the company ☐
B. Company location ☐
C. Money (pay) ☐
D. Field of interest ☐

Other influences *please specify*:

(c) **Size of company**
If you were to do (or are doing) a work placement would you prefer to work in a Small/Medium/Large company? (*Please tick the relevant*)
Small ☐ Medium ☐ Large ☐

(d) **Location of company**
If you were to do (or are doing) a placement would you prefer to work in a Company which is: (*Please tick the relevant*)
Near family ☐ Near Friends ☐ No preference ☐

In UK ☐ Abroad ☐ No preference ☐

(e) **Money (pay)**

If you were to do (or are doing) a placement would you prefer to earn:
(*Please tick one box only*)

About the same as I receive now as a student ☐
More than I receive now as a student ☐
Much more than I receive as a student ☐
Not important to me ☐

(f) **Field of interest**

If you were to do (or are doing) a placement would you prefer to do work which:
(*Please tick one box only*)

Will help you do research ☐
Prepare you for work in that industry ☐
General experience of working in industry ☐

Any others? *Please specify*:

(g) Have you yet secured a work placement place?
(*Please tick one box only*)

Yes ☐ No ☐ Not yet applied ☐ Not intending to apply ☐

If Yes, do questions 13, 14 and 15. Otherwise go to Section C

13. Name and Address/location of the company where you will be doing your work placement:

14. What kind of work do you expect to do on placement?

15. When are you going on placement?
(*Please tick one box only*)

At the end of your 2nd year ☐
At the end of your 3rd year ☐
At the end of your 4th year ☐
Others. *Please specify*:

Section C – About you

16. For an entry into a prize draw (**MP3 Player**), please record your student ID number: . Your ID number may also be used to contact you for a follow up chat regarding some aspects of industrial placements. All information will be treated as strictly confidential to the researchers.

17. Are you:

Male ☐ Female ☐

18. (a) How old were you at your last birthday?
(*Please tick one box only*)
18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ over 23 ☐

(b) Which year of your degree course are you in?
(*Please tick one box only*)
1st year ☐ 2nd year ☐ 3rd year ☐ 4th year ☐

Other. *Please specify*:

19. Which department are you in?
(*Please tick one box only*)
Aeronautical & Automotive Engineering ☐
Chemical Engineering ☐
Civil Engineering ☐
Design Technology ☐
Electronic & Electrical Engineering ☐
IPTME ☐
Systems Engineering ☐
Wolfson School of Mechanical & Manufacturing Engineering ☐
Others. *Please specify*:

20. Did you have work experience in engineering prior to coming to University?
(*Please tick one box only*)
Yes ☐ No ☐

21. Did you have any work experience in other areas before coming to University?
(*Please tick one box only*)
Yes ☐ No ☐

22. For University fee paying purposes. Are you considered to be?
(*Please tick one box only*)
UK/EU Student ☐ International Student ☐

23. How useful do you think engineering work placements are for developing transferable skills?
(*Please tick one box only*)
Very useful ☐ Useful ☐ Fairly useful ☐
Little use ☐ Not useful ☐ Useless ☐

24. Please give your honest opinion of the value (or otherwise) of work placements for developing transferable skills.

Thanks for taking the time to complete this questionnaire.

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Students Post-Work Placement Questionnaire

This questionnaire aims to find out about your views on work placements and the transferable skills you have developed during your course and work placement. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Prof. Richard Holdich, Dr Barry Haworth, Prof. George Brown and Yussuf Ahmed, Centre for Excellence in Engineering Teaching and Learning.

Section A - About Work Placement and Transferable Skills:

1. In general, how important do you feel it is to have the following transferable skills in work placements? Please tick the box closest to your view:
   1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant.
   4 = Slightly important, **5** = Important, **6** = Very important.

		1	2	3	4	5	6
a.	Communication skills	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

2. Please assess your current level of transferable skills using the following scale. Please read the scale carefully. Tick the box closest to your view:
   1 = Aware of this skill, **2** = Know about this skill, **3** = Not yet competent in the practice of this skill in the workplace,
   4 = Fairly competent at this skill in the workplace but need *strong support*, **5** = Fairly competent at this skill in the workplace but need *support*, **6** = Fairly competent at this skill in the workplace but need *occasional support*.
   7 = Competent in routine work situations **8 =** Competent in most work situations, **9** = Expert

		1	2	3	4	5	6	7	8	9
a.	Communication skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐	☐	☐	☐

e.	Management skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)									
		☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐

3. Please rate your work placement experience with regards to:
   1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant.
   4 = Slightly important, **5** = Important, **6** = Very important.

		1	2	3	4	5	6
a.	Future employability	☐	☐	☐	☐	☐	☐
b.	Improving transferable skills	☐	☐	☐	☐	☐	☐
c.	Improving academic performance	☐	☐	☐	☐	☐	☐

4. Have your expectations of the work placement been met?
   (Please tick one box only)
   Definitely Yes ☐ Yes ☐ No ☐ Definitely No ☐

   Comments:

5. Overall, do you think work placement have helped you to improve your transferable skills?
   (Please tick one box only)
   Definitely Yes ☐ Yes ☐ No ☐ Definitely No ☐

   Comments:

6. How many times did the University tutors visits you during your Work placement?
   (Please tick one box only)

Never visited	☐
Once	☐
Twice	☐
Three times or more	☐

7. In your view, is a degree course which includes a work placement more effective for the development of transferable skills than a degree course without?
   (Please tick one box only) Yes ☐ No ☐

   If Yes, why? If No, why not?

8. Please give the titles or codes of any modules/training courses which you think helped you to prepare for a work placement.

9. What else have you gained from work placement?
   Comments:

10. Finally, would you say that work placements generally have a:
Please tick the box closest to your view:

Very strong impact on transferable skills	☐
A strong impact on transferable skills	☐
A fairly strong impact on transferable skills	☐
Some impact on transferable skills	☐
A weakish impact on transferable skills	☐
Not much impact on transferable skills	☐

Section B – About you

11. Student ID Number:

12. Are you:
Male ☐ Female ☐

13. Which department are you in?
(Please tick one box only)
Chemical Engineering ☐
Civil Engineering ☐
IPTME ☐
Others. *Please specify*

14. For University fee paying purposes. Are you considered to be?
(Please tick one box only)
UK/EU Student ☐ International Student ☐

Thanks for taking the time to complete this questionnaire.

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Students in Final Year Questionnaire

This questionnaire aims to find out about your views on work placements and the transferable skills you have developed during your course. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Dr Richard Holdich, Dr Barry Haworth, Prof. George Brown and Yussuf Ahmed, Centre for Excellence in Engineering Teaching and Learning.

Section A - About Work Placement and Transferable Skills:

1. In general, how important do you feel it is to have the following transferable skills when you start your first job? Please tick the box closest to your view:
   1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant.
   4 = Slightly important, **5** = Important, **6** = Very important.

		1	2	3	4	5	6
a.	Communication skills	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

2. Do you think the modules in the final year have helped you to improve your transferable skills?
   (Please tick one box only)
   Definitely Yes ☐ Yes ☐ No ☐ Definitely No ☐

   Comments:

3. Please assess your current level of transferable skills using the following scale. Please read the scale carefully. Tick the box closest to your view:
1 = Aware of this skill, **2** = Know about this skill, **3** = Not yet competent in the practice of this skill in the workplace,
4 = Fairly competent at this skill in the workplace but need *strong support*, **5** = Fairly competent at this skill in the workplace but need *support*, **6** = Fairly competent at this skill in the workplace but need *occasional support*.
7 = Competent in routine work situations **8 =** Competent in most work situations, **9** = Expert

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
a.	Communication skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)									
		☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐

4. Looking back on your degree course, do you think a degree course which includes a work placement more effective for the development of transferable skills than a degree course without?
(Please tick one box only) Yes ☐ No ☐

If Yes, why? If No, why not?

5. Finally, if you had done a work placement, do you think it would have had:
Please tick the box closest to your view:

Very strong impact on transferable skills	☐
A strong impact on transferable skills	☐
A fairly strong impact on transferable skills	☐
Some impact on transferable skills	☐
A weakish impact on transferable skills	☐
Not much impact on transferable skills	☐

6. Any other comments on transferable skills and work placements

Section B – About you

7. Student ID Number:

8. Are you:
   Male ☐ Female ☐

9. Which department are you in?
   (Please tick one box only)
   Chemical Engineering ☐
   Civil Engineering ☐
   IPTME ☐
   Others. *Please specify*

10. For University fee paying purposes. Are you considered to be?
    (Please tick one box only)
    UK/EU Student ☐ International Student ☐

11. If you would like to be entered into the prize draw to win MP3 Player, please tick this box ☐

Thanks for taking the time to complete this questionnaire.

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Line Managers' Questionnaire 1
Work Placements and Transferable Skills

This questionnaire aims to find out about your views on the impact of work placements on the development of students transferable skills in engineering. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Yussuf Ahmed, Dr Barry Haworth, Dr Richard Holdich, and Professor George Brown, Engineering Centre for Excellence in Teaching and Learning

1. In general, how important do you feel it is that students develop the following transferable skills on placements? *Please tick the box closest to your view*:
   1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant
   4 = Slightly important, **5** = Important, **6** = Very important.

		1	**2**	**3**	**4**	**5**	**6**
a.	Communication skills	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

2. In your view, is a degree course which includes a work placement more effective for the development of transferable skills than a degree course without?
   (*Please tick one box only*) Yes ☐ No ☐
   Discussion:
   If Yes, why? If No, why not?

3. Would you expect work placements to improve students transferable skills?
   (*Please tick one box only*) Yes ☐ No ☐
   Discussion:
   If Yes, why? If No, why not?

4. Do you think doing a work placement helps students gets a better degree?
   Discussion:

5. Do you think students value work placement?
   Discussion:

6. What do you think students get most out of work placements?
   Discussion:

7. What would you like them to be able to do before they come on work placements?
   Discussion:

8. How long would you prefer a student to stay in the company for a work placement?
   (*Please tick one box only*)
   ☐ About 3 months ☐ About-6 months ☐ About a year
   Why do you have this preference?
   Discussion:

9. How do you think students change from the beginning of a placement to the end of the placement.
   Discussion:

10. Finally, would you say that work placements generally have a:
    Please tick the box closest to your view:

Very strong impact on transferable skills	☐
A strong impact on transferable skills	☐
A fairly strong impact on transferable skills	☐
Some impact on transferable skills	☐
A weakish impact on transferable skills	☐
Not much impact on transferable skills	☐

Thanks for taking the time to complete this questionnaire.

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Line Managers' Questionnaire 2
Work Placements and Transferable Skills

This questionnaire aims to find out about your views on the impact of work placements on the development of students' transferable skills in Engineering. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Yussuf Ahmed, Dr Barry Haworth, Dr Richard Holdich, and Professor George Brown, Engineering Centre for Excellence in Teaching and Learning

Section A - About Work Placement and Transferable Skills:

1. Using *i* for initially (at the beginning of the placement) and *n* for where the students is now, on this 9 points scale, please rate the student on the following transferable skills:

   1 = Aware of this skill, **2** = Know about this skill, **3** = Not yet competent in the practice of this skill in the workplace, **4** = Fairly competent at this skill in the workplace but need *strong support*, **5** = Fairly competent at this skill in the workplace but need *support*, **6** = Fairly competent at this skill in the workplace but need *occasional support*. **7** = Competent in routine work situations **8 =** Competent in most work situations, **9** = Expert

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
a.	Communication skills									
b.	Ability to solve problems									
c.	Ability to work as a team member									
d.	Planning and organising skills									
e.	Management skills									
f.	Technical skills									
g.	Personal effectiveness skills									
h.	Research skills									
i.	Information Technology skills									
j.	Decision making skills									
k.	Time management									
l.	Other (*please state*)									

2. Overall would you regard the student have:
   (Please tick one box only)

Outstandingly pass	
Very good pass	
Borderline fail	
Fail	
Seriously fail	

Comments:

3. Looking back over the years you have supervised students on placement, please tick the boxes which gives your overall assessment of the students at the end of their placement:

   1 = Aware of this skill, **2** = Know about this skill, **3** = Not yet competent in the practice of this skill in the workplace, **4** = Fairly competent at this skill in the workplace but need *strong support*, **5** = Fairly competent at this skill in the workplace but need *support*, **6** = Fairly competent at this skill in the workplace but need *occasional support*. **7** = Competent in routine work situations **8 =** Competent in most work situations, **9** = Expert

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
a.	Communication skills									
b.	Ability to solve problems									
c.	Ability to work as a team member									
d.	Planning and organising skills									
e.	Management skills									
f.	Technical skills									
g.	Personal effectiveness skills									
h.	Research skills									
i.	Information Technology skills									
j.	Decision making skills									
k.	Time management									
l.	Other (*please state*)									

4. What alternatives would you suggest for the students who are not doing work placements to acquire the same skills as those who have done placement?

5. Name of the student:

Thanks for taking the time to complete this questionnaire.

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DIS Tutors' Questionnaire – Work Placements and Transferable Skills

These are the interview questions that I will be using when I come to see you, please do consider them beforehand. Please do answer question 1, before our interview. At this stage, there is no need to write a response to the remaining questions, unless you wish to do so.

The aim of this interview is to find out about your views on the impact of work placements on the development of students transferable skills in engineering. The information will be used to help improve the experience of students on courses and industrial placements in the future. All information you provide will be treated as strictly confidential to the researchers Yussuf Ahmed, Dr Barry Haworth, Professor Richard Holdich, and Professor George Brown, Engineering Centre for Excellence in Teaching and Learning.

1. In general, how important do you feel it is that students develop the following transferable skills on placements? *Please tick the box closest to your view, based on the context of the 'average' work placement*

   1 = Very unimportant, **2** = Unimportant, **3** = Slightly unimportant
   4 = Slightly important, **5** = Important, **6** = Very important.

		1	**2**	**3**	**4**	**5**	**6**
a.	Communication skills	☐	☐	☐	☐	☐	☐
b.	Ability to solve problems	☐	☐	☐	☐	☐	☐
c.	Ability to work as a team member	☐	☐	☐	☐	☐	☐
d.	Planning and organising skills	☐	☐	☐	☐	☐	☐
e.	Management skills	☐	☐	☐	☐	☐	☐
f.	Technical skills	☐	☐	☐	☐	☐	☐
g.	Personal effectiveness skills	☐	☐	☐	☐	☐	☐
h.	Research skills	☐	☐	☐	☐	☐	☐
i.	Information Technology skills	☐	☐	☐	☐	☐	☐
j.	Decision making skills	☐	☐	☐	☐	☐	☐
k.	Time management	☐	☐	☐	☐	☐	☐
l.	Other (*please state*)						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

2a. Please name two transferable skills which work placement have the **most** impact on

2b. Please name two transferable skills which work placement have the **least** impact on

3. In your view, is a degree course which includes a work placement more effective for the development of transferable skills than a degree course without?
   (*Please tick one box only*) Yes ☐ No ☐
   Discussion:
   If Yes, why? If No, why not?

4. Would you expect work placements to improve students transferable skills?
   (*Please tick one box only*) Yes ☐ No ☐
   Discussion:
   If Yes, why? If No, why not?

5. Do you think doing a work placement helps students gets a better degree (higher class degree)?
   Discussion:

6. Do you think students value work placement?
   Discussion:

7. What do you think students get most out of work placements?
   Discussion:

8. What do you think employers gain most out of the DIS placements?
   Discussion:

9. How do you think students change from the beginning of a placement to the end of the placement?
   Discussion:

10. What alternatives would you suggest for the students who are not doing work placements to acquire the same skills as those who have done placement?
    Discussion:

11. Finally, would you say that work placements generally have a:
    Please tick the box closest to your view

Very strong impact on transferable skills	☐
A strong impact on transferable skills	☐
A fairly strong impact on transferable skills	☐
Some impact on transferable skills	☐
A weakish impact on transferable skills	☐
Not much impact on transferable skills	☐

Thank you for your time and willingness to participate in this interview.

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Appendix 5 – Choice of statistical Methods

As indicated in Chapter Three, this appendix provides the underlying reasons for the choice of statistical methods used in this thesis. The reasons are based on Siegel and Castellan (1988). For the mathematical theory underlying the approaches used, the reader is also referred to Siegel and Castellan (Siegel, S., and Castellan, N. J., 1988).

The chi-squared (χ^2) Test

This test is primarily used to test if there is a significant association between a row of a value variables and another row. The test is conservative, that is it may not detect a significant difference, also its limitations are no cell can contain a 0 and a frequency of less than 5. Consequently the data has to be collapsed into categories so that they contain more than 5. A further constraint is the test does not take into account if the data is in rank order. Tests which take this feature into account are likely to be more precise. However an advantage of χ^2 (chi-squared) is that, if the results are significant it is likely that other tests which are less conservative will yield significant results. It was used in this study.

Kolmogorov-Smirnov Test

This test determines whether the difference between two sets of ordered data are significantly different. It can be used on relatively large numbers and it will accept zero frequencies in any cell. It does not require the distribution of frequencies to follow a normal curve. It was used in this study to test degree classifications and work placements.

t-tests

‘t’ tests also tests significant differences between two sets of data. If the data is independent (e.g. Males vs. Females) the uncorrelated ‘t’ test is used. If the data is correlated (e.g. same sample take the test twice to check if there is a significant change), then the correlated ‘t’ test is preferred because it is more precise. The ‘t’ tests assume the sets of data came from data based on interval or rational levels of measurements. That is, there are equal interval between the numbers used so that the ‘gap’ between 6 and 5 is the same as the gap between 3 and 4. And there is an

absolute zero. These two conditions are not usually met in social research, based on rating scales. This condition can be relaxed for sample over 30.

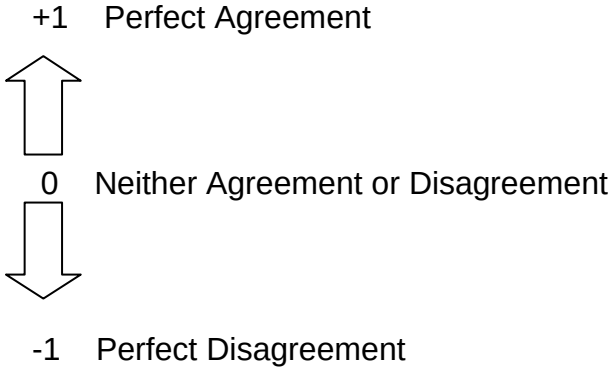
Results based on ‘t’ tests should be treated cautiously. They were used in this study to, for example compare difference between males and females and differences between departments

The Mann Whitney test

This test is also used to compare differences between two sets of data. The test does not assume that there are equal intervals between numbers (e.g. on rating scales). It, instead uses rank orders such a score of 6 is greater than a score of 5, but the test is unreliable if there are several ‘ties’, that is several people agree on the same score, consequently it is of little value for comparing differences based on questionnaire data.

Correlation ‘r’ test

This test is used to determine how closely related two sets of data are. Positive correlations shows that as the values in one set data increase so does the values in the other set of data. Perfect agreement is +1, zero correlation means there is no relationship between the data. When one value increases and another decreases, means there is a negative correlation, and this yield to numbers between 0 and -1 (total disagreement). The test assumes the data are from normal population and the values are at the interval or ratio level. However for large sample it is usually accepted. It was used in this study to correlate the views of the students, line managers and lecturers.



Spearman's rho – a measure of correlation

This test also tests the degree of agreement between two sets of data but it does not assume the data is from different normal populations. All that is required is that the data is in rank order and there are few ties in the data. Questionnaire data often has ties (e.g. several people give a rating 3), so it should not be used except when the samples are small. The test was used in this study to measure the linear relationship between the results obtained from the students, line managers and the lecturers.

The Impact of Work Placements on the Development of Transferable Skills in Engineering

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Abstract

This paper presents the initial findings of the pre-placement survey undertaken in three engineering departments (Chemical Engineering, Civil & Building Engineering and Institute of Polymer Technology & Materials Engineering – IPTME) at Loughborough University. It is a part of the research project on the impact of work placements on the development of transferable skills in engineering. One hundred and seven students participated in the survey.

The main results were that the majority of the students had, in their view a solid basis for developing transferable skills whilst on placement. They valued work placement and they considered the work placements would have an impact on their transferable skills. These results provide a baseline for measuring the impact of work placements on transferable skills.

This study will be a longitudinal study of students embarking on their placements, during and afterwards. The results, of the first stage of the research achieved using pre-placement questionnaires, are reported in this paper.

The longitudinal study aims to identify the impact of work placements on the academic performance and the development of transferable skills of a sample of engineering students. This project is funded and supported by the Engineering Centre for Excellence in Teaching and Learning (engCETL) at Loughborough University.

Keywords

Work placement, sandwich placement, summer placement, transferable skills, work-based learning, engineering, skills.

Introduction

This paper provides a summary of the work completed so far for a research project on the impact of work placements on the development of transferable skills in engineering. In this brief introduction, the key concepts are outlined. This paper describes the design of the research and the findings from the analysis of the pre-placement questionnaires completed by 107 students. The questionnaire was concerned with the students' initial perception of the value of work placements for developing transferable skills. This project is funded and supported by the Engineering Centre for Excellence in Teaching and Learning (engCETL). engCETL was established in March 2005, initially for a five year period, and is located in the Faculty of Engineering at Loughborough University in the UK.

How is the impact measured?

The standard method of measuring impact in engineering and in social science is to take measures before and after the impact. This model of pre-test intervention post-test is used in this research. However the measurement of impact in the social sciences and educational is different from measurement in engineering. Whereas in engineering the measurements include precise instruments, in the social science the measurements relies heavily upon subjective measures such as the perception of students, their university/industrial training tutors and their line managers in industry.

In this research project, a variety of quantitative and qualitative methods to measure the impact are being used. These include structured and open ended questionnaire, interviews, focus groups, documentary analysis of curriculum and modules and measures of students' achievement. The core of the overall study is the students' perception and their levels of achievement. The perception of the students will be correlated whenever possible with the perception of tutors and line managers. A control group of students who have not undertaken placements will be surveyed and their results compared with the results of those who have undertaken placements. In this paper the initial results are reported.

What are work placements?

QAA Code of Practice Section 9: Placement Learning provides a broad definition of placement learning: "A work placement is a planned period of learning, normally outside the institution at which the student is enrolled, where the learning outcomes are an intended part of a programme of study."

Whether work placements are planned, have learning outcomes and are an intended part of a programme of study, is a matter to be examined in this project. It may be that not all work placements fit the QAA's code of practice.

Work placements are increasingly regarded by policy makers as beneficial to all students. The Dearing report (1997) recommends that, work experience should be made available to a greater number of students. Work experience does not mean only one year in industry, it can be a three months summer placement, a few months internships (placement in a firm or agency related to a student's major program and/or career plans), a few weeks work-based project or work shadowing (where a student observes a member of staff working in an organisation).

The duration and type of placements is a potential problem with work placements. The various types of placements are: Sandwich placement (paid work in industry which is part of some degree courses), Work-based project (a specific piece of assessed work for a course, undertaken at an employer's premises), Work shadowing (where the students observe a member of staff working in an organisation), vacation work (paid or unpaid work undertaken during University holidays) etc. Clearly these different work placements are likely to have differential effects upon students.

Some of the claims for the value of work placements are as follows: it helps students discover and improve the skills that they will need to use to be successful. For example: planning and organising; the ability to work as a team member; the ability to solve problems; presenting in professional way; motivation and initiative as well as providing an opportunity for students to be able to take what they have learnt and apply it to real problems. Whether these claims actually occur in practice is not at all clear.

What are Transferable Skills?

Some papers define "transferable skills" as the skills that someone has acquired and developed through one situation that are useful when transferred into another (next career), Fallows and Stevens (2000). The DfES (2005) identified six key skills which are: communication, application of number, information technology, working with others, improving own learning and performance, problem solving. In this study a composite of skills drawn from the literature were used. These were *communication skills, ability to solve problems, ability to work as a team member, planning and organising skills, management skills, technical skills, personal effectiveness skills, research skills, information technology skills, decision making skills, time management.*

Are Skills Transferable?

It is often assumed that, once learned, personal transferable skills will transfer from the context in which they were acquired to another; however this may not happen in practice. Brown, Bull and Pendlebury (1997) suggest that in order for the skills to be transferred, the learner must understand the skills *and* the context in which the skills are to be transferred.

Presentation and Discussion of the Results

The following are the analysis of results completed so far.

Profile of students' characteristics

One hundred and seven questionnaires were completed by student from three departments: Civil Engineering, Chemical Engineering and IPTME. Students who completed the questionnaires were 84 males and 20 females and 3 did not indicate their gender. The age range of the sample was from 19 to over 23 years of age. The majority (59) were 20 years of age. Twelve of the students were international, 91 reported they were UK/EU students and 4 did not respond.

One hundred and three students were second years, 1 was an Erasmus (*European Community Action Scheme for the Mobility of University Students*) student and three did not complete this question. Forty nine of the students were from Civil Engineering department, 33 from Chemical Engineering and 25 from IPTME.

Eighty seven students expected to do work placements and 18 reported they are not doing work placements. The majority of students will be doing placements at the end of their second year. Thirty three students had an experience of work in engineering prior to their courses, the remaining students did not. Seventy nine students had other work experience, 24 did not and 4 did not respond to this question.

When asked about the factors which would (or have) influenced their choice of company, 58 students were not concerned about the size of the company, 18 preferred to work in a large company, 26 in a medium company, 3 in a small company. Thirty six students preferred to work near their families. Seventy eight percent of the students gave their ID numbers. These will be followed up in the post placements surveys and interviews.

The perceived value of work placements

Ninety five students (88.8%) said a degree course which includes a work placement is more effective for the development of transferable skills than a degree course without. Nine (8.4%) disagree and 3 (2.8%) did not respond, see Figure 1 below.

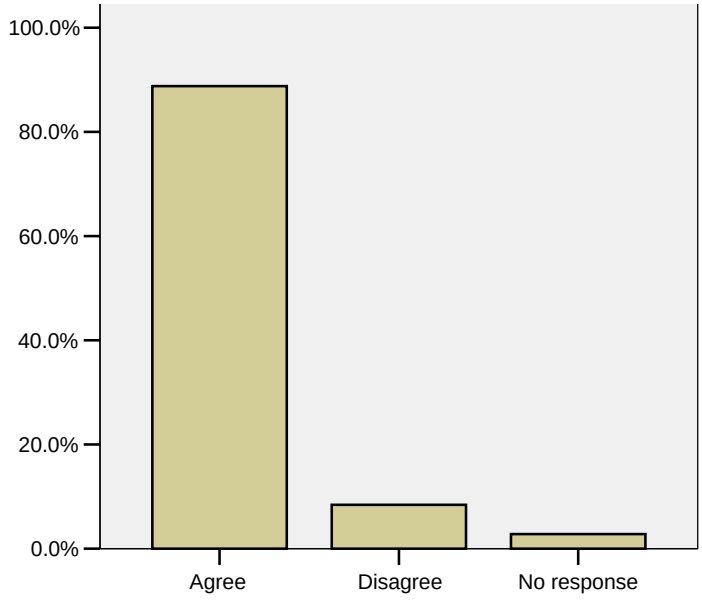

Figure 1: The perceived value of work placements

Students were also asked to rate the reasons on why students go on placement, using the mean and standard deviation, the three reasons rated high were for *work experience, to improve their chances of getting a job when they finish university and to give them an idea of what industry is really like*. This supports previous findings on the benefits of work placements (Harvey et al, 1997; Falconer, S. et al, 2003; Pickle, T. A, 1999) as well as highlighting the students' expectation by doing work placements.

The lowest was because *it is a part of the course*; this item had a wide distribution of views. The next two most lowest were: *they need break from education and because they need money*.

Transferable skills

Students were also asked to give their views on the importance of developing transferable skills. Using the mean and standard deviation the three transferable skills which the students thought were the most important to develop were: *communication skills, planning and organising skills and information technology skills*. The least important were *time management, research skills and management skills*, but even these had a relatively low standard deviation.

The highest rating and narrowest range of responses on students' self assessment of their transferable skills were: *ability to work as a team member, ability to solve problems and planning and organising skills*. These results imply the students feel they are fairly competent but will need some support. The three transferable skills the students self-assessed lowest were: *management skills, information technology skills and time management*. From these results one may conclude, that in the opinion of this sample of students, their experiences at university and earlier had laid a solid foundation for the development of transferable skills which they expected work placements would improve further.

The data obtained from the pre-placement questionnaire shows that, the majority of the sample of students reflects most upon *time management, ability to work as a team member and planning and organising*. It is interesting to note that this frequency of reflection does relate to some of the skills which the students were least confident about. This implies a high degree of reflection and self awareness by this sample of students.

The least frequent transferable skills which were reflected upon were: *information technology skills, communication skills and management skills*. These results may be because these skills do not figure largely in the modules taught in the departments surveyed. Different results would have probably been obtained from a sample of Electronic & Electrical Engineering and Computer Science departments.

It is interesting to note that the students thought communication skills, information technology and management skills were important to develop. In their response to the question which asked them "if they were to do (or are doing) a work placement, would they expect it to improve their transferable skills?" 94.4% believe work placements will help them improve their transferable skills, while 2.8% didn't agree and another 2.8% didn't answer this question. But the responses to the question asking why students go on placements revealed that students do not believe that going on work placement will improve their academic performance. If this is true, then work placements do not have an impact upon academic performance even though successful academic performance is based in part upon transferable skills such as the ability to solve problems, research skills, management skills. Analyses of actual performance in degree examinations will be undertaken and these results compared and discussed with this finding to check if their initial perceptions are correct.

From these results one can conclude that the majority of students had, in their view, a solid basis for developing transferable skills whilst on work placements. They valued work placements and they considered work placements would have an impact upon their transferable skills.

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Engineering Students' and Line Managers' Perceptions of Value of Work Placements in Higher Education

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A survey of views of current students and line managers on the value of supervised and assessed work placements was undertaken prior to placement. The students were from three engineering departments (Chemical Engineering, Civil Engineering and the Institute of Polymer Technology and Materials Engineering (IPTME)) at Loughborough University and line managers from 11 different companies which takes students on placement. Results indicated that the overwhelming majority of students valued work placements as a way of developing transferable skills, but about two thirds did not think that work placements would improve their degree results. Students particularly valued work placements for the experience, in order to improve their chances of 'getting a job when they finish university' and 'to give them an idea of what industry is really like'. Lowest values were given to the items 'because it is a part of the course', 'they need a break from education' and 'because they need money'.

There were some significant differences between students from each of the departments / engineering disciplines, between males and females and between those who are planning work placements and those who are not. Overall, students have a high expectation of work placements, in order to develop their transferable skills, whilst pursuing a full-time undergraduate engineering degree programme.

Eighty six percent of the line managers interviewed, considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Most of the line managers stressed that work placements increased the confidence and maturity of the students. Communication skills particularly presentation and report writing were thought to improve. But also technical and practical problem solving, team working and time management. They also gained a knowledge of how companies operate and the experience helps them to decide on their careers. There was a divided opinion from line managers regarding the impact of work placements on the students academic performance. Fifty percent of the line managers didn't think that work placement will help students get a better degree.

Keywords: Work placement, sandwich placement, summer placement, transferable skills, work-based learning, engineering, skills.

1. Introduction

Work placements have been part of engineering education in the United Kingdom since the 1950's (Brennan and Little, 2006). They are usually in the form of a 'thick sandwich' of a year in industry in which, it is claimed, students gain valuable work experience and employers and industry in general benefit from the contributions made by students in the short and long term (Blackwell *et al*, 2001; Morris, 2002).

During the early years of implementing placements, it was not thought necessary to integrate the work experience into the degree courses. There was little emphasis on preparation for work experience, on supervising work placements or using the experience in courses after returning to University. Subsequently there have been attempts to justify and integrate work placements into the structure of degrees, not wholly with success (Pickles, 1999, Ryan *et al*, 1996).

The sandwich principle has been characterised as founded upon 'the interaction of academic study and practical applications such that each serves to illuminate and stimulate the other' (Crick Report cited in Nixon, 1990). The purpose of the work based learning gained in placements has been variously described as gaining 'employability', 'transferable' or 'generic' skills, developing an understanding of world and work organisations, and understanding the 'real world' application of skills (Ryan *et al*, 1996 Kerawala et al, 1998, Pickles, 1999, Baird, 2005).

Of these arguments perhaps the most persuasive is the role of work placements in developing 'transferable skills' since these are arguably the basis of applying knowledge and understanding of work and of the work place. The transferable skills developed on work placements, may feed back to academic study and provide a foundation for the transfer of these skills when the students enter the engineering or other professions. However the precise nature of transferable skills is open to dispute (Bennett, Dunne and Carre, 2000).

As indicated above, the term 'transferable skills' is often used interchangeably with employment-related skills, generic skills and personal transferable skills. (Fallows and Stevens, 2000, Chadha, 2005). Bennet, (2002) defines transferable skills as the skills "needed in any job and which enable people to participate in a flexible and adaptable work force". This definition provides a useful basis for identifying a list of important transferable skills and many such lists exist (Bennett, Dunne and Carré, 2000, Dearing Report, 1997, DfES, 2005, MIT-Cambridge, 2006).

The study was undertaken in order to explore students' perception and expectations of work placements immediately before they went on placements, which may influence what they gain from placements. Also to explore the Line Managers' perception of the values of work placements to the students in developing their transferable skills

2. Methods of data collection and analysis

A questionnaire was designed, piloted, and administered to 107 current engineering students at Loughborough University during class time, one month prior to the summer vacation when placement students will be starting their work experience. All the students completed the questionnaire which consisted of structured questions on placements and transferable skills.

Also a semi-structured interview schedule was designed and piloted to fifteen line managers from 11 different engineering companies. These companies were: Lubrizol Ltd., Tyco Electronics, BP, Balfour Beatty, Interserve, British Sugar, Diageo, Rolls Royce, Cytec Engineered Material Ltd., Smiths Medical.

The interviews were recorded and transcribed and analysed by the researcher. An independent observer checked the categories and carried out a blind analysis of a sample of the transcripts. The correlation between the researcher and the observer analysis was 1, which indicates a high degree of inter common reliability.

This paper reports the main findings. Means, standard deviations and the percentage coefficients of variation (CV) were calculated to measure the central tendencies and range of scores, to provide a measure of the reliability of the scores, to enable the rank orders of students' responses to be identified and to distinguish between means with the same value. In these cases, the mean score with the lowest coefficient of variation was deemed to have the higher rank. Chi-squared tests, uncorrelated 't' tests and Spearman's rank correlation were used to identify significant relationships within the data. The conventional levels of significance were used: $p < 0.05$ is statistically significant, $p < 0.01$ is highly significant and $p < 0.001$ is very highly significant. The analysis of the results was undertaken with SPSS version 14.

3. Profile of the students' characteristics

Of the 107 questionnaires completed, there were 84 male and 20 female respondents and 3 did not indicate their gender. The age range of the sample was from 19 to over 23 years of age. Twelve of the students were international, 91 reported they were UK/EU students and 4 did not respond. One hundred and three students were second years, 1 was an Erasmus student and 3 did not complete this question. Forty nine of the students were from Civil Engineering department, 33 from Chemical Engineering and 25 from IPTME (Materials Engineering). Eighty seven students expected to do work placements and 18 reported they were not doing work placements and 2 did not respond. Seventy four percent of students had an experience of work in engineering or other work experience prior to their courses. Field of interest, company location, followed by the size of the company were the most important factors that have influenced their choice of company. Fifty eight students were not concerned about the size of the company, 18 preferred to work in a large company, 26 in a medium company, 3 preferred to work in a small company and 2 students did not respond. Sixty seven percent of the students preferred to work in companies close to their family home and friends in UK.

4. The perceived value of work placements - Students

Ninety per cent of the students agreed or strongly agreed that work placements would help them develop their transferable skills but, again, taking agree and strongly agree as a measure, only 35.5% thought it would improve their grades on return to University, whilst about 65% thought that it would have little effect upon their academic performance.

Two further questions in different parts of the questionnaire were asked concerning the specific value of work placement for developing transferable skills. In response to the question 'is a degree which includes a work placement more effective for the development of transferable skills than a degree course without?' Ninety four percent of the placement students said 'Yes' compared with only 67% of the non-placement students. Not surprisingly, there was a significant difference between students going on placements and those who were not ($\chi^2 = 10.0$, df = 1, $p < 0.02$). As a cross-check, the second question asked was "if you were to do (or are

doing) a work placement, would you expect it to improve your transferable skills?" Again 94% thought that work placements would help them improve their transferable skills, while 3% didn't agree and another 3% did not answer this question. Again, there was a significant difference between placement and non-placement students ($\chi^2 = 15.6$, df = 1 $p < 0.02$). One hundred percent of the placement students agreed with this statement compared with 82% of the non-placement students. There were no significant differences between placement and non-placement students, between genders or between engineering disciplines on these issues. The concordance between these sets of results confirms that students value highly work placements as a means of developing transferable skills.

Students particularly valued work placements for the experience to improve their chances of 'getting a job when they finish university' and 'to give them an idea of what industry is really like'. Lowest values were given to the items 'because it is a part of the course', 'they need a break from education' and 'because they need money'. But, not surprisingly, there were significant differences between placement and non-placement students on the value of placements. Overall, placement students valued placements more than non-placement students (Placement mean (P x) = 54.39, non-Placement mean (nonP x) = 50.38, $p < 0.05$). Placement students differed from non-placement students in their views on: 'to improve their chances of getting a job' (P x = 5.48, nonP x = 4.78, $p < 0.001$), 'to give them an idea of what industry is really like' (P x = 5.27, nonP x = 4.78, $p < 0.05$) and 'the year in industry counts towards getting their Chartership' (P x = 4.70, non P x = 4.11, $p < 0.05$). Females were less likely to report that 'they needed a break from education' (F x = 3.50, M x = 4.20 , $p < 0.05$) or 'because it is part of the course (F x = 2.50, M x = 3.46, $p < 0.01$), more likely for 'Personal Development (F x = 5.35, M x = 4.71, $p < 0.05$), 'it will be an opportunity to apply theory' (F x = 4.85, M x = 3.95, $p < 0.05$), and 'it will help them to choose what to do in their final project' (F x = 4.50, M x = 3.95, $p < 0.05$).

5. The perceived value of work placements – Line Managers

13 out of the 15 line managers considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Most of the line managers stressed that work placements increased the confidence and maturity of the students. Communication skills particularly presentation and report writing were thought to improve. But also technical and practical problem solving, team working and time management. They also gained a knowledge of how companies operate and the experience helps them to decide on their careers.

LM3 – "They mostly gain an appreciation of how things work/get done in industry. Those who are most able gain in confidence, learn how to work in teams, and learn about how to get their ideas across. Some are able to develop some ideas about how they want their career to develop",

LM8 – "They are learning to apply their chemistry knowledge in commercial environment, they usually almost all of them are becoming less shy, and lot more open, and a lot more happier to deal with people, obviously they are used to deal with the people of their ages but probably not that much dealing with adults or whatever, you see their communication improving a lot both written and oral and you see them gaining more confidence".

Almost all line managers preferred work placement of one year. Three main themes emerged: benefit for students, benefits for companies and obstacles. Most of the respondents focussed upon the benefits to their companies but they also considered the benefits for the students.

LM15 - "It gives the student a decent length of time to learn from the experience and also gives our company a chance to benefit from the placement",
LM10 - "The students benefits the most from having a year placement, their contribution is much higher in the last 6 months compared to the first 6 months. So its much more valuable to both parties and it can take about 6 months before they really start to positively contribute".

But some line managers thought that shorter placement did not benefit their company sufficiently. **LM5** - "Short placements are not worthwhile as it takes at least 3 months to understand the systems, procedures and processes before the Intern is able to contribute useful work. Summer placements are impossible because with summer holidays, there is never enough experienced staff to look after the Interns, with the lean manning now in the process industries".

Others pointed out that the investment/training/supervision of the students for short placement is not workable. **LM9** - "Our industry sector requires close supervision for the first six months and its only in the second six months we regain the cost of supervision and training".

6. The importance of developing transferable skills

Students were asked give their views on the importance of developing transferable skills. In descending order, the top four were 'communication skills', 'working as a team member', 'problem-solving' and 'planning and organising'. The lowest ratings in ascending order were given to 'management skills', 'research skills' and 'technical skills'. There were no significant differences between males and females, students from different departments or those going or not going on placements. Table 1 below summarises the students' views on the importance of developing transferable skills. Most of the students thought that these transferable skills were important to develop on placements.

Table 1 – The importance of developing transferable skills

	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	3	0	0	3	26	74	5.56	0.94	16.9
Ability to solve problems	3	1	3	11	47	41	5.08	1.07	21.06
Ability to work as a team member	3	1	1	6	35	60	5.35	1.04	19.4
Planning and organising skills	2	3	0	13	56	33	5.03	1	19.9
Management skills	2	5	5	31	44	20	4.59	1.11	24.2
Technical skills	2	2	7	22	55	19	4.71	1.02	21.66
Personal effectiveness skills	3	1	3	20	48	32	4.92	1.07	21.75
Research skills	2	6	13	35	36	15	4.33	1.15	26.6
Information Technology skills	3	0	2	18	45	22	4.87	1.03	21.15
Decision making skills	4	0	4	22	53	24	4.79	1.07	22.3
Time management	5	0	2	17	44	38	4.97	1.17	23.5

1 = very unimportant, **2** = unimportant, **3** = slightly unimportant,
4 = slightly important, **5** = important, **6** = very important.

Table 2 below shows the comparison of the results obtained from line managers and the students on the importance of developing transferable skill and table 2 shows the spearman's correlation coefficient .

Table 2 – Comparison between line managers' and students' feedbacks on the importance of developing the following transferable skills

	Students	Line Managers
Communication skills	5.56 (1)	5.53 (1)
Ability to solve problems	5.08 (3)	5.00 (4)
Ability to work as a team member	5.35 (2)	5.20 (2)
Planning and organising skills	5.03 (4)	4.67 (7)
Management skills	4.59 (10)	3.27 (11)
Technical skills	4.71 (9)	5.07 (3)
Personal effectiveness skills	4.92 (6)	4.87 (6)
Research skills	4.33 (11)	4.13 (9)
Information Technology skills	4.87 (7)	4.07 (10)
Decision making skills	4.79 (8)	4.13 (8)
Time management	4.97 (5)	4.93 (5)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.

Table 3 – Spearman's Correlation Coefficient

		Students	**Line Managers**
Students	Correlation Coefficient	1.000	0.715*
	Sig. (2-tailed)		0.013
	N	11	11
Line Managers	Correlation coefficient	0.715*	1.000
	Sig. (2-tailed)	0.013	
	N	11	11

* Correlation is significant at the 0.05 level (2-tailed)

As you can see from the table 3, there is a close agreement from line managers and students views on the importance of transferable skills, spearman's rho (ρ = 0.013). The line managers and students regarded communications skills as the most important to develop followed by ability to work as a team member and ability to solve problems.

Management skills were not thought to be important by either group. The main disagreement was upon technical skills, line managers regarded this most important at work while students did not.

7. Benefits of placements to students

Most of the line managers stressed that work placements helped students to make and improve their careers choice and employability. **LM11** - "If the students does a good work placement, the biggest advantages, they might get a graduate job with us, if they do a good work placement we will then hopefully get them back as a graduates, so we can guarantee them a job hopefully", **LM15** - "The student gains a better CV by being able to state they have worked for a certain time with, in our case, a high profile company. It therefore increases their chance of gaining employment in the future. It could result in a job opportunity within our company",

LM1 – "Permanent job after graduating, confirming career choice", **LM2** - "Students can either confirm (or otherwise) that they have chosen the right field of engineering for them, in addition to the confidence, self-esteem, communication issues mentioned above".

8. Impact of work placement on academic performance and transferable skills

There was a divided opinion from line managers regarding the impact of work placements on the students academic performance. 50% of the line managers didn't think that work placements will help students get a better degree. But the main theme emerged from the line managers in this question, seems that they value work placements more.

When line managers were asked that, would they expect work placements to improve students transferable skills? All of them agreed and believe that some transferable skills can be developed better at work place as the students gets the opportunity to work in a team in a real work environment as well as learning a lot from others.
LM5 - "Opportunity to work in a Team in a real work environment. Communication and presentation at all levels. May be opportunities for formal training in time management, influencing skills, negotiating skills etc",
LM15 - "The student is placed in a situation where he/she is using these skills daily and getting coaching and feedback on a regular basis".

Another line manager thought that work placements, usually reveals what skills the students already has, more than actually developing them, **LM3** - "There should normally be opportunities to work in teams, solve problems, present conclusions, and recommend courses of action. But, ultimately, I think the work placement more usually reveals what skills the student already has, more than actually developing them".

One line manager believe that, many of the skills could be developed reasonably effectively during the degree course. Another issue emerged was the length of the placement, **LM3** - "A work placement clearly has some value in the development of transferable skills, though it is not clear to me (i) whether a formal/official placement is entirely necessary, and (ii) how long it needs to be. Many of the skills above could be developed reasonably effectively during the degree course".

9. Discussion

The overall majority (90%) of students and 87% of the line managers valued work placements highly as a means of developing transferable skills. The majority of students agreed that it was important to develop transferable skills and, of these skills, the most important to develop were communication, team working, problem solving and planning and organizing. They rated fairly highly their competences in these skills and reflected most frequently on two of these skills: planning and organizing and problem solving. The students did also reflect frequently upon time management and IT skills. These are skills which are necessary for their current academic achievement.

The skills which students thought were least important at this stage during their placements were research skills and management skills. These were also the skills they regarded as their weakest and were amongst the skills least reflected upon. These skills do not figure largely in the first two years of their undergraduate

courses. Majority of the line managers interviewed also thought that the research skills and management skills were not very important for the students during their work experiences. From the data collected from the students, these skills had high coefficients of variation which indicate a wide spectrum of views on the importance, self-assessment and frequency of assessment of these skills.

The students had less confidence that work placements would assist them to obtain better degrees even though it is sometimes argued that work placements do enhance transferable skills and therefore feedback into academic performance (Blackwell *et al*, 2001). Perhaps the students' views are realistic. It is likely that their experience in the workplace will develop their transferable skills and understanding of work and work organisations (Ryan *et al*, 1996). But whether these experiences and skills will transfer depends, in part on the nature of the placement and the existing capabilities of the students. A student who does an IT project on a placement is obviously better equipped in the final year to do a similar project than one whose experience has been confined to shop floor management. The variability of work placements is a vexing problem in the assessment of the impact of placements on transferable skills. Further, if work placements have a relatively uniform effect upon transferable skills relevant to academic performance, this effect would not necessarily change the rank order of performance in the final year of the degree (Brown, Bull and Pendlebury, 1997).

Some caution should be taken in drawing conclusions from these results. Only 15 line managers took part in the survey, and the sample of the students surveyed was drawn from only three engineering disciplines, only 18 of the sample were not going on placements and the results are based on students' perceptions. But, insofar as this sample is typical of other engineering students, it would seem that, regardless of gender or discipline, most students value work placements very highly and regard transferable skills as very important to develop. They regard themselves as fairly competent in transferable skills but in need of further support and development during work placements. They do reflect upon transferable skills which are relevant to their immediate tasks and, by induction, one can assume they will continue to do so. In short, the students have high expectations of work placements. It remains to be seen if these expectations are realised.

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Loughborough University

Insert Name of Research Proposal

INFORMED CONSENT FORM
(to be completed after Participant Information Sheet has been read)

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved by the Loughborough University Ethical Advisory Committee.

I have read and understood the information sheet and this consent form.

I have had an opportunity to ask questions about my participation.

I understand that I am under no obligation to take part in the study.

I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others.

I agree to participate in this study.

Your name _____

Your signature _____

Signature of investigator _____

Date _____

Loughborough University

Ethical Clearance Checklist

(TO BE COMPLETED FOR ***ALL*** INVESTIGATIONS INVOLVING HUMAN PARTICIPANTS)

All staff wishing to conduct an investigation involving human participants in order to collect new data in either their research or teaching activities, and supervisors of students who wish to employ such techniques are required to complete this checklist before commencement. It may be necessary upon completion of this checklist for investigators to submit a full application to the Ethical Advisory Committee. Where necessary, official approval from the Ethical Advisory Committee should be obtained ***before*** the research is commenced. This should take no longer than one month.

IF YOUR RESEARCH IS BEING CONDUCTED OFF CAMPUS AND ETHICAL APPROVAL FOR YOUR STUDY HAS BEEN GRANTED BY AN EXTERNAL ETHICS COMMITTEE, YOU MAY NOT NEED TO SEEK FULL APPROVAL FROM THE UNIVERSITY ETHICAL ADVISORY COMMITTEE. HOWEVER, YOU WILL BE EXPECTED TO PROVIDE EVIDENCE OF APPROVAL FROM THE EXTERNAL ETHICS COMMITTEE AND THE TERMS ON WHICH THIS APPROVAL HAS BEEN GRANTED.
If you believe this statement applies to your research, please contact the Secretary of the Ethical Advisory Committee for confirmation.

IF YOUR RESEARCH IS TRANSFERRING INTO LOUGHBOROUGH UNIVERSITY AND APPROVAL WAS OBTAINED FROM YOUR ORIGINATING INSTITUITON, THERE IS A REQUIREMENT ON THE UNIVERSITY TO ENSURE THAT APPROPRIATE APPROVALS ARE IN PLACE.
If you believe this statement applies to your research, please contact the Secretary of the Ethical Advisory Committee with evidence of former approval and the terms on which this approval has been granted.

IT IS THE RESPONSIBILITY OF INDIVIDUAL INVESTIGATORS TO ENSURE THAT THERE IS APPROPRIATE INSURANCE COVER FOR THEIR INVESTIGATION.
If you are at all unsure about whether or not your study is covered, please contact the Finance Office to check.

Name and Status of Senior Investigators (Research Grade II and above):

(Please underline responsible investigator where appropriate)

.....

.....

Department .....

Name and Status of Other Investigators:

.....

.....

Department .....

Title of Investigation

.....

.....

Section A: Investigators

Do investigators have previous experience of, and/or adequate training in, the methods employed?	Yes ☐	No** ☐
Will junior researchers/students be under the direct supervision of an experienced member of staff?	Yes ☐	No** ☐
Will junior researchers/students be expected to undertake physically invasive procedures (not covered by a generic protocol) during the course of the research?	Yes** ☐	No ☐
Are researchers in a position of direct authority with regard to participants (eg academic staff using student participants, sports coaches using his/her athletes in training)?	Yes** ☐	No ☐

** If you select any answers marked **, please submit your completed Ethical Advisory Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the Ethical Advisory Committee.

Section B: Participants

Vulnerable Groups

Will participants be knowingly recruited from one or more of the following vulnerable groups?

Children under 18 years of age (please refer to published guidelines)	Yes* ☐	No ☐
People over 65 years of age	Yes* ☐	No ☐
Pregnant women	Yes* ☐	No ☐
People with mental illness	Yes* ☐	No ☐
Prisoners/Detained persons	Yes* ☐	No ☐
Other vulnerable group (please specify _____)	Yes* ☐	No ☐

* Please submit a full application to the Ethical Advisory Committee.

Chaperoning Participants
If appropriate, eg studies which involve vulnerable participants, taking physical measures or intrusion of participants' privacy:

Will participants be chaperoned by more than one investigator at all times?	Yes ☐	No* ☐	N/A ☐
Will at least one investigator of the same sex as the participant(s) be present throughout the investigation?	Yes ☐	No* ☐	N/A ☐
Will participants be visited at home?	Yes* ☐	No ☐	N/A ☐

* Please submit a full application to the Ethical Advisory Committee.

If you have selected N/A please provide a statement in the space below explaining why the chaperoning arrangements are not applicable to your research proposal:

Advice to Participants following the investigation

Investigators have a duty of care to participants. When planning research, investigators should consider what, if any, arrangements are needed to inform participants (or those legally responsible for the participants) of any health related (or other) problems previously unrecognised in the participant. This is particularly important if it is believed that by not doing so the participants well being is endangered. Investigators should consider whether or not it is appropriate to recommend that participants (or those legally responsible for the participants) seek qualified professional advice, but should not offer this advice personally. Investigators should familiarise themselves with the guidelines of professional bodies associated with their research.

Section C: Methodology/Procedures

To the best of your knowledge, please indicate whether the proposed study:

Involves taking bodily samples (please refer to published guidelines)	Yes † ☐	No ☐
Involves procedures which are likely to cause physical, psychological, social or emotional distress to participants	Yes † ☐	No ☐
Is designed to be challenging physically or psychologically in any way (includes any study involving physical exercise)	Yes † ☐	No ☐
Exposes participants to risks or distress greater than those encountered in their normal lifestyle	Yes* ☐	No ☐
Involves collection of body secretions by invasive methods	Yes* ☐	No ☐
Prescribes intake of compounds additional to daily diet or other dietary manipulation/supplementation	Yes* ☐	No ☐
Involves testing new equipment	Yes* ☐	No ☐

Involves pharmaceutical drugs (please refer to published guidelines)	Yes* ☐	No ☐
Involves use of radiation (please refer to published guidelines. Investigators should contact the University's Radiological Protection Officer before commencing any research which exposes participants to ionising radiation – e.g. x-rays).	Yes* ☐	No ☐
Involves use of hazardous materials (please refer to published guidelines)	Yes* ☐	No ☐
Assists/alters the process of conception in any way	Yes* ☐	No ☐
Involves methods of contraception	Yes* ☐	No ☐
Involves genetic engineering	Yes* ☐	No ☐

***** Please submit a full application to the Ethical Advisory Committee

† If the procedure is covered by an existing generic protocol, please insert reference number here __
If the procedure is not covered by an existing generic protocol, please submit a full application to the Ethical Advisory Committee.

Section D: Observation/Recording

Does the study involve observation and/or recording of participants? If yes please complete the rest of section D.	Yes ☐	No ☐
Will those being observed and/or recorded be informed that the observation and/or recording will take place?	Yes ☐	No* ☐

***** Please submit a full application to the Ethical Advisory Committee

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Section E: Consent and Deception

Will participants give informed consent[<] freely?	Yes ☐	No* ☐

If yes please complete the ***Informed Consent*** section below.
*If no, please submit a full application to the Ethical Advisory Committee.

[<] Note: where it is impractical to gain individual consent from every participant, it is acceptable to allow individual participants to "opt out" rather than "opt in".

Informed Consent

Will participants be fully informed of the objectives of the investigation and all details disclosed (preferably at the start of the study but where this would interfere with the study, at the end)?	Yes ☐	No* ☐
Will participants be fully informed of the use of the data collected (including, where applicable, any intellectual property arising from the research)?	Yes ☐	No* ☐

For children under the age of 18 or participants who have impairment of understanding or communication:

- will consent be obtained (either in writing or by some other means)?	Yes ☐	No* ☐	N/A ☐
- will consent be obtained from parents or other suitable person?	Yes ☐	No* ☐	N/A ☐
- will they be informed that they have the right to withdraw regardless of parental/ guardian consent?	Yes ☐	No* ☐	N/A ☐
For investigations conducted in schools, will approval be gained in advance from the Head-teacher and/or the Director of Education of the appropriate Local Education Authority?	Yes ☐	No* ☐	N/A ☐
For detained persons, members of the armed forces, employees, students and other persons judged to be under duress, will care be taken over gaining freely informed consent?	Yes ☐	No* ☐	N/A ☐

***** Please submit a full application to the Ethical Advisory Committee

Does the study involve deception of participants (ie withholding of information or the misleading of participants) which could potentially harm or exploit participants?	Yes ☐	No ☐

If yes please complete the ***Deception*** section below.

Deception

Is deception an unavoidable part of the study?	Yes ☐	No* ☐
Will participants be de-briefed and the true object of the research revealed at the earliest stage upon completion of the study?	Yes ☐	No* ☐
Has consideration been given on the way that participants will react to the withholding of information or deliberate deception?	Yes ☐	No* ☐

***** Please submit a full application to the Ethical Advisory Committee

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Section F: Withdrawal

Will participants be informed of their right to withdraw from the investigation at any time and to require their own data to be destroyed?	Yes ☐	No* ☐

***** Please submit a full application to the Ethical Advisory Committee

Section G: Storage of Data and Confidentiality

Please see University guidance on Data Collection and Storage.

Will all information on participants be treated as confidential and not identifiable unless agreed otherwise in advance, and subject to the requirements of law?	Yes ☐	No* ☐
Will storage of data comply with the Data Protection Act 1998? (Please refer to published guidelines)	Yes ☐	No* ☐
Will any video/audio recording of participants be kept in a secure place and not released for use by third parties?	Yes ☐	No* ☐
Will video/audio recordings be destroyed within six years of the completion of the investigation?	Yes ☐	No* ☐

***** Please submit a full application to the Ethical Advisory Committee

Section H: Incentives

Have incentives (other than those contractually agreed, salaries or basic expenses) been offered to the investigator to conduct the investigation?	Yes** ☐	No ☐
Will incentives (other than basic expenses) be offered to potential participants as an inducement to participate in the investigation?	Yes** ☐	No ☐

** If you select any answers marked **, please submit your completed Ethical Advisory Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the Ethical Advisory Committee.

Compliance with Ethical Principles

If you have completed the checklist to the best of your knowledge without selecting an answer marked with * or † your investigation is deemed to conform with the ethical checkpoints and you do not need to seek formal approval from the University's Ethical Advisory Committee.

Please sign the declaration below, and lodge the completed checklist with your Head of Department or his/her nominee.

Declaration
I have read the University's Code of Practice on Investigations on Human Participants. I confirm that the above named investigation complies with published codes of conduct, ethical principles and guidelines of professional bodies associated with my research discipline.

Signature of Responsible Investigator .....

Signature of Student (if appropriate) .....

Signature of Head of Department or his/her nominee .....

.....

Date .....

If the provision for Compliance with Ethical Principles does not apply, please proceed to the ***Guidance from Ethical Advisory Committee*** section below.

Guidance from Ethical Advisory Committee

If, upon completion of the checklist you have ONLY selected answers marked **, please submit your completed Ethical Advisory Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the Ethical Advisory Committee.

If, upon completion of the checklist, you have selected an answer marked with * or † it is possible that an aspect of the proposed investigation does not conform to the ethical principles adopted by the University. Therefore you are requested to complete a full submission to the Ethical Advisory Committee. You should aim to complete the entire form in brief but need only provide specific detail on the questions which relate directly to the issues for which you have selected an answer marked * or † on the checklist**. A copy of this checklist, signed by your Head of Department should accompany the full submission to the Ethical Advisory Committee**.

Please contact the Secretary if you have any queries about completion of the form. The relevant application form can be downloaded from the Committee's web page.

Signature of Responsible Investigator .....

Signature of Student (if appropriate) .....

Signature of Head of Department or his/her nominee .....

.....

Date .....

ETHICAL ADVISORY COMMITTEE

Loughborough University

RESEARCH PROPOSAL FOR HUMAN BIOLOGICAL OR PSYCHOLOGICAL AND SOCIOLOGICAL INVESTIGATIONS

This application should be completed after reading the University Code of Practice on Investigations Involving Human Participants

1. Project Title

2. Brief lay summary of the proposal for the benefit of non-expert members of the Committee. *This should include the scientific reasons for the research, the background to it and the why the area is important.*

3. Details of responsible investigator (supervisor in case of student projects)

Title: Forename: Surname:
Department:
Email Address:

Personal experience of proposed procedures and/or methodologies

4. Names, experience, department and email addresses of additional investigators

5. Proposed start and finish date and duration of project

Start date: Finish date: Duration:

Start date for data-collection:

NB. Data collection should not commence before EAC approval is granted.

6. Location(s) of project

7. Reasons for undertaking the study (eg contract, student research)

8. Do any of the investigators stand to gain from a particular conclusion of the research project?

9a. Is the project being sponsored? **Yes** ☐ **No** ☐
If Yes, please state source of funds including contact name and address

9b. Is the project covered by the sponsors insurance? **Yes** ☐ **No** ☐
If No, please confirm details of alternative cover (eg University cover).

10. Aims and objectives of project

11a. Brief outline of project design and methodology
(It should be clear what each participant will have to do, how many times and in what order.)

11b. Measurements to be taken
(Please give details of all of the measurements and samples to be taken from each participant.)

12. Please indicate whether the proposed study:

Involves taking bodily samples Yes ☐ No ☐

Involves procedures which are physically invasive (including the collection of body secretions by physically invasive methods) Yes ☐ No ☐

Is designed to be challenging (physically or psychologically in any way), or involves procedures which are likely to cause physical, psychological, social or emotional distress to participants Yes ☐ No ☐

Involves intake of compounds additional to daily diet, or other dietary manipulation / supplementation Yes ☐ No ☐

Involves pharmaceutical drugs (please refer to published guidelines) Yes ☐ No ☐

Involves testing new equipment Yes ☐ No ☐

Involves procedures which may cause embarrassment to participants Yes ☐ No ☐

Involves collection of personal and/or potentially sensitive data Yes ☐ No ☐

Involves use of radiation (Please refer to published guidelines. Investigators should contact the University's Radiological Protection Officer before commencing any research which exposes participants to ionising radiation – e.g. x-rays) Yes ☐ No ☐

Involves use of hazardous materials (please refer to published guidelines) Yes ☐ No ☐

Assists/alters the process of conception in any way Yes ☐ No ☐

Involves methods of contraception Yes ☐ No ☐

Involves genetic engineering Yes ☐ No ☐

If Yes, please give specific details of the procedures to be used and arrangements to deal with adverse effects.

13. Participant Information

Number of participants to be recruited:

Details of participants (gender, age, special interests etc):

How will participants be selected? Please outline inclusion/exclusion criteria to be used:

How will participants be recruited and approached?

Please state demand on participants' time.

14. Control Participants

Will control participants be used? Yes ☐ No ☐

If Yes, please answer the following:
Number of control participants to be recruited:

How will control participants be selected? Please outline inclusion/exclusion criteria to be used.

How will control participants be recruited and approached?

Please state demand on control participants' time.

15. Procedures for chaperoning and supervision of participants during the investigation

16. Possible risks, discomforts and/or distress to participants

17. Details of any payments to be made to the participants

18. Is written consent to be obtained from participants? Yes ☐ No ☐

If yes, please attach a copy of the consent form to be used.

If no, please justify.

19. Will any of the participants be from one of the following vulnerable groups?

Children under 18 years of age	Yes ☐	No ☐
People over 65 years of age	Yes ☐	No ☐
People with mental illness	Yes ☐	No ☐
Prisoners/other detained persons	Yes ☐	No ☐
Other vulnerable groups (please specify)	Yes ☐	No ☐

If Yes, to any of the above, please answer the following questions:

What special arrangements have been made to deal with the issues of consent?

Have investigators obtained necessary police registration/clearance? (please provide details or indicate the reasons why this is not applicable to your study)

20. How will participants be informed of their right to withdraw from the study?

21. Will the investigation include the use of any of the following?

Observation of participants	Yes ☐	No ☐
Audio recording	Yes ☐	No ☐
Video recording	Yes ☐	No ☐

If Yes, to any, please provide detail of how the recording will be stored, when the recordings will be destroyed and how confidentiality of data will be ensured?

22. What steps will be taken to safeguard anonymity of participants/confidentiality of personal data?

23. Please give details of what steps have been taken to ensure that the collection and storage of data complies with the Data Protection Act 1998?

Please see University guidance on Data Collection and Storage and Compliance with the Data Protection Act.

24. If human tissue samples are to be taken, please give details of and timeframe for the disposal of the tissue.

Please note that this information should also be outlined on the Participant Information Sheet

24. Insurance Cover

It is the responsibility of investigators to ensure that there is appropriate insurance cover for the procedure/technique.

The University maintains in force a Public Liability Policy, which indemnifies it against its legal liability for **accidental** injury to persons (other than its employees) and for accidental damage to the property of others. Any **unavoidable** injury or damage therefore falls outside the scope of the policy.

Will any part of the investigation result in **unavoidable** injury or damage to participants or property?

Yes ☐ No ☐

If Yes, please detail the alternative insurance cover arrangements and attach supporting documentation to this form.

The University Insurance relates to claims arising out of all **normal** activities of the University, but Insurers require to be notified of anything of an unusual nature

Is the investigation classed as **normal** activity? Yes ☐ No ☐

If No, please check with the University Insurers that the policy will cover the activity. If the activity falls outside the scope of the policy, please detail alternative insurance cover arrangements and attach supporting documentation to this form.

25. Declaration

I have read the University's Code of Practice on Investigations on Human Participants and have completed this application. I confirm that the above named investigation complies with published codes of conduct, ethical principles and guidelines of professional bodies associated with my research discipline.

I agree to provide the Ethical Advisory Committee with appropriate feedback upon completion of my investigation.

Signature of applicant: .....

Signature of Head of Department: .....

Date .....

For all applications:

Please ensure that you have attached copies of the following documents to your submission

- Participant Information Sheet
- Informed Consent Form

In addition, please attach copies of the following documents if applicable.

- Willingness to Participate Forms
- Health Screen Questionnaire
- Questionnaires and Example Interview Questions
- Advertisement/Recruitment material
- Evidence of consent from other Committees

LOG OF TRAINING COURSES, CONFERENCES: Sept, 2005 – Sept, 2008

Y. AHMED

	Event Name	Date	Start Time	Finish Time	Event Status
1.	Doing Pedagogic Research by Prof. George Brown - engCETL	Sept, 2005	2 days workshop		Event Completed
2.	Wardens & Sub-Wardens Training Day	Mon 26/9/2005	9:15am	6:00pm	Event Completed
3.	Wardens and Subwardens Training Programme - Health & Safety Roles and Responsibilities	Wed 5/10/2005	1:30pm	4:30pm	Event Completed
4.	Postgraduate Research Students Induction	Thu 3/11/2005	9:00am	4:15pm	Event Completed
5.	Conference Presentation Skills - Part A	Fri 18/11/2005	9:30am	12:30pm	Event Completed
6.	Wardens and Subwardens Training Programme - Drugs and Alcohol Awareness	Wed 23/11/2005	1:30pm	4:30pm	Event Completed
7.	Designing and Producing Conference Posters	Tue 29/11/2005	2:00pm	5:00pm	Event Completed
8.	SPSS - Part A	Wed 30/11/2005	2:00pm	4:00pm	Event Completed
9.	Conference Presentation Skills - Part B	Fri 2/12/2005	2:00pm	4:30pm	Event Completed
10.	Wardens and Subwardens Training Programme - Harassment and Bullying	Wed 7/12/2005	1:30pm	4:30pm	Event Completed
11.	What is a Literature Review?	Mon 16/1/2006	9:30am	12:30pm	Event Completed
12.	Paired and Unpaired T-tests	Thu 2/3/2006	10:00am	12noon	Event Completed
13.	Poster Competition for PGRs	Mon 20/3/2006	9:00am	5:00pm	Event Completed
14.	IPTME Research Day 2006	Wed 31/5/2006	9:00am	5:00pm	Event Completed
15.	Wardens and Subwardens Training Programme - Health & Safety Roles and Responsibilities	Wed 20/9/2006	6:00pm	8:00pm	Event Completed
16.	Transferable Skills in the Curriculum	Thu 26/10/2006	2:00pm	4:30pm	Event Completed
17.	Critical Reading for Self-Critical Writing: Reviewing Literature, Planning your Thesis, and Getting Published	Thu 11/1/2007	11:00am	5:00pm	Event Completed
18.	Pedagogy Research Workshop by Prof. George Brown – engCETL & Prof. Mike Bramhall	Tue - Wed 27/03/2007 28/03/2007	2 days workshop		Event Completed
19.	National Instruments LabVIEW Hands-On Workshop	Tue 17/04/2007	9:00am	12:30pm	Event Completed
20.	Poster Competition for PGRs - Design Clinic	Tue 17/4/2007	2:00pm	4:00pm	Event Completed

21.	CETL Pedagogic Research Methods Holiday Inn Camden Lock - London	Wed 16/05/2007	9:00am	5:00pm	Event Completed
22.	Loughborough Local GRAD school Part A	Tue 29/5/2007	9:00am	5:30pm	Event Completed
23.	IPTME Research Day	Wed 13/6/2007	9:00am	5:30pm	Event Completed
24.	Reading for Research	Tue 26/6/2007	2:00pm	5:00pm	Event Completed
25.	First Aid at Work	Mon - Thur 6-9/8/2007	4 days course		Event Completed
26.	Fire Training – Refresher Course	Mon 05/11/2007	12:00pm	2:00pm	Event Completed
27.	Writing up Thesis	Thur 01/05/2007	9:30pm	12:30pm	Event Completed
28.	IPTME Research Day	Wed 04/6/2007	9:00am	5:30pm	Event Completed

	Conferences	**Date**	**Place**
29.	Enterprise Learning Conference: good practice and coherent policy	Fri 14/10/2005	Firth Hall University of Sheffield
30.	Student Placements in HE	15/11/2005	EVERSHEDS Manchester
31.	Embedding Sustainable Development into the Curriculum	Tues 13/12/2005	The Higher Education Academy - York
32.	1st Pedagogical Research in Higher Education: Enhancing Student Learning	2nd&3rd/05/2006	Liverpool Hope University, Liverpool
33.	ASET Annual Conference 2006 – The Placement and Employability Professionals' Conference	5th – 7th/Sept/2006	Cadbury's Manor House, Birmingham
34.	Work placement: adding value to education?	20th/Oct/2006	Oxford Brookes University, Headington Campus
35.	The National Agenda for Employability: Implications for HE policy and practice	28th/June/2007	London South Bank University
36.	ASET Annual Conference 2007 – The Placement and Employability Professionals' Conference	4th – 6th/Sept/2007	UWIC, Cardiff
37.	Advancing Skills for Professionals in the Rural Economy (*Aspire*) Conference	7th – 8th/April/2008	Harper Adams University College, Newport, Shropshire
38.	Sigma and Engineering CETL Students Conference	3rd/June/2008	engCETL, Loughborough University
39.	2nd Pedagogical Research in Higher Education (PRHE): Curriculum Change for Learning	16th – 17th/June/2008	Liverpool Hope University, Liverpool
40.	ASET Annual Conference 2008 – The Placement and Employability Professionals' Conference	2nd – 4th/Sept/2008	Robbins Conference Centre, Plymouth