Universidade de Aveiro Departamento de Ciências da Educação
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Isabel Huet e Silva

Docência e Sucesso Académico no Ensino Superior. Estudo de caso: o ensino e aprendizagem da Programação nas Universidades de Aveiro e Strathclyde

Teaching and Academic Success in Higher Education. Case study: teaching and learning of Programming at the Universities of Aveiro and Strathclyde

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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Ciências da Educação realizada sob a orientação científica do Professor Doutor José Tavares, Professor Catedrático do Departamento de Ciências da Educação da Universidade de Aveiro e do Professor Doutor George Weir, Professor do Departamento de Informação e Ciências da Computação da Universidade de Strathclyde, Reino Unido.

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'This morning I took out a comma and this afternoon I put it back in again'.
Oscar Wilde

The road to my graduate degree has been long and winding, but had been always supported by my family and friends. A special thanks to my mother, father and Diogo who had always believed on my work, no matter how many commas I would add or delete in one day.

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palavras-chave

Sucesso académico no Ensino Superior (ES), docência e aprendizagem no ES, formação pedagógica de professores universitários, factores motivacionais para o ensino e aprendizagem, prática reflexiva, comunidades de aprendizagem.

resumo

O Departamento de Ciências da Educação, juntamente com o Departamento de Informática e Telecomunicações da Universidade de Aveiro, tem vindo a desenvolver um trabalho de parceria com o Departamento de Informação e Ciências da Computação da Universidade de Strathclyde (UK) com o objectivo de fomentar o ensino e aprendizagem de cursos introdutórios à programação. Ambas as instituições pertencem ao Consórcio Europeu de Universidades Inovadoras (ECIU), tendo como linhas orientadoras o desenvolvimento e implementação de novas formas de ensino, a formação e investigação; a afirmação de uma cultura inovadora nas universidades; a experimentação de novas formas de gestão e administração e a promoção do pensamento crítico (Menges, 1991).

A presente tese discute o impacto que diferentes abordagens de ensino e organizações de curso podem ter nas práticas pedagógicas. Por outro lado, apresenta também uma meta-análise dos resultados relacionados com a prática pedagógica para a promoção das aprendizagens e do sucesso académico.

No decorrer dos últimos três anos recolheram-se dados de origem qualitativa e quantitativa, nomeadamente, através de entrevistas, de questionários e de observação não participativa. Os diversos dados pretendem contribuir para uma melhor compreensão da organização dos diferentes cursos de introdução à programação e das abordagens de ensino e aprendizagem subjacentes. O estudo contou com a colaboração de vários docentes que contribuíram activamente para este, participando em reuniões e seminários, com o objectivo de promover a reflexão sobre aspectos relacionados com o ensino e aprendizagem, contribuindo, assim, para um aumento do sucesso académico. Durante este processo, investigadora e docentes foram reflectindo sobre métodos e estratégias de ensino, partilhando sugestões para uma reformulação dos cursos de introdução à programação. A percepção dos estudantes foi essencial para uma diferente visão, mais enriquecida, acerca desta temática.

keywords

Academic success in Higher Education, continuous professional training of academics, motivational factors for teaching and learning, reflective practice, partnerships of learning.

abstract

The Department of Educational Sciences and the Department of Electronic & Telecommunications at the University of Aveiro (Portugal) have been working together with the Department of Computer & Information Sciences at the University of Strathclyde (UK), with the aim of improving the teaching and learning of introductory programming courses. Both institutions belong to the 'European Consortium of Innovative Universities' (ECIU), with a commitment to 'developing and implementing new forms of teaching, training, and research; to assuring an innovative culture within their walls; to experimenting with new forms of management and administration; and to sustaining and nurturing internationally-minded staff' (Menges, 1991, p. 86).

Over the past three years, data has been collected through interviews, questionnaires and class observation, to better understand the organisation of the different courses and approaches to teaching and learning. Members of academic staff have been actively involved in trying to enhance the students' learning experience through reflection on teaching methods and trying new ideas to aid student success. During this process we have assimilated insights on teaching philosophies, methods and suggestions for course redesign. As an important piece of the 'puzzle', students also provided useful feedback on differing aspects of teaching and course organisation.

This thesis discusses the impact that teaching philosophies and course organisation may have on best teaching practices. In addition, it presents a meta-analysis of the findings on the relevance of teaching practices for promoting students' learning.

Table of contents

List of Tables

Stage 3: structured interviews (University of Aveiro)

Semi-structured interviews (University of Strathclyde)

List of figures

Section I

Introduction
Literature review

CHAPTER 1 - INTRODUCTION

1. Structure of the thesis

This work falls into two sections. The first, comprising Chapters 1 to 2, provides the setting for this work, gives the study purpose and background (Chapter 1), and presents a survey of related literature (Chapter 2).

The second section comprises four chapters. Chapter 3 presents the conceptualisation of the study. This Chapter presents the research questions, and hypotheses of the study, description of the study aims, objectives, the methodology as well as the context of the study.

The research questions and hypotheses generated from the literature survey are then put forward, followed by results and discussion of the findings for each component of the hypothetical research framework in Chapters 4 and 5.

Thereafter, Chapter 4 presents data results from the quantitative study, conducted in two Universities, namely at the Universities of Aveiro (Portugal) and Strathclyde (United Kingdom), and Chapter 5 details qualitative data gathered at both universities.

Chapters 4 and 5 are presented as a *stand alone* document explaining the concepts therein. Chapter 6 presents an overview of the main issues detailed and discussed in Chapters 4 and 5, with suggestions for further research.

2. Purpose of the study

> *Although the teaching function is usually regarded as having a lower status when compared to research, increasing worldwide attention is being given to teaching in Higher Education. Indeed, the massive numbers of students who nowadays enrol in Higher Education programmes (and not just the older days elite) require rethinking the pedagogical approaches. What then makes a good university teacher?*
>
> *(Gil, Alarcão, Sarrico, Oliveira, Azevedo, Borges & Vieira, 2003, p.1)*

Quality and innovation of Higher Education is clearly pointing to a better pedagogic knowledge of the faculty members aiming at the academic success of the students. This aim requires, from the institution and teachers, a much greater involvement than what has been the case, at least, in Portuguese universities (Tavares, 2003).

Today, we acknowledge a growing concern of the faculty members about the issues of pedagogy and academic success. It is clearly a turning point on the traditional conception of teaching and learning in Higher Education (Robertson, 1998). Still, many academics are resistant to change (Gibbs, 2004; Hashweh, 2003). Traditionally, namely Portuguese and Scottish academics put their effort on research leading to a decrease interest and effort on teaching. This situation is explained by a set of *external* factors that led academics to feel more motivated to research than teaching (Jenkins, Breen, Lindsay & Brew, 2003; Lindsay, Breen & Jenkins, 2002; Gibbs, 2002, 2004; Hattie & Marsh, 1996; Blackburn & Lawrence, 1995). Among these factors we point out one that might be related to institutional pressures for research quality at universities, and which can conduct to a lower interest and/or dedication of academics for teaching. However, many academics seem to feel frustrated with continuing reliance on research and publication as the primary criteria for promotion (Tavares, 2003; Blackburn & Lawrence, 1995). On the other hand, the reduce number of mechanisms to evaluate teaching quality and the increase of departmental duties can lead academics not to put so much effort in teaching activities (Blackburn & Lawrence, 1995).

However, and in particular with the Bologna process, quality of teaching becomes nowadays a major concern at institutions (Azevedo, 2005). In fact the Bologna Process implies a similar stage structure of Higher Education programmes, degrees, in order to promote students and academics mobility around Europe. It is important that Higher Education institutions reflect upon the quality of their teaching in order to successfully accomplish the European Higher Education common goals. This political measure implies a growing pressure to increase the quality of teaching in Higher Education institutions (QAA in the UK – 'Quality Assurance Agency' for HE, and CNAVES – 'Conselho Nacional de Avaliação do Ensino Superior' in Portugal). These pressures are differently interpreted by different countries, institutions and programmes (Teichler, 2003) according to their own policies and priorities.

Due to the growing importance for teaching quality in universities (Tavares, 3003), this study aims to strategically promote the reflection and research on teaching based issues to improve student learning. The objectives underlining this purpose are as follow:

- to analyse the influence that teaching best practices might have on students' academic success (through the views of students and academics);
- to involve academics in educational research within their scientific area, reflecting upon this experience.
- to promote a reflective university community on best teaching practices;
- to contribute for the development of HE knowledge.

In order to attempt those aims, a set of empirical studies were carried out in two different institutions (Aveiro and Strathclyde) and which represent the continuous work carried out with academics and students from first year Introductory Programming courses since the year 2000 until 2004.

3. Background of the study

The design of this study took into account the concern to link teaching best practices and student academic success and motivation. With teaching best practices we refer to the 'competence in the teaching function' (Gil, Alarcão, Sarrico *et al.*, 2003). Gil, Alarcão, Sarrico *et al.* (2003) present a set of competences that a university teacher should possess, namely: (a) '*communicating his/her own knowledge to students and common citizens, through continuous improvement both in written and oral expression, and always committed to an appropriate organization of the knowledge to be transmitted*'; (b) '*promoting meaningful, critical, autonomous and responsible learning of high quality by students, at both the graduate and postgraduate level (promoter of learning)*'; (c) '*assessing the learning outcomes accomplished by each student in a fair, unbiased and responsible way for both formative and summative purposes (constructive judge)*'; and (d) '*showing availability and flexibility towards the students and interest in their progress, by balancing hard requirements with understanding of their difficulties (critical friend)*' (p. 2-3). These competences in conjunction with the 'expertise in the field' and 'general competences' (Gil, Alarcão, Sarrico *et al*., 2003) can determine the quality of a good university teacher.

The first step in this research process emerged as a consequence of some findings collected from the research activity 'Having coffee with professors and students to talk about Higher Education pedagogy and academic success'. This preliminary study was developed in 2000/01 at the University of Aveiro and involved two lecturers and three research students (Tavares, Brzezinski, Huet, Cabral & Neri, 2001).

3.1 Findings from the activity 'Having coffee with …'

The activity 'Having coffee' aimed to ascertain teachers' proficiency as well as the academic success of the students. The dialogue with students and faculty members aimed mainly at the identification of first-year academics' views about teaching and the importance of the best teaching practices for promoting the students' academic success. This dialogue also allowed academics to reflect upon their own teaching practices and to consider students' perspectives on learning and studying.

The methodology used in the present research consisted of informal meetings that took place during coffee breaks. The participants were academic staff and students of the first-year of science and engineering courses. There were twenty professors and eighty students involved in the research. The students' interviews consisted of groups of three or four students. A report was done after each interview aiming to establish different categories of analyses.

The dialogue with lecturers and students sought to address the following questions:

1. How did first-year academics and students perceive teaching practice and how important was it for promoting the students' academics success?

2. How did academics view the evaluation of teaching practice?

3. What were the academics' views about the reasons for the students' failure at the courses?

4. In which courses was it most difficult to achieve good grades and what were the reasons underlying this?

5. How did students perceive the first-common year at the University of Aveiro?

From these informal meetings emerged ideas that contributed to the case-study design. The comments of academic staff indicated the presence of implicit theoretical assumptions about teaching that needed to be articulated in order to address teaching problems. As noted by Ramsden (1992), '*improving teaching involves the same process that informs high quality student learning. It implies changing how we think* *about and experience teaching – it involves changes in our conceptions, in our common-sense theories of teaching as they are expressed in practice*' (p.4). This changing process implies deep reflection by academics. The term 'teaching reflection' will be used to describe the process whereby academics reflect on their teaching. This aspect is a central aspect of the present study.

In the 'Having coffee' preliminary study we came to the conclusion that academics were concerned with students' academic success and demonstrated interest in better understanding the students' learning process and motivation. The findings showed unmotivated students and a high level of academic failure on courses such as Programming, Data Structure and Algorithms (PEDA), and Calculus I.

3.2 Setting the scene of the main study

The decision to work with first-year Introductory Programming courses, and mainly centred on teachers, arose from the preliminary study findings as well as from other arguments such as the low incidence of studies in this area, unlike the situation in other subject areas, such as Calculus (Souza & Tavares, 2003). Also, recent admission statistics have shown a massive growth in vocational orientated courses in Higher Education. In particular, courses in software engineering and computer science have benefited greatly from this trend. It is however unfortunate that this trend has also been accompanied by an increase in student failure and drop out from the early years of many university courses (Thomas, Ratcliffe, Woodbury & Jarman, 2002; Woods, Felder, Stice & Rugarcia, 2000; Jones, 1979).

Thomas, Ratcliffe *et al* (2002) recognised that many students of Software and Computer Science claim to 'hate programming' and feel unable to do it. Students come to these courses with varying background knowledge of Programming which leads them to experience differing learning difficulties throughout the course. Recent studies of Introductory Science courses show, also, that many students are driven away from Science ' (…) *by the failure of introductory courses to motivate the students, by the passivity and competitiveness that is forced upon students and by the focus on algorithmic problem solving rather than conceptual understanding*' (Tobias, as cited in Thomas *et al.*, 2002, p. 33).

Current studies have focused on the role of students and their preparation for university when investigating the reasons for this failure (Tavares, 2003). Fewer studies, however, focus its attention on the teacher. Thus, we design a research that focuses its study on the teachers, namely in examining approaches to teaching and learning, as well as the attitudes of lecturers and students.

Furthermore, as it is explained below, we have decided to involve in our study two academic institutions.

The Department of Educational Sciences and the Department of Electronic & Telecommunications at the University of Aveiro (Portugal) have been working together with the Department of Computer & Information Sciences at the University of Strathclyde (United Kingdom/Glasgow) since 2001. The main aim of such collaboration is to improve the teaching and learning of introductory programming courses. The academic community across the University of Aveiro and the University of Strathclyde has a growing concern with student failure rates and academic achievement in first-year science and engineering courses. Both institutions belong to the 'European Consortium of Innovative Universities' (ECIU), with a commitment to '*developing and implementing new forms of teaching, training, and research; to assuring an innovative culture within their walls; to experimenting with new forms of management and administration; and to sustaining and nurturing internationally-minded staff*' (ECIU). The proximity of these two institutions proved beneficial as a basis for developing a study in two different contexts in order to deepen our understanding of our object of study.

In the context of the collaboration mentioned above, over the past three years, data has been collected through interviews, questionnaires and class observation, to better understand the organisation of the different courses and approaches to teaching and learning. Members of academic staff have been actively involved in trying to enhance the students' learning experience through reflection on teaching methods and trying new ideas to aid student success. During this process we have assimilated insights on teaching philosophies, methods and suggestions for course redesign. As an important piece of the 'puzzle', students also provided useful feedback on differing aspects of teaching and course organisation.

Student background knowledge and level of intrinsic motivation to learn programming influence their academic achievement but educators can remedy some of these problems. We believe that lecturers and their teaching practice have an important role in influencing the students' motivation and achievement in Higher Education. Therefore, it is important to work with faculty toward the improvement of quality in teaching and learning. The choice of teaching approach, together with different forms of assessment, can make courses more interesting and appealing to the wider range of students now entering Higher Education.

We decided to explore some of the variables that influenced students' academic success, focusing our attention on best practices in teaching and the organisation of first-year Introductory Programming courses. From the outset, academics were keen to discuss and reflect on their teaching practices. In addition, Portuguese academics were interested to learn about the teaching strategies and methods used by other colleagues, the students' problems in learning programming, as well as the organisation of the courses in a foreign university. As referred above adopting an approach with two units of analysis seemed a good way to complement and enrich the study and to facilitate interaction of academics from both universities.

The study reported here does not intend to compare the institutions on indicators of teaching or academic success (Thomas, 1990) but aims at a deeper understanding of the teaching and learning of introductory programming courses at the Universities of Strathclyde and Aveiro, in the hope of improving the teaching quality and, indirectly, the academic success of students across universities. A second benefit from this work is an exchange of experience that contributes to co-operation in Education between these institutions. This echoes a second goal of the ECIU: '*to establish a structured exchange of experience concerning internal teaching and administrative staff development*' (ECIU2).

In conclusion, the design of our case-study has evolved in co-operation with academics. Their suggestions and concerns were taken in account, aiming for collaboration between educational researchers and academics from the engineering scientific area. As a result of this collaboration academics from both departments at universities reflected on teaching best practices and curriculum organisation. Indicators of this commitment can be given through the publication of three papers in international conferences (Huet, Pacheco, Tavares & Weir, 2004; Huet, Tavares, Weir, Ferguson & Wilson, 2003; Huet, Pacheco & Tavares, 2003) and the participation of academics in two thematic seminars (Appendix nr. 10). Therefore, one of the objectives of this research was accomplished: 'to involve academics in educational research within their scientific area, reflecting upon this experience and to promote a reflective university community on best teaching practices'.

3.3 Current projects in the area in Portugal

In Portugal the Universities of Minho, Aveiro, Algarve, Technical of Lisboa, and Nova de Lisboa are leading institutions in developing research and holding seminars and conferences on the topic of teaching and learning in Higher Education. Research teams at these institutions have published several books and articles in national and international journals (Huet & Tavares, 2004; Tavares, Gomes, Pereira, Cabral, Huet, Neri & Carvalho, 2004; Tavares, 2003; Huet & Tavares, 2003; Vieira, 2002, 2003;Tavares, Brzezinski, Cabral & Huet (eds.), 2002; Costa Oliveira & Sarmento, 2002; Vieira, Gomes, Gomes, Silva, Moreira & Melo, 2002; Huet & Tavares, 2001; Sousa, Sousa Lemos & Januário, 2001; Rego, 2001; Rego & Sousa, 2000; Gonçalves, 1998, 2000, 2002; Tavares & Santiago (eds.), 2000).

Research Units of teaching and learning in Higher Education do exist in Portugal due to project funds. The University of Aveiro (UA) supports much of these projects in co-operation with other Portuguese Universities, such as the University of Algarve, Minho, Nova de Lisboa, and Porto.

Different projects take place at the University of Aveiro (UA). These projects are linked together aiming to promote the academic success in Higher Education through diagnosis and intervention. Results from previous research (Alarcão, 2000; Bessa & Tavares, 2000) reveal that academic success needs to be dealt with in a trandisciplinary and systemic perspective that does not accomplish summary and insular studies.

Therefore, one of these projects is the 'Higher Education Study Intervention Lab' (LEIES[1]). This laboratory develops research around four factors: student, faculty, curriculum and institution. The topics for the research deal with the students' competence and skills in Higher Education (reading/comprehension and writing), sleep-wake habits, self-regulation, students' and teacher's personal development, transition to the university, curriculum, and faculty and teaching competence. The main purpose is to present the emergent trends of academic success focusing not only on the student as a learner but also on the lecturer as a professional without leaving aside their own personal development.

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[1] http://www.dce.ua.pt/leies

This integrated project has been developing intervention strategies[2] near the students, faculty, curriculum and institution, namely: (i) reading, comprehension and writing workshops with first-year students (Cabral & Tavares, 2003; Cabral & Tavares, 2002); (ii) educational /intervention workshops for students about circadian rhythms and sleep issues (covering topics such as information about sleep, sleep hygiene and evaluation of each student circadian rhythms characteristics), to promote adequate sleep-wake habits and sleep quality (Gomes, Tavares & Azevedo, 2003; Gomes, Tavares & Azevedo, 2002); (iii) - seminars and workshops with academics at the Universities of Aveiro and Strathclyde, development of learning communities (Huet & Tavares, 2004; Huet, Cabral, Tavares & Makinnen, 2003); (iv) integration of human sleep and circadian rhythm issues in the curricula of undergraduate courses in the fields of education, psychology and health; (v) promote academic self-regulation regarding the variables of the freshman aiming the transition experience (Bessa & Tavares, 2003); (vi) workshops on strategies for coping with anxiety, stress and emotional disorders in higher education (Monteiro, Pereira, Gomes & Tavares, 2005; Pereira & Motta, 2005)

This laboratory works also in collaboration with members of the Research Unit 'Development of Pedagogic Knowledge in Education and Training Systems' ('Construção do Conhecimento Pedagógico nos Sistemas de Formação', CCPSF) in a wider project entitled: 'Higher Education. Being between two transitions: secondary school and professional integration'. This project runs in three axles: transition to Higher Education, staying and getting involved in Higher Education institutions and the transition to active and professional life.

The objectives of this project meet some of the LEIES but with a new dimension: '*to study the way in which the transition of graduated students to active life is performed, the insertion processes, the professional and social trajectories and the functional suitability levels of acquired competences in university to the business systems needs*' (Research Unit CCPSF technical addendum, 2003).

Another project is related to a third year discipline, that the University of Aveiro offers as an optional course ('Strategies for promoting the students' academic success in Higher Education'). This course run for the first time in 2004/05 and it is now at the second edition (2005/06). The objective to create such an innovative course is to 'pray what we preach'. A group of researchers under the supervision of Professor José

[2] The intervention strategies were given by each researcher.

Tavares (Department of Educational Sciences, UA), and who are working in projects related to teaching and learning in Higher Education, decided to give to students a set of information that may be useful to improve their learning competences and skills. The course, that follows a blended learning methodology, was divided in 2004/05 in the following modules: (i) reading, comprehension and writing skills; (ii) educational /intervention workshops for students about circadian rhythms and sleep issues, (iii) speech techniques, and (iv) students' self-regulation study strategies. In 2005/06 a new topic was added. This topic ranges a set of wider topics related to research on teaching and learning in Higher Education. One of these issues is the discussion about the Bologna process and its implication for teaching and learning in HE. The teachers-researchers believe that a discussion on this topic is essential for the students understanding of the new educational structure.

The University of Algarve runs several projects under the 'Permanent Observatory for Teaching Quality' ('Observatório Permanente da Qualidade de Ensino'). The work in progress is published in the on-line magazine FASES @n-Line[3].

In spite of these intervention activities, the existing studies on best teaching practices and its influence on students' academic success in Higher Education are recent and not well organised in themes (Vieira, 2002).

There is no national association of researchers working on these issues, nor any specialised journals. However, seminars and conferences are growing more frequent in Portugal in this research area. Vieira (2002) summarised research conducted in Portugal on teaching and learning in Higher Education. The author collected 59 empirical studies produced in different Higher Education institutions[4], mainly public institutions, with particular emphasis on the Universities of Aveiro and Minho (Table 1).

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[3] http://www.ualg.pt/OPQE/fases

[4] These studies were conducted between 1984 and 2002.

Table 1: Purpose and focus of the studies

Description of perceptions (11 studies – 18.7%)
1. Pedagogy, teaching/learning practices, plan of studies (6)
2. Courses: objectives, contents, strategies and assessment (3)
3. Relationship between teaching and academic success (2)
Description of practices (16 studies – 27.1%)
1. Development of learning processes (8)
2. Design of T/L strategies/resources (3)
3. Evaluation of learning problems (2)
4. Evaluation of course impact (1)
5. Designing a strategy to evaluate teaching (1)
6. Evaluation of a pedagogical training programme (1)
Intervention on practices (32 studies – 54.2%)
1. Development and evaluation of T/L strategies and resources (16)
2. Development and evaluation of continuous assessment methods (7)
3. Development and evaluation of extra-curricular activities (4)
4. Changing practice through collaborative research (3)
5. Pedagogical training through the formative evaluation of performance (1)
6. Course development (1)

(T/L: Teaching/Learning) (Source: Vieira, 2002, p. 8)

The studies on teaching practices are largely descriptive with only a view toward intervention. Opinions from academic staff and students on teaching concepts and course organisation are considered, but there is little attention given to the evaluation of best teaching practices (Vieira, 2002).

The establishment of a Thematic Network on Teaching and Learning is growing more likely. Such a network is necessary in Portugal in order to raise the profile of teaching and learning as credible concerns for academia. In 2005 a network is starting to be thought and its name is 'DADAES'[5] ('Docência, Aprendizagem, Desenvolvimento e Avaliação no Ensino Superior'/'Teaching, Learning, Development and Evaluation in Higher Education'). This network aims to bring national researchers to work under a common objective: to collaborate in the research of teaching and learning in Higher Education. This network intends to brake with a traditional university culture of

[5] http://www.dce.ua.pt/leies/dadaes_index.htm

individualism. The underneath philosophy is to promote collaborative learning in academia, allowing the exchange of information and cooperation in projects that might be useful to a wider range of institutions.

Continuous Professional Development (CPD) modules for academics are also starting to get place at some Portuguese institutions and accepted by some members of academia. CPD modules follow the premise of lifelong learning. Indeed, the society of knowledge requires more updated professionals. Also, the widespread pressure for quality teaching requires from academics skills in pedagogical issues. The new paradigm of teaching and learning in Higher Education, such as the teaching focused on the learner and based on competencies requires a different involvement of academics. A more detailed consideration of CPD modules for academics is given later in Chapter 2.

Also, at an international level, the University of Aveiro, together with other 22 European institutions, is participating in the European Network 'NETTLE'[6] ('Network of European Tertiary Level Educators'). The defining aim of NETTLE is to develop European wide academic frameworks for equipping tertiary level educators with the skills and competencies they require to provide effective and validated support for learners:

> *Through working together, those with a commitment to educational development will gain insights into pedagogic practice at tertiary level in the participant countries; identify good and innovative practice; and be strategically placed to negotiate truly multinational frames of reference. This will also enable them to provide more effective, evidence-based support for learners from different educational traditions than their own, and to contribute to the free mobility of educators* (NETTLE project, 2005, p. 5).

The project is innovative in undertaking the first systematic analysis of pedagogic traditions, needs and provision for tertiary level educators across all European countries.

[6] http://www.nettle.soton.ac.uk

CHAPTER 2 - LITERATURE REVIEW

1. Overview

The literature covered in this review outlines the major research questions of the study. Publications mentioned in this chapter report a number of major and minor research topics, mainly from Australia, United Kingdom, United States of America and Portugal. Each topic is further addressed when discussing the findings. The present researcher did not seek to cover every aspect of teaching and learning in Higher Education but to give some guidelines for a better understanding of the nature and complexity of the subject.

2. Defining Academic Success

The term 'academic success' requires special attention. Tavares & Huet (2001) define academic success as the product of a set of results obtained by students during their time in academia. These results comprise cognitive, meta-cognitive, behavioural, and communication competencies acquired and developed throughout the students' time at university (Tavares & Huet, 2001).

In contrast to this definition, academic success is often measured by ratio grades, a consequence of our system of evaluation in Higher Education. Indeed, when leaving Higher Education, students are selected for a job in accordance with the grades obtained at the end of the course. A key question is whether a final grade is the most appropriate indicator of student competencies. According to Tavares & Huet (2001), it is important to take into consideration the personal and social side of the individual, balance, good sense, maturity, creativity, the ability to develop human relations between peers and hierarchical superiors, and their facility to help solve conflict in the work environment (macro level). Therefore, academic success can not be measured just by the students' achievement in different subjects and by their higher or lower grades (micro level). The bottom line is that academic success emerges from a 'complex system':

> *A complex system is a system consisting of a large number of agents that interact with each other in various ways. Such a system is 'adaptive' if these agents change their actions as a result of the events in the process of interaction (Vriend, 1994, p.1).*

Science is very concerned with the interrelationship between the microscopic and the macroscopic (De Greene, 1997). Indeed, biologists, physicists, and mathematicians look for concepts that can be explained through an 'evolving system'[7] (De Greene, 2000). In social sciences, the macro-level reality of a specific social phenomenon is also explained by the interaction of the sub-levels of the microscopic reality. This conceptual framework has implications for education. De Greene (2000) suggests that:

> *At times of instability and chaos, rigidities such as programs, plans, curricula, learning objectives, fixed assignments, tests, and administrative control are likely to be indifferent at best and harmful at worst. Educational needs, expressed as fluid learning experiences, pioneering behaviour of those who can sense and move with the dynamics of the field (p.294).*

Indeed, multiple studies exploring student academic success have reached similar conclusions, despite the view that a multiplicity of inter-connected factors are at work, namely: (i) the student; (ii) academic staff; (iii) curricula; (iv) institution; and (v) policies and ideologies (Tavares & Huet, 2001; Mclnnis, Hartley, Polesel & Teese, 2000; Evans, 2000; Yorke, 1999; McGivney, 1996; Martinez & Munday, 1998; Tinto, 1993). These factors interact with each other to become part of the academic success 'macroscopic' reality with each factor or variable affecting sub-levels of 'microscopic' concepts.

Yorke (1999) and Weston (1998) characterised a number of 'microscopic' factors that could have negative effects on students' academic success (Table 2). These are not only student-related factors but also institutional, pedagogic and organisational.

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[7] Evolving systems show feedback between macroscopic structures or collective fields and the events of individual interactions at the microlevel (De Greene, p.277, 2000).

Table 2: 'Microscopic' factors that may determine students' academic success in Higher Education

Yorke (1999)	Wrong choice of programme Poor quality of the student experience Unhappiness with the social environment Matters related to financial need Satisfaction with aspects of institutional provision Problems with relationships and finance Assure of work (academic and employment)
Weston (1998)	Learning efficiency (students' general cognitive skills) Students' self efficacy (self reliance, locus of control, self directedness) Quality of instruction (students' perceptions of the quality of teaching) Course difficulty in relation to academic support and counselling available Interaction with faculty staff Students' goal commitment (planning skills; motivation) Time for learning (students' planning and organising of their study programs)

Prior to these studies, Miller (1970) indicated factors that were student-centered and that are still being studied, namely: (i) social class and family variables; (ii) ability age and maturity, (iii) psychiatric and other stress variables; (iv) vocational orientation; (v) intrinsic interest in the subjects studied, (vi) persistence and motivation, and (vii) other personality attributes, study habits and discipline.

Beyond the student, the curriculum organisation of the courses and their articulation with the adopted plan of studies also contributes to student academic success. The levels of university resources, nature of educational policies and ideologies complete this picture. Each variable is crucial for understanding the problem of academic success in Higher Education and should not be analysed individually without considering the macro level context.

It is often accepted that, according to the relevance attributed to each factor, different perspectives emerge. From these perspectives, attributes of the student are often treated as the main reason for academic failure (Taylor & Bedford, 2004; Tavares & Huet, 2001). A study conducted by Taylor & Bedford (2004) suggested that the factors that led to students' failure were attributed to the students and to the skills they bring with them to university: 'their level of preparedness, motivation and abilities to manage study' (Taylor & Bedford, 2004, p. 390) as well as '*the mismatch between student, 2004, and university expectations, especially for on-campus students'* (Taylor & Bedford, 2004, p 390). The same authors concluded that academics were not sure about the influence of their teaching (e.g. students-teaching interaction, assessment, feedback) nor of course design on students' retention.

Furthermore, this concept may be a consequence of academics who perceive teaching at 'Level 1' (Biggs, 1999). According to Biggs (1999) academics operating at 'Level 1' believed that differences in learning outcomes were due to differences in student abilities, motivation and other student-related factors.

Tavares (2003) supports the idea that a higher commitment and autonomy of students in the construction of knowledge, study methods, use of new technologies, creativity and initiative, contribute to better levels of success in academia. Student autonomy is actually one of the most debated issues in Higher Education. Research in this area (Tavares, 2003; Tavares & Huet, 2001) focuses upon the students' problems in coping with learning strategies. Most first-year students enter Higher Education without efficient study methods and are not able to organise and manage their time (Tavares, 2003). Tavares (2003), Bessa (2000) and Mäkinen, Olkinuora, Lonka (2002) share the opinion that it is necessary to promote and help students to acquire more effective, personalised and consistent study methods to allow a higher autonomy and efficiency in relation to academic activities. To accomplish these objectives it is necessary to change the course design, teaching, and institutional practices.

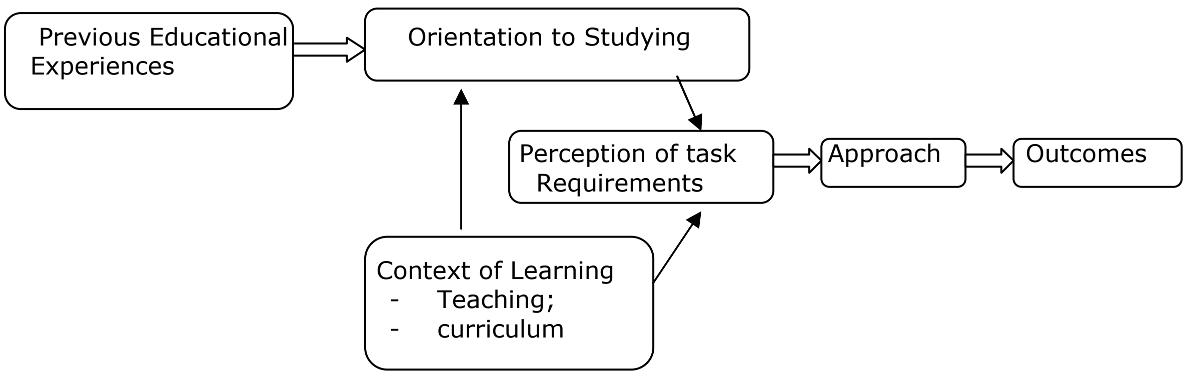
Consequently, academics and their teaching practice play an important role in student motivation and academic achievement. Authors, such as Tavares (2003), Vieira (2002), Biggs (1999), Havita (1998), Chalmers (1996), Trigwell, Prosser & Taylor (1994), Ramsden (1992), and Gibbs (1992), have been developing studies relating high quality teaching to student learning outcomes.

This research focuses its attention on the lecturer and best teaching practices as one variable whose change may promote effective learning and quality teaching across universities. We will further consider the importance of this variable for a better understanding of the students' academic success. The focus on this variable takes into consideration other variables mentioned earlier in this chapter, with a special concern for the organisation of the courses.

3. Students' learning achievement and teaching practice

There is considerable educational literature to suggest that student learning achievements are strongly related to the way students approach learning, which in turn is influenced by a range of personal and contextual factors (Marton & Booth, 1997; Schmeck, 1988). This complex process is described by Ramsden (1992) as a '*heuristic, not deterministic*' model of learning (Ramsden, 1992, p.84) (Figure 1). An understanding of the students' learning outcomes supports the development of '*points of intervention to enhance the quality of student learning by changing the curricula we construct, the teaching methods we use, and the ways in which we assess our students*' (Ramsden, 1992, p. 84). Within this perspective, academics must appreciate the importance of the students' model of learning and teaching practice for achieving the desired student success. Thereby, exploring teaching philosophies and students' views of teaching practices (Sander, Stevenson & Coats, 2000) yields insights on the teaching and learning process in Higher Education. In addition, an appreciation of course conception and curriculum design complement this understanding and contribute to a more reliable and valid study.

Figure 1: Student learning in context



(Ramsden, 1992, p.83)

Indeed, while the different factors are interconnected, in this study the authors are concerned to explore how teaching affects students' approaches to learning since it is impossible for any single study to explore all aspects.

Academics often attribute the causes of academic achievement or retention to the students' interest and motivation, but they do not often associate it with themselves and their teaching practices (Taylor & Bedford, 2004; Ramsden, 1987). Research has supported the theory that students' approaches to learning are related not only to their perception of learning but also to teaching environments (Biggs, 1999; Ramsden, 1992; Trigwell & Prosser, 1991). So, it is reasonable to assume that students' approaches to learning can be influenced by how teachers approach their teaching (Kim & Branch, 2002).

4. Effective teaching

> *Good teaching encourages high quality student learning. It discourages the superficial approaches to learning represented by 'imitation subjects' and energetically encourages active engagement with subject content.*
>
> *(Ramsden, 1992, p.86)*

Research indicates that '*enthusiastic teaching may lead to greater student involvement and commitment to the subject, while its lacklustre and rambling counterpart results in negative attitudes and a sense of futility*' (Ramsden, 1992, p. 73). Nevertheless, further work suggests that a good performance or a 'colourful presentation' (Ramsden, 1992, p.74), does not necessarily mean good teaching and that students are often quite critical on this issue (Saroyan & Amundsen, 2001).

Teaching effectiveness is not easily described in terms of competences. Researchers agree that there is no single method for promoting good teaching. Indeed, the '*lecturer can adopt differing teaching methods, and offer all students pedagogy that suits them'* (Davis, 2003, p.250). Ramsden (1992) explores six key principles for teaching effectiveness in Higher Education, as conceived by individual instructors: (1) interest and explanations; (2) concern and respect for students and student learning; (3) appropriate assessment and feedback; (4) clear goals and intellectual challenge; (5) independence, control, and active engagement, and (6) learning from students. The conjunction of these principles makes a good lecturer effective, but the capacity to reflect upon these characteristics and the ability to change one or other aspect can distinguish the teaching quality of lecturers. Ramsden (1992) reflects this view with a clear statement:

> *Good teaching is open to change: it involves constantly trying to find out what the effects of instruction are on learning, and modifying that instruction in the light of the evidence collected (p.102).*

The relevance of reflection for changing and improving teaching practices is not new. Different authors (Zeichner & Liston 1996; Kemmis, 1985; Schön, 1983, 1987; Dewey 1933) described the power of reflection in developing and changing the individual's actions. Different terms for 'reflection' are also applied by the different authors, but are always associated with research on teaching practices. Thus, terms such as 'reflective thinking' (Dewey, 1933), 'reflective teaching' (Zeichner & Liston, 1996), 'reflective practitioner' (Schön, 1983) are familiar to every educational researcher. In Portugal, Vieira & Marques (2002), Serrazina (1998), Alarcão (1996), and Sá-Chaves (1991) support the importance of 'reflection', mainly in studies that focus upon teacher training.

The ability to reflect on or about action, as well as to reflect about action reflection, helps individuals to analyse their actions, and reflect about the moment of reflection in action (Schön, 1992). Each of these phases aims to achieve a deeper understanding of a specific educational phenomenon and is crucial for lecturer improvement and success (Schön, 1987).

An effective teacher must first engage student interest, and motivate them toward a deeper understanding of the concepts being introduced. Furthermore, an 'effective teacher' should carefully prepare the exercises for each class and think about the best strategy to implement in the classroom. But, effective teaching is even more than class preparation or a list of specific activities. Blackburn & Lawrence (1995) refer to it as 'an art, a performance' (p. 31) that is difficult to measure. Effective teaching requires deep knowledge of the student learning process in order to transform them into active learners. As Christensen, Roland, Garvin, David & Sweet (1991) indicate:

> *To teach is to engage students in learning; thus teaching consists of getting students involved in the active construction of knowledge. A teacher requires not only knowledge of subject matter, but knowledge of how students learn and how to transform them into active learners. Good teaching, then, requires a commitment to systematic understanding of learning (…). The aim of teaching is not only to transmit information, but also to transform students from passive recipients of other people's knowledge into active constructors of their own and others' knowledge. The teacher cannot transform without the student's active participation, of course. Teaching is fundamentally about creating the pedagogical, social, and ethical conditions under which*

> *students agree to take charge of their own learning, individually and collectively (p. xiii, xvi).*

In future, effective teachers will face a climate of continual change in which distance learning and other teaching media are more prevalent. Teachers as social scientists '*have a plurality of methods from which to choose when they research a subject, and it is their responsibility to select the one method that best fits the ontological contours of the problem they are studying*' (Harvey & Reed, 1997, p.296). Furthermore, there is no single method that can '*fully appropriate the manifold complexity of social life'* (Harvey & Reed, 1997, p. 296,) and the same is applied to the teaching methods. Academics have to adjust each method according to the student needs and the complexity of the subject.

Some teaching strategies in the area of engineering were explored by Felder & Silverman (1988) aiming to motivate and develop deep learning approaches in students and to turn them into reflective and active learners (Kolb, 1984). Nevertheless, different types of learners are more motivated by one strategy than another. The success of the implementation of any strategy lies in the lecturer's ability to combine activities that accommodate different types of students and different moments of the class. Felder & Silverman (1988) summarised this idea:

> *The idea, however, is not to use all the techniques in every class but rather to pick several that look feasible and try them; keep the ones that work; drop the others; and try a few more in the next course. In this way a teaching style that is both effective for students and comfortable for the professor will evolve naturally and relatively painlessly, with a potentially dramatic effect on the quality of learning that subsequently occurs (p.680).*

Table 3 summarises some teaching techniques lecturers may use according to the different types of learners (sensing, intuitive, visual, auditory, inductive, deductive, active and reflective). Effective teachers should reach both types of student, developing teaching strategies that blend concrete information (facts, data, and observable phenomena) and abstract concepts (principles, theories, mathematical models).

Table 3: Teaching techniques to address the different learning styles

Felder & Silverman (1988, p. 680)

1. Motivate learning. As much as possible, relate the material being presented to what has come before and what is still to come in the same course, to material in other courses, and particularly to the students' personal experience ***(inductive/global)***.

2. Provide a balance of concrete information (facts, data, real or hypothetical experiments and their results) ***(sensing)*** and abstract concepts (principles, theories, mathematical models) ***(intuitive).*** (Jung, 1971)

3. Balance material that emphasises practical problem-solving methods *(sensing/active)* with material that emphasises fundamental understanding *(intuitive/reflective).*

4. Provide explicit illustrations of intuitive patterns (logical inference, pattern recognition, generalisation) and sensing patterns (observation of surroundings, empirical experimentation, attention to detail), and encourage all students to exercise both patterns *(sensing/intuitive).* Do not expect either group to be able to exercise the other group's processes immediately.

5. Follow the scientific method in presenting theoretical material. Provide concrete examples of the phenomena the theory describes or predicts *(sensing/ inductive);* then develop the theory *(intuitive/inductive/ sequential);* show how the theory can be validated and deduce its consequences *(deductive/sequential);* and present applications *(sensing/deductive/sequential).*

6. Use pictures, schematics, graphs, and simple sketches liberally before, during, and after the presentation of verbal material *(sensing/visual).* Show films *(sensing/visual.)* Provide demonstrations *(sensing/visual),* hands-on, if possible *(active).*

7. Use computer-assisted instruction—sensors respond very well to it *(sensing/active).*

8. Do not fill every minute of class time lecturing and writing on the board. Provide intervals—however brief—for students to think about what they have been told *(reflective).*

9. Provide opportunities for students to do something active besides transcribing notes. Small-group brainstorming activities that take no more than five minutes are extremely effective for this purpose *(active).*

10. Assign some drill exercises to provide practice in the basic methods being taught *(sensing/active/sequential)* but do not overdo them *(intuitive/reflective/ global).* Also provide some open-ended problems and exercises that call for analysis and synthesis *(intuitive/reflective/global).*

11. Give students the option of cooperating on homework assignments to the greatest possible extent *(active).* Active learners generally learn best when they interact with others; if they are denied the opportunity to do so they are being deprived of their most effective learning tool.

12. Applaud creative solutions, even incorrect ones *(intuitive/global).*

13. Talk to students about learning styles, both in advising and in classes. Students are reassured to find their academic difficulties may not all be due to personal inadequacies. Explaining to struggling sensors or active or global learners how they learn most efficiently may be an important step in helping them reshape their learning experiences so that they can be successful (all *types).*

Therefore, the authors concluded that different types of learners would be satisfied with teaching methods that corresponded to their individual differences:

> *A student who favors intuitive over sensory perception, for example, would respond well to an instructor who emphasises concepts (abstract content) rather than facts (concrete content); a student who favors visual perception would be most comfortable with an instructor who uses charts, pictures, and films (Felder & Silverman, 1988, p. 674).*

Furthermore, the same authors support the view that engineering education is usually auditory, abstract (intuitive), deductive, passive, and sequential; while many engineering students are visual, sensing, inductive, and active. These mismatches can '*lead to poor student performance, professorial frustration, and a loss to society of many potentially excellent engineers*' (p.680).

4.1 Summary

Essentially, academics offer students cognitive apprenticeships by working with students and modelling key aspects of learning until the students are able to work unassisted and become responsible for their own learning and the learning of others. The lecturer is responsible for passing on knowledge of the process rather than simply focusing on content. Ideally, the faculty member serves as a facilitator or coach (Smith, 1999). Effective teachers adopt different teaching methods to offer all '*students' pedagogy that suits them'* (Davis, 2003, p. 250). The ability to combine different methods and teaching techniques requires from the lecturer a deep knowledge of the students' learning styles (Kuri & Truzzi, 1998; Sims & Serbrenia, 1995; Marton, 1988; Schmeck, 1988).

Institutions around the world apply different surveys to academics to gather their feedback regarding the relevance of effective teaching to themselves, to faculty colleagues, and to institutional faculty reward systems (Brawner, Felder, Allen & Brent, 2002). A study carried out by Brawner *et al*. (2002) with a group of engineering academics, revealed that effective and innovating teaching was mainly relevant to themselves and not so relevant for their colleagues, deans and department heads. The same authors concluded that faculty who work in developing new teaching methods are not concerned with institutional rewards or recognition from their colleagues, but just concerned with their personal satisfaction.

5. Theories of teaching

> *Thinking about teaching as a process of changing students' understanding in a general way insufficient to ensure that good teaching actually happens. (…) Becoming skilled at teaching requires developing the ability to deploy a complex theory of teaching in the different contexts relevant to the teaching and learning of that subject matter.*
>
> *(Ramsden, 1992, p. 110-111)*

Work on teaching and learning in Higher Education highlights the influence that teaching theories appear to have on teachers' conceptions of teaching and consequently on the students' approaches to learning (Kim & Branch, 2002; Biggs, 1999; McKenzie, 1996; Trigwell, Prosser & Taylor, 1994; Ramsden, 1992; Trigwell & Prosser, 1991).

Studies of teacher thinking and beliefs at the pre-college level indicate that academics develop and hold implicit theories about their students, about the subject matter that they teach, about their roles and responsibilities, and about how they should act (Clark, 1988). Furthermore, lecturers should develop a student-focused conception of teaching which encourages deep approaches to learning (Mckenzie, 1996; Biggs, 1999; Trigwell, Prosser & Taylor, 1994; Ramsden, 1987, 1992).

Ramsden (1987, 1992) has undertaken several studies on teachers' conceptions of teaching and its implication for the students' academic achievement in Higher Education. His research aimed to help academics change their understanding and beliefs about teaching. The author supports the idea that academics can improve their teaching by studying the students' learning (Ramsden, 1987, 1992). Ramsden (1992) describes teachers' views and beliefs in the context of three progressively theories about teaching: (i) teaching as telling, (ii) teaching as organising student activity, and (iii) teaching as making learning possible. According to each theory, lecturers will address teaching differently.

Biggs (1999) follows the linear model of teaching by Dunkin & Biddle's (1974) and creates the *3P* model of teaching and learning. The main idea of this model is its interactiveness. Effective teaching depends on how lecturers conceive the process of teaching regarding the students' learning process and through reflection come to some conclusions about the best strategies and methods that may do their particular job better (Biggs, 1999). The 3P model contains three theories of teaching, also discussed by Ramsden (1992): a) what students are, b) what teachers do, c) what students do. At the first level, the lecturer' role is to display the information and it is the students' responsibility to acquire the knowledge. At the second level, the lecturers' role is to use the best skills and techniques to explain concepts and information. The lecturer is more reflective on the strategies to use but not so concerned if the student is successfully acquiring the knowledge. At level three, the focus is to engage the students to learn successfully.

Following this theoretical framework, the understanding of the student learning process and motivation is not only important for the student himself but also for academics. It is critical that educators are aware of the nature of students' conceptions of learning, since students' epistemological assumptions will influence the way they go about learning (Marshall *et al*., 1999). Marshall, Summer & Woolnough, (1999), Trigwell & Prosser (1996), Trigwell, Prosser & Taylor (1994), and Ramsden (1992) note the importance of understanding the students' conception of learning as holding implications for teaching and curriculum design. The intentions and strategies of lecturers need to be studied and then addressed before substantial improvements in approaches to teaching can be expected (Trigwell *et al*., 1994).

According to Martin & Ramsden (1993), the first step to change academics' conceptions of teaching is 'expanding awareness'. Teachers' awareness regarding how knowledge is represented, how students are helped to encounter that knowledge and how learning happens, can be the changing point towards a more student-centered teaching approach. This way, lecturers tend to associate teaching with learning, contributing to developing a deep approach to learning. Different teaching conceptions only make a positive effect if they imply changes in teaching approaches.

Indeed, research pointed out that a change in lecturers' beliefs about teaching would imply different teaching approaches (Trigwell & Prosser, 1996; McKenzie, 1996; Martin & Ramsden, 1993). In order to achieve different teaching approaches it is necessary to reflect. Reflection about teaching implies 'searching for ideas, trying these ideas out in practice, seeking feedback from students and colleagues' (McKenzie, 1996). According to Ramsden (1992) 'the quality of a teacher's reflections on how his or her teaching is working affects the theories used and in turns the future actions taken' (Ramsden, 1992, p. 119). This continuous process creates more self-aware lecturers, able to change their attitudes towards teaching. When students find teaching good and relevant for their goals, they will be satisfied and motivated to do better work.

Teaching theories will certainly be influenced by the academic environment. This environment may lead to different teaching understanding. Academics who participate in teaching training programmes, or attend workshops about teaching and learning in Higher Education, will probably perceive teaching in a different way from other teachers who have never been in contact with such activities (Ramsden, 1992).

6. Students' approaches to learning associated to learning and teaching conceptions

> *As university and college teachers, we should study how our students learn in order to discover the elusive but very apparent academic quality described by Pirsig. On this journey we should follow two paths. We ought to study learning because we want to describe what students do; we should apply what we find out to making learning better.*
>
> In: Ramsden, 1987, p.275

One of the questions frequently addressed in the literature is how students conceive learning and how it can influence their approaches to learning (Trigwell, Prosser & Waterhouse, 1999; Entwistle, 1998). Indeed, much has been argued about the relationship between students' approaches to learning to their learning and teaching concepts. Of course, approaches to learning are not only related to motivation but also to the conceptions of learning that each student possesses. Säljö (1979) presented information regarding how individuals conceptualised learning. Through the analysis of interviews the author summarised his findings in five categories. Later on, Marton, Dall'Alba & Betty (1993) added one more to give six categories in total, namely: (i) quantitative increase of knowledge; (ii) memorisation; (iii) acquisition of facts and methods for using; (iv) abstraction of meaning; (v) interpretative process aiming to understand the reality, and (vi) personal development.

A few years after the Säljö studies, Van Rossum & Schenk (1984, p.24) found out that different conceptions of learning would lead to different learning approaches. Their study revealed that 'memorisation' and 'quantitative increase of knowledge' were strongly correlated with a superficial approach to learning. In contrast to this superficial approach, students who sought for a better understanding of the reality and constantly searched for meaning were developing a deep approach to learning.

On the other hand, many students do not have a clear notion of the nature of learning. This limitation in understanding the concept prevents from developing a deep learning approach (Gibbs, 1992). Nevertheless, through the students' conception of what represents 'good teaching' (Van Rossum & Taylor, 1987), Gibbs (1992) assumed that teaching conceptions would be connected to learning conceptions. Indeed, students who perceived 'good teaching' as a teacher-centred approach ('closed' conception of teaching), would have a conception of learning that Gibbs (1992) defined as 'reproduction' (surface approach to learning). In contrast, students who perceive 'good teaching' as a student-centered approach, attributing to the lecturer the role of learning mediator and facilitator ('open' conception of teaching) will have a conception of learning that Gibbs (1992) denominates as 'making sense' (deep approach to learning).

In conclusion, students' approaches to learning derive not only from their motivation but also from their conceptions of learning and teaching. A better understanding of the students' learning and teaching conceptions can help academics to derive new methodologies for promoting deep approaches to learning.

7. Models for the improvement of teaching quality

> *Teaching effectiveness is multifaceted. The design of instruments to measure the students' evaluations and the design of research to study the evaluations should reflect this multidimensionality.*
>
> *(Marsh, 1984, p.709)*

Teaching effectiveness is a complex system, and because of the complex and multifaceted nature of this task, we consider that no one system of evaluation can be adequate and sufficiently reliable to measure and/or evaluate a specific teaching process (Lewis, 1993, Collins, 1991, Watkins, Marsh & Young, 1987). Disagreement in the literature focuses on whether one evaluation program can serve both to improve performance and to help in personnel decisions. One contention (Seldin, 1984) is that while both purposes are vital, they must be kept separate.

Centra & Bonesteel (1990) believe that a rigorous assessment of teaching is possible. Though, the level of decision to choose the best model, the one that will take into account the variables that are beyond the teacher's control, is difficult to make.

Several models of instructional improvement have been explored in the literature. Each model follows different perspectives and offers distinctive insights into the nature of the process (Paulsen & Feldman, 1995).

7.1 Student evaluation questionnaires

University students '*are extremely astute commentators on teaching*' (Ramsden, 1992, p. 89) and able to identify the characteristics of a good lecture as well as lecturers. Findings prove exactly this point of view (Wachtel, 1998; Ramsden, 1992; Cashin, 1990, 1995, 1996; Marsh, 1987, 1983).

There is an extensive research literature on the use of student evaluation questionnaires to measure different aspects on teaching as well curriculum and assessment. Authors such as Marton & Säljö (1997), Entwistle & Ramsden (1983), Ramsden (1992) defend the view that students' perceptions are key determinants of their approaches to learning and the quality of their learning outcomes. Clarke (1995, 1998) concludes that students are '*capable of discriminating between what they consider to be good and bad educational experiences*' (quoted in Dorman, 2000, p. 26).

Johnson (2000), Ramsden (1991), Marsh (1982, 1984, 1987), Feldman (1978) and Ramsden & Entwistle (1981) discuss the validity, reliability and utility of the students' evaluations of university teaching. Although there are disagreements about how valid and reliable the students' evaluation questionnaire could be, the authors agree that student ratings are effective methods for encouraging and helping lecturers' best practices. This is clearly expressed by Marsh (1984):

> *Student ratings are clearly multidimensional, quite reliable, reasonably valid, relatively uncontaminated by many variables often seen to be useful by students, faculty and administrators (p. 749).*

The questionnaire purposes, especially in some American and Australian universities can be defined according to Marsh (1986) as providing a measure of teaching effectiveness to use in tenure/promotion decisions and information for students to use in the selection of courses and instructors.

A crucial question relates to the validity of the student ratings as measuring teaching effectiveness. Cashin (1995) suggests that since teaching effectiveness is such a complex process, '*the best that one can do is to try various approaches, collecting data that either support or contest the conclusion that student ratings reflect effective teaching*' (Cashin, 1995, p.3). This idea reflects the need to employ different models of teaching evaluation.

7.2 Peers and student collaboration and interaction

It is argued that representing the scholarship of teaching as a reflective and informed act engaging students and teachers in learning is supportive of the aims central to the project of developing a scholarship of teaching (Trigwell & Shale, 2004; Alarcão, 1996).

Teachers can receive input or feedback through the collaboration and interaction with peers and students. According to Austin & Baldwin, (1991) 'team teaching' benefits lecturers by developing their teaching abilities, engaging them as self-directed learners, and more closing connecting them to the university. 'Collegial coaching' is defined by Keig & Waggoner (1994) as observation of classroom teaching and instructional consultation.

A study developed by Froh, Menges & Walker (cited in Paulsen & Feldman, 1995, p.33) reveals that 88 faculties at six research universities feel that opportunities to talk about teaching with peers as well with students help them to increase the intrinsic rewards of teaching. Frequent interaction, collaboration and community among faculty can bring three major benefits to lecturers according to the review of the literature carried out by Austin & Baldwin (1991): improvement of teaching ability, increased intellectual stimulation and reduction in the degree of isolation associated with teaching.

Literature suggests that peer observation of teaching can be seen as a means by which the quality of the teaching and learning process in Higher Education establishments is both accounted for and improved (Hammersley-Fletcher & Orsmond, 2004, p. 489).

7.3 Self evaluation

Frazer (1991) assumes that real and enduring quality can only come by actions of the universities themselves. The basis for these actions must be self-evaluation. Inspection and quality control imposed solely from outside would not work.

Frazer (1991) emphasises the importance of self-evaluation in the processes of teaching and learning. A good professional should be constantly monitoring how the course is proceeding, the difficulties and successes of the students, and logistical and pedagogic problems (Frazer, 1991). There are different ways to proceed to evaluation (Biggs & Habeshaw, 2002). The observation of the teaching practice can be developed by more experienced colleagues. This technique is not very well accepted by academics that seem to feel intimidated by external observation. Another more acceptable way of monitoring the process include student feedback and regular self critical planning and review meetings by the staff (Frazer, 1991). Seldin (1984) asserts that evaluation systems aimed at faculty development which provide constructive feedback to the professor often create a kind of dissatisfaction that motivates the professor to improve. Chances for faculty improvement increase when: (i) immediate feedback is given; (ii) the professor wants to improve, and (iii) the professor knows how to bring about the improvement.

7.4 Effects and consequences of Higher Education quality evaluation

There are reports that in the US, Australia, and possibly in the UK, scores are used as input for promotion and tenure decisions, though tests suggest that the weight placed on such data may well be limited (Leventhal, Perry, Abrami, *et al.*, 1981; Salthouse, McKeachie & Lin, 1978). Some universities publish their results thus allowing students to choose modules and degrees based on such data (Marsh, 1984). They are also reported as input for general reviews of the teaching process carried out by the universities own administrations (Marsh & Dunkin 1992) and by external regulatory bodies (Centra, 1979). In sum the results reach into virtually all parts of the teaching process but do they really provide sufficient information to faculty for improving teaching? In practice, evaluation rarely gives sufficient information to faculty for improving teaching. In recent years, in fact, time-honoured practices of faculty evaluation have been rather harshly criticised.

In Portugal, the Higher Education National Evaluation Committee (HENEC)[8] is responsible for the evaluation of quality in Higher Education. The meta-evaluation of the system can also be made by national or international identities but always in collaboration with the HENEC (law nº 205/98, article 1, D.R. nº 158/98). The results of such evaluation will have the following outputs: (i) reinforcement of public funding;

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[8] Translated from the original word: CNAVES (Conselho Nacional de Avaliação do Ensino superior), http://www.cnaves.pt/

(ii) incentive to the creation of new courses or the development of existing courses; (iii) reinforcement of research activities funding, and (iv) development of measures for coping with some problems detected by the evaluation committee. The evaluation system focuses on the scientific and pedagogical quality, namely: (i) the curricular structures of the courses, the scientific domain, the pedagogical processes and its innovative characteristics; (ii) the qualifications of the teaching agents, (iii) the research, (iv) the connection to the community, namely through services and cultural events, (v) the quality of the resources (pedagogical and scientific equipments) and (vi) the international cooperation projects (law nº 38/94, D.R. nº 269/94). Nevertheless, teaching effectiveness is not taking in consideration by the evaluation committee. The evaluation is at a macro-level and not at a micro level.

8. Partnerships of learning

Developing learning partnerships inside each institution or across countries is one strategy for improving the quality of teaching in Higher Education (Peggy & Panizzon, 2001). Different countries around the worlds develop different activities such as academic staff development units and networks. Recently, there is a growing attention on the development of on-line learning environments, which easily allow the '*partnerships between academics across faculties and disciplines; partnerships across multiple campuses; and partnerships online regardless of location'* (Soo, Oon tan & Jamieson, 2001, p. 2).

Following the 'communal constructivism' concept developed by Holmes, Tangney, FitzGibbon & Savage (2001), students and academics are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit other students and academics. Every year students and academics learn from each other and in collaboration with peers. The construction of scientific and pedagogic knowledge is not only built on constructivist theories, where academics are involved in building their own knowledge, but also by a social constructivism idea which adds an interactive dimension to the learning process. This approach is influenced by the work of Vygotsky (1978) who believed that children learn from within themselves and as well as from influences in their social or cultural environment. Dewey (1916) argued at the turn of the century that learning is a building process. Some authors (Holmes, Tangney, *et al.*, 2001; Ramsden, 1999, Biggs, 1992) believe that education as a whole should also be considered as in the same light. Academics have much to learn, or rather much to construct, in this communal approach to constructivism.

Partnerships of learning imply a reflective attitude towards the curriculum, courses' organisation and pedagogy. Research shows that reflective practice leads to better learning (Davis, 2003; Schön, 1983). It is important faculty think about their teaching practice, their Praxis, and the reasons that lead them to act in a specific way (Alarcão, 1991; Gonçalves, 1998).

8.1 Academic Staff Development Units and Networks

> *Change is hard and typically does not occur without a group of colleagues who care and provide support and encouragement for one another. The research support for cooperation among faculty is just as strong as that for cooperation among students.*
>
> *(Smith, Johnson, and Johnson, 1992, p.36)*

The effort to promote Academic Staff development is not new. In 1987 the Unesco's Centre for Higher Education in Europe (CEDES) prepared a working paper to be presented in a conference at the University of Aveiro which underlined the importance for establishing staff development programmes in Higher Education:

> *One way which a Higher Education institution can face the challenges of the time is by having staff members who can knowledgeably assess both the value of tradition and the need for innovation. Academics hold a strategic position: they are the ones who produce, organise, and transmit knowledge, set 'standards of excellence' and direct learning and evaluation. They are institutionally, socially and professionally responsible for the development of courses and curricula and for the ways in which the minds of students and their qualifications are moulded so as to better cope with increasingly more complex professional roles and functions in modern societies.*
>
> *At the same time, university teachers are faced with new challenges arising from the need to adapt their institutions to new requirements being set both from inside and from outside Higher Education. Slowly but surely, it has become obvious that the process of adaptation cannot be*

> *undertaken haphazardly. What is needed is deliberate planning, which in its turn requires knowledge, as well as innovative skills and attitudes.*
>
> (Berendt, 1994, p.76)

In Europe academic staff development programmes are concentrated on the teaching area. Nevertheless, the increase of staff accountability is demanding new management skills to academics apart from teaching. In spite of this reality we will mention 'academic staff development' associated to teaching.

Around the world research groups and networks[9] are growing up to discuss, encourage and disseminate good teaching practice in Higher Education. These groups organise events, provide accredited and recognised programmes/activities for staff development and produce a variety of publications with a long term commitment to '*influence Higher Education policy on behalf of their membership*' (King, 1998, p. 51).

Some internationally recognised units of staff development are starting to encourage more members of staff to enrol in their accredited programmes. These activities are recognised by some universities as essential for academics to progress in academia. Recognition of the programmes undertaken still represents the most important motivation for staff members (King, 1998). Some Universities and Units (SEDA) offer Graduate Certificates in Higher Education or Accreditation of Professional in Higher Education (APHE). These accredited courses/modules are based on a practically oriented program of initial training in Higher Education teaching. They provide the knowledge and skills for staff to develop and advance their teaching practices. The modules offered are diverse. Brown (1989) gathered information regarding the topics preferred by British university staff (Table 4). Junior Staff preferred training in preparing and giving lectures and also instructions for small group teaching. Experienced staff preferred support for helping them on delivering lectures and application for research grants.

[9] Some of these groups are the HERDSA (Higher Education Research and Development Society of Australasia), SEDA (Staff and Educational Development Association, UK), AAHE (American Association for Higher Education), STLHE (Society for Teaching and Learning in Higher Education, Canada), AIPU (Association Internationale de Pédagogie Universitaire, France), AHD (The Association for Research and Development in Higher Education, Germany), POD (Professional and Organizational Development Network in Higher Education).

Table 4: Range of topics in the past 2 years in Great Britain preferred by British university staff

Courses for junior or new staff	**%**
Preparing and giving lectures	50.8
Small group teaching	50.8
Writing research grant applications	34.3
Making assessments and examinations	32.9
Counselling students	32.9
Supervising research students	32 9
Courses for experienced staff	
Lecturing	61.2
Applications for research grants	58.2
Small group teaching	52.2
Research supervision	49.2
Marketing/media presentation	35.4

(In Berendt, 1994, p. 80, extract from G.A. Brown, 1989)

The success of such initiatives is limited by the institutions' political systems, academia tradition and financial situation. Academia is still reluctant to enrol these courses. Teaching is regarded in many traditional institutions as unquestionable. Those attending support programmes can feel discriminated by some of the peers. This carries out the relevance of questioning the meaning of the word 'support'. How is this word connoted by the academia? What is the credibility of the Units who offer these support programmes? Should the programmes be compulsory or facultative? Furthermore, the study aims to collect the instructors' opinions about the most effective teaching methods for evaluate teaching quality in Higher Education.

The Technical University of Lisbon is one of the leading institutions to develop Continuous Professional Development (CPD) modules for academics. These activities were succeeded because they were directly supported by the institution. As Professor Peleteiro, vice-rector of the Technical University of Lisbon, said at a conference held at the University of Minho '*the university believed that promoting these teaching modules would increase the lecturers' skills and satisfaction for teaching*'. Every year different modules are offered to academic staff. Nevertheless, the modules need to be opened to other learning communities since to the lower number of participants at the present.

The University of Minho had experienced a similar experience but just with a smaller group of academics from Science and Engineering (Ribeiro, Torres, Vasconcelos & Van Hattum, 2002; Fonte & Vasconcelos 2002).

At the University of Aveiro, CPD modules[10] are starting to be implemented. Until recently, seminars and joint research have been the strategies used to promote best teaching practices. The available courses are divided in three themes, namely: (i) University pedagogy and curriculum design; (ii) ICT in HE; and (iii) Collaborative learning in HE. Each course has three editions and is delivered by a group of academics and researchers with research experience in each specific topic. The first course edition runs between September and November 2005 and counts with 27 academics from the University of Aveiro. The first reactions are very positive. The interaction with peers from different areas of knowledge seems to be very effective and start to join researchers from areas such science, engineering and education in common educational topics.

The University of Lisbon (Educational Department) has recently started a master program on University Pedagogy. The topics approached in this course concern the continuous professional development of academics, the student failure on postgraduate courses, and the different approaches for delivering different courses or singular subjects. One of the main concerns, expressed by the organisation committee, was the reduced number of academics interested to attend this course. Indeed, most of the participants are teachers from secondary or middle school. This reality can put in risk the future of the course. Portuguese academics are still reluctant in undertaking a specialisation outside their scientific area. University pedagogy is still far away from being a priority among academic staff.

The Scottish School of Further Education[11] within the University of Strathclyde is the sole agency for the provision of initial teacher training to further education lecturers in Scotland. The BA and Postgraduate Certificate in Post-School Education is the course aiming to equip students to teach in further education. This course can be taken as a one-year full-time course for students who are not otherwise employed or on a part-

[10] The courses are held at the UNAVE ('Associação para a formação profissional e investigação da Universidade de Aveiro', 'Professional training and research association of the University of Aveiro'

[11] http://www.strath.ac.uk/ssfe/

time basis over two years for students already employed by a further education institution. On completion of the course students with a non-graduate qualification, typically an HND or equivalent will be awarded the BA qualification.

From September 2001 all new full-time and fractional (part-time, permanent) lecturers in England and Wales were required to hold or gain a teaching qualification (a university Certificate in Education or a PGCE) within two to four years of taking up their post. Full-time courses leading to either of the above qualifications are also offered at universities and colleges around the country and usually last for one year. The Department for Education and Skills[12] (DfES) requires that all courses leading to a Higher Education teaching qualification are endorsed by the Further Education National Training Organisation[13] (FENTO). In-service training is likely to be provided to update skills and knowledge and to develop new skills. For some staff, continuing professional development in their occupational area may also be a requirement. Many further education colleges support their unqualified lecturing staff through part-time study leading to a recognised teaching qualification.

8.2 Summary

Many key issues of Higher Education today cannot be solved by innovations in teaching methods or by staff development programmes and courses alone. What is really needed are significant improvements in staff/student ratios, the degree structure and, often, the reform of curriculum and assessment requirements. Moreover, the importance of university education for national development priorities requires close scrutiny. Over the past few years, universities have devised a variety of additional solutions within their limited budgets to go beyond innovative teaching methods. These include different forms of evaluation as well as tutorial and mentor programmes. However, it has become evident that they cannot solve the problems of mass education without extra funding from national and other sources.

Tavares & Huet (2001) reported some strategies and ideas necessary to improve teaching quality in Higher Education, namely: (i): to fight an individual and collective idea, still very present in most of the Portuguese society, that for teaching it is just necessary to be scientifically competent; (ii) to discuss the best strategies for promoting the university teachers' teaching skills; (iii) to promote strategies that

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[12] http://www.dfes.gov.uk
[13] http://www.fento.org

approximate the different training agents, and (iv) to valorise the teaching practice for the career progression.

It is urgent to motivate and involve more actively the lecturers in lifelong learning, giving them the opportunity to acquire scientific and pedagogic training according to the needs of each individual (Gibbs & Coffey, 2000). Since the ethos of Higher Education is to encourage the pursuit of lifelong learning, why not apply this ethos to our essential staff?

This training can not be restricted to the organisation of courses. Indeed, it is necessary to involve academia, students and other educational agents in a dynamic and co-operative learning community. This way, the development of working and research spaces inside the universities might be one way to promote a strong structure that could lead to innovative changes for teaching quality.

Research indicates that instructors who receive pedagogical training reflect more on their teaching practice (e.g. through students' feedback, peer evaluation or self-assessment) than those instructors without such pedagogical training (Shannon, Twale & Hancock, 1996).

9. Motivation of academics at work

Over the years, numerous theories have been proposed attempting to capture the various sources of motivation promoting individual behaviour. These theories all propose a limited set of motivational sources, some arranged in a hierarchy, and other viewed as developmental stages (Leonard, Beauvais & Scholl, 1995). These models differ to the degree to which they theorise a dominant source of motivation, grounded on non-cognitive or cognitive theories (Blackburn & Lawrence, 1995).

As non-cognitive theories '*little or no human cognition is required, as any learning about how to behave involves non-cognitive conditioning of the bond between these stimuli and responses*' (Blackburn and Lawrence, 1995, p.19). It is assumed under these theories that external incentives, personality dispositions, and rewards will cause an individual to behave in predictable ways (Blackburn & Lawrence, 1995; Katz & Kahn, 1966,). Blackburn & Lawrence (1995) identified sub-categories that fall under the non-cognitive theories of motivation, such as 'Personality and Career Development Theories' (Baltes & Brim, 1983; Levinson, Darrow, Levinson & McKee, 1978), 'Reinforcement Theories' and 'Dispositional Theories'.

Cognitive theories of motivation '*assume that people make decisions about how to behave by evaluating their capacity to respond to situations and estimating their possible losses and gains*' (Blackburn & Lawrence, 1995, p.21). The most relevant theories to research on college and university faculty are four: (i) 'Expectancy Theories', (ii) 'Attribution Theories', (iii) 'Efficacy theories', and (iv) 'Information Processing Theories' (Blackburn & Lawrence, 1995).

Table 5 summarises the sources of motivation and motivational 'Inducement Systems' (Leonard, Beauvais & Scholl, 1995).

Table 5: Description of five basic sources of motivation according to different authors and four Motivational 'Inducement Systems'

		Motivational Inducement Systems			
Sources of Motivation **Conditions for Motivation**	**Motivational Driver (Motivational theories)**	**Reward System Pay & Promotion**	**Managerial System Leadership Style**	**Task System Job Design**	**Social System Culture**
Intrinsic Process (Leonard, Beauvais & Scholl): Enjoyment. **Intrinsic Motivation** (Ryan & Deci), **Task Pleasure**, (Deci), **Sensory Intrinsic**, (Bandura), **Work Conditions** (Herzberg)	(Cognitive theories)			'Laisez-fair', Leadership, Job Rotation, Social Activities, Quality of Work	
Instrumental Extrinsic (Leonard, Beauvais & Scholl): Increase Pay and/or promotion is linked to high performance (ERB) **External Regulation** (Ryan & Deci), **Physiological, Safety** (Maslow**)**, **Extrinsic** (Deci and Bandura), **Salary, Security** (Herzberg), **Legal Compliance and External Rewards** (Katz & Kahn)	Increases in pay and promotion (non-cognitive theories: reinforcement theories')	Merit Pay, Commissions, Incentive Pay, Profit Sharing, Bonuses, Promotion			
Self Concept: External (Leonard, Beauvais & Scholl): Increased status, recognition and external validation are associated with high performance (ERB) **Introjected Regulation** (Ryan & Deci), **Social, Ego** (Maslow**)**, **Interpersonal** (Deci), **Peer relations, Subordinate Relations, Status, Recognition** (Herzberg)	Group acceptance, Individual worth, Group Status, Group Influence (non-cognitive theories)	Promotion	Recognition Empowerment Positive Reinforcement	Job Enlargement	Peer recognition, Customer recognition, Team Building
Self Concept: Internal (Leonard, Beauvais & Scholl): Skills, abilities and values are validated through high performance (ERB), **Integrated Regulation** (Ryan & Deci), Ego, Self Actualisation (Maslow**)**, **Intrinsic Challenges** (Deci), **Achievement Growth** (Herzberg), **Self Expression, Self Concept** (Katz & Kahn), **Personal Standards** (Bandura)	Achievement, Validation of competencies (cognitive theories)		Empowerment, Participation in problem solving, Linking skills to mission	Job Enrichment, Knowledge of Results	
Goal Identification (Leonard, Beauvais & Scholl):High performance (ERB) is essential in the accomplishment of important goals or benefits to others, **Identified Regulation** (Ryan & Deci), **Intrinsic Outcomes** (Deci), **Internalised Values**(Katz & Kahn)	Accomplishment (cognitive theories)			Vision creation, Goal Setting, Empowerment in mission development	Alignment activities, Knowledge of Results

Leonard, N.H *et al.* (1995)

9.1 Motivation of students for academic achievement at Universities

> *Some students seem naturally enthusiastic about learning, but many need or expect their instructors to inspire, challenge, and stimulate them: 'Effective learning in the classroom depends on the teacher's ability … to maintain the interest that brought students to the course in the first place' (Ericksen, 1978, p. 3). Whatever level of motivation your students bring to the classroom will be transformed, for better or worse, by what happens in that classroom.*
>
> *(Davis, 1993, p. 30)*

Motivation is a complex term to define because it implies a deep understanding of human behaviour (Ball, 1977; Ryan & Deci, 2000; Spaulding, 1992). Literature suggests different theories that converge '*on a set of assumptions about the nature of people and about the factors that give impetus to action*' (Deci & Ryan, 1985, p.3). Most researchers (Pervin, 1989; Blackburn & Lawrence, 1995) agree that motivation is a function of the interaction among Internal or dispositional factors (Cognitive style, personality, self concept, attitudes and values) and external or situational factors (reward system, leadership style, job design, culture).

Theorists and researchers of human motivation point to two generic types of motivation: extrinsic and intrinsic (Deci & Ryan, 1985; Lepper & Green, 1978; Deci, 1975). Extrinsic motivation exists when individuals are motivated by an outcome that is external or functionally unrelated to the activity in which they are engaged (e.g. getting a good grade, getting a job easily, passing the course, avoiding punishment, waiting for rewards). Intrinsic motivation, on the other hand, '*exists when someone works because of an inner desire to accomplish a task successfully, whether it has some external value or not*' (Spaulding, 1992, p.4). There are no external controls regulating the behaviour (DeCharmes, 1968). What is challenging (Deci, 1975) may be considered enjoyable to some people. Intrinsically motivated students do not have to be 'enticed' (Ames & Ames, 1992, p. 4) into participating in a task. Instead, they look for a task that challenges their cognitive skills. The pleasure of looking for information and to solve an exercise, for example, leads this type of students in a state of deep attention (Deci & Ryan, 1985).

Literature suggests that unmotivated students with few interest in developing a specific task, in a certain period of their learning cycle, is seen as a product, rather than pre-established cognitive characteristics (Ramsden, 1988; Entwistle & Ramsden, 1983; Fransson, 1977). In many cases, lack of motivation explains why students do not use a strategy even though they are cognitively prepared for it (Pintrich & Schrauben, 1992). According to this, the higher the students' motivation, the more likely will be the use of cognitive and learning processes and strategies essential for 'optimal learning' (Covington, 2000), especially if motivation is intrinsic (Suárez, Cabanach & Valle, 2001). Furthermore, the use of strategies that enhance meaningful learning is determined very directly by the person's intrinsic motivation. As stated by Schneider & Pressley (1989), although knowledge of different strategies may be necessary for their use, it is usually not enough; students must be motivated to use that knowledge.

9.2 Academics and the relationship with students' motivation

Academics could make the difference regarding the students' academic success when promoting student involvement, participation and interaction in class. Students tend to study harder and learn more effectively when they are interested in and believe they have a need to know (McKeachie, 1999; Ramsden & Entwistle, 1981; Wankat & Oreovicz, 1993).

Teachers may come across students who, despite sufficient cognitive resources to solve a certain task successfully, do not use them because they are not sufficiently motivated. In many cases, lack of motivation explains why students do not perform an activity or task effectively even though they are cognitively prepared for it (Pintrich & Schrauben, 1992). Inductive learners need motivation for learning (Felder & Silverman, 1988). Like sensors, they need to see the phenomena before they can understand and appreciate underlined theory. The question is how to teach both deductive and inductive learners. An effective way is to follow the scientific method in classroom presentations: first induction, then deduction.

Teachers who aim to increase their students' intrinsic motivation in academic environments must remember that intrinsic motivation is situationally determined psychological state and that no student will be in a perpetual state of intrinsic motivation. As situations change from day to day, even minute to minute, so will students' perceptions of self-determination and competence (Pintrich & Schrauben, 1992, p.8).

McBer (2000) identified three factors related to academics that significantly influenced the students' progress: (i) teaching skills ('micro-behaviours' p. 9, such as applying teaching methods appropriate to the curriculum, using a variety of activities or learning methods), (ii) professional characteristics (self-image, values, traits, motivation that drives performance), and (iii) classroom climate. Both of these constructs are different in nature. According to McBer (2000) the three factors predicts teaching effectiveness, while socio-demographic characteristics and career could not predict teaching effectiveness.

Fallows & Kemal (1999) summarised several teaching approaches that could make learning more effective, namely:

1. To be enthusiastic about the subject matter

2. To avoid unnecessary jargon

3. To have students work in groups

4. To provide rapid feedback

5. To provide a variety of teaching methods/materials

6. To relate material to applications, using examples

7. To use experiential learning, either 'real world' or simulated

8. To provide opportunities for problem solving and investigation

In many cases, academics feel frustrated when many students from engineering courses feel apathetic and fail to pass the courses (Felder, Woods, Stice & Rugarcia, 2000).

9.3 Motivation, expectation and satisfaction of academics at work

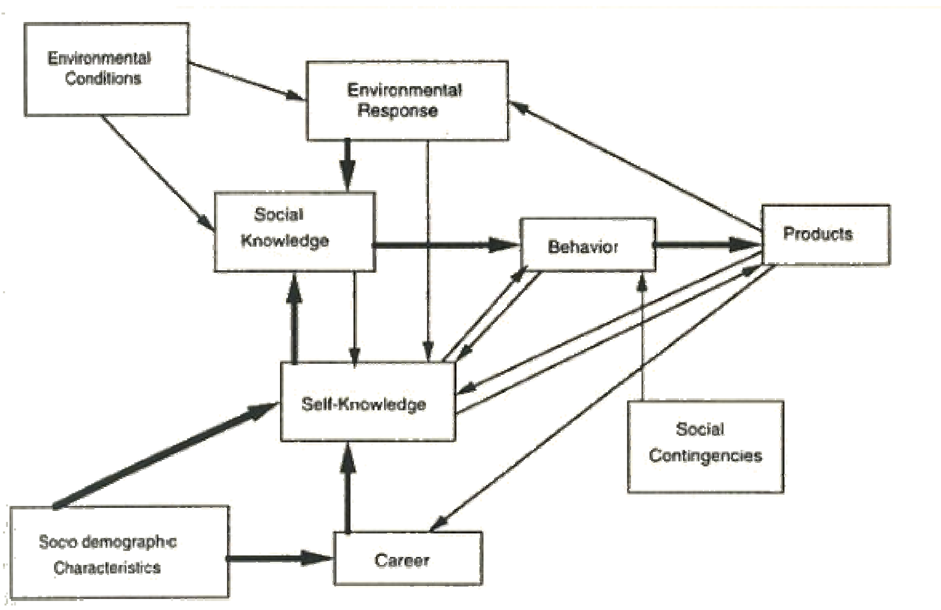
> *Calvin, the well-known cartoon character, exclaims to Hobbes: 'I hate change. It's too disruptive. When things are different, you have to think about the change and deal with it! I like things to stay the same, so I can take everything for granted'.*

Faculty too must be motivated to make significant changes in their teaching approaches and to invest the considerable time and effort into learning new support for these changes (Colbeck, Cabrera & Marine, 2002; Atkinson, 2000; Blackburn & Lawrence, 1995). Thus, teaching activities, the interest on the students' learning approaches and strategies are issues often relegated for second place by academics (Tavares, 2003). The question to address is to understand the reasons beyond this situation.

Motivation, expectation and satisfaction may influence faculty behaviour and productivity (Blackburn & Lawrence, 1995) which can lead to different teaching commitments. Faculty too must be motivated to make significant changes in their teaching approaches and to invest the considerable time and effort into learning new support for these changes. McKeachie (1999) encourages faculty wishing to change to set clear and measurable goals.

Blackburn and Lawrence (1995) conceptualise faculty role performance ('behaviour') and achievement ('productivity') based on motivation theories. Their studies support the idea that faculty role performance and achievement depend on a number of variables ('individual' and ''environmental'), synthesised in figure 2 (Blackburn & Lawrence, 1995, p.27):

Figure 2: Theoretical framework for faculty role performance and achievement



As mentioned earlier, motivation is a function of the interaction among Internal or dispositional factors ('individual') and External or situational factors ('environmental'). It is in the interaction of these factors that individuals behave distinctively from each other. Within the properties of the variable 'individual', Blackburn & Lawrence (1995) identified four individual constructs: (i) socio-demographic characteristics; (ii) career; (iii) self-knowledge, and (iv) social knowledge. For the properties of the 'environment' the same authors (1995) identified three constructs: (i) environmental conditions; (ii) environmental responses, and (iii) social contingencies.

Academia demands more effective teachers, researchers, student support counsellors and managers of their modules. Members of staff often question the effectiveness of such activities. The few resources supplied and the lack of recognition in return can lead many members of staff to feel unmotivated, especially regarding teaching (Gibbs & Coffey, 2004). Furthermore, staff members often claim not to have enough time for new initiatives (Davis, 2003). Davis (2003) argues that academics are allocated to manage different activities at the universities, which can lead to less time allocated for teaching reflection. Members of staff are '*pulled in many directions*' (Davis, 2003, p.252) which might lead to excessive workload in some areas and less dedication in another.

In Portuguese and Scottish institutions best teaching practice is not yet rewarded by academia as a consideration toward professional promotion. The traditional role of the teacher is still too powerful to be questioned, although teaching practice is starting to be taken in consideration by the members of academic juries in Portugal and there is a growing concern for pedagogical issues at the juries' evaluation committees. Nevertheless, research quality is still the main factor in promoting academics.

In some respects, teachers are pressured to publish by academia and the conferences are a vehicle of spreading the knowledge that will benefit other peers and academia. But few of these works relate to teaching experiences in specific subject areas.

In addition, when students are academically motivated, their teachers often become professionally motivated, working hard to provide students with '*worthwhile educational experiences and finding more satisfaction in doing so'* (Spaulding, 1992, p.4).

10. External factors modelling the lecturers' approaches to teaching: the organisation of classes

The current classroom model is largely a product of the industrial revolution whereby groups of students of the same age come to a single physical location to be instructed in the same subject matter at the same pace. By comparison, earlier models of learning were much more tailored to individual learners and stressed high-level interaction between the tutor and student (Holmes *et al*., 2001) . Indeed modelling the process of learning was considered as important as imparting facts and information. A stress on skills of speaking and rhetoric has been largely lost as delivery was increasingly restricted to the teacher. Assessment plays a defining role that results in students being conditioned to learn only what is of direct relevance to examinations and often only then in a superficial manner. Although it varies somewhat from country to country, for the most part the education system acts as a 'shrinking pipeline' (Holmes *et al.*,2001) '*with students being channelled into greater and greater specialisations at earlier and earlier ages*'[14](Holmes *et al.*, 2001, p.2).

Educational institutions in different locations adopt different teaching methods. Generally, the choices reflect local presumptions on the appropriate means to enhance students' learning and autonomy. Common ingredients include lectures, small group teaching (Brown & Atkins, 1996) and laboratory sessions. Our use of the term 'small group teaching' spans seminars, tutorials, and problem-solving classes. Brown & Atkins (1996) propose this generic term as applicable in different subjects, departments and institutions.

Lectures have been the traditional teaching method at universities throughout the world (Bligh, 1980). Students and lecturers, however, are often sceptical of the effectiveness of this technique. Studies of students and lecturers' views of lecturing (Brown & Bakhtar, 1983; Brown & Daines, 1981) identify negative aspects of lectures, such as the unresponsive audience, large groups, lecturers saying too much too quickly, and assuming too much knowledge. Indeed, teaching large classes presents a challenge to the lecturer who has to '*provide coverage of a topic, to generate understanding, and to stimulate interest*' (Brown & Atkins, 1996). Despite such

[14] In Ireland, for example, many undergraduate degrees are specialised, or professional in nature. Entry to university is highly competitive and judged on the results of a single set of nation-wide exams and students are encouraged, and in some cases are required, to pick between language and science courses as early as fourteen.

difficulties, different styles and techniques of lecturing can help to motivate students (Saroyan & Snell, 1997).

Small group teaching can benefit from lectures because of the reduced number of students. Studies on small groups have been developed by social psychologists (Argyle, 1983; Kelly & Thibaut, 1969) who suggested that working with twenty students was the limit for developing interaction. The advantages of this method seem obvious. Working with fewer students allows a higher degree of interaction and discussion opportunities in the class.

Tutorials or small group teaching are usually lead by a lecturer and form a current practice in UK and American institutions. They may serve to different purposes, such as to pass advice concerning essay writing, examinations and modules for future enrolment or as a complement of the classroom teaching. In this latter case, tutorial represent a more directed and focus teaching since lecturers work with a reduced number of students. Group discussion may take part of tutorials which is claimed as an effective teaching method, where '*active learning can take place and where critical thinking and the development of communication skills can be encouraged*' (Anderson, 1997, p.184). The student-centred discussion groups offer advantages compared to large classes with a more lecturer-centred teaching and can be an effective complement to the traditional lectures. A study carried out by Anderson (1997) emphasised the benefits of tutorials. Interviews with students show their satisfaction for tutors to engage them '*in an interactive process of 'clarifying' their understanding of a particular topic*' (Anderson, 1997, p.191).

In contrast, laboratories are an essential component in science and engineering courses. Brown & Atkins (1996) reported that British science and engineering students spent between 50 and 70 per cent of their time in laboratory work. Each laboratory might combine different teaching strategies according to the course, plan of course and students' interests. Strategies might include facilitating methods, written instructions, demonstration, exercises, structured enquiries, open-ended enquiries and projects (Brown & Atkins, 1996). These methods help students to develop problem-solving skills, improve understanding and nurture professional attitudes.

11. Individual versus collaborative work

Work developed in small group teaching, laboratories or even lectures can be individual or collaborative. Studies in the area of engineering support the idea that student programmers who participate in teamwork and develop 'pair programming' (PP) tend to perform better at coding programs and are more likely to succeed in early code development than if they had worked alone (Williams, Wiebe, Yang, Ferzli, & Miller, 1991). In a study conducted at Monash University, Freeman, Jaeger & Brougham (2002) conclude that pair work brought advantages for the students since working in pairs can make computer coding more accessible to those with minimal or no background in this field. In turn, this may contribute to a higher level of programming aptitude and programmer confidence. Nevertheless, the same authors express concerns when using this teaching approach. Some of the proposed work was actually split into tasks and students would then work separately on component tasks. It was suggested that this work should be done inside the class under staff supervision to ensure that students are engaged in pair programming activities. This would also mitigate some of the student concerns of not being able to secure time to meet in groups.

SECTION II

Conceptualisation of the study
Qualitative study
Quantitative study

CHAPTER 3 - CONCEPTUALISATION OF THE STUDY

1. Research questions, key premises and hypothesis

The research questions addressed in this work were based on the scope, facts and theory presented in the previous chapter. Answers to these questions will assist with the involvement of academics in teaching and educational research by promoting higher levels of professionalism and job satisfaction.

The main questions addressed by the current research are:

1. What are students and lecturers perception of teaching effectiveness? To what extent are these perceptions similar? How do lecturers perceive the impact of their teaching on student learning and motivation? How do academics feel regarding motivation for teaching?

2. How do student perceptions of teaching effectiveness affect their motivation for the course and attendance at lectures?

3. What are lecturers' views regarding the effect that seminars, workshops, colloquia, team teaching (Austin & Baldwin, 1991), Collegial coaching (Keig & Waggoner, 1994) or student evaluation questionnaires (Marsh, 1982, 1984) have as ways of rewarding, recognising and ensuring good teaching? What are lecturers' perceptions of teaching evaluation?

5. Given that the organisation of the courses within universities leads to different teaching approaches, how is the organisation of the courses and teaching of first-year introductory programming held in both universities involved in the study and what advantages and disadvantages arise from such course organisation and teaching approaches?

6. How can the interaction between lecturers and educational researchers contribute for the improvement of best teaching practices and, in particular, how can academics become reflective learners?

In addition, this Dissertation proposes the following hypothesis:

University of Aveiro

Hypothesis 1, 2 and 3 refer to the teaching practice as predicting: the students' attendance at lectures (hypothesis 1); the students' motivation for the course (hypothesis 2) and the students' expectations for the course (hypothesis 3).

Hypothesis 4 refers to individual lecturers as having a differing influence on the way students perceive the motivation for the course.

Hypothesis 5 suggests that students who attend more frequently the lectures have higher expectations for the course.

University of Strathclyde

Hypotheses 1 and 2 refer to the teaching practice as predicting the students' attendance at lectures, and expectations for the course.

Hypothesis 3 suggests that students who attend more frequently the lectures have higher expectations for the course.

The key premises underlying the framework of the empirical studies are as follow:

First, students' perception of teaching effectiveness can affect their view of attendance at lectures, their motivation, and their expectations of the course. Furthermore, we can say that academics and teaching practice influence the way students approach their learning (Ramsden, 1991).

Second, students who most frequently attend lectures may be showing greater confidence in their expectations, which re-enforces the view that lectures are an efficient method for content delivery (Bligh, 2000).

Third, student ratings of their instructors and suggestions for teaching the course may lead faculty to reflect on their teaching leading to progressively changes in their behaviour as a consequence of the comments they receive (Ramsden, 1992; Marsh, 1987; Cashin, 1995)

Fourth, academics' motivation for teaching and their conception of teaching can affect their behaviour towards teaching (e.g. innovative teaching practices, low expectations of students' academic success). Motivation is the key issue for achieving satisfaction at work and to improve productivity (Blackburn & Lawrence, 1995).

Fifth, faculty may perceive seminars, workshops or student evaluation questionnaires as methods for the improvement of teaching quality. In addition, these methods might be considered more effective when conciliated to each other (Ramsden, Margetson, Martin & Clarke, 1995).

Sixth, evaluation of teaching in Higher Education is necessary for the recognition of academic effort in teaching. Furthermore, teaching evaluation should lead to a teaching reward system.

Seventh, the organisation of the course in different institutions may lead to different teaching approaches and different study methods. By analysing both courses we can contribute toward better understanding of the teaching and learning process of teaching Programming.

Eighth, the interaction with academics in both institutions can promote and/or enhance both reflection on educational issues and the involvement of academics in further educational research (Smith, K. A., Johnson, D. W., & Johnson, R. T., 1992)

2. Aims and objectives

Studies related to teaching and learning (Tavares, Brzezinski, Huet, Cabral & Neri, 2001; Tavares & Huet, 2001; Tavares, 2003) have shown a growing concern about the quality of teaching in HE arising from faculty themselves (Chapter 1). Since there was a clear concern from academics to analyse some factors leading to students' retention or unmotivation, we designed a research focused on the teacher and best teaching practices.

Furthermore, the research aims to discuss how teaching best practices relate to student attitudes to learning and their motivation for course involvement and also how the organisation of introductory programming courses in both institutions reflects the teaching philosophy of the members of staff.

In addition, the study aims to promote reflection, and practices based on reflection, on educational issues by engineering lecturers at two European universities: Strathclyde (Glasgow, UK) and Aveiro (Portugal), as well as to involve them in educational research within their scientific areas. Along with this main purpose the thesis will meet the following objectives:

(1) To collect and analyse academics' and students' views regarding the relevance and impact of best teaching practices on student motivation, expectations and attendance at lectures.

(2) To investigate the relationship of lecturer and teaching practice with students' attendance at lectures, motivation and expectations for the course.

(3) To identify the views of academics regarding the processes for teaching evaluation.

(4) To compare the students' and lecturers' perception of teaching practice and to involve each member of staff in the discussion of such results.

(5) To compare and discuss the organisation of the two courses and its impact on the approaches to teaching and learning in both universities. In addition, it is expected to analyse the impact that such course organisation might have on student expectations and passing rates at the University of Aveiro.

(6) To involve engineering lecturers in research related to teaching and learning in Higher Education and to create opportunities for reflection on best teaching practices.

Within this context, the present work presents a description of the academic settings in which each introductory programming course is delivered followed by a conceptual framework of methods. Based upon our data collection, we detail and discuss some of the views expressed by staff and students, with particular regard to course organisation, teaching methods and strategies, course motivation and lecture attendance. This reflects an output from our research on teaching and learning in Higher Education in which we have developed several perspectives on teachers' conceptions and approaches to teaching and implications for students' academic achievement and motivation.

3. Context of the study

This chapter presents information related to facts and figures about the two Universities, design of the courses, the study sample as well as an overview of the students' approach to the academic life.

3.1 Universities (facts and figures)

3.1.1 University of Aveiro

Founded in 1973, the University of Aveiro has at the present 10,886 undergraduate and 1,663 postgraduate students[15]. The University offers 58 undergraduate courses in engineering, science and technology, arts, humanities, education, accountancy and administration, economics and planning, communication, fine arts and health. Aveiro also a wide range of Master degrees and several PhD and specialization programmes. The teaching staff numbers around 927.

Aveiro University campus is composed of 17 Departments with 17 Research Units and 2 Associated Laboratories. The main areas of research lie in engineering and teacher training. The University currently provides an assortment of business-related services: from professional training and distance learning through surveying and sampling in specific research, to the creation of new business ventures.

National and international exchange has also been one of the University's primary goals with support for student mobility and training courses, as well as participation in many European Union, Education, Science and Technology Programmes. There are 451 international students studying in the campus and 142 Portuguese students studying abroad.

The campus has a complete infrastructure that makes it autonomous from the city. The institution's 40 buildings are composed of academic departments and administration buildings, student halls of residence, canteens, bars and restaurants, athletics track, gymnasium, laundries, post office, bank, University shop, libraries, bookshops, photocopy centre, conference halls, galleries and a kindergarten. The buildings were designed by Portuguese architects and are visited each year by thousands of architects and architecture students from across the world.

Classes for first-year students are concentrated in one building that hosts computers, a library and a bar (open until midnight). In this setting, students attend lectures and labs.

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[15] The facts and figures about the University of Aveiro were collected from the External Relations Services and are related to 2004/05 academic year.

3.1.2 University of Strathclyde

The University of Strathclyde[16] was formed from the Royal College of Science and Technology and the Scottish College of Commerce and received its Charter in 1964. Both these institutions had long traditions of involvement in Higher Education, in the case of the Royal College, dating back to 1796.

The total number of students actively associated with the University is over 14,000 with full-time students broadly distributed over disciplines as follows: Engineering (including Architecture) – 2,450; Science and Applied Sciences – 3,000; Arts and Social Sciences – 2,050; Business Management and Professional Studies – 3,050; Education – 3,100. A high proportion of students are aged 21 or over. The University also has over 3,400 employees including some 1,500 academic and academic-related staff.

Strathclyde has a strong international student community drawn from all continents and especially the European Union. The University is home to many leading and pioneering institutes including the Institute of Photonics, the Centre for Advanced Structural Materials, Fraser of Allander Institute and the Strathclyde Institute for Drug Research.

Currently, the University has two campuses located in different areas of Glasgow (the Jordanhill campus and the John Anderson campus) and are linked by bus. The John Anderson buildings are located in the city centre and intersperse with other city buildings. The Jordanhill campus is located outside the city. Both campuses have a library, coffee shops, bookshops, gymnasium and computer centres. Student halls of residence are also located in both campuses.

Both Strathclyde and Aveiro belong to the *European Consortium of Innovative Universities* (ECIU), with a commitment to '*developing and implementing new forms of teaching, training, and research; to assuring an innovative culture within their walls; to experimenting with new forms of management and administration; and to sustaining and nurturing internationally-minded staff*' (ECIU).

[16] The facts and figures about the University of Strathclyde were collected from the site http://www.strath.ac.uk

3.2 Design of the introductory programming courses

3.2.1 Course objectives

The subjects of analysis in this study were first-year introductory programming courses. These programming classes have common primary objectives, which are to provide the student with the fundamental principles of computer programming. On completing either class, the student should be able to: (1) understand the principles of program design and demonstrate their practical application, and (2) understand the syntax and semantics of a general purpose programming language (Java at the University of Strathclyde and Pascal, C or Fortran at the University of Aveiro) to allow the implementation of the designed programs.

3.2.2 Course Organisation

Each class combines practical and theoretical components. Both institutions lay great emphasis on practical work: 'the only way you will learn how to program is to write lots of programs' (Programming Foundations General Course Information-University of Strathclyde). The major difference lies on the organisation of the practical component. At the University of Aveiro the labs have three hours duration per week and are compulsory for all students enrolled in the course. These classes have around 24 students per lab and 2 students per computer. At the University of Strathclyde the labs run two hours per week and have around 30 students per lab. Students have one computer each per lab. The labs are not compulsory, but students have to accomplish pre-established assignments each week.

3.2.3 Resources

The number of students and academic staff in each institution is quite different. In large measure, this stems from the broader course catchment at the University of Aveiro. For example, in the session 2003/2004, the 1st semester class 'Programming I' was a compulsory component of six degree courses. This resulted in an enrolment of 484 students. Staff deployment amounted to one member delivering the lectures and seven members delivering the labs.

At the University of Strathclyde, the equivalent class ('Programming Foundations') was compulsory for five course cohorts. In addition, this class was available as an elective for other science-based courses. Session 2001/2002 saw 283 students enrolled in this programming class. Here, staff deployment amounted to two lecturers to deliver the lectures (one in each semester), numerous monitors and one lecturer to manage the labs. Lab monitors are PhD and undergraduate students from later years.

Neither institution includes tutorials for these programming classes, although one-hour 'surgeries' at which students can ask for help or explanation on any aspect of the course, are offered each week.

3.2.4 Assessment

At the University of Aveiro, a student's final class mark is determined by three evaluation components: continuous evaluation (3 or 4 mini-tests), a practical exam (done at the computer), and a written final exam. Some adaptations can be made according to each co-ordinator of the introductory programming courses.

The final exam can be taken at the 1^{st} call in June and at the 2^{nd} or 3^{rd} call in July. The students are not expected to sit the exam unless a minimum mark of 7 (in a scale of 0 to 20) has been achieved in the continuous evaluation. In the session 2003/04, 208 students sat exam.

At the University of Strathclyde, a student's final class mark is determined by practical work and a final written exam, held at the end of the semester. This written exam lasts 2 hours and is 'open book'. Practical work is a combination of weekly assignments (16 in number) and four practical tests. The importance of these practical elements is such that students will not be expected to take the exam unless a mark of 70 per cent has been achieved for the practical component. In the session 2001/2002 208 students sat exam.

3.2.5 Rethinking the curricula at the University of Aveiro

At the University of Aveiro the introductory programming courses were re-design in 2001/02. Since this study started in 2000/01 it is important to describe how the course was organised before and after this process.

Until the implementation of the process 'Rethinking the Curricula' (described further on) all first-year undergraduate students from Science and Engineering courses at the University of Aveiro had two compulsory classes divided in two terms:

1. Introduction to Informatics (1st term)

2. Programming, Data Structure and Algorithms, PDSA (2nd term)

The Introduction to Informatics class gave students a broad overview of the field of computer science and the necessary skills to start working with a programming language, in this case the Pascal language. The second semester course, PDSA, required students to develop deeper skills in the use of a programming language with a lower and medium complexity to simulate real language code.

In the second semester of 2000/01 the PDSA class consisted of a total of 23 lectures, which was divided between 6 academic staff sharing lectures and laboratories. There was also a PhD student who also assisted in supporting the labs. In terms of time allocation, there were three hours per week of lectures and two hours per week of supervised laboratory.

The Department of Informatics also created five one-hour labs' support each week, hoping students to come along to practice the exercises and ask the lecturer for help in case of having questions. These labs were not compulsory. The percentage of students attending these extra hours was very low during the semester, only increasing before the exams. The lecturers of the theoretical classes also had in their schedule one hour per week to attend the students, but once again few of them look for their help outside the classes.

Although the University of Aveiro has the common practice to revise their programmes of study after each cycle of 5 years is completed, students still complained about the length of programmes, selection and sequence of courses to be taught, student class time load and balance of lectures and labs. Students think the competencies they develop in some courses are not important for the job providers and feel frustrated with the curricula programmes.

3.2.5.1 The turning point: rethinking the curricula

The University of Aveiro decided to start a process known as 'Rethinking the curricula'. This process took three years to be completed and was finally put in practice in the 2001/02 academic year in all areas of study. The revision of the Curricula not only focus on simply looking at the courses and the sequence of the programmes but also performs a deep inquiry process involving representatives of the academic staff, students and the directors for each main area of the programmes.

The reasons for this deeper involvement of the institution in implementing a new curriculum structure was mainly due to the high percentage of student failure, mainly in the first-year Science and Engineering courses. The frustrations that both lecturers and students face to this background context set the foundation to initiate a reflection on what students are learning at the university, how they are assessed, how teachers are teaching and the purpose of such teaching. The 'rethinking the Curricula' process has involved the whole community in a shared self-reflection, led by a vision of what members of the same community wish for the future of the institution (Alarcão, 2000).

The reorganisation discussed in the Electronic and Telecommunication Department to the Informatic, Science and Technology area of programming established three levels of programming teaching: a) elementary, b) intermediate, and c) advanced. Each level requires the students' development of skills according to the specific needs of each course in the area of Science and Engineering at the University of Aveiro. A uniform learning model as presented in the previous chapter seemed not to be effective for the students' success since students have different backgrounds of preparation. As a consequence of this, six courses were created as shown in Table 6.

Table 6: Curriculum adjustments according to the development of skills required to science and engineering students

Elementary level	***Intermediate level***	***Advanced level***
Information and Communication Technology (1st term)	Application to Science and Engineering (1st) Introduction to Programming in C (2nd)	Application to Science and Engineering (1st) Programming I (1st)
	Introduction to Programming in Fortran (2nd)	Programming II (2nd)

The elementary level of programming is offered to courses where the computer appears as a basic work tool. Students are required to use programmes such as Microsoft Word and Excel, the basic knowledge to work with a computer. Students are also required to look for information on the Web. The Introduction to Information and Communication Technology class was introduced for the first time in humanity courses.

In an intermediate level students are required to master basic theoretical and implementation skills in a particular programming language with a deeper level of complexity. Students attending the introductory programming classes (C or Fortran) come from courses such as Civil, Mechanic, Physic, and Chemical Engineering.

In an advanced level students are introduced to theoretical concepts of computer architecture, numerical and symbolic computing, algorithms and data structures. These students are required to develop deeper programming skills since many will be using it as a main component in their professional work. They attend courses such as Mathematic Applied to Computing and Electronic and Telecommunication Engineering.

The decision of choosing a programming language according to each course took into account one main objective: a useful programming language to be used in specific problems in each area of study.

Furthermore, an exploratory study is described in this study to better understand the impact of the new curriculum design in the students' expectations and motivation for the course (Chapter 5).

4. Method

Case study is an ideal methodology when a holistic, in-depth investigation is needed (Feagin, Orum & Sjoberg, 1991). Case studies have been used in varied investigations, particularly in sociological studies, but increasingly, in instruction (Bassey, 1999). In this case, bearing in mind the purpose, aims and objectives of our study, we decided to adopt a multiple case study approach (Yin, 1994).

This research method was considered most suitable because it is '*examining a contemporary event that can not be manipulated*' (Yin, 1994, p.8). According to Yin (1994, p.9), a case study is developed when a 'how' 'what' or 'why' question is being asked about a contemporary set of events.

In this study, there are several 'what' questions, which justify an exploratory case-study (Yin, 1984). Examples of such questions include:

- What are students and lecturers perception of teaching effectiveness?

- What are the views of lecturers regarding the effect that seminars, workshops, colloquia, team teaching (…) have as ways of rewarding, recognising and ensuring good teaching?

The existence of several 'how' questions made the study explanatory as well (Yin, 1994). Examples of such questions include:

- How do student perceptions of teaching effectiveness affect their motivation for the course and attendance at lectures?

- How can the interaction between lecturers and educational researchers contribute for the improvement of best teaching practices?

Multiple case studies may be conducted in national or cross-national settings. We decided to adopt a cross-national case study (Kohn, 1989) with two units of analysis:

Unit 1: Teaching and learning introductory programming courses at the University of Aveiro;

Unit 2: Teaching and learning introductory programming courses at the University of Strathclyde.

As mentioned before we decided for two units of analysis to enrich the understanding of the research questions. Cross-national studies (Kohn, 1989) have the potential to analyse the details of a given educational setting in depth and compare it to a different reality. Comparing systems of education also helps us better understanding our own system, in spite of the cultural context, as clearly expressed by Sadler (1979):

> *In studying foreign systems of education we should not forget that the things outside the school matter even more than the things inside the schools, and govern and interpret the things inside. We cannot wander at pleasure among the educational systems of the world, like a child strolling through a garden and pick off a flower from one bush and some leaves from another, and then expect that if we stick what we have gathered into the soil at home, we shall have a living plant. A national system of education is a living thing, the outcome of forgotten struggles*

> *and difficulties and of battles long ago (…) The practical value of studying in the right spirit and with scholarly accuracy the working of foreign systems of education is that it will result in our being better fitted to study and understand our own.*
>
> (quoted in Trethewey,1976, p. 18-19)

Kohn (1989) argues that cross-national research is valuable and even indispensable, for establishing the generality of findings and the validity of interpretations derived from single–nation studies. Nonetheless, Yin (1994) argues that a single case is capable of providing a generalising conclusion. Hamel (Hamel, Dufour & Fortin 1993) and Yin (1984, 1993, and 1994) argue that the relative size of the sample, whether 2, 10, or 100 cases are used, does not transform a multiple case into a macroscopic study. The goal of the study should establish the parameters, and then should be applied to all research. In this light, even a single case could be considered acceptable.

On the other hand, this case study can be understood as a '*retrospective cumulative case study*' (Lynn, 1991) since we are aggregating information from several sources of data collected at different times. The information aims to a deeper understanding of a specific phenomenon through time with the possibility to allow a certain kind of generalisation.

Such case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes, as pointed out by Cohen & Manion (1994) . Thus, the case study, like the experiment, does not represent a 'sample', and the '*investigator's goal is to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization)*' (Yin, 1994, p.10).

Nowak argues that generalizations formulated or substantiated in a monocultural study often turn out to be 'non-replicable' in other societies. Investigators have to limit their conclusions to 'historical generalization', valid for one society only (Nowak, 1989). Thus, the degree of confirmation of our hypothesis may be different for different populations. The 'overall credibility' of a hypothesis may then be a 'weighted average' of all the cross national results.

Although relevant literature and deductive reasoning were used to set some hypotheses, these were only established to provide a starting point for data collection and did not inhibit the inductive development of new or different categories, particularly those emerging from qualitative data. Therefore, the inductive nature of the study is not questionable. Merriam (1991) suggests that most case studies rely on inductive reasoning in that '*generalizations, concepts, or hypotheses emerge from an examination of data*' (p. 13). Using this method, theory is developed after collecting data, and is therefore 'grounded' in the data (Neuman, 1997).

4.1 Methodology triangulation[17]

Accepting the importance of running a case study in education, it is essential to conduct a valid study (Stenhouse, 1997). The first issue to address is the most appropriate methods and procedures to develop a scientific and credible study. Otherwise, the researcher can risk missing important variables.

In a case study the researcher does not control the data collection environment (Yin, 1994) as in other research strategies; hence the procedures become all the more important. Therefore, the best strategy to develop a case study, that can have a single or multiple-case design (Yin, 1994), is the need to look for information in different sources of data and to establish protocols that are used to ensure accuracy and alternative explanations. Stake (1995) refers to these protocols as triangulation. The need for triangulation arises, also, from the ethical need to confirm the validity of the processes. In case studies, this could be done by using multiple sources of data (Yin, 1994), which has the prospect to '*overcome the weakness or biases of a single method*' (Denzin, 1988, p. 511).

In developing this study, quantitative and qualitative data were collected (a) from the analysis of archival records; (b) from students (through surveys); (c) by direct observation, and (d) from instructors (through interviews and surveys). The data were analysed and interpreted to generate theory grounded in the data and to confirm, or disconfirm, existing theories, to provide suggestions (in our case, for improved teaching practice in Higher Education), and to develop ideas for future research. Table 7 presents the design of the research in terms of multiple sources of data, so the reader can clearly understand the methodological process used in the study.

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[17] Data triangulation is just one type of triangulation. Denzin (1988) refers four types of triangulation: data, investigator, theory and methodological triangulation.

Table 7: Map of the research design: sources of data, time schedule and sample

Sources of data	University of Aveiro	Time schedule	Sample	University of Strathclyde	Time schedule	Sample
Interviews (academics)	Informal interviews	2001 (March/June)	N=19	Semi-structured	2002 (February/ March)	N=7
	Semi-structured	2004 (January/ February)	N=7	Structured	April 2004	N=5
	Structured	2004 (March)	N=7			
Surveys (students)	Teaching practice and academics success questionnaire (TPASQ)	2001 (2^{nd} term)	N=492	Programming course experience questionnaire ($PCEQ_4$)	2002 (2^{nd} term)	N=101
	Programming course experience questionnaire ($PCEQ_2$)	2002 (2^{nd} term)	N=346	Programming course experience questionnaire ($PCEQ_5$)	2003 (1st term)	N=62
	Programming course experience questionnaire ($PCEQ_3$)	2003 (1^{st} term)	N=315			
Survey (academics)	Academics' perception of their teaching practice, students' expectations and motivation for the course	2004 (March)	N=5	Academics' perception of their teaching practice, students' expectations for the course and class organisation	2004 (April)	N=1
Direct observation	Non participant observation	2000/01		Non participant observation	2001/02	
Archival records	Evaluation sheets Reports Statistical data	2000/01 until 2003/04		Evaluation sheets Statistical data	2001/02 until 2003/04	

4.2 Sources of Data

This research is based on four types of data source: documentary, interview, survey, and direct observation. Data were used in combination to answer the research questions, and to interpret how this information may be used to enhance theory, practice, and future research.

4.2.1 Questionnaires

The survey research was conducted through questionnaires. This data collection method was used since it is a process that leads to structured inventories of attitudes, representations, behaviours and motivations (Ghiglione & Matalon, 1993).

Nevertheless, like other research methods, this approach has advantages and disadvantages. The biggest disadvantage is the limitation that arises from analysing restricted information of the object under study and can lead to a macroscopic view of the issues.

The questionnaires developed in this study consist not solely of rated scale questions (Spector, 1992), also known as a Likert scale, but also use multiple and open-ended questions. Ghiglione & Matalon (1993) commend the use of open-ended questions for gathering data as an additional way to collect information that can be very useful, if analysed properly.

The questionnaires were self-administered by the data subjects, thereby minimising researcher interference (Alferes, 1997). In order to establish the credibility of the survey, respondents were given information to clarify the purpose of the study. This aspect was not forgotten since the reliability of conclusions from a psychosocial survey has to do with adequate answers of the classic questions: 'who asks what, to whom, how, where, when and why?' (Alferes, 1997, p.103).

The questionnaire delivered to students at the University of Strathclyde was slightly adapted from the instrument used at the University of Aveiro. Academic staff added some new items and deleted others according to their teaching and learning backgrounds. A new summating scale was added to measure the students' perception of the course organisation and assessment at the University of Strathclyde.

The study used three questionnaires at the University of Aveiro and two at the University of Strathclyde. The questionnaire validation addresses two different instruments for use in different educational settings. The questionnaire delivered to students in 2003, at the University of Strathclyde, had a reduced sample (N=62). This number of participants was not enough to constitute a reliable sample. Due to this constrain we decided not to analyse this last questionnaire.

At the University of Aveiro the items of the 'Programming course Evaluation Questionnaire' PCEQ were formulated to address faculty perceptions. We aimed to contrast both analyses and discuss the results with each member of staff. This intervention was completed in 2002/03 with apparently positive results since it has established time for lecturers to reflect on their teaching practice and possible strategies to improve their teaching performance.

4.2.2 Interviews

> *Both qualitative and quantitative researchers tend to rely on the interview as the basic method of data gathering, whether the purpose is to obtain a rich, in-depth experiential account of an event or episode in the life of the respondent or to garner a simple point on a scale of 2 to 10 dimensions.*
>
> *(Fontana & Frey, 2003, p.63)*

The interviews in this study are 'focused' interviews[18] in which a respondent is interviewed for a short period of time, forty-five minutes to an hour. Interviews were both structured and semi-structured and assumed a conversational manner. Furthermore, in conducting these interviews, the interviewer followed a set pattern of questions derived from the outline case study.

Some conventions have been adopted concerning the 'style' and 'notation' of the transcripts (Gilbert, Watts & Osborne, 1985, p. 18). The transcript is not punctuated or divided into sentences; full stops and commas are omitted; we decided to keep the question mark; pauses are also recorded. Table 8 presents the notation used to transcribe the interviews in this study.

[18] Robert K. Yin, Case Study Research: Design and Methods, (London: Sage Publications, 1994), p. 84

Table 8: The code of notation used for the interview transcripts

Code	Behaviours
/	Very short pause (<2 seconds), thereafter the number of periods indicates the length of the pause.
(…)	They enclose unavoidable interpretations and they are put within the utterance that they apply.
[…]	They enclose parts of the speech that was not transcribed in English (used when parts of the transcripts were translated into English)
umm hmm umm er	These sounds are also included wherever appropriate.
?	Question mark

The structured interview was adapted from the '*Survey of Academic Staff*' (Ramsden, Margetson, Martin & Clarke, 1995) with the aim of analysing the views of academics on the effectiveness of some methods as ways of rewarding, recognising and ensuring good teaching. The interview comprised 17 items ranging across a scale of 1 (no effect) to 3 (a great effect). Due to its closed structure, the interview worked as a survey interview.

4.2.3 Direct Observation

The observation of lectures and labs was a research complement to describe teaching approaches and diagnose students' behaviour in class and to help faculty in changing and adapting their teaching approaches. We decided to adopt a non-participant observation. When attending lectures, the author was anonymous. This anonymity was not possible in the labs due to the reduced number of students per lab.

The observation was structured. The procedure adopted was the 'field notes' (Taylor-Powell & Steele, 1996) according to guidelines previously established. These guidelines were simple topics that we would like to observe. In this case, the teaching approaches and student behaviour in classes. The field notes allowed a '*narrative descriptive style'* (Taylor-Powell & Steele, 1996, p. 3).

The researcher visited lectures and labs of four academics during the first semester of 2000/01 at the University of Aveiro. At Strathclyde, the observation of lectures and labs occurred in the first semester of 2001/02.

5. Data Analysis

5.1 Statistical Analysis

Statistical analyses were completed using the SPSS package (1988), applying parametric and non parametric techniques (Mann-Whitney U Test; Spearman's Correlation, Kruskal Wallis test and multiple regressions) because the data were either nominal or ordinal. These techniques are described in more detail in later chapters.

5.2 Content Analysis

Content analysis can be defined as '*an overall approach, a method, and an analytic strategy*' that '*entails the systematic examination of forms of communication to document patterns objectively*' (Marshall & Rossman, 1995, p.85). Content analysis is generally applied to narrative texts such as transcribed interviews, political speeches, and published literature. This approach looks for certain key phrases or words that articulate the authors' understanding of a specific phenomenon, beliefs and terminology. Content analysis applies significance or meaning to information collected and helps to identify patterns in the text (Wilkinson & Birmingham, 2003, p.68).

Some software programs, such as askSam, ETHNO, InfoSelecto, QUALPRO and ATLAS/ti, and NUD.IST (Coffey & Atkinson, 1996) are available to code and retrieve qualitative data. Due to the limited number of participants and the limited functionality in analysing deep structures, such software was not used in this research.

6. Limitations of the Study

As mentioned in the introductory chapter, the author understands the importance of the different variables that may influence the students' academic success in Higher Education. Due to the complexity of this issue, the study reported here only targets those indicators related to the lecturer and teaching practice, with strong focus upon the course organisation. This last factor was considered of great importance for a reliable understanding of different teaching approaches.

Another limitation of the study lay in the design of the questionnaire. The PCEQ was adapted from the '*Course Evaluation Questionnaire'*, CEQ (Ramsden, 1987) and the '*Students' Evaluation of Educational Quality*', SEEQ (Marsh, 1982). Many factors were not included in the study and new factors were added to the scale. Although the reliability values of the scale were considered very acceptable (Nunnally & Bernstein, 1994), other items could be added to the instrument and perhaps further enhance reliability. The decision to work with fewer factors and items reflected the concern to answer specific research questions and not make this study into generalized research on factors influencing student academic success. This micro level analysis of the problem does not necessarily simplify the research. Instead, it allows a deep analysis of the role of academics in the teaching and learning process.

A further limitation is that participants may not have provided accurate answers. The questionnaire topic is a personal one and some participants may have not answered truthfully. This possibility should be taken into consideration when the results are further examined.

Several other limitations may impact upon the scope of the study. To ensure the study remained of manageable size, data collection was limited to specific introductory programming courses, students and instructors. A final limitation of the study was that the number of interviews with instructors was limited to those instructors who volunteered their participation. Although care was taken to ensure that data were collected from representative courses, students, and instructors, perhaps these limitations had some impact on the results.

CHAPTER 4 – QUALITATIVE STUDY

1. University of Aveiro

1.1 Data gathered from Interviews: aims and procedures

At the University of Aveiro the interviews were set at three different stages. It is quite common for researchers to find that, after an analysis is underway, more detailed questions need to be asked.

The interviews at the first stage consisted of informal meetings (as semi-structured interviews). This research was developed from January to March of 2001 and involved 19 members of staff. These interviews were not recorded.

At the second and third stage the interviews were more formal (as semi-structured and structured interviews) and took place at the lecturers' office.

The semi-structured interviews were booked by e-mail with each interviewee during the months of January and February 2004 and involved seven members of staff. The interview was based upon the questions detailed in Appendix nr 3. Each interview was recorded and then transcribed. In order to analyse the content of interviews the transcripts were read and re-read in order to code for emergent themes. Most of the categories follow the questions addressed to the respondents. Nevertheless, we allowed categories to emerge naturally, not imposing a preconceived set of themes on the data. Throughout this chapter, selected extracts from the respondents' replies to the questions at the University of Aveiro are quoted in the text. These quotations were translated into English with the concern to reflect the flow and inconsistencies of the spoken word. Two teachers holding a degree in Portuguese and English studies reviewed the translation. The full transcripts are shown in Appendix nr. 2.

After the interview, there was an informal non-recorded discussion about the comparison between the students' and lecturers' perceptions of the teaching practice, students' motivation and expectations for the course. The PCE questionnaire was adapted to a different audience (the teachers) and sent by e-mail (Appendix nr 7). Most of the lecturers (five) filled in the PCEQ and forwarded it in the same week. Data was then compared with the ones from their students. A figure with the comparative data was presented to lecturers where they could easily see the differences between their perception and their students'. This comparative analysis was very well accepted by the members of staff allowing a reflection about their conceptions of teaching effectiveness with the ones of their students.

The structured interviews were also booked by e-mail with each interviewee during the months of March 2004. Seven lecturers accepted to give their opinion regarding the most effective methods for rewarding, recognising and ensuring good teaching.

1.2 Stage 1: informal interviews

In 2001 we started sketching some of the research questions to develop the study. At that time the introductory programming class (PDSA) was compulsory for all the Science and Engineering courses. There were 5 academics lecturing the classes and 17 supervising the labs, from which 19 academics participated in the study. The interviews, previously booked by phone, were conducted with each teacher and were based upon the questions detailed in Appendix nr 3. These interviews were a continuation of the activity 'Having coffee with….'. Since the philosophy underlining this activity was to create an informal environment where academics and researchers could talk about teaching practice and academic success, the interviews were not recorded. The analysis was based on notes that the author took during the interviews.

1.2.1 Content analysis

In the first contact with academics we were concerned to seek some answers about the importance of best teaching practices for the student learning and motivation, as well as the necessity of initial teaching training for academics. Table 9 presents the results collected from the individual interviews and the categories of analysis. These interviews were not transcribed.

Table 9: Categories and sub-categories of the informal interviews

Categories	Sub-categories and indicators		Frequency
Teaching relevance for promoting the students' learning	Frequently		2
	Often		8
	Always		9
Initial teaching training for academics	No	No teaching methods resist to unmotivated students.	1
		Teachers learn with the experience, with the students' feedback in the classroom.	3
	Yes	Learning new teaching methods for a most effective delivery of the scientific knowledge.	7
	Depends	Only if the training was given by educational experts with an expertise on engineering issues.	3
		Only for teachers who do not have a natural competence for teaching.	3
		Only if best teaching practices were considered important for the career progression of academics.	2
Motivation as an essential factor for the students' academic success	Frequently		1
	Often		2
	Always		15
	Sometimes		2
	Frequently		5
	Often		10
	Always		2

The majority of academics agreed that teaching practice was important for promoting the students' learning. They are aware of the relevance to understand the students' learning process and to apply teaching methods that will enhance the student learning. However, there were different opinions when it came to the necessity for initial training of university lecturers.

Faculty have different ideas about the importance of teaching training, which change according to their own perceptions of teaching and learning. Teaching training was not perceived as important (mentioned 3 times at the interviews) because teachers improve their teaching with the experience and, on the other hand, no teaching methods enhance learning if students feel already unmotivated to learn. For these academics, initial teaching training will not bring any advantage in the process of teaching and learning.

The importance of the initial training (mentioned 7 times) was justified through one reason: the need for learning new teaching methods and approaches aiming a most effective delivery of the scientific knowledge.

Eight academics were more reluctant, sharing positive and negative ideas about this issue. The training of university teachers was identified as necessary depending on three factors: a) only if the training was given by educational experts with an expertise on engineering issues, b) only for the academics who did not have a natural competence for teaching, and c) only if best teaching practices were considered important for the career progression of academics.

The majority of teachers considered motivation as an essential factor for the students' academic success and agreed that academics and their teaching practice are, in part, responsible for motivating the students to learn and to succeed at the course. Nonetheless, two academics refer that sometimes best teaching practices do not necessarily enhance the students' motivation if these students are not intrinsically motivated to learn.

As one teacher said: '*How can we motivate a student who doesn't listen to what we are saying?*'. These teachers understand motivation as an intrinsic factor, depending mainly from the student and not so much from external factors such as teaching. This idea is closer to Schneider & Pressley (1989) believes. The authors agree that although knowledge of different strategies may be necessary for their use, it is usually not enough; students must be motivated to use that knowledge (Chapter 2).

At the interviews academics were also asked for suggestion in teaching the course. We gathered these suggestions in three categories: teaching practice, course design, and resources. For each category different sub-categories emerged (Table 10).

Table 10: Academics' suggestions to the teaching of Programming (informal interviews)

Category	Description	Sub-categories	Indicators	F	Sub-total	Total
Teaching practice	This category is applied to students' ideas related to teaching best practices	(i) Exercises	1. Adapt the exercises level of difficulty according to the different courses. ['The exercises can be very difficult for some students. Students need to solve the exercises to feel motivated' ; 'examples related to the different courses to motivate the students'; 'It does not make any sense to teach a concept with a difficult exercise'; 'very complex exercises for this level of teaching']	3	13	32
		(ii) Assessment	1. Continuous evaluation. ['with a continuous evaluation students would need to work at home more frequently', 'daily classes evaluation', 'continuous task throughout the semester with concrete objectives, counting 30 or 40 per cent to the final grade']	3		
			2. Less time allocated to evaluation. ['we loose too much time in evaluation moments. I suggest 12 students per lab, 1 student per computer with a set of exercises to complete. Individual support by academics']	1		
			3. Exams with no multiple choice ['students do not actually solve the exercise which does not promote the students' abstract thinking']	1		
		(iii) Peers' interaction	1. Better coordination and interaction of the staff members ['Academics should better coordinate the content delivery for each lab and lecture'	4		
		(iv) Teaching experience	3. More experience staff members for supervising the labs ['this course should be delivered by more experienced staff members with at least two years of teaching experience']	1		

Course design	This category is applied to suggestions regarding the redesign of the course contents and the organisation of lectures and labs	(i) Curriculum design	1. Optional class according to the different courses ['the class should be restricted to the engineering courses']	3	11	
			2. Actualisation of the concepts ['the concepts of this class are the same for about 17 years']	1		
			3. Content of the class adapted to the courses	2		
		(ii) Organisation of lectures and labs	1. Theoretical and practical classes	3		
			2. Block of thematic concepts ['the class would be divided into three moments, first the presentation of a concept, second its analysis, and third its practical application']	1		
			3. Compulsory lecturers	1		
Resources	This category is applied to suggestions regarding the university resources	(i) Working tools	1. One student per computer	5	8	
		(ii)Time allocation	2. More time allocated to labs [' programming without practice does not succeed, I propose 3 hours allocated to labs'	2		
		(iii)Staff recruitment	3. Same lecturer for delivering the lecturers and labs	1		

The strongest category was related to the teaching practice. The sub-categories that specified the main category were as follow: (i) exercises, (ii) assessment, (iii) peers interaction, and (iv) teaching experience. Some examples consisted on a better coordination of the exercises' level of difficulty to the different courses, an effective continuous evaluation at the labs and a better coordination and interaction of the staff members.

The second most mentioned category was related to the course design. Academics' suggestions were gathered in two sub-categories: (i) curriculum design and (ii) organisation of lectures and labs. Academics suggested an update of the course contents according to the different courses, the organisation of classes in theoretical and practical content delivery and the existence of compulsory lectures for bringing more students to the class.

The third category is related to the university resources. We gathered academics' suggestions in three sub-categories: (i) working tools, (ii) time allocation, and (iii) staff recruitment. Academics suggested one student per computer which would imply more computers at the labs, more time allocated to labs and the same lecturer for delivering the lectures and labs.

1.3 Open ended question: 'students' suggestion to the teaching of the course' (construct 1/2000)

Students were also submitted to the same question at the end of the TPAS questionnaire (analysed further on in chapter 5). The three same categories and sub-categories emerged in the students' answers. In addition, a new sub-category emerged: the student-lecturer interaction (Table 11). This sub-category was included in the category 'teaching practice'. Students suggested a better teacher and student communication.

The strongest category is related to the teaching practice, followed by the course design and resources.

Table 11: Students' suggestions to the teaching of the course: categories description, indicators and frequencies (construct 1/2000)

Category	Description	Sub-categories	Indicators	F	Sub-total	Total
Course design	This category is applied to suggestions regarding the curriculum design and organisation of lectures and labs	(i) Curriculum design	1. A different programming language than Pascal	2	56	149
			2. Substitute the class	3		
			3. Optional course	3		
			4. Non-compulsory labs	4		
			5. Re-design of the course contents according to the different courses	24		
		(ii) Organisation of lectures and labs	1. Theoretical and practical classes	20		
Resources	This category is applied to the university resources	(i) Time allocation	1. More time allocated to labs.	15	17	
		(ii) Staff recruitment	1. The same lecturer for both labs and lectures	2		
Teaching practice	This category is applied to ideas related to teaching best practices	(i) Teaching approaches and strategies	1. More objectivity in the contents	5	62	
			2. Design of a course syllabus	4		
			3. Better co-ordination of the contents delivered at the lectures and labs	7		
			4. Delivery of theoretical and practical contents in lectures	13		
			5. More teaching support at the labs	5		
			6. To teach from the simply to the complex	2		

		(ii) Exercises				
			1. More examples and exercises	5		
			2. More theoretical and practical exercises	5		
		(iii) Teaching experience	1. More qualified teachers in terms of teaching practice	7		
		(iv) student-lecturer interaction	1. Better teacher and student communication	9		
		(v) Assessment	1. Easier tests	3	14	
			2. More time allocated for the resolution of the mini-tests	4		
			3. More evaluation moments (continuous evaluation)	7		

Indeed, students' suggestion regarding the design of the course, organisation of labs and lectures, time allocation, exercises, teaching experience and assessment were similar to the academics' suggestions (Table 12). Students and academics aimed a redesign of the course contents for the different courses, the integration of theory and practice at lectures, more time allocated to labs since programming requires a lot of practice (Felder, Wood, Stice & Rugarcia, 2000), more examples related to the students' interests, more qualified teachers in terms of teaching practice and an effective continuous evaluation.

We came to the conclusion that both students and academics aimed for a redesign of the course. In order to achieve this objective it is necessary to proceed at changes in different level, such as: the curriculum, teaching practice and university resources.

During the time dedicated to this study, we knew that some changes would occur in the curriculum organisation of the course, but no further information was available at that moment. Indeed, most faculty members were not aware of the future implications of this process.

Table 12: Teachers' and students' common suggestions to the teaching of Programming

Category	Description	Sub-categories	Indicators
Course design	This category is applied to suggestions regarding the curriculum design and the organisation of lectures and labs.	(i) Design of the course contents	1. Re-design of the course contents for the different courses
		(ii) Organisation of lectures and labs	1. Theoretical and practical classes
Resources	This category is applied to suggestions regarding the university resources	(i) Time allocation	1. More time allocated to labs
Teaching practice	This category is applied to students' ideas related to teaching approaches, strategies, methods and assessment.	(i) Exercises	1. Examples related to the different courses
		(ii) Teaching experience	1. More qualified teachers in terms of teaching practice
		(iii) Assessment	1. Continuous evaluation

1.4 Stage 2: semi-structured interviews

The redesign of the 'Programming, Data Structure and Algorithms' (PDSA) course occurred in 2001/02 (described in Chapter 3). We were then interested to deeply analyse academics' views regarding the impact of teaching in the student learning outcomes. The objective was to complement and enrich the study started in 2000/01. The following interviews took place from October to December 2003 and involved 7 members of staff who teach the course 'Programming I'.

1.4.1 Content analysis

The questions of these interviews were carefully thought in order to seek academics' opinions regarding different aspects of teaching. Each category corresponds to the question addressed at the interviews. Furthermore, for each category we analysed its sub-categories. Along with the explanation of each category and sub-categories the concepts were reinforced with examples of the interviews' transcripts (Appendix nr. 1).

1.4.2 Questions underlining the interviews

(1) How do respondents view the relevance of teaching methods and activities for promoting the students' academic success?

Respondents were asked about the relevance of teaching methods and activities for promoting the students' academic success. For the category 'teaching relevance' respondents' answers were divided in two sub-categories: 'relevant' and 'relevant but with limitations' (Table 13).

Table 13: Category description and frequency: teaching relevance

Category	Description	Sub-categories	F	Total
Teaching relevance	Relevance of teaching methods and activities for promoting the students' academic success	(i) relevant	9	11
		(ii) relevant but with limitations	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Respondents gave different justifications for each category while three respondents just limited to affirm that teaching methods and activities were relevant for promoting the academic success. Lecturers referred that teaching methods and activities would be important to promote: (1) the students' understanding of more complex contents, mentioned twice in the text (lecturer 5 and 6), (2) more interactive teaching and dynamic classes, mentioned three times (lecturers 6, 4 and 2), and (3) well designed evaluation, mentioned one time (lecturer 5). As mentioned lecturer 6:

> *(...) an essential element is the communication that is established with them and therefore how adequate it is / the way the information gets through / how it's understood by the students is vital so that later they can make logical connections and turn information into knowledge // so that's essential in communication // the other aspect is related to the previous and consists of the methods that are being used in the present // how we're going to interact with the students according to the information we're trying to pass making sure we're helping to build that knowledge // and so these are two crucial elements / first the communication and second the adequate methods (...).*

Delivering the information requires teaching techniques and training (Ramsden, 1992; Tavares & Huet, 2001; Biggs, 1999; Cannon, 2001). Most academics are aware of the importance of pedagogy in helping students to better understand the delivered concepts.

Despite the important relevance of teaching methods and activities, one lecturer (lecturer 1) affirmed that methods and activities developed by the teacher were not the most relevant factor for promoting the academic success, mentioned twice in the text. This lecturer agreed that students' intrinsic motivation and consequent work involvement were much more important factors for achieving the success in the course.

(2) What do respondents think about the relevance of motivation for the students' academic success?

Respondents agreed on the relevance of motivation for helping students to achieve a higher level of academic success. In spite of this common belief, one respondent went further and affirmed that lecturers were not responsible for motivating the students. Academics could spread enthusiasm near students who were already motivated but could not do much for those who entered Higher Education with no motivation at all:

> *(...) It's not the teacher's or the university's job to supply that motivation to the students / when the students go to university they have to be conscious about one thing / they're either motivated to pursue a degree and a career in the same area and therefore the motivation is personal or they're not motivated and motivation can't be given by others / It's not the teacher's job (...) Now there's a second aspect that is also important/ if there's motivation the teacher can help a lot in the student's performance / if he can motivate them at a higher level/ who is motivated on a first level basis won't loose that motivation / if they really know what they want out of life / if they're willing to face problems and move on / now there are different ways to move on and the most productive ones are those in which the teacher is stimulating the students (...).*
>
> Respondent 6

(3) What are the respondents' views about the academics' role in developing the students' motivation?

The interviewer aimed to collect the opinion of respondents regarding the role of academics in developing the students' motivation. This question was not addressed to respondent 6 since he had clearly expressed his view in the previous question: academics could not motivate the unmotivated students.

For the category 'academics and students' motivation' two sub-categories emerged: (i) 'important but with limitations', mentioned six times in the text and (ii) 'not so important', mentioned twice in the text (Table 14).

Table 14: Category description and frequency: academics and students motivation

Category	Description	Sub-categories	F	Total
Academics and students motivation	Respondents' views regarding the role of academics in developing the students' motivation.	(i) important but with limitations	6	8
		(ii) not so important	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The majority of academics understood the importance of their teaching in promoting the students' motivation. One academic admitted that different teachers can make the difference:

> *It's a very important role / but I'm not sure if we are doing the right things to motivate them / it depends on one way or another and also on the person / but the way it's taught and the person who's teaching drastically change the students' motivation.*
>
> Respondent 3

In spite of this idea, the majority of respondents attributed some limitations to their role as motivating the students. They took in consideration the intrinsic motivation, such as the personal interests and enrolment in the first option of the course:

> *(...) it's obvious that there are stranger factors to the teacher (...) I had some trouble explaining to Tourism Planning and Management students / students that came from Biology / that a programming class could be important in their future (...) to me as a teacher it's hard to motivate them (...) so there are some situations in which it's hard for the teacher to motivate the students because the context is not the best one but it's really important that he teacher has that role and tries to motivate them.*
>
> Respondent 5

Other respondents did not agree that teaching could actually be the main motivational factor in promoting the students' motivation. According to these teachers, students' motivation depends in great measure on the students' approaches to learning. Autonomous students would not need any extra motivation from the lecturer; they are already motivated to learn. On the other hand, students who are not so independent and that need an extra reinforcement and motivation to achieve their goals, will need a stronger involvement and support from academics:

> *It depends / it changes a lot depending on the student / a student that is more independent when he gets to college / may have some difficulties in the beginning but after the first classes he shows up with his homework done and is able to ask questions / on the other hand some students that finish high school are used to a teacher that guides them // I think the teacher is important but the work besides that is more important (...).*
>
> Respondent 1

(4) What are the respondents' views about the factors contributing for the students' motivation?

During the previous two questions we gathered information regarding the importance of motivation for the students' academic success and the relevance of teachers and teaching practice in developing that motivation. Furthermore, it was important to clarify and summarise the factors that could promote the students' motivation. For the category 'students' motivation' we gathered two sub-categories: (i) 'extrinsic factors', mentioned seven times in the text and (ii) 'intrinsic factors', mentioned twice (Table 15).

Table 15: Category description and frequency: students' motivation

Category	Description	Sub-categories	F	Total
Factors contributing for the students' motivation	Respondents' views regarding the factors contributing for the students' motivation	(i) extrinsic factors (pedagogical approach)	7	9
		(ii) intrinsic factors	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

We collected different indicators related to extrinsic factors. Some respondents pointed out pedagogical strategies that could contribute for the student motivation, namely: (1) to give positive reinforcement, (2) to explain and emphasise the relevance of the course contents for the students' future work or academic work, (3) to give clear information about the courses, (4) to prepare complex assignments divided by tasks, and (5) to promote the student and lecturer interaction (tutoring). In addition, we present some transcripts of the interviews for a better clarification of the proposed strategies:

(1) Positive reinforcement:

> *It's crucial for the students to feel that they're dealing with the concepts that are being taught (...) otherwise when they feel lost it's difficult / I always try to help my weakest students but sometimes (...) they are so far behind that it's impossible to recover them / but that's the way / motivate them to feel they are on top of the subject (...) appreciate what they already learned so they can move to another level.*
>
> Respondent 7

(2) To explain and emphasise the relevance of the course contents for the students' future work or academic work:

> *One of the strategies I've been using is to show them the importance of what I'm teaching in their academic and professional life / specially*

professional / (...) what I try to tell them is that the skills they are acquiring will be used in the next years (...) the other strategy that I sometimes use is to find problems we can solve within their specific area of interest (...) this allows the student to solve old problems in a new way / and that makes it more interesting.

Respondent 5

(3) To give clear information about the courses

That's a difficult answer to give/ it depends if we're dealing with student A or B (...) there are no principles that motivate learning because motivation has to come from inside / you got to have an enormous curiosity / the question to ask is what alternative or associated means can we supply the students with/ to help them on a way that is of sacrifice and difficulties / in the most effective and productive way// First of all the general information on the degree / on the fields of knowledge it crosses / on the impact those are going to have on the degree / even if they are abstract areas with a distant connection (…).

(4) To prepare complex assignments divided by tasks

I don't know if that's motivating on a first stage / but if we provide them with a complex task / and I've had that experience (...) / their first reaction is panic / that it's too hard too complicated / but if we take the time to follow their work / at the end of the task/ even if they didn't reach all the goals / they still have the feeling of accomplishment.

Respondent 1

(5) Student-lecturer interaction (tutoring)

(...) The second is proximity or availability / the teacher has to be available to talk to the students about different subjects / not all related to the degree / help the students understand difficulties and define their path are strategies to integrate the student in university (...) One of the things that was suggested and that I believe in is the institution of an advising teacher / a tutor for each three or four students / so that when they have problems adjusting to this new environment they have

> *someone to talk to/ someone who is also a mediator / unfortunately that hasn't been approved yet because there is a Portuguese cultural barrier between teachers and students // but I think it's worth betting on it / although it will be a long time until they come up with it / it will be an important factor for the learning process.*
>
> Respondent 6

The student intrinsic motivation was mentioned two times in the text. Respondents suggested the existence of a general lack of motivation in society. For these respondents just motivated students could succeed in their studies or work. Students should be motivated to acquire knowledge and be able to apply it in different learning contexts. Academics should help students in different areas to help them feel integrated in the academia:

> *First of all being on the course of their choice is very important (...) for instance students from Telematic and Computing Engineering or Electronics have a bigger interest on programming than others / specially those that are on the course of their first choice and have good grades (...) sometimes I think there's a lack of action which makes students have a certain behaviour and that's a taboo in some universities / like prescription and other measures / some students flunk for absence / they just get use missing the classes (...) Portuguese society is not motivated (...) parents educate their children to do what they want, without responsibilities and that happens since tender age.*
>
> Respondent 4

(5) What are the respondents' views regarding the most effective strategies for keeping the students' attention and attendance at lectures?

This question arose a feeling of frustration since respondents affirmed to have been trying different strategies with a lower level of success. The strategies they considered efficient were more institutional than pedagogical which made things more difficult to implement. For the category 'students' attention and attendance at lectures' two sub-categories emerged: (i) 'institutional and political measures' and (ii) 'pedagogical measures'. The first sub-category was mentioned eleven times in the text while the second three times (Table 16).

Table 16: Category description and frequency: students' attention and attendance at lectures

Category	Description	Sub-categories	F	Total
Students' attention and attendance at lectures'	Respondents' views regarding the most effective strategies for keeping the students' attention and attendance at lectures	(i) institutional and political measures	11	14
		(ii) pedagogical measures	3	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Respondents emphasised the necessity for institutional and political measures such as: (1) a different organisation of labs and lectures, and (2) penalties for consecutive students' retention. For the suggestion 'organisation of lectures and labs' respondents refer to: (a) a mixture model of theory and practical classes, (b) a model of compulsory lectures, and (d) more time allocated to lectures.

A mix model of theory and practice in classes was suggested three times in the text. According to faculty, students entering Higher Education are not used with the model of lectures and labs and do not follow the sequence of the contents and the inter-connection of theory and practice.

> *One that is being tried is to change the type of classes in the first-year courses / students are used to a small classroom in some cases during the three years of high school, where the subject is presented by posing study questions in the first place / then there is some theoretical elaboration followed by practical examples again / they get to university and there is a separation of lectures where teachers spill out definitions / and then there are the theory and practice classes where they do some exercises and then they have labs to solve problems / students aren't used to this rhythm / they can't keep up and feel lost in the middle of all of this/ then end up going to classes without effectiveness / (...) the rector's office provides human and material means and the teachers compromise themselves to teach certain types of classes and follow certain methods looking for an improvement in the quality of teaching / the results on assiduity were excellent this past year on Calculus I because there were few absences / there's a purpose to extend this new*

> *model to other first-year courses / and the teachers as responsible as they are for their class should be able to negotiate with the university for the best methods to use (…).*
>
> Respondent 6

Respondents suggested compulsory lectures (mentioned three times in the text) while one respondent suggested that lectures and labs should not be compulsory at all (mentioned once in the text). According to this last respondent, students should have the autonomy to decide if they would attend the classes or not. This way, just the motivated students would be present.

> *(...) when someone mentions assiduity or caption of the student's attention it's a different ball game / the student's (...) stop going to my class or my colleagues' because someone tells them that they have no purpose (...) and essentially because if they fail they still have two other opportunities that year and then ten more years to keep trying/ without any addition of cost to pass the course (...) a student that is enrolled in this university has a cost implied and that cost is an investment when a student finishes his degree in five years and then proceeds with his professional life and the country gains from that (...) if it was possible I would like to relate those students going to lectures with their performance in that class / it would be nice if students could punch a card every time they go to a lecture (...) / and in the end I could confront the final results with the number of presences they had in lectures and labs (...) a student that fail in consecutive years and who doesn't go to lectures means he should have gone and should pay more for his next registration.*
>
> Respondent 5

Other indicator is related to the time allocated to lectures. More time allocated to lectures would allow implementing theory and practice in simultaneous. This indicator was mentioned once in the text.

For the suggestion 'penalties for consecutive students' retention' we collected indicators regarding the payment of higher fees for students who do not attend lectures and fail the course in consecutive years. This measure would just be applied to ordinary students and was mentioned 3 times in the text:

> *The first is hard and pure repression / for example ending the present absence regime and make them go to classes / another is to create the theoretical and practical classes (...) another would be to make practical classes shorter and with an effective continuous evaluation / that means that the student should understand that as in electronics' or physics' labs, the students have a task to do and in the end of the task they are evaluated for the work done.*
>
> *Respondent 4*

The other measures represented issues more related to pedagogy, such as: (1) to create an informal teaching environment at the labs, mentioned once in the text, (2) to attribute more importance to the contents of the course, mentioned once, and (3) to demystify the complexity of introductory programming courses, mentioned once.

> *One thing I do and I'm a bit harsh on that but I think it works, is not allowing the 15 minutes of tolerance / I give them 10 minutes and by the end of that time who ever comes in has a registered absence / they know that / and by the end of two classes they all get to class on time / I am as strict with the students as with myself / so it helps to take things more seriously if we are more strict and responsible with ourselves (...) and then there's the mutual respect that I always look for / I have it in my class / if that motivates them or not I don't know / but I try to make them comfortable to ask all the questions and not feel embarrassed and I feel that it works / I leave my classes sweating / completely.*
>
> Respondent 7

> *(...) to a conceptual level it would be very advantageous to group the students by degrees in lectures and labs/ so that they could be motivated by examples related to their interest even in practical classes there would be an advantage in elaborating a list of problems related to subjects that students would apply in the future // the student would be motivated because/ for example in programming/ without meaning to he would be learning to programme things that would be of great use in the*

future (...) / assuming that students come to university already motivated (...) to have a certain complicity between the teacher and the students/ to help them to go trough difficulties // if the class is too big we can't have that but if it's smaller it's easier / for them to feel they're already solving problems that will come up in the future helps to fight the prejudice/ the same that math has/ that it's something unreachable.

Respondent 2

(6) What are the respondents' experiences in implementing innovative teaching strategies?

For the category 'innovative teaching strategies' we gathered five indicators: (i) 'the use of the blackboard', mentioned once in the text, (ii) 'the introduction of brief theoretical concepts in the labs', mentioned twice, (iii) 'the introduction of homework tasks', mentioned once, (iv) 'the development of practical written tests at the labs', mentioned once, and (v) 'the introduction to the exercises at the lectures', mentioned once (Table 17).

Table 17: Category description, indicators and frequency: innovative teaching approaches

Category	Description	Indicators	F	Total
Innovative teaching approaches	Respondents' experiences in implementing innovative teaching strategies	(i) the use of the blackboard	1	6
		(ii) The introduction to brief theoretical concepts in the labs	2	
		(iii) The introduction of homework tasks	1	
		(iv) the development of practical written tests at the labs	1	
		(v) the introduction to the exercises at the lectures	1	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The indicators more often mentioned in the text were related to the introduction of theoretical concepts in the beginning of the labs. Two respondents believed that this strategy could help students in acquiring the basic skills to develop the exercises at labs, especially when they did not attend lectures frequently:

> *(...) my concern was to previously prepare my lectures so that I could introduce the concepts students would need to know for that class/ I would present a lot of them in transparencies / but never too many / with concrete information on aspects they needed to know / some of the students would ask for the transparencies at the end of the lecture but I could never give them to them because of superior orders / because that would benefit students that didn't go to lectures / for students that went it was just a matter of remembering what had been said (...)*
>
> Respondent 2

Respondent 3 emphasised that when he did not present a brief introduction to theory in the labs, he clearly saw the students' achievement dropping down. According to this respondent spending the first 10 minutes in explaining some theoretical concepts at the labs could bring more benefits than problems, even when the coordinator of the course did not share the same perspective:

> *Honestly none / it was like this I used to do that/ but the co-ordinators of the courses didn't approve specially the Programming I co-ordinator and we agreed that I would stop doing it/ which is why in my opinion the results got worst / I used to make a small introduction to the subject in the beginning of the class / Why is it that the co-ordinators don't want that? / I think it's because the students might stop going to lectures / on the other hand we have a three hours class where only five students know what they're doing while the other ten don't even know what I'm talking about or what's asked in the exercise / If I have three hours to spend what does it cost to take ten minutes and make the students understand the subject?*
>
> Respondent 3

In an informal conversation with the coordinator of the course we understood why academics were advised not to deliver theoretical concepts at the labs. This measure intended to bring more students to lectures. According to this respondent if academics approached theoretical concepts at the labs it could lead, in a certain way, to the students' absence at lectures. Consequently, if students realised that the theoretical concepts were being presented at the labs, they would start missing lectures even more.

Another innovative strategy referred to by respondent 7 was the use of the blackboard at the labs. The respondent affirmed to use the blackboard in the beginning of the semester while the exercises were not so complex. He usually asked one student to solve an exercise and explain it to the class. This strategy aimed the interaction with students, which could be positive to students who had some difficulties in understanding the lecturers' explanations:

> *Whenever I can / it happened in the beginning of the semester / not after that because the programs are too complicated but whenever I can / I ask the students to go to the blackboard / that's not new // I do that in other classes to / I walk around the room to see who has finished and then ask a student to go to the blackboard / the reason for that is simple / that way the student can explain in his own words and reach students that I'm not able to / the student answers questions addressed by his colleagues but in his own language.*

Respondent 7

The delivery of small tasks as homework was another strategy mentioned by respondent 1. The delivery of homework tasks worked out for first-year students because they were still used to this strategy in secondary education. According to this respondent homework tasks, even not being compulsory, should count for the continuous evaluation. This way, students would come to the class more prepared which contributed to a higher academic achievement:

> *(...) what works really well with them / in order to improve their performance in class is having homework / since they're used to that in high school / I mean it's not compulsory / but in a certain way it helps with the continuous evaluation / but just the fact of having homework to deliver makes them a lot more productive in the next class (...)*

Respondent 1

The final strategy came from the coordinator of the course. In the beginning of the semester he decided to design a final exam where students would combine the resolutions of exercises with written explanations of the abstract thinking developed to solve the exercises. This strategy aimed to develop the students' writing, reading and comprehension skills. According to respondent 4 the training of these skills was essential for engineering students. The results of the test were low, which did not surprise the lecturer since he knew the students' difficulties in explaining their ideas:

> *Last year I tried to make different tests and not only did I mechanise the exercises I would also ask why they got that result / I try to make future teachers and engineers to know how to write something in Portuguese / I see that students find it difficult to express themselves and take an abstract concept and explain how it works / I have that in the final test and it made a lot of students struggle / there are still very high grades on mini-tests that don't reflect the students' knowledge / a lot of students with average grades of seventeen, eighteen, nineteen, twenty, on continuous evaluation which is mainly done by mini-tests (...) get a two, three or four on the practical exam.*

(7) What are the respondents' views regarding the language used in classes? Is it clear to students?

Respondents agreed that the language used in class was understood by the students. Though, they shared the opinion that students had problems in understanding the questions addressed in the exams, as well as the instructions for the exercises in the classes. This idea was already mentioned above and is now emphasised by another respondent: students' skills in reading, writing and comprehension are very low:

> *I feel that there's a lack of culture on students / (...) I give them a written problem and they don't understand it / that's more serious (...) it has to do with understanding/ they don't understand what they're reading or read in diagonal / I don't know / how is it possible that I ask about one thing and they answer about another? // it's impossible impossible // they skip lines while they're reading / I don't know (...).*
>
> Respondent 7

(8) What are the respondents' views about 'pair programming'?

For the category 'pair programming *versus* individual work' we gathered two sub-categories: (i) 'pair programming' and (ii) 'individual work' (Table 18).

Table 18: Category description and frequency: pair programming versus individual work

Category	Description	Sub-categories	F	Total
Pair programming *versus* individual work	Respondents' views regarding the effectiveness of pair and individual work	(i) pair programming	1	4
		(ii) individual work	3	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The majority of lecturers thought first-year students should first start work individually, which meant one student per computer at the labs. Pair programming might work in advanced years when students were more mature and autonomous or as complementary work, but it was not efficient for freshmen:

> *(...) I think, for example that if there was only one student for each computer / that would make the student work / I think many of the students are just waiting for the colleague to do the job / but that's out of our reach / someone decided that labs would have twenty four students with two students per computer and some already have twenty six/ twenty seven (...).*
>
> Respondent 4

> *In programming classes I'm a hundred per cent in favour of one student per computer / I don't agree at all with having two students per computer / I think that in programming classes you can only learn if you do it yourself / looking at your colleague programming won't make you learn absolutely nothing even if you're understanding what he's doing / but as you didn't do it when you were supposed to/ when you have to you can't / I think it's bad for a university with good resources not*

> *having increased the number of computers a bit more / a student per computer / the group work is very important but it should be done outside class / classes are only three hours a week and so the student should perform to the fullest / that way I wouldn't even care if I had twenty two or twenty four students in class / that's a lot of students to follow individually but it can be done (...).*
>
> Respondent 3

Respondent 7 thought individual work at the labs would develop students' skills in working with the computer. In his view, some students did not have enough practice to use the keyboard which brought them some difficulties in quickly find the icons on the keyboard during the mini-test:

> *(...) many students stick to their partner and try to fool themselves / because their partners understand a bit more they stick to them and get to the end without any writing or mental skills / and I tell them / that they don't even learn how to use a keyboard which is also important / it's important that they can write fast because they win some time / if they're trying to find the icons they waste a lot of time / I always try to make them switch positions in the middle of the class / but they don't / and the one that has more skills gets the keyboard and writes / the other keeps up and thinks he's understanding / naturally he's understanding some of it but it's not enough / the student doesn't explore / doesn't take advantage to the fullest.*
>
> Respondent 7

Nevertheless, respondent 5 believed that 'pair programming', if well structured, would help students to construct the knowledge. In addition, students with more learning difficulties could ask the colleagues for help. This idea was not yet shared by the majority of the academics.

(9) How do respondents view the evaluation of individual teaching?

This question aimed to collect respondents' views regarding the necessity of teaching evaluation for the improvement of teaching quality. Furthermore, we considered the 'evaluation of teaching' as one category (Table 19).

Table 19: Category description and frequency: evaluation of teaching

Category	Description	Sub-categories	Total
Evaluation of teaching	Respondents' views regarding the necessity of teaching evaluation	(i) important	9

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Respondents shared the opinion that teaching evaluation was important for the improvement of teaching quality.

The importance of teaching evaluation for all the professionals was mentioned twice in the text. Respondent 5 emphasised that the activities developed by professionals in all areas should be always submitted to evaluation:

> *Teaching must be clearly evaluated / in my point of view / all our activity as university teachers must be evaluated / and as professionals of other areas we should be evaluated to / everything we do should be evaluated (...).*

The idea that teaching evaluation would be essential for the career progression was mentioned twice in the text. According to respondent 4 teaching should contribute for the career progression. The evaluation of teaching would make the academia to valorise the effort of lecturers in activities related to teaching and learning:

> *It should be evaluated and it should be considered for university career progression / I think it's a mistake that it isn't / and that it's looked at with some contempt / for example I once heard a comment about someone who make an aggregation/ a teacher that said that someone*

published a lot of supportive texts for the students and that they had no interest at all / no interest at all? Does that mean that it's all about writing papers? / What about the quality of teaching? What are we here for? To be teachers or researchers? So there should be an evaluation in that sense / it should have some weight in our career progression (...).

The other respondents agreed on the need for the academics' teaching evaluation but did not mention any justification.

(10) What are the respondents' views about the most effective processes for teaching evaluation?

The previous category clarified the respondents' views regarding the importance of teaching evaluation at universities. Thus, we were concerned to collect the respondents' views about the most effective processes for the evaluation of teaching. The interviewer suggested four processes (evaluation conducted by students, peers, external experts and self-assessment) and respondents had to identify the one they considered to be more effective. Six sub-categories emerged (Table 20).

Table 20: Category description and frequency: processes for teaching evaluation

Category	Description	Sub-categories	F	Total
Processes for teaching evaluation	Effective processes to evaluate teaching at universities	(i) Evaluation/feedback carried out by students	5	18
		(ii) Evaluation/feedback carried out by peers	4	
		(iii) Lecturers' self-assessment	2	
		(iv) Evaluation carried out by external experts	2	
		(v) Analysis of the student academic records	1	
		(vi) Conjunction of the previous categories	6	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The sub-category more often referred to in the text was the conjunction of all the above sub-categories. The feedback carried out by the students was mentioned five times followed by the peers. Lecturers' self-evaluation and external experts in the area of education were mentioned twice each while there was just one reference to proceed to the analysis of the students' academic records.

Some respondents agreed that students' opinions about teaching could be very useful for teachers to reflect on their teaching and consequently to be able to modify some aspects (formative evaluation). In spite of the students' feedback, lecturers believed that it was on the combination of the different processes that could lay the most effective approach.

> *I think all four are important / if it's only up to the students the system could be perverted / I'm not saying that all four methods should be used every year/ but some could be used in one year and the others in the next.*
>
> Respondent 7

On the other hand, isolated students' evaluation did not represent a reliable method for teaching evaluation:

> *I refuse to be evaluated by someone I have to evaluate / I mean/ I know some cases of classes in this university in which the results were really bad / all because there was a bad framing and a subject that should have been taught in the previous year in a certain way/ wasn't (...) I say that the virtue lies in the several methods all together (...) I mean/ if I make an inquiry to the students and the results come out bad/ that really doesn't mean anything to the teacher/ but it should raise a warning flag and perhaps we should try to understand what happened / and this is the first type of evaluation to be made by the students / through questionnaires or focused group interviews (...).*
>
> Respondent 5

There were some divergences related to the efficiency of the other processes. Respondent 5, for example, did not see the relevance of the external audits evaluation, while respondent 2 thought external audits should work in conjunction with the students' evaluation:

> *(...) I would probably choose a mix between the first and the last / the students and audits made externally / outside experts would contact the students themselves because what is being done by other teachers turns out to be a subjective issue / one thinks that is using the best method there is / another thinks that the method used by his colleague could be improved / on the other hand if it's only based on the students there's the problem of liking the teacher, then they'll say good things/ and not liking the teacher/ then they'll say bad things / so there has to be a certain distance and that's where the role of auditors with expertise to evaluate would be important.*
>
> Respondent 2

Furthermore, respondent 3 believed in the importance of external experts, but did not think that it would be the best process to implement frequently since it would bring extra financial costs to the institution:

> *(...) well/ hiring experts would be a good solution but only to be used once in a while because of the costs that would bring / hiring good experts to be here long enough to make an accurate and valid evaluation every year seems to me an unlikely scenery to happen / so it would be good once in a while (...)*
>
> Respondent 3

Respondent 1 did not believe that peers' feedback would be a credible choice, while respondent 3 believed that colleagues might bring a useful contribution for helping the colleagues to better understand a specific problem. In this perspective, peers are a more credible element to judge a certain teaching issue than are actually the students:

> *(...) concerning the colleagues / I think it's a bit complicated and artificial to make colleagues watch other colleagues (...)*
>
> Respondent 1

(...) what I think would form the best option would be the evaluation done by the students later mediated by the peers / I mean the students would make their evaluation / then the teachers would interpret it according to strict parameters (...) The students are good evaluators but are not one hundred per cent infallible.

Respondent 3

According to respondent 6, analysing the students' academic records could be an effective complement to evaluate the quality of teaching.

The evaluation will have to be done / those are possible methods but I would include another one that consists of an objective evaluation of the teaching quality (…)

Respondent 6 agreed that this measure could help identifying effective teachers, if effective teachers were considered the ones who passed the knowledge to their students, making them able to apply the knowledge in new learning contexts. Nevertheless, this point of view was in a certain way questionable by another respondent who thought academics could not make students learn if they did not want to:

(...) our students get here / they've passed the first-year but don't know anything / so what have they been doing so far? // we do what we can / but we can't make students learn if they don't want to (...)

Respondent 4

(11) How do respondents view the relevance of teaching training for university lecturers?

Following the idea that teaching methods and strategies are important for improving the students' academic success and these members of staff did not have any pedagogical training, the study aimed to analyse the relevance of teaching training for university lecturers. The category 'teaching training' was divided in two sub-categories: 'relevant' and 'not so relevant' (Table 21).

Table 21: Category description and frequency: teaching training

Category	Description	Sub-categories	F	Total
Teaching training	Relevance of teaching training for academics	(i) relevant	3	12
		(ii) not so relevant	9	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Just one respondent viewed the teaching training as very relevant for academics: 'I think it is relevant' (respondent 2). Respondent 6 was more reluctant but yet convicted of the importance of such training:

> *(...) my opinion on that has evolved through time / nowadays I think it's important that there is some reflection about methodologies and pedagogies / about the best ways to communicate and sustain ourselves in methods (...)*

The relative relevance of university teaching training was mentioned nine times in the text. Lecturers justified their answers by presenting three reasons: (1) it would depend on the expert who would deliver the training or the keynote speaker at a seminar or workshop, (2) it would depend on the ability or competence for teaching of each individual lecturer, and (3) it would depend on the expected objective for the teaching training.

The first justification, mentioned twice in the text, refers to the effectiveness of the teaching training according to the person who is delivering the training or the keynote speaker at a seminar or workshop. Lecturer 6 stated that a good communicator in the area of engineering and with experience in education could motivate more effectively an audience of engineering lecturers than an expert of education delivering theoretical concepts. For this respondent teaching training could be more effective if delivered by experts in areas, such as engineering, since engineering academics would be more motivated to listen a keynote speaker who would be more familiar to their daily class problems:

In my life I've been to three or four workshops about aspects related to pedagogic practices in teaching and the first three were of little use to me / they were focused and mainly lectured by psychologists and elements of traditional departments of education and (...) the engineering perspective (...) is completely different (...) however the last workshop I've been to was extremely interesting and was lectured by a teacher from Strathclyde / I think / (...) he was a Civil Engineering teacher that in his mid fifty's decided to turn to educational science (...) I was reluctant at first and thought that it was going to be another one of those workshops that would supply me with little information but it turned out to be a revelation (...) the problem with workshops has to do with the language that is used in some lectures because the biggest obstacle to overcome is to find an adequate language for each kind of audience / and in sciences and engineering, objectivity and effectiveness are two fundamental elements to which the teachers are sensitive to (...)

The second reason deals with the relevance of teaching training just for some members of staff, especially for novice academics. This reason was mentioned four times in the text. Respondent 4 clearly expressed this view:

For first and second year students maybe / but this is an aspect that we keep learning about through mistakes we make and student's remarks / well/ sometimes we realise that // for instance when you have two different classes / you have to change certain things according to the students you're addressing to / at some point you realise that the students don't understand what you're saying / but that's something you pick up with experience / and it can't hurt to learn a few things (...)

Respondent 1 suggested that a teacher with no experience in teaching can be an effective teacher while a teacher with teaching experience might not be such an effective teacher. This respondent saw 'good teachers' as having a natural competence for teaching. In spite of the teaching training, if the lecturer did no have a natural competence for teaching the probabilities to become a much better lecturer were not very significant:

(...) someone who is not a good communicator / who doesn't have a natural talent to be a teacher / even with pedagogical classes it won't be

guaranteed to reach certain goals / because this teaching business has to do with talent as much as other professions trades.

The third reason deals with the expected goals in the teaching training. Two respondents suggested that teaching training might be important for the improvement of teaching but would not solve the problem of students' failure and lack of motivation. Lecturer 1 went further and mentioned that the most important factor for improving teaching was the scientific knowledge of the lecturer and not so much the pedagogical competence.

(12) What do academics valorise most in their careers: teaching or research?

At this stage we were interested to analyse the relevance attribute to teaching and research by academics. Thus, academics were asked about what the valorise most in their careers. For the category 'teaching *versus* research', three sub-categories emerged: (i) 'teaching', (ii) 'research', and (iii) 'teaching and research' (Table 22).

Table 22: Category description and frequency: teaching versus research

Category	Description	Sub-categories	F	Total
Teaching *versus* research	Academics' views about what they valorise most in their careers: teaching or research.	(i) teaching	2	7
		(ii) research	2	
		(iii) teaching and research	3	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The sub-category more often mentioned in the text was the combination of teaching and research. Nevertheless, respondents often attribute more importance to one or another:

I think both / but for me research is more important because I like it more / although I enjoy teaching / I think none is done correctly / I mean/ how I would like to do them / I think I should have more time for *research but my teaching schedule makes it difficult to do / my productivity increases on vacation time.*

Respondent 1

Other respondents affirmed to have been putting more effort in teaching even knowing it would not be taken in consideration for their career progression. The fact that these academics were coordinators of first and second year courses did not leave them with too much available time for research. The feeling of frustration highlighted their interviews:

Teaching because research (...) when we have first and second year classes with hundreds of students we can't find time to do anything else (...) right now I don't dedicate any of my time to research / for almost five years now / and one of these days that's going to cost me.

Respondent 4

(...) when I'm asked about what occupied most of my time in the last five years (...) I have to say teaching / there were some years when I was the coordinator of Programming and Structures of Art and Algorithms which meant being in charge of six/ seven hundred students / besides I have taught classes with two thousand students per year / so whether I wanted it or not that absorbed a big piece of my time as a teacher in this university // Then there's a contradiction because I've been spending most of my time as a professional in something that won't be advantageous in my career (...)

Respondent 5

The relevance attributed to research in terms of career progression led other respondents to dedicate more time to research:

Clearly research / teaching doesn't count in terms of career in a Portuguese university// The pedagogic success or failure of a teacher counts zero / It's very frustrating that it doesn't have any weight when we spend most of our time teaching.

Respondent 3

Respondents shared the idea that effective teaching in Portugal should be taken in consideration for the career progression. Academics felt frustrated with the time spending in class preparation, lecturing and other related teaching tasks:

> *I've dedicated myself and made an important effort in aspects related to teaching / connected to the universities' management / tried to change practices at that level / although that didn't affect my career in any way / that is one of the dramas of the Portuguese situation.*
>
> Respondent 6

(13) How do respondents feel about teaching?

Throughout the interview academics demonstrated a widespread dissatisfaction regarding teaching. Academics felt disappointed for spending so much effort on class preparations, especially when they realised that this effort was not often recognised by academia. Thus, we decided to collect respondents' views regarding their teaching satisfaction. Furthermore, three sub-categories emerged: (i) 'satisfaction to teach', (ii) 'relative satisfaction to teach', and (iii) 'no satisfaction to teach' (Table 23).

Table 23: Category description and frequency: teaching satisfaction

Category	Description	Sub-categories		F	Total
Teaching satisfaction	Academics' satisfaction towards teaching	(i)	Satisfaction to teach	3	6
		(ii)	Relative satisfaction to teach	4	
		(iii)	No satisfaction to teach	1	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

The sub-categories more often referred were the 'relative motivation to teach', mentioned 4 times in the text, followed by the 'motivation to teach' (mentioned three times) and 'no motivation' (mentioned once).

Respondent 2 felt motivated to improve teaching and enthusiastic to make students realise the importance of achieving good grades:

I feel motivated to do better each time but I don't like the situation of students only trying to get the minimum grade / it doesn't bring me down but it makes me want to fight the best I can.

Some respondents felt motivated for teaching when realised that the students were interest and motivated for learning and felt frustrated when: (1) students did not valorise the lecturer effort in preparing and delivering a lecture, (2) students were not motivated to learn (mentioned twice), and (3) the effort spending on teaching was not recognised by academia and not taken into consideration for the career progression (mentioned twice):

(...) I have to answer to that according to my conscience in two stages / if that question is made in the middle of the semester after a class that went exceptionally well/ when on the other side I have eighteen nineteen twenty year-old kids/ full of life/ that learned everything that I tried to transmit I tell you that my motivation is the most fantastic one there is and that I'm very happy / if you ask me now/ when I'm in the middle of my career evaluation and I look for my peers' recognition/ for my hard work teaching these first-year programming classes / and if I look at my peers' recognition for this heavy work load/ for example/ in my career progression I am deeply unmotivated (...)

Respondent 5

I like teaching classes but (...) I feel that as a teacher there's a heavy workload// in which I would feel useful / I wouldn't mind to work the same hours if the students were motivated or even if classes had less students / because with twenty four students it's really complicated (...)

Respondent 1

One respondent felt even more frustrated with the teaching effort spent in the last few years. The low recognition of teaching in academia, the students' lack of motivation and the high level of students' failure led this academic not to feel motivated to lecture.

No and it's getting worst / (...) and I'm starting to get tired / I do like teaching classes to young people (...) / it's the whole teaching *conjuncture on first-year courses / I think something has to change or people will start to get tired of the situation (...).*

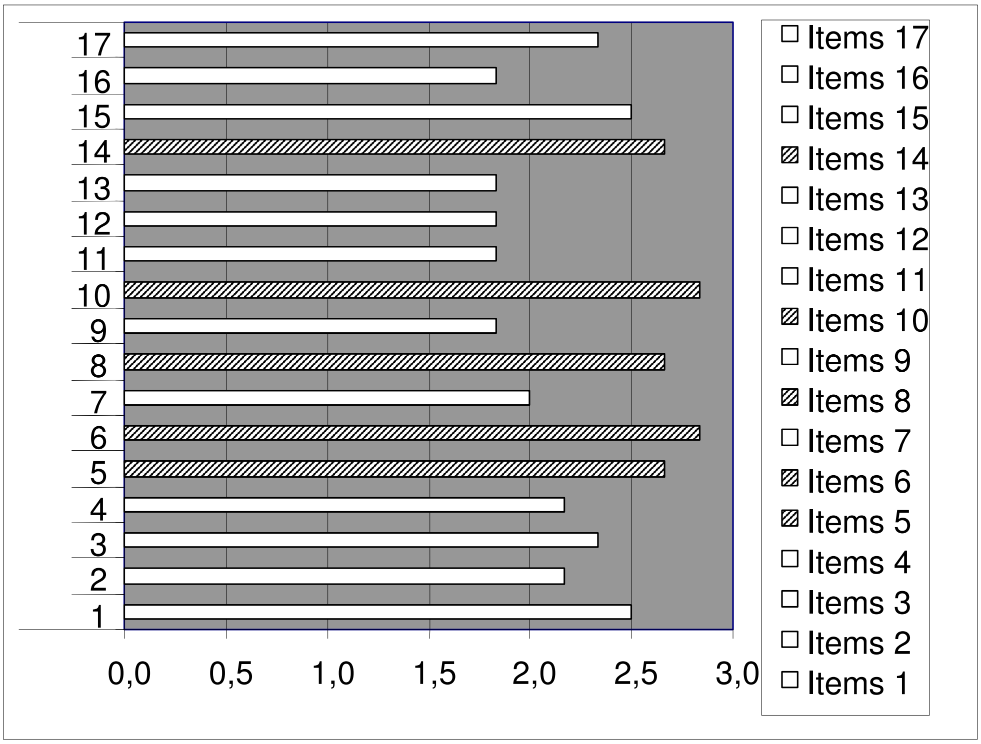
Respondent 4

1.5 Stage 3: structured interviews

In order to proceed to the analysis of the academics perception of the most effective processes for rewarding and ensuring good teaching, the same academics were asked about the effectiveness of these methods in a scale ranging from 1 to 3 (1-no effect, 2-some effect, 3-a great effect) (Appendix nr. 11).

The analysis of the mean scores reveals that some processes were considered to be more effective than other. The more effective processes were (Table 24): (i) the indicators for evaluating the courses; (ii) the need to attribute more importance to teaching in terms of career promotion; (iii) the recognition of the most effective lecturers through the delivery of grants, and (iv) more time allocated for teaching activities and projects related to best teaching practices. The processes considered less effective are related to the creation of compulsory training courses for lecturers, workshops or seminars about teaching and learning and the attribution of rewards for the most effective academics. Lecturers agree on the advantages of learning and teaching units at the universities for supporting academics in their teaching activities. In spite of the close structure of the interviews, academics agreed that each process should not be used alone but always as possible in conjunction with others. In addition, lecturers agreed that just one process for rewarding and ensuring good teaching could vitiate the system and instead of improving the teaching quality it could create a bad environment in academia.

Table 24: Mean scores of the views of academics about the effectiveness of some processes as ways of rewarding, recognising and ensuring good teaching at the University of Aveiro



Legend: 1: Conducting surveys of students' course experiences and satisfaction; 2: Requiring accreditation as a competent university teacher for all academics; 3: Ensuring heads of departments and courses give more praise for teaching innovation and quality; 4: Establishing informal courses in teaching for academic staff about teaching methods and strategies, not leading to a qualification; 5: Making special arrangements (e.g. time release) for teaching development projects; 6: Taking greater account of teaching in the promotions process; 7: Establishing an effective staff development unit/centre for learning and teaching in every university; 8: Awarding prizes and grants for good teaching to individual academics; 9: Establishing courses for academic staff leading to a teaching qualification; 10: Applying performance indicators of course quality to academic departments; 11: Providing workshops and seminars on teaching and learning based in particular faculties or departments; 12: Providing general workshops and seminars on teaching and learning; 13: Conducting compulsory student ratings of individual teaching performance, linking the results to promotion and/or extra financial rewards; 14: Conducting student evaluation of individual teaching performance, using the results only for feedback to the staff member; 15: Introducing mentoring programs in which experienced teachers help less experienced ones to develop their skills; 16: Providing compulsory orientation programs for less experienced teachers; 17: Undertaking national quality audits of teaching.

1.6 Summary

Throughout the interviews respondents were asked about some aspects related to students’ motivation, teaching training and evaluation, innovative teaching strategies and teaching satisfaction. We reached the following conclusions:

First, academics perceived teaching methods and activities as relevant to promote the students’ academic success, namely through the understanding of more complex contents, more interactive teaching and dynamic classes, and a well designed evaluation.

Second, in spite of the relevance attributed to teaching methods in promoting the academic success, academics perceived their role as teacher with some limitations to motivate the students. Academics pointed out other limitative factors that could contribute for the students’ motivation as well, namely the intrinsic motivational factors (e.g. personal interests, enrolment in the first option of the course) and students’ approaches to learning. Nonetheless, one lecturer admitted that different academics could motivate the students differently: ‘*the way it’s taught and the person who’s teaching drastically change the students’ motivation*’ (respondent 3).

Curiously, respondents’ answers revealed two contradictions. First, in spite of the academics’ perceptions regarding their limitative role in motivating the students, the same academics attributed a stronger importance to pedagogical issues for promoting the students’ motivation (e.g. to give positive reinforcement, to explain and emphasise the relevance of the course contents for the students’ future work or academic work, to give clear information about the courses, to prepare complex assignments divided by tasks, to promote the student-lecturer interaction - tutoring). Second, if these academics believed that pedagogical issues could actually contribute for the students’ motivation, how do they attribute to institutional measures the most effective procedure for bringing more students to class?

We assume that academics understand the relevance of teaching for the students’ motivation and academic success. Nevertheless, academics are surrounded by a set of external factors that influence some of their views.

Third, academics have been implementing innovative teaching strategies. One strategy that academics would like to implement was related to the individual work. Nonetheless, it was not possible to proceed with this strategy since there was just one computer for two students at the labs. The majority of academics believed pair work might work in latest year, but did not work in first-year courses. In addition, the effort to realise a written test as a complement to the computer exam revealed a serious problem: students' skills in reading, writing and comprehension are very low. This problem brings serious difficulties for students to programme since they are not able to proceed to abstract thinking. A study developed in this area (Cabral, 2003) revealed that engineering students have problems in writing and understanding.

Fourth, teaching evaluation was perceived as a way of recognising and rewarding excellent teaching. Academics believed that an evaluation procedure would contribute to give some merit to best teaching practices (cf. Biggs & Habeshaw, 2002). Nonetheless, academics perceived the pedagogical training of university teaching with some limitations. The training of university teachers would depend on three factors: (1) the expert who would deliver the training or the keynote speaker at a seminar or workshop, (2) the ability or competence for teaching of each individual lecturer, and (3) the expected objective for the teaching training.

Fifth, throughout the interviews we stated a widespread dissatisfaction towards the teaching of first-year courses. In one hand, academics seemed to feel frustrated with continuing reliance on research and publication as the primary criteria for promotion. On the other hand, the students' lack of interest and motivation for the course, absence at lectures and academic failure, led some of the lecturers to feel unmotivated to teach.

1.7 Open ended question: 'students' suggestions to the teaching of the course' (construct 3/2003)

The open question at the end of the $PCEQ_3$ in 2003 aimed to analyse the students' views about suggestions for teaching the class. We gathered the students' answers in three categories: 'teaching practice', 'university resources', and 'curriculum design'. Table 25 presents the data gathered in each category and sub-category, as well as some indicators illustrating the students' views.

Table 25: Students' suggestions to the teaching of the course: categories description, indicators and frequencies (construct 3/2003)

Category	Description	Sub-categories	Indicators	F	Sub-Total	Total
Teaching practice	This category is applied to ideas related to teaching best practices	(i) student-lecturer interaction	1. Dynamic/interactive classes [‘I think there should be more interaction between lecturers and students at the labs’], [‘Lectures should motivate more the students and ask for student’s intervention. Lectures should not be just a place to read the class contents’], [The lecturer should better understand the students' learning difficulties. One way to do this would be a higher interaction with the students, a dialogue about the class contents and eventually to prepare informative tests’]	32	110	166
		(ii) Teaching approaches and strategies	2. Delivery of theoretical concepts at the labs [Lecturers at the labs should present a brief resume of the theory necessary for the development of the exercises. This would help the students who did not attend the lecture (because of the schedule or simply because they could not attend a specific lecture). This way they would understand the exercises much better’], [‘Use more time in the beginning of the labs to explain the exercise procedures’]	4		
			3. Different approach for delivering the course contents and more motivating classes [‘An attempt to change the teaching approach at lectures could bring more students to attend the class and more motivated students’]; [I wish lecturers could motivate and help more the students. I think, I mean, I'm sure that lecturers have a good scientific knowledge but do not know how to pass this knowledge to students efficiently and in my opinion this is the most important thing’]; [I think it would be very useful if lecturers were more dynamic and comfortable in lecturing, giving examples and curiosities related to the course contents. This course needs lecturers to motivate the students’]	16		

			4. Fewer contents in lectures and labs, more time to understand and to give students some time for getting familiar with the course and then starting to solve the exercises [‘One suggestion might be to slow down the rhythm of teaching for the courses that are not directly related to informatics’], [‘To slow down the content delivery at the lectures’], [‘To teach the contents of the course with moments for reflection. It would provide an easier acquisition of knowledge’], [‘lecturers should not start giving exercises for students immediately in the beginning of the semester. Rather, should wait some time for students to get familiar with the course’]	13		
			5. Better explanation of the programming language [‘Lecturers should better explain the meaning of some programming functions, such as if and until so that we know how to solve the exercises...’], [I think the biggest problem is that we are faced with a new language without having the necessary skills to learn with that language (...)’], [‘To make the programming language more familiar to students (...)’] [‘Classes are prepared with the idea that students have already an advanced knowledge of the contents’]	38		

			6. To avoid reading from transparencies or slides [‘Lectures should not be an exposition of slides. It should consist on a more detailed explanation of the details’], [‘The teaching strategy at lectures should change because I can read slides at home’]	9		
		(iii) Exercises	1. More motivating exercises, related to the daily life context and more examples in lectures for a better understanding of the theory [‘Exercises more motivating and with a practical application’], [In my opinion it should exist a better relation between the exercises developed at labs and the daily-life problems that might occur when entering the work life. We should have a notion of the practical application of the contents of the course’]	22		
			2. Exercises available on line or at the end of the class with solutions [‘Lecturers should give at the end of the class the solutions of the exercises’], [To give the solutions of the exercises done at the labs in the following class for helping students not to get lost’]	16		
		(iv) Assessment	1. Continuous evaluation [‘Continuous evaluation (the three mini-tests) counting 60 per cent for the final grade. The theoretical and practical exams would count 20 per cent each’], [‘The evaluation through out the semester is not enough valorised for the final grade. There should be a balance between the continuous evaluation and the final exams’]	12		

Resources	This category is applied to suggestions regarding the university resources	(i) Time allocation	1. More time allocated to labs [‘More hours allocated to labs’], [‘More hours allocated to labs and fewer hours dedicated to lectures’]	6	25	
			2. Less consecutive hours allocated to labs [To eliminate the block of three hours labs in two with two hours each’], [Less consecutive hours at the labs. The block of three hours lab becomes very boring’], [‘(...) the three hours labs gets to be very exhaustive and monotonous. Students start losing attention’]	12		
		(ii) Staff recruitment	1. Rotation of lecturers [‘Lecturers should be recruited for lecturing according to their skills for teaching. There are some academics who know a lot of programming but do not know how to pass that knowledge to students’], [Selection of lecturers who reveal to have better skills for teaching, lecturers who bring students to lectures’]	3		
		(iii) Working tools (computers)	1. More computers at the labs [‘More computers to the students at the labs’], [‘A computer for each student’]	4		
Course Design	This category is applied to suggestions regarding the curriculum design and organisation of lectures and labs	(i) Curriculum design	1. Revision of the course contents, different programming language [Re-design of the course contents in order to turn the course more important for our future work’], [‘The content of the class as well as the syllabus should be up-dated’], [‘Students would probably take more advantages from the class if the course was thought in another programming language, more useful to apply in a future work’], [‘The programming language used at this course is no longer used, so i think we should learn a more recent programming language’]	8	31	

			2. Remove the course from the curriculum ['This subject should be removed from the curriculum since in the future we are not going to apply the knowledge acquired in this class'], ['This subject should be compulsory for courses more related to informatics']	6		
		(ii) Organisation of lectures and labs	1. Theoretical and practical lectures ['To get the theory and the practice together for a better acquisition of knowledge'], [Instead of having lectures and labs there should be a class where theory and practice were together'], ['Students feel not so shy when taking doubts in a small class with around 20 students per class than in a bigger lecture room with around 100 students']	17		

Legend: F: frequency counting of particular indicators; Sub-total: frequency counting of the sub-categories; Total: frequency counting of the total category.

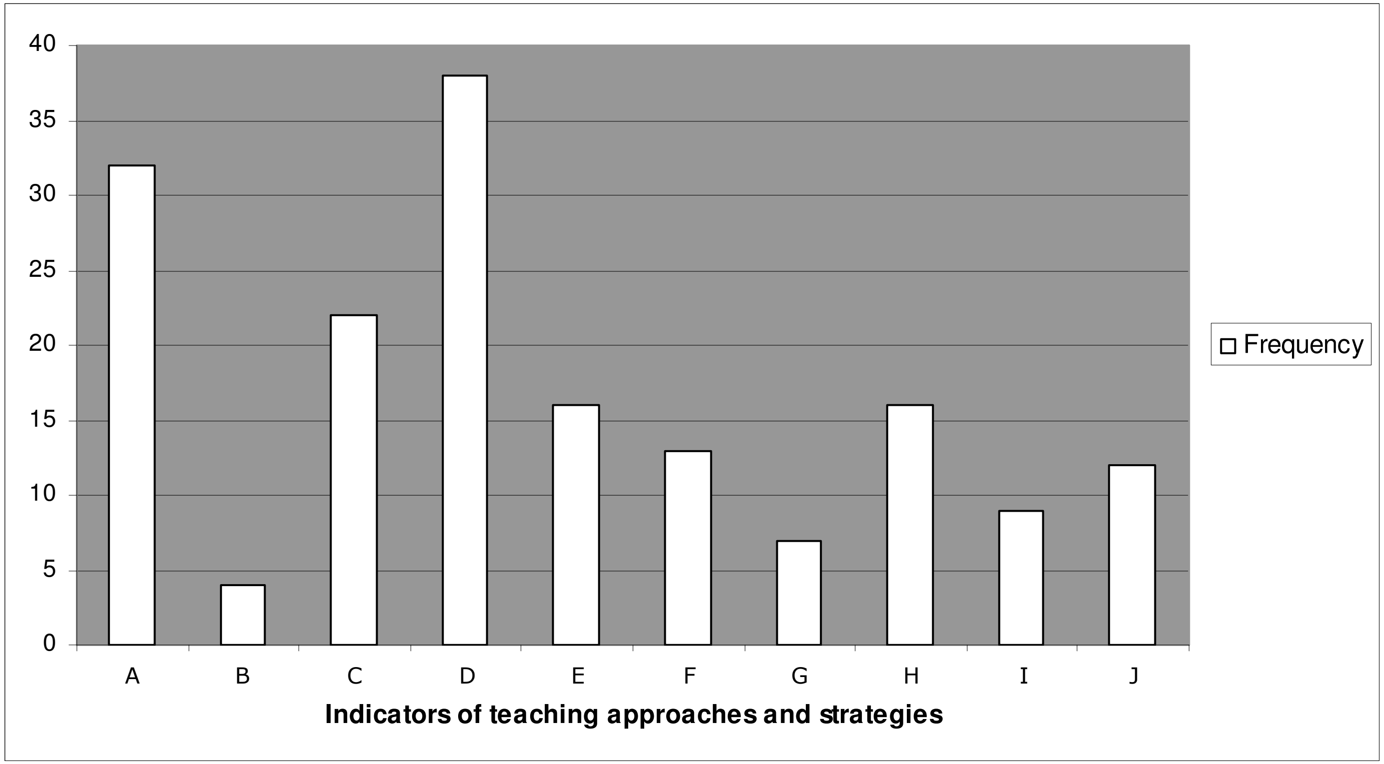
The first category 'teaching practice' is applied to students' ideas related to best teaching practices. Three sub-categories emerged: i) student-lecturer interaction, ii) teaching strategies and approaches, and iii) exercises.

The second category 'university resources' is applied to students' suggestions regarding the university resources that influence the organisation of classes, staff recruitment and computers' acquisition. From the analysis of the students' answers three sub-categories emerged: i) organisation of lectures and labs, ii) staff recruitment, and iii) working tools.

The third category 'curriculum design' is applied to students' suggestions regarding the design of the curriculum and is divided in two sub-categories: i) re-design of the course, and ii) elimination of the course from the curriculum.

The strongest category is the one associated to the teacher and the best teaching practices, mentioned 169 times in the text. Students suggestions regard more dynamic and interactive classes (mentioned 32 times), a stronger support of academics (mentioned 38 times), more motivating exercises, related to the daily life context and more examples in lectures for a better understanding of the theory (mentioned 22 times), different teaching approaches for delivering the course and more motivating classes (mentioned 16 times), fewer contents in lectures and labs (mentioned 13 times), better explanations of the programming language (mentioned 7 times), exercises available on line or at the end of the class with solutions (mentioned 16 times), avoid reading from transparencies or slides (mentioned 9 times), continuous evaluation (mentioned 12 times) and the delivery of theoretical concepts at the labs (mentioned 4 times in the text). The strongest indicators are related to a stronger support of academics and more dynamic and interactive classes (Figure 3).

Figure 3: Frequency of each indicator in the category 'teaching practice' (construct 3)



Legend: A: dynamic and interactive classes; B: delivery of theoretical concepts at the labs; C: more motivating exercises; D: stronger support of academics; E: different teaching approaches and more motivating classes; F: fewer contents in lectures and labs; G: better explanation of the programming language; H: exercises available on-line; I: avoid reading from the transparencies and slides and J: continuous evaluation.

1.8 Comparative analysis of students' suggestions (before and after the 'redesign of the curricula')

In 2003, two years have passed since the redesign of the curricula. Thus, we intend to compare students' suggestions for teaching the course before and after the 'redesign of the curricula'. Furthermore, we took in consideration findings from 2001 and 2003.

The students' suggestions before and after the 'redesign of the curricula' differ in what concerns the course design. While in 2001, students suggested the re-design of the course contents according to the different courses (this indicator was mentioned 24 times), in 2003 fewer students suggested a revision of the course contents (mentioned 8 times). These findings suggest that students are more satisfied with the actual course design.

On the other hand, the organisation of lectures and labs is still mentioned by the students. The traditional style of lecturing was perceived as a not successful method for promoting learning outcomes.

Teaching practice is still perceived as fundamental for promoting the quality of teaching and learning at this course.

The findings suggest that more dynamic and interactive classes, a better explanation of the programming language, a different teaching approach in lectures, a more effective continuous evaluation, and a careful choice of the exercises would improve the content delivery of this course.

Also, the time allocation to labs in 2003 (3 consecutive hours) was criticised by students (mentioned 12 times). While in 2001, students suggested more time allocated to labs, the consecutive hours was considered not to be the best solution for the problem.

1.9 Academics' reaction to the questionnaire results

Appropriate feedback was given to academics regarding the students' perception of their teaching practice, attendance at lectures and motivation. The interaction with lecturers aimed mainly to promote the reflection on their teaching performance and also to make academics to feel more involved in the study. Academics were surprised with some of the students' perception. Some members of staff admitted to have never thought about some issues presented on the questionnaire and were very happy to be able to discuss them with the author.

Academics were also asked to complete some of the items from the students' questionnaire (Appendix nr.7). This way, it was easier for them to compare both perceptions. Appendix nr.9 presents the comparison of both students' and academics' perceptions.

The analysis of the figures reveals that some members of staff seem to share more or less the same perceptions (Appendix nr.9, Figure 4 and 1) as the students, while others seem to disagree more with the students (Figure 3 and 5).

1.10 Data gathered from direct observation and documentary analysis

1.10.1 Model of teaching strategies in lectures and laboratories

During 2001/2002, the University of Aveiro made radical changes to curriculum organisation in the teaching provision of introductory programming, as previously explored in chapter 3.

Before the process 'rethinking the curricula' academic staff , faced with the prospect of a course with 1640 students, tried different teaching approaches, such as spending the first 10/15 minutes of each lab explaining basic concepts. This strategy sought to help students understand the concepts underlying the practical exercise. In contrast, many lecturers shared the opinion that theoretical concepts should only be addressed in lectures with labs being a place to apply the theory. This view presumed that students would more often attend lectures if these were required as a basis for doing the practical exercises.

During the 90 minute lectures there was time for an exposition of the main theoretical concepts followed by a discussion of some practical exercises and also an introduction to the exercises explored in the labs. During labs, the lecturers followed a syllabus and students were supposed to solve at least one exercise of moderate complexity. The exercises required some prior preparation by students.

In spite of this effort, we identified four main problems of such course organisation, namely:

1. Students frequently did not attend the lectures. Some lecturers thought that the brief explanation of theory in the labs would not be a disincentive for students to attend lectures. In a lecture where 160 students should be attending, just half of them would attend the class. Some lectures did not even reach fifth per cent attendance. The reasons for this situation were explored by Huet Silva & Tavares (2002) who point to the methodologies used by lecturers as the main reason for the students' lack of motivation and missing lectures.
2. Students' infrequent attendance at lectures together with their bad study habits led to a low performance level in the labs.
3. The duration of labs often left insufficient time to complete the exercises. In addition, the limited time was an obstacle to frequent evaluations.
4. The number of students in each lab was too large to permit individual work.

The revised course organisation in 2002 aimed to secure the following objectives:

1. Increase the time spent in the labs.
2. Introduce a block of four hours where students would focus on programming (one hour of lecture followed by three hours of lab).
3. Develop more evaluation points at the labs. This gauges student progression in the labs through small exercises (mini-tests).
4. Promote the practical course content.
5. Adapt the programming language and make the exercises more appealing to each course (Huet, Pacheco, & Tavares, 2003).

Following these developments and in terms of conclusion, the findings over the past three years indicated not only positive aspects but also less positive ones, namely:

1. A significant number of students find the block of three hours lab very heavy.
2. Students are still frequently not attending the lectures. This fact has promoted further discussion between lecturers on the necessity to introduce theoretical concepts in the labs.
3. Some staff members share the view that student performance is poorer because they do not work at home, do not attend the lectures, feel tired and suffer loss of concentration during the block of four hours.

4. Lecturers argue that changing from one hour and thirty minutes lectures to just one hour does not give enough time for presenting a concept, giving examples and discussing the material.
5. Some lecturers feel that pair programming in labs is less efficient for first-year students than individual work. This opinion derives from the fact that often just one of the students actually program while the colleague becomes an observer. In contrast, other staff members think programming in pairs is essential to promote learning since one of the students can serve as a kind of a tutor for the other.
6. Students do not look for help outside of labs. The hours dedicated exclusively to help students outside labs are not well supported by students.
7. The block of three hours facilitated multiple small evaluation opportunities, thereby incrementing students' study throughout the semester.
8. The new course organisation gave each coordinator the opportunity to choose exercises that were more suited to each course.

1.10.2 Lectures versus labs

The Aveiro experience is that lecturer participation in practical classes allows them to pick up on common student questions that subsequently can be explained to the whole class. According to some lecturers, this strategy has two advantages since it reduces the repetition of answering questions and also engages the quieter students who would not ordinarily come forward.

The lecturer introduces the exercises, explaining in some cases the theoretical background. Nevertheless, some lecturers think this attitude is not the most correct one since students should attend the theoretical lecturers where the theory is explained. Although there are other lecturers who discuss the idea that sometimes it is useful to explain the theoretical contents again in the practical lecturers. They defend that some students have difficulty to assimilate all the concepts immediately and if they do not understand how to solve an exercise in the labs, then it should be the lecturers' responsibility to explain the theory again. In 2003/04 the co-ordinator of 'Programming I' gave instruction to avoid the approach of theoretical concepts in the labs. This measure aimed to bring more students to the lectures. Two lecturers affirmed that this change was not helping the students' performance in the labs. These lecturers shared the view that student motivation and achievement would be higher if they approach some theory at the beginning of the practical class.

Students were supposed to conclude three exercises in each practical, but this number changed according to the performance level of each class. Engineering students tended to be more successful and able to finish the 3rd exercise, or at least be able to start it.

Poor attendance at lectures is a problem at the University of Aveiro. A curious fact that occurred during lectures is that students leave in the middle of the class. When attending the lectures we observed students leaving the class after the first thirty minutes and getting visibly nervous to leave as the lecturer was writing on the board or taking notes. From observation, it appeared that just those students sitting in the front rows were actually keeping some attention. Other students tended to talk, play games on cell phones or read magazines.

1.10.3 Individual *versus* collaborative work

Pair programming has been employed for some time at the University of Aveiro. In labs, two students per computer address the exercises under lecturer supervision. In spite of the benefits of the collaborative work for the engineering department[19], most of the academics would prefer to have one student per computer. The experience acquired from supervising this teaching strategy says that PP can lead some of the students to become passive learners, hoping other colleagues would solve the exercises for them.

[19] Pair programming work reduces the number of computers and licenses that would be required for the course.

2. University of Strathclyde

2.1 Data gathered from interviews: aims and procedures

At the University of Strathclyde the interviews were informal (as semi-structured and structured interviews) and took place at coffee breaks and at the lecturers' office. The participants were two lecturers and monitors from an introductory programming course. The author took notes while talking with the interviewees for a period of two months in 2002 and during one week in 2004. Appendix nr. 12 presents the questions addressed at the interviews in 2002.

The semi-structured interviews carried out at two lecturers and four monitors aimed to collect their opinions regarding: (i) the importance of teaching best practices for the students' academic success and motivation and (iii) to collect suggestions for teaching the course. The interviews took place at the lecturers or at the interviewer office.

In addition, the interviews also aimed to collect the lecturers' views regarding the use of monitors at the labs and the monitors' views regarding their experience at the labs.

The structured interviews were also booked by e-mail with each interviewee during the months of April 2004. Four lecturers accepted to give their opinion regarding the most effective methods for rewarding, recognising and ensuring good teaching.

2.2 Semi-structured interviews: category Analysis

In the next section, the category analysis of the respondents' answers was divided in three moments: (i) questions addressed to both lecturers and monitors; (ii) questions addressed to lecturers, and (iii) questions addressed to monitors.

2.2.1 Questions underlining the interviews: lecturers and monitors

(1) How do lecturers and monitors view the relevance of teaching methods and activities for promoting the students' academic success?

Respondents were asked about the relevance of teaching methods and activities for promoting the students' academic success in a scale ranging 1 ('no relevance') to 3 ('very relevant'). For the category 'teaching relevance' respondents' answers were divided in two sub-categories: 'relevant' and 'very relevant' (Table 26). The strongest category reveals that lecturers and monitors view the teaching methods and activities as very relevant in promoting the students' academic success.

Table 26: Category, sub-categories and frequency: teaching relevance

Category	Sub-categories	F	Total
Teaching relevance	(i) relevant	2	6
	(ii) very relevant	4	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(2) How do lecturers and monitors view the relevance of teaching training for university lecturers?

Respondents were asked about the relevance of teaching training for academics in a scale ranging from 1 (not so relevant) to 3 (very relevant). The category 'teaching training for academics' was divided in three sub-categories: (i) 'not so relevant', (ii) 'relevant', and (iii) 'depends' (Table 27).

Table 27: Category, sub-categories, indicators and frequency: teaching training

Category	Definition	Sub-categories	F	Total
Teaching training	Relevance of teaching training for academics	(i) not so relevant	2	6
		(ii) relevant	2	
		(iii) depends	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Two respondents viewed the teaching training as not so relevant for their academic profession. As one lecturer said:

> *(...) The quality of teaching is important, but this is not necessarily related to a formal qualification. University teachers should be critical of*

> *their own abilities and approaches, and encourage others to be critical of them. If necessary, training should be provided, but a formal qualification is not a pre-requisite.*

One demonstrator viewed the teaching training as essential for helping lecturers to pursue teaching skills. For this respondent good teachers need to have both scientific and pedagogical skills to become an effective teacher: '(…) *teaching training may help teachers to be more effective. Sometimes they have the scientific knowledge but do not have the necessary teaching skills to be effective*'.

Furthermore, two monitors affirmed that teaching training would not be necessary for all academics, since teaching training does not necessarily imply good teachers as the final product: '(…) *some teachers possess teaching qualifications and still perform badly as teachers, others don't have teaching qualifications but perform effectively as teachers*'.

(3) What do lecturers and monitors think about the relevance of motivation for promoting the students' academic success?

Respondents were asked about the relevance of students' motivation for promoting the academic success in a scale ranging from 1 ('not relevant') to 3 ('very relevant'). Three lecturers perceived motivation as 'relevant' and 'very relevant' for promoting the students' academic success (Table 28). No further comments were added to this question.

Table 28: Category, sub-categories and frequency: motivation and students' academic success

Category	Definition	Sub-categories	F	Total
Motivation and students' academic success	Relevance of students' motivation for promoting the academic success	(i) relevant	3	5
		(ii) very relevant	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(4) What are the lecturers and monitors views about the factors contributing for the students' motivation?

As a continuation of the previous question we were concerned to collect data regarding the factors that might contribute for the students' motivation. For the category 'students' motivation' we gathered two sub-categories: (i) 'extrinsic factors', mentioned 7 times at the interview and (ii) 'intrinsic factors', mentioned 6 times (Table 29).

Table 29: Category, definition, sub-categories, indicators and frequency: students' motivation

Category	Definition	Sub-categories	Indicators	F	Total
Factors contributing for the students' motivation	Respondents' views regarding the factors contributing for the students' motivation	Extrinsic factors (Pedagogical approach)	1. More challenging work	2	7
			2. More interesting examples, related to the students' interests	2	
			3. More time allocated for practical work	1	
			4. Making programme to be fun	1	
		Extrinsic factors (student)	5. To pass the module (need to finish the course as soon as possible)	1	
		Intrinsic factors	1. long term goal to have a degree	1	6
			2. to stay in the academia	1	
			3. interest for the subject	2	
			4. to find a job easier	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

Both sub-categories were mentioned with a similar frequency by respondents. We conclude that both intrinsic and extrinsic factors are considered important for promoting the students' interest and motivation at the course.

(5) What are the lecturers and monitors views regarding the language used in classes? Is it clear to students?

Respondents were asked, in a scale ranging from 1 ('never') to 3 ('often'), if the language used in classes was clear and understood by the students. Academics thought the language used in classes was most often clear to students ('*I would hope so (….) the student questionnaires seem to suggest that*'). One demonstrator affirmed to explain a concept in a different way if students did not understand it: '(…) *I try not to use jargon, if they don't understand me I try to explain in a different way'* (Table 30).

Table 30: Category, sub-categories and frequency: language clarity

Category	Definition	Sub-categories	F
Language clarity	Respondents' view regarding the language clarity	often	5

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(6) How do lecturers and monitors view the relevance of teaching methods and activities for promoting the students' academic success?

Respondents were asked about the relevance of the teaching methods and activities in promoting the students' academic success in a scale ranging 1 ('not relevant') to 3 ('very relevant'). For the category 'teaching relevance' respondents' answers were divided in two sub-categories: (i) 'relevant' and (ii) 'very relevant' (Table 31). Respondents viewed the teaching methods and activities as relevant and very relevant.

Table 31: Category, definition, sub-categories and frequency: teaching relevance

Category	Definition	Sub-categories	F	Total
Teaching relevance	Respondents' views regarding the relevance of teaching methods and activities for promoting the students' academic success	(i) relevant	1	5
		(ii) very relevant	4	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(7) What are the lecturers and monitors suggestions for teaching the course?

Respondents were asked for suggestions regarding the teaching of the course. For the category 'suggestions' two-sub-categories emerged: (i) 'resources' and (ii) 'pedagogical approach' (Table 32). For the sub-category 'resources' we collected two indicators: (1) 'more monitors at the labs or reduction of the number of students at the labs', (2) 'to teach in a laboratory rather than in a lecture theatre'. For the sub-category 'pedagogical approach' we collected just one indicator: (1) 'to improve the degree of interaction with students'.

Table 32: Category, definition, sub-categories and frequency: suggestions for teaching the course

Category	Definition	Sub-categories	F	Total
Suggestions for teaching the course	Respondents' suggestions regarding the course teaching	(i) resources	3	4
		(ii) pedagogical approach	1	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

2.2.2 Questions underlining the interview: lecturers

(1) What are the lecturers' views regarding the most effective strategies for keeping the students' attention and attendance at lectures?

Respondents were asked about the most effective strategies for keeping the students' attention and attendance at lectures. For the category 'students' attention and attendance at lectures' one sub-category emerged (mentioned four times): (i) 'pedagogical approach'. Lecturers believe that innovative teaching approaches can bring more students to class and keep students with more attention, such as: (1) 'the use of laptop for live examples', (2) 'the mixture of theory and practice requiring the student input', (3) 'to engage students in problem solving', and (4) 'to ensure the material does not encourage a passive form of learning' (Table 33).

Table 33: Category, definition, sub-categories and frequency: students' attention and attendance at lectures

Category	Description	Sub-categories	F
Students' attention and attendance at lectures'	Respondents' views regarding the most effective strategies for keeping the students attendance and attendance at lectures	(i) Pedagogical approach	4

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(2) How do lecturers view the interaction with peers?

Respondents were asked about the frequency they interact with peers in a scale ranging to 1 ('rarely') to 3 ('often'). The two lectures affirmed to interact often with their colleagues (Table 34).

Table 34: Category, definition and frequency: interaction with peers

Category	Description	Sub-categories	F
Interaction with peers	Respondents' views regarding the frequency they look for colleagues to change ideas or discuss teaching issues	(i) often	2

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(3) How do lecturers view the advantages of having monitors at the labs?

Respondents were asked about the advantages of having monitors supporting the labs. For the category 'advantages of monitors supporting the labs' several indicators were gathered, such as: (1) 'the support for practical problem solving', and (2) 'one-to-one tutoring' (Table 35).

Table 35: Category, definition and frequency: advantages of the monitors

Category	Description	Indicators	F	Total
Advantages of the monitors	Respondents' views regarding the advantages of having monitors supervising the labs	1. Support for practical problem solving ['Help to explain student mistakes, suggesting and justifying improvements'; 'Different perspective from the lecturing staff so may be able to explain things in an alternative manner']	3	4
		2. One-to-one tutoring ['It is important that students that are learning to program have one-to-one tuition. One of the most effective ways of learning programming is from a more experienced programmer e.g. Master-Apprentice']	1	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

2.2.3 Questions underlining the interviews: monitors

(1) What are the monitors views regarding the intervention of students at labs?

Monitors were asked about the frequency students ask for help at the labs in a scale ranging 1 ('never') to 3 ('often'). Monitors affirmed that students ask frequently and often for monitors' help at the labs (Table 36).

Table 36: Category, sub-categories and frequency: students' questioning the monitors

Category	Definition	Sub-categories	F	Total
Students' questioning the monitors	Respondents' views regarding the students' intervention at the labs	(i) frequently	2	4
		(ii) often	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(2) What are the monitors' views regarding the student behaviour at the labs? Do students feel shy when asking for questions?

For the category 'student behaviour at labs' one sub-category emerged: (i) 'no shyness'. According to the monitors, students do not feel shy to ask questions at the labs (Table 37). The age proximity between students and monitors can help in this situation, as referred by one demonstrator. The same idea is shared by the lecturers.

Table 37: Category, sub-categories and frequency: student behaviour at labs

Category	Definition	Sub-categories	F
Student behaviour at labs	Respondents' views regarding the students' behaviour at the labs	(i) no shyness for asking questions	4

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(3) What are the monitors' views regarding the student frequency in looking for help outside the labs?

Respondents were asked if students looked for help outside the labs in a scale ranging from 1 ('never') to 3 ('often'). Students never looked for the monitors' help outside the labs. This idea is also shared by the lecturers (Table 38).

Table 38: Category, sub-categories and frequency: looking for monitors outside the labs

Category	Definition	Sub-categories	F
Looking for monitors outside the labs	Respondents views regarding the students' frequency in looking for help outside the labs	(i) never	4

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(4) How do monitors view their preparation for helping students at the labs?

Respondents were asked about what they usually did before going to labs. For the category 'preparation for the labs' two sub-categories emerged: (i) 'previous preparation' and (ii) 'no previous preparation' (Table 39). Two monitors referred not to make a previous preparation before going to the labs. They admitted just to look for the solutions of the exercises: '(…) nothing special, just look for the solutions of the exercises before going to the labs'. Two other monitors went further and said they usually try to understand the exercises before looking for the solution and prepare a set of potential answers for questions students might ask: 'I usually try to understand the exercise and then look for the solution. One hour before I think about potential questions students might ask'.

Table 39: Category, definition, sub-categories, indicators and frequency: preparation for the labs

Category	Definition	Sub-categories	F	Total
Preparation for the labs	Respondents' views regarding the preparation for the labs	(i) previous preparation	2	4
		(ii) no previous preparation	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(5) How do monitors view the students' learning difficulties at the labs?

Monitors were asked about their perception regarding the students' learning difficulties at the labs. For the category 'learning difficulties' two sub-categories emerged: (i) 'no class preparation' and (ii) 'difficulty in proceeding to abstract thinking' (Table 40). One demonstrator believed students had problems in solving exercises because they did not attend lectures frequently: '*students don't prepare the classes and don't go to lectures'*. Two other respondents believed students had difficulties in proceeding to abstract thinking: '*students have difficulties in thinking of an overall solution, they just see the pieces. This way it is difficult to succeed in the resolution of some exercises'*.

Table 40: Category, sub-categories, indicators and frequency: learning difficulties

Category	Definition	Sub-categories	F	Total
Learning difficulties	Respondents' views regarding students' learning difficulties	(i) no class preparation	1	3
		(ii) difficulty in proceeding to abstract thinking	2	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

(6) How do monitors view the importance of tutorials?

Respondents were asked about the importance of tutorials in a scale ranging from 1 ('no important') to 3 ('very important'). Respondents perceived the tutorials as important or very important for the students' learning success (Table 41).

Table 41: Category, sub-categories and frequency: importance of tutorials

Category	Sub-categories	F	Total
Importance of tutorials	(i) important	2	5
	(ii) very important	3	

Legend: F - frequency counting of particular sub-categories, Total - frequency counting of the total category.

2.3 Structured interviews

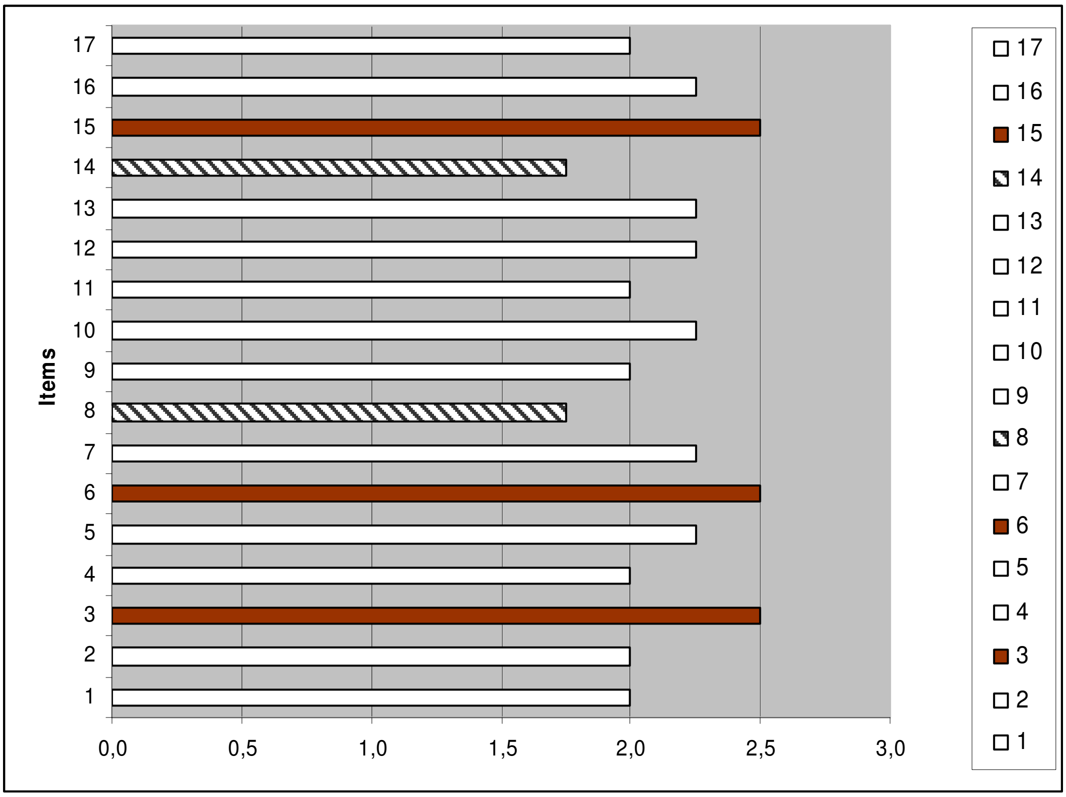
In order to proceed to the analysis of the academics perception of the most effective processes for rewarding and ensuring good teaching, academics were asked about the effectiveness of these methods in a scale ranging from 1 to 3 (1-'no effect', 2-'some effect', 3-'a great effect') (Appendix nr. 11).

Similar to what have happened at the University of Aveiro, the analysis of the mean scores reveals that some processes were considered to be more effective than other. The more effective processes were: (i) ensuring heads of departments and courses give more praise for teaching innovation and quality; (ii) taking greater account of teaching in the promotions process, and (iii) introducing mentoring programs in which experienced teachers help less experienced ones to develop their skills.

The less important processes are related to the attribution of rewards for the most effective academics and to conduct student evaluation of individual teaching performance, using the results only for feedback to the staff member. Issues such as making special arrangements (e.g. time release) for teaching development projects, to establish staff development units for learning and teaching in every university, to apply performance indicators of course quality, to provide general workshops and seminars on teaching and learning, to conduct compulsory student ratings of individual teaching performance, to link these results to promotion and/or extra financial rewards, and to provide compulsory orientation programs for less experienced teachers were also perceived as important methods for the improvement of teaching (Figure 4).

Three academics agreed on the difficulty to rate each process since they should not be used alone but always as possible in conjunction with others.

Figure 4: Mean scores of the views of academics about the effectiveness of some methods as ways of rewarding, recognising and ensuring good teaching



Legend: 1: Conducting surveys of students' course experiences and satisfaction; 2: Requiring accreditation as a competent university teacher for all academics; 3: Ensuring heads of departments and courses give more praise for teaching innovation and quality; 4: Establishing informal courses in teaching for academic staff about teaching methods and strategies, not leading to a qualification; 5: Making special arrangements (e.g. time release) for teaching development projects; 6: Taking greater account of teaching in the promotions process; 7: Establishing an effective staff development unit/centre for learning and teaching in every university; 8: Awarding prizes and grants for good teaching to individual academics; 9: Establishing courses for academic staff leading to a teaching qualification; 10: Applying performance indicators of course quality to academic departments; 11: Providing workshops and seminars on teaching and learning based in particular faculties or departments; 12: Providing general workshops and seminars on teaching and learning; 13: Conducting compulsory student ratings of individual teaching performance, linking the results to promotion and/or extra financial rewards; 14: Conducting student evaluation of individual teaching performance, using the results only for feedback to the staff member; 15: Introducing mentoring programs in which experienced teachers help less experienced ones to develop their skills; 16: Providing compulsory orientation programs for less experienced teachers; 17: Undertaking national quality audits of teaching.

2.4 Summary

Throughout the analysis of the interviews, we reached the following conclusions:

First, lecturers and monitors viewed the teaching methods and activities as relevant or very relevant in promoting the students' academic success.

Second, teaching training was perceived with limitations; especially if it was developed as a formal qualification. In addition, two monitors affirmed that teaching training might not be necessary for all academics, since academics with teaching training might not be effective teachers.

Third, motivation was perceived as important for the students' academic success. The factors contributing for that motivation were divided between extrinsic and intrinsic factors. Respondents believed that extrinsic factors, in this case factors related to the teaching practice and the student (e.g. more challenging work, more interesting examples, related to the students' interests, making programme to be fun, necessity to pass the module as soon as possible) could promote the students' motivation. Nonetheless, the intrinsic factors were considered very important as well (e.g. the long term goal to have a degree, the objective to stay in the academia, the interest for the subject).

Fourth, respondents viewed the teaching methods and activities as relevant and very relevant for promoting the students' academic success. Lecturers believed that teaching methods used in class could keep the students' attention and attendance at lectures, namely: (1) the use of laptop for live examples, (2) the mixture of theory and practice requiring the student input, (3) to engage students in problem solving, and (4) to ensure the material does not encourage a passive form of learning.

Fifth, respondents suggested for the course teaching issues related to the university resources, such as: (1) more monitors or fewer students at the labs, and (2) to teach in a laboratory rather than in a lecture theatre. In addition, there was just one reference related to pedagogical issues (e.g. to improve the degree of interaction with students).

Sixth, lecturers perceived the use of monitors at the labs as very important to support students in problem solving. On the other hand, monitors could contribute for the 'one-to-one tutoring'. According to this lecturer one of the most effective ways of learning programming was from a more experienced programmer (e.g. Master-Apprentice).

Seventh, monitors agreed that students did not feel shy in asking for questions. This situation was justified by both monitors and students as a consequence of having younger monitors to support the labs. The similar age of students and monitors helped to overcome a possible 'generation gap'. Nonetheless, it did not bring more students to look for assistance outside the labs.

Eight, monitors realised students had some difficulties to proceed to abstract thinking and to prepare the exercises at home. Tutorials were understood as very important for the students' academic success at the course.

Finally, the most effective processes for ensuring and rewarding good teaching were: (i) to ensure that heads of departments and courses give more praise for teaching innovation and quality; (ii) to take greater account of teaching in the promotions process, and (iii) to introduce mentoring programs in which experienced teachers help less experienced ones to develop their skills.

The less important processes were related to the attribution of rewards for the most effective academics and to conduct student evaluation of individual teaching performance, using the results only for feedback to the staff member. Student evaluation would be valid if the results could be linked to promotion and/or extra financial rewards.

2.5 Open ended question 'suggestions for teaching the class' (construct 4/2001)

Similar to what have happened at the University of Aveiro, students' suggestions regarding the teaching of the course were gathered in three categories: 'teaching practice', 'university resources', and 'curriculum design'. Table 42 presents the data gathered in each category and sub-category, as well as some indicators illustrating the students' opinions.

The strongest category deals with the resources and teaching practice. For this group of students the strongest indicators (figure 5) related to teaching approaches and strategies deal with: (1) more motivating exercises, related to the daily life context and more examples in lectures for a better understanding of the theory (B), (2) different approach for delivering the course contents and more motivating classes (D), and (3) fewer contents in lectures and labs and more time to understand the theoretical concepts (E).

For the university resources indicators (figure 6) students pointed out more time allocated for labs (A), the organisation of tutorials (B), and the rotation of lecturers (C). Few suggestions were made regarding the curriculum organisation of the course.

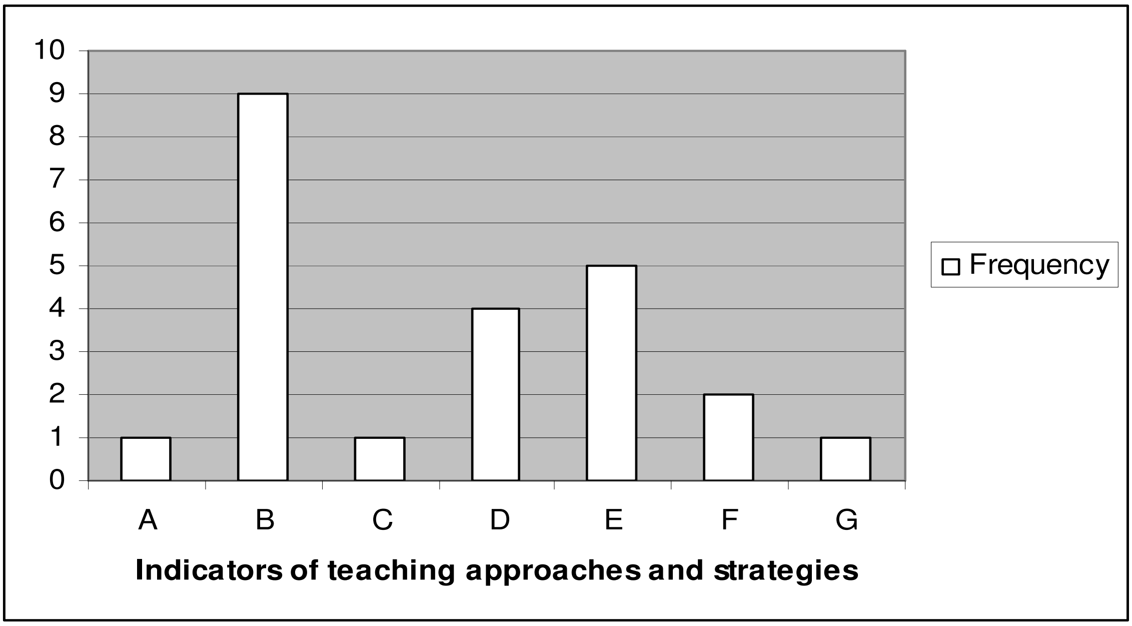
Table 42: Students' suggestions for teaching the course: categories description, indicators and frequencies

Category	Description	Sub-categories	Indicators	F	Sub-Total	Total
Teaching practice	This category is applied to ideas related to teaching best practices	(i) Student-lecturer interaction	1. Dynamic/interactive classes [‘Become more interactive in lectures’]	1	23	49
		(ii) Teaching approaches and strategies	1. More motivating exercises, related to the daily life context and more examples in lectures for a better understanding of the theory [‘More practical examples would help. Before attempting assessments’], [‘Spend more time on the fundamentals of Java and its application in real life situations. This will allow us to further our interest in the subject’], [‘The Lecturer should go through a fully working program each lecture, as a working example is usually the best way to appreciate objects, instances, etc. It is also the best way to practice spotting errors’], [‘More Example programs to be used in the lectures, which tie in with the lecture material being taught’]	9		
			2. More support for students who come from secondary education with lower skills on programming [‘More lectures aimed more at people who have never done programming in there life’], [‘Preparing for practicals take up a lot of time and you do not have time to practise other programs, which is needed when you are a beginner’]	1		
			3. Different approach for delivering the course contents and more motivating classes [‘Cover classes more - sometimes it was just program drivers that were covered’], [‘Touch on the Java package read me on the actual Java site - sometimes looking through the site can help me find a command I was wanting. Sometimes, I feel mentioning this site would help’], [‘better guidelines in writing a program during the second semester’]	4		

		(ii) Teaching approaches and strategies	4. Fewer contents in lectures and labs, more time to understand and to give students some time for getting familiar with the course and then starting to solve the exercises [‘More time to understand the basics’], [‘The pace of the class is a bit fast sometimes because we are supposed to be able to apply the skills we have learned in a lecture on a Friday and use them in writing programs as early as Monday, regardless of work commitments at the weekend or other subjects’], [‘Materials are too much for just a beginner. Too much to take in little time’], [‘The lecturer should take more time to make sure everyone understands before moving on the course’]	5		
			5. Better explanation of the programming language [‘Pay more attention to students in the practicals, if they don't understand something explain it to them in a way that they will, rather than using the programming terms that they have just told you they don't understand’], [‘Lectures include too much jargon and assumed previous knowledge. To learn this topic only the textbook and practical exercises help’]	2		
		(iii) Assessment	1. Continuous evaluation [‘practical work should not be assessed but there should be more scheduled assessment sessions during the semester’]	1		

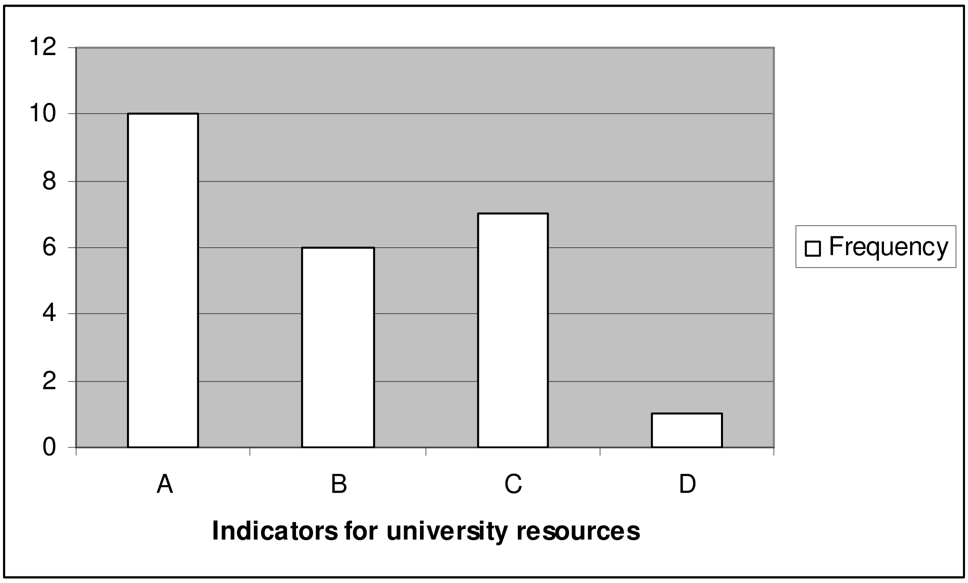
Resources	This category is applied to suggestions regarding the university resources	(i) Time allocation	1. More time allocated to labs (a) ['learning programming requires more scheduled practical sessions and fewer lectures'], [' In front of the computer is where i learn most about programming not in the lecture all; even though it is helpful. Labs are where most people (I believe) pick most up about programming. I would like to see the lectures in this dept take advantage of that and teach a lot more in the labs'], ['To have emphasis on practicals because its different from listening in the lectures to actually sitting down and doing it yourself']	10	24	
		(ii) Tutorials	1. Organisation of tutorials ['Perhaps a compulsory classroom tutorial would hammer home important points'], ['Tutorials where you can ask questions and more people to help if you are having problems in the lab'], ['tutorials to go over problems incurred']	6		
		(iii) Staff recruitment	1. Rotation of lecturers (3) ['More supervisors in the labs too, as there are not enough in the more difficult labs to offer help to everybody'], ['Have more monitors in labs'], ['The labs should have more assistants as a simple problem can take up to 15minutes to be answered']	7		
		(iv) Working tools (computers)	1. More computers at the labs (5.1)	1		
Couse design	This category is applied to suggestions regarding the curriculum design and organisation of lectures and labs	(i) Organisation of lectures and labs	1. Theoretical and practical lectures ['To do similar examples to the practical assignments during the lectures, rather than just the theory']	1	2	
		(ii) Curriculum design	1. Revision of the course contents (13.1), different programming language (13) ['Stop teaching Java! Try a real language like C++']	1		

Figure 5: Frequency of each indicator in the category 'teaching practice (University of Strathclyde)



Legend: A: Dynamic and interactive classes; B: more motivating exercises, related to the daily life context and more examples in lectures for a better understanding of the theory; C: more support for students who come from secondary education with lower skills on programming; D: different approach for delivering the course contents and more motivating classes; E: Fewer contents in lectures and labs and more time to understand the theoretical concepts; F: better explanation of the programming language; G: continuous evaluation.

Figure 6: Frequency of each indicator in the category 'university resources' (University of Strathclyde)



Legend: A: more time allocated for labs; B: organisation of tutorials; C: rotation of lecturers; D: more computers at the labs.

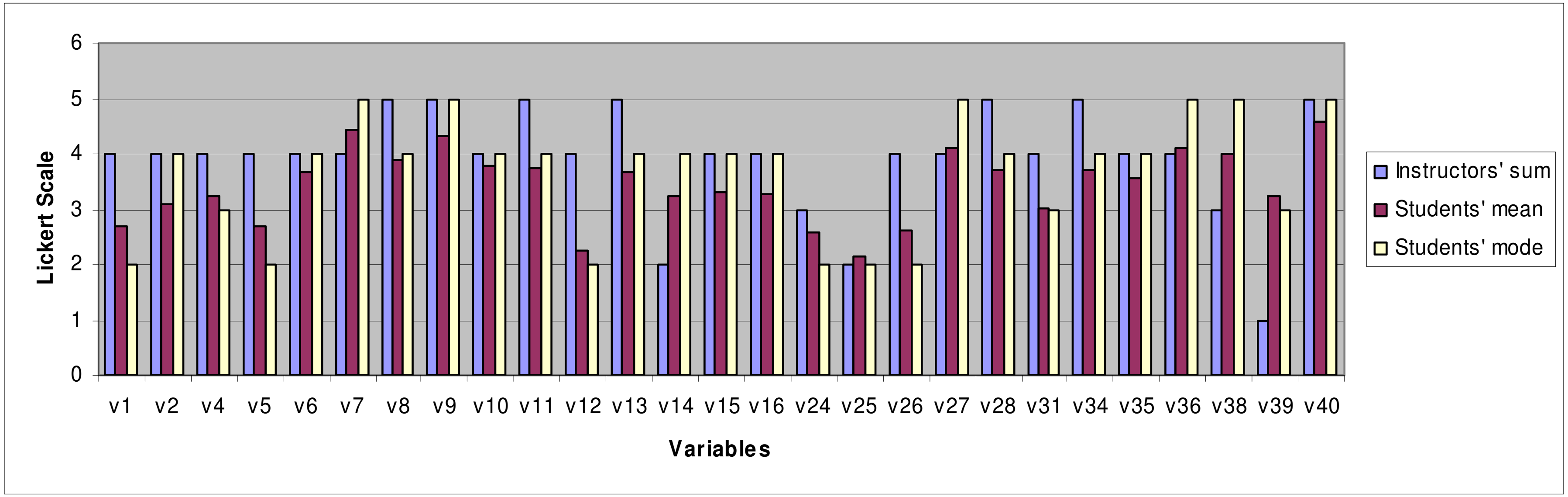
2.6 Academics reactions to the questionnaire results

Similar to what have happened at the University of Aveiro, the lecturer at the University of Strathclyde was informed about the students' perceptions of his teaching best practices, expectations and organisation of the course. This feedback relates to the findings of the $PCEQ_4$ (2002). In addition, the data were then compared with academics own perceptions of teaching best practices (Figure 7, Appendix nr.8). Students and academics perceptions are similar in what regards language clarity (v6), enthusiasm for the subject (v9) and lecturer as a good communicator. Students perceived the other variables of factor 1 lower than the lecturer who was more confident in motivating the students' interest (v1) or in using examples that motivate the students' curiosity to the subject (v5).

In what concern the factor 4 ('expectations') students and academics agree on the rate of content delivery (v15) and on the understanding of what have been learned (v16). Students seem to be more confidant than lecturers regarding the success in the class (v14). The same does not happen on the importance of the course for the students' professional life (v13). The lecturer perceives the course as more important for the students' professional life. These findings were similar at the University of Aveiro.

Students and academics share the same opinion regarding the variable 35 ('I agree with the actual assessment for this class') and variable 40 ('practical work is an effective way to learn programming'). Students perceive that their performance in labs should be evaluated (v36) while academics are more reluctant. Students perceive that the objectives for the class are well defined (v27). Academics are also more reluctant on this issue. The same tendency occurs in variable 38 ('tutorials would be important to assist my learning'). In the other variables the lecturer perceives to be more positive than the students.

Figure 7: Descriptive analysis of the instructor's and students' perception of teaching effectiveness, expectations and organisation of the course (University of Strathclyde, 2002)



2.7 Data gathered from direct observation and documentary analysis

2.7.1 Design of the course

At the University of Strathclyde the labs run two hours per week. Students have one computer each per lab and the labs are not compulsory. The introductory programming course 'Programming Foundations' is compulsory for five course cohorts. In addition, this class is available as an elective for other science-based courses. Session 2002/2003 saw 283 students enrolled in this programming class, from which 265 attended the labs and submitted class exercises. Here, staff deployment amounted to one lecturer to deliver the lectures, numerous monitors and one lecturer to manage the labs. Lab monitors are PhD and undergraduate students from later years.

2.7.2 Model of teaching strategies in lectures and labs

At Strathclyde the labs are not viewed as the place for theoretical exposition of course content, rather they provide an opportunity to practice and provide help in the resolution of the exercises. Students come to the lab and have to do a required number of exercises to get a grade. A lecturer marks completed exercises whereupon the students may leave the lab. At the outset of the course, the lecturers allowed students to finish the exercise by the day after their practical time. This leeway was removed because students were clearly taking advantage of the extra time. In consequence, practical submission deadlines stopped being so flexible.

At the University of Strathclyde the labs are supervised by lecturers and monitors. Thus, in 2002 academia agreed that academic staff should no longer be timetabled to supervise labs and the responsibility should be passed to postgraduate students. This change was brought about partly by the fact that the department had enough postgraduates to cover the course, and partly to give academic staff more flexibility with their time (primarily to generate grant income - which is an absolute necessity for the department to survive).

Furthermore, academic staff still has the responsibility for ensuring that students can deal with the work set. The postgraduates will deal with immediate problems, but other more significant ones will have to be dealt with by the lecturing staff. They can choose to do this in any way - running a helpdesk, having office hours, a newsgroup, email, or even turning up to labs - it is entirely up to the individual.

This measure implied more training of postgraduates, both generally and for specific classes. Exercises and sample solutions would have to be made available well in advance, and if any marking is to take place in the labs then clear and unambiguous marking schemes need to be issued. Staff have to make it clear to students how they intend to deal with questions.

2.7.3 Individual versus collaborative work

At Strathclyde the reality is quite contrary compared to Aveiro. Academics have been employed individual practical work for several years but have now decided to try 'pair work', aiming to create cooperative work between the students.

Academics believe that working in pairs is a technique of cooperative learning that can be very positive to develop the necessary skills for students entering working life. In the words of one Strathclyde student: '*practical test for pair work would assess group working skills that would give a little insight into how, as engineers we would have to work in teams to come up with a solution to a given problem quickly and under pressure*'. Problem based learning is here combined with a collaborative work to a better development of the students' skills.

2.7.4 Students' attention at the lectures

We observed some of the lectures and concluded that students who sat on the lasts rows of the room had a tendency to leave the class 30/35 minutes after it has started. Other students would play games on the cellular phone or would talk to their colleagues. Some authors suggest that most learners can stay focused on a lecture for only 15 to 20 minutes at a time and attention seems to decrease as the class goes on (Johnstone & Percival, 1976; Middendorf & Kalish, 1996). The reasons for such behaviour can be explain in many different ways. Indeed, the amount of information delivered in each class, the examples used to explain a theoretical concept, the enthusiasm of the lecturer for the subject, the interaction between lecturers and students, and the interest or motivation of students for the course, can contribute for a higher level of attention in the class.

3. Summary

Findings at the University of Aveiro suggest that academics in general feel frustrated for the amount of work expected in teaching and research, and for the low students' rates and interest in the course. These factors can inhibit academics in developing innovative teaching approaches. In addition, the no recognition of teaching best practices for the career progression leads some of these staff members to feel disappointed as teachers.

If the institutional policies can contribute for staff dissatisfaction, students can sometimes contribute for this overall dissatisfaction as well. Indeed, academics denote a strong disappointment with students. For example, most of the suggestions pointed out by academics to keep the student attention and attendance at lectures would imply, apart from a different organisation of labs and lectures, the existence of penalties for continuous student retention, and the existence of compulsory lectures. These institutional measures would definitely make the students attend the lectures and to become more responsible learners.

In spite of this general disappointment, there is a strong interest to discuss teaching and institutional strategies in order to invert the process.

The suggestions for teaching the class match some of the strategies used at the labs in the University of Strathclyde, namely the use of one computer per student, different assignments allocated for each week and the concept that the labs are place to practice the exercises with the support of monitors.

Findings from the University of Strathclyde did not point towards unmotivated academics. The reasons for such behaviour were not deeply addressed in the interviews. Nevertheless, the differences between the satisfaction of academics can be explained through a different educational and cultural system. The student autonomy at Strathclyde (e.g. not compulsory labs, exercises divided by tasks), the actual law of Higher Education fees in the UK (e.g. payment of the studies after getting the first job), the pedagogical support for new members of staff (e.g. professional training modules at Strathclyde for new staff members), and the recognition of teaching by academia (especially by the peers), can easily make the difference between academics' satisfaction for teaching at Strathclyde and the unmotivated academics at the University of Aveiro.

Academics and monitors at Strathclyde understand the importance of teaching best practices for the student motivation and academic success. The factors contributing for the student success are equally related to the pedagogical approach and the student intrinsic motivation for learning.

In what regards the strategies for keeping the students' attention and attendance at lectures, academics pointed out pedagogical issues. No mentions were made regarding institutional measures.

In what concerns the most effective processes for rewarding and ensuring quality teaching, academics in both institutions perceived the different processes as positive for improving teaching quality. We stated a widespread dissatisfaction with the current criteria for promotion. Academics seemed to feel frustrated with continuing reliance on research and publication as the primary criteria for promotion. Teachers believed on a rigorous assessment of teaching and on its relevance for their academic promotion. A systemic evaluation of teaching practice either developed by peers, students or external audits would certainly make a move towards a better effort in teaching quality.

Furthermore, students' suggestions for course teaching in both universities pointed out towards more motivating exercises, different teaching approaches and motivating classes, fewer contents in lectures and labs, more time allocated for labs, and rotation of lecturers.

Students at Aveiro suggested more dynamic and interactive classes (referred 32 times in the text), while this indicator was mentioned just one time at Strathclyde. These findings may suggest that lectures at Strathclyde are more dynamic and interactive.

CHAPTER 5 – QUANTITATIVE STUDY

1. Introduction

The qualitative study is divided in five constructs. Three of these constructs were applied at the University of Aveiro (constructs 1, 2 and 3; Appendices nr. 2, 3 and 4) and two at the University of Strathclyde (constructs 4 and 5; Appendices nr. 5 and 6). The construct 5 was not used in the thesis due to the reduced number of the sample[20].

2. Sample

2.1 University of Aveiro – Sample of construct 1

The questionnaire was delivered to 492 freshman students of science and engineering drawn from a total of 1619 registered students in the 2000/01 academic year. The respondents were recruited from 19 courses, 216 were women and 276 were men. The average age of participants was 19.27, S.D.=2.62.

[20] The sample of this construct was 61. According to Bryman & Cramer (1999) the factor analysis is valid if extracted from a sample with more than 100 subjects.

Table 43: Number of students per course (construct 1)

	Frequency	Percent	Valid Percent	Cumulative Percent

Table 44: Number of students per course (construct 2)

		Frequency	Percent	Valid Percent	Cumulative Percent
Courses	MATHS	27	7,8	7,8	7,8
	MAC	34	9,8	9,8	17,6
	ETE	94	27,2	27,2	44,8
	CTE	44	12,7	12,7	57,5
	EI	17	4,9	4,9	62,4
	CE	29	8,4	8,4	70,8
	MECE	3	,9	,9	71,7
	PHY/CHE	10	2,9	2,9	74,6
	EE	19	5,5	5,5	80,1
	CHEE	10	2,9	2,9	82,9
	PYS/MET	5	1,4	1,4	84,4
	BIOCHE	17	4,9	4,9	89,3
	IME	8	2,3	2,3	91,6
	PHSE	21	6,1	6,1	97,7
	ANA/CHE	6	1,7	1,7	99,4
	CHE	2	,6	,6	100,0
	Total	346	100,0	100,0	

Legend: Maths: Mathematics teacher training; MAC: Mathematic Applied to Computing; ETE: Electronics and Telecommunication Engineering; CTE: Computers and Telematics Engineering; EI: Electronics and Informatics Teacher Training; CE: Civil Engineering; MECE: Mechanical Engineering; PHY/CHE: Physics and Chemistry Teacher Training; EE: Environmental Engineering; CHEE: Chemistry Engineering; PYS/MET: Physics/Meteorology; BIOCHE: Biochemistry and Food Chemistry; ICHEM: Industrial Chemistry and Management; Physics Engineering; CHE: Analytic Chemistry; CHE: Chemistry;

2.3 University of Aveiro - Sample of construct 3

The questionnaire was delivered to 315 freshman students of the introductory programming course ‘Programming I’ out of a total of 484 registered students in the 2003/04 academic year. The respondents were recruited from 6 courses (Table 45), 246 were males and 68 were females (Tables 46 and 47). The average age of participants was 19.59, S.D.=2.67.

Table 45: Number of students per course (construct 3)

		Frequency	Percent	Valid Percent	Cumulative Percent
Course	ETE	112	35,6	35,6	35,6
	MAC	21	6,7	6,7	42,2
	CTE	65	20,6	20,6	62,9
	Maths	22	7,0	7,0	69,8
	E/I	21	6,7	6,7	76,5
	IME	74	23,5	23,5	100,0
	Total	315	100,0	100,0	

Legend: ETE: Electronics and Telecommunication Engineering; MAC: Mathematic Applied to Computing; CTE: Computers and Telematics Engineering; Maths: Mathematics (teaching training); E/I: Electronics and Informatics (teaching training) and IME: Industrial and Management Engineering.

Table 46: Distribution of the sample according to the gender and age in clusters (construct 3)

			age in clusters				Total
			17 to 19	20 to 22	23 to 25	higher or equal to 26	
gender	**female**	Count	42	17	7	2	68
		% of Total	13,3%	5,4%	2,2%	0,6%	21,7%
	male	Count	160	67	15	5	246
		% of Total	50,8%	21,3%	4,8%	1,6%	78,4%
Total		Count	202	84	22	7	315
		% of Total	64,1%	26,7%	7,0%	2,2%	100,0%

Table 47: Distribution of the sample according to the gender and course (construct 3)

			course						Total
			ETE	MAC	CTE	Maths	E/I	IAE	
gender	female	Count	9	8	10	19	0	22	68
		% of Total	2,9%	2,5%	3,2%	6,0%	,0%	7,0%	21,6%
	male	Count	103	13	55	3	21	52	247
		% of Total	32,7%	4,1%	17,5%	1,0%	6,7%	16,5%	78,4%
Total		Count	112	21	65	22	21	74	315
		% of Total	35,6%	6,7%	20,6%	7,0%	6,7%	23,5%	100,0%

2.4 University of Strathclyde - Sample of construct 4

The present study involved a sample of 101 first-year students from the introductory programming course ‘Programming Foundations’ drawn from a total of 283 registered students in the 2001/02 academic year. The respondents were recruited from eight undergraduate courses (Table 48), 17 were women and 84 were men (Table 49 and 50). The average age of participants was 18.63, S.D=2.23.

Table 48: Number of students per course (construct 4)

		Frequency	Percent	Valid Percent	Cumulative Percent
Courses	Computer science	45	44,6	46,4	46,4
	Mathematics and computer science	5	5,0	5,2	51,5
	Business information systems	2	2,0	2,1	53,6
	Computer electronic engineering	8	7,9	8,2	61,9
	Technology and business studies	23	22,8	23,7	85,6
	Mathematics, statistics and finance	2	2,0	2,1	87,6
	Physics	2	2,0	2,1	89,7
	Software engineering	10	9,9	10,3	100,0
	Total	97	96,0	100,0	
Missing	System	4	4,0		
Total		101	100,0		

Table 49: Distribution of the sample according to the gender and age in clusters (construct 4)

			age in clusters			Total
			17 to 18	19 to 20	higher than 20	
gender	female	Count	15	1	1	17
		% of Total	14,9%	1,0%	1,0%	16,8%
	male	Count	60	17	7	84
		% of Total	59,4%	16,8%	6,9%	83,2%
Total		Count	75	18	8	101
		% of Total	74,3%	17,8%	7,9%	100,0%

Table 50: Distribution of the sample according to the gender and course (construct 4)

			Courses								**Total**
			CS	MCS	BIS	CEE	TBS	MSF	physics	SE	
Gender	F	Count	3	3	2	1	4	0	0	4	17
		% of Total	3,1%	3,1%	2,1%	1,0%	4,1%	,0%	,0%	4,1%	17,5%
	M	Count	42	2	0	7	19	2	2	6	80
		% of Total	43,3 %	2,1%	,0%	7,2%	19,6%	2,1%	2,1%	6,2%	82,5%
Total		Count	45	5	2	8	23	2	2	10	97
		% of Total	46,4 %	5,2%	2,1%	8,2%	23,7%	2,1%	2,1%	10,3 %	100,0%

Legend: CS: Computer science; MCS: Mathematics and computer science; BIS: Business information systems; CEE: Computer electronic engineering; TBS: Technology and business studies; MSF: Mathematics, statistics and finance; SE: Software engineering

2.5 University of Strathclyde - Sample of construct 5

The present study involved a sample of 76 first-year students from the introductory programming course 'Programming Foundations' drawn from a total of 180 registered students in the 2003/04 academic year. The respondents were recruited from seven undergraduate courses (Table 51), 21 were women and 55 were men. The average age of participants was 18.37, S.D=2.84.

Table 51: Number of students per course (construct 5)

		Frequency	Percent	Valid Percent	Cumulative Percent
Course	computer science	36	47,4	47,4	47,4
	business information systems	3	3,9	3,9	51,3
	computer electronic eng.	1	1,3	1,3	52,6
	tbs technology and business studies	17	22,4	22,4	75,0
	physics	1	1,3	1,3	76,3
	software eng.	6	7,9	7,9	84,2
	computer, electronic systems	12	15,8	15,8	100,0
Total		76	100,0	100,0	

3. Psychometric measures applied in the constructs' development.

The Factors extraction and reliability of the instruments explained in this chapter were obtained from a consistent sample of 100 or more subjects with exception of construct 5 delivered in Strathclyde.

Before studying the validity of the instrument it was necessary to proceed to the analysis of the questionnaires' missing values. We eliminated the questionnaires that had more than 10 per cent of non respondent items (Bryman & Cramer, 1999) followed by the Expectation Maximisation (EM) Method to substitute the other missing values (Tabachnick & Fidell, 2001)[21]. To make the construct even more reliable we evaluated the statistical tendency of the respondents' answers to each item, namely the median, mode and standard-deviation (SD).

Furthermore, we proceeded to the analysis of the internal consistency of the constructs using the Pearson Correlation Coefficient to identify the correlation of the

[21] We used the SPSS command MVA (/EMTOLERANCE=0.001 CONVERGENCE=0.0001 ITERATIONS=25) to substitute the missing values, to 25 interactions and based in a normal distribution.

items with the scale. Some of the items were eliminated since to have a correlation lower than .30[22] with the total scale.

Before carrying the exploratory Factor analysis we looked for the KMO[23] (Kaiser-Meyer-Olkin Measure of Sampling Adequancy) and the Bartlett test of Sphericity followed by the analysis of the Anti-Image correlation matrix[24].

The next step was the use of a principal components, varimax rotation, Factor analysis of the responses to extract the Factors from the questionnaires. The study concerning the number of Factors followed the Kaiser criterion and the scree test of Cattel (1966), as well as the total variance explained. To complement the statistical analysis the items of each Factor were also analysed in terms of interpretation.

According to Kline (1994) a Factor loading of .30 for a sample of 100 subjects is enough to indicate that the loading is salient. It was adopted the following approach: to regard as salient loadings above .40. Items loading similar values in two or three Factors were removed from the analysis.

The reliability of each scale was measured using Cronbach's (1951) coefficient alpha to assess the internal consistency of responses for each of the questionnaires' scales. Nunnally & Bernstein (1994) suggests that a coefficient α based upon a sample of 300 or more subjects is rarely accepted as low as .60 and widely accepted as high as .80. In this study only the scales with a higher .70 coefficient α will be accepted for analysis.

The constructs were individually validated in the two institutions. The validations of the questionnaires represented two different instruments to be used in different educational settings. The constructs were submitted to exploratory factor analysis.

4. University of Aveiro: quantitative study overview

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[22] Bryman & Cramer (1999) suggest the criterion proposed by Cohen & Holliday (1982) regarding the evaluation of the coefficients of correlation, for which a correlation of 0.19 is very low and low between 0.20 and 0.30.

[23] Pestana & Gageiro (2000) agree on the following criterion for classifying the relation between the KMO indicator and Factor analysis reliability: <0,5, Factor analysis not acceptable; between 0,5 and 0,6, bad ; between 0,6 and 0,7, reasonable; between 0,7 and 0,8, very reasonable; between 0,8 and 0,9, good; between 0,9 and 1, very good indicator for proceeding the Factor analysis.

[24] The anti-image matrix is a measure of sampling adequacy (MSA) for the use of Factor analysis. Items with low values on the diagonal should be removed. Higher the values, better for the Factor analysis. The values outside the diagonal represent the matrix symmetric of the correlations which should be low to the use of the Principal Component Analysis (Pestana & Gageiro, 2000).

The constructs used in the study provided survey data on first-year students' perceptions of their experience in introductory programming courses at the University of Aveiro. This section presents the research questions addressed in each exploratory study, as well as the validity and reliability of the constructs.

Furthermore, for each exploratory study we present the research questions, the validity and reliability of the constructs, as well as the data results. In addition, construct 3 presents the results of the descriptive analysis of the global scale as well as the five Factors. The hypotheses of the final study lead to a more complex statistical analysis.

4.1 Construct 1: 'Teaching Practice and Academic Success Questionnaire'

The construct 'Teaching Practice and Academic Success Questionnaire' (TPASQ) (Appendix nr.2) aimed to explore the students' perceptions of best teaching practices, learning approaches, expectations and motivation for a first-year introductory programming course in 2001.

In addition, this exploratory study also intended to verify some correlations between variables. First, if there was a correlation between the educational background of the parents and the expectations of the students for the course. Second, if the course enrolment, previous background in Programming, attendance at lectures and motivation for the course influenced the students' expectations for the course. Third, if individual lecturers had a differing influence on the students' perception of teaching effectiveness.

We were also interested to collect the students' opinions regarding their attendance at lectures and motivation for the course. The same concern was also expressed by the coordinator of the course. He was curious to know if students attending lectures more frequently would feel more confident to achieve success at the course or if students' motivation was a product of intrinsic or external factors, such as the teacher pedagogical expertise. The coordinator of the course believed students would not come to lectures frequently because they did not feel motivated for learning. The reasons behind students' attendance would be connected to a high intrinsic motivation for the course. Therefore, one of the questions addressed in the questionnaire was to know the reasons that might lead to students' absence in lectures.

4.1.1 Generation of initial pool of items of the construct TPASQ

The TPASQ was based on some items of the 'Course Experience Questionnaire' (Ramsden, 1991) and the 'Students' Evaluations of Educational Quality' (Marsh, 1987). The empirical basis of the instrument lies on the premise that: (i) students' perception of teaching is associated with the quality of student learning (Ramsden & Entwistle, 1981; Ramsden, 1991), (ii) there are real differences in teaching quality and that these variations can be measured (Ramsden, 1991), (iii) different learning approaches can influence the students' academic success (Entwistle & Ramsden, 1983), and (iv) students' confidence in achieving success can determine their self-esteem and consequently their success at the course (Deci & Ryan, 1985).

The items developed by Ramsden (1991) were reformulated and others translated from the original. Nevertheless, most of the items were adapted to the Portuguese context and followed the lecturers' suggestions.

The TPASQ was composed by a Likert scale, two close questions, two multiple questions and an open-ended question. The summated rating scale was composed by 26 items. Respondents used a 5-point scale, on which a '1' represented 'strongly disagree' and a '5' represented 'strongly agree'.

The 26 items of the Likert type scale measured the students' perception of the teaching effectiveness and their learning approaches.

The two closed questions ('yes' and 'no' response) looked for answers related to the students' attendance at lectures and motivation for the course. In case the answer for the first closed question turned to be negative ('I don't go to the lecturers frequently') students were guided to a set of multiple-choice questions. In case the answer for the second closed question turned to be positive ('I feel motivated for the course'), students had to choose an answer from a set of multiple questions.

An open-ended question at the end of the questionnaire aimed to gather information regarding suggestions for teaching the course (findings from the open-ended question were explored in Chapter 4).

4.1.2 Exploratory Validity of the construct

An internal consistency analysis showed a coefficient α of .83 for the 26-item scale. To achieve a higher internal consistency 5 variables were removed which contributed to a coefficient α of .86 (Table 52).

Table 52: Item-scale correlation and coefficient α value if items are deleted (construct 1)

Code	Items	Correlation Item-scale	coefficient α if item deleted
	Items eliminated in the first analysis		
V12	Lecturers should have teaching training.	.101	.833
V15	To succeed at this subject I need to have a good memory.	.130	.831
V17	It is possible to succeed at this subject by just studying some weeks before the exam.	.063	.834
V19	I frequently memorise concepts without really understanding them.	-.160	.840
V22	I do not like to memorise because I forget things easily.	.179	.830
Scale Alpha total = .86			

A principal –components, varimax rotation, Factor analysis of the responses (N=492) to the 21 variables resulted in a scree plot of eigenvalues forced to four Factors from the initial 5 Factors (Table 53). The variables of the scales accounted for cumulative percentage variance of 50 per cent.

The extracted Factors were related with the following dimensions (Table 54): teaching effectiveness (10 items, Cronbach alpha =.87) and students' expectations for the course (4 items, coefficient α =.74). The third and fourth Factors were not relevant for analysis since the number of items was not enough to constitute a Factor. The first principal Factor explained 21 per cent of the variance and the second Factor explained 11 per cent.

The theoretical relevance of Factor 1 for the study purpose led us to select these 10 items in constructs 3, 4 and 5. The scale 'teaching effectiveness' comprises items such as clarity of explanation, enthusiasm, help with study problems, clear goals and motivation. The scale 'expectations' comprises items such as relevance of the course for the students' future work and level of confidence to succeed at the course. This scale was used in constructs 2, 3, 4 and 5.

Table 53: Factor analysis and communalities (h^2) (construct 1)

Code	Items	F1	F2	F3	F4	h^2
V1	Instructor's style of presentation motivates my interest during classes (adapted from Marsh, 1982)	,735	,186	,173	,105	,616
V2	We are encouraged to participate in class discussions (adapted from Marsh, 1982)	,686	,108	,062	,017	,487
V3	The instructor asks questions to the students individually.	,386	,080	-,056	-,045	,161
V4	The instructor motivates me to ask questions and expose my doubts.	,788	-,026	,153	,021	,645
V5	The instructor uses examples that motivate my curiosity on the subject.	,712	,225	,178	-,020	,590
V6	The language used by the instructor is clear and objective.	,598	,266	,073	,138	,452
V7	The instructor defines the objectives for each lesson.	,458	-,019	,277	,278	,365
V8	The instructor is accessible to answer questions.	,648	-,083	,109	,198	,478
V9	The instructor is dynamic and enthusiastic in conducting the course. (adapted from Marsh, 1982)	,768	,004	,128	,191	,643
V10	A good instructor is a good communicator.	,215	-,071	,011	,763	,634
V11	The teaching methods used by the instructor are important for my academic success.	,074	,140	,169	,784	,667
V13	The instructor prepares the classes having in mind we do not have too much knowledge on the subject.	,444	,398	-,155	,287	,462
V14	The instructor gives me feedback on my progress.	,561	,327	-,066	,200	,466
V16	I have enough time to understand what I have learned	,208	,688	,028	,190	,554
V18	I feel that the subject contents are important to my future career	-,025	,688	,309	-,112	,582
V20	Before solving an exercise I first think in the best strategy to solve it.	,108	,192	,705	,046	,547
V21	To better understand a concept I try to relate it with a real example where I can apply it.	,124	,105	,715	,014	,538
V23	When studying for this subject I solve at least 2 exercises	,000	,078	,635	,164	,436
V24	I find the course intellectually challenging and stimulating (adapted from Marsh, 1982)	,169	,662	,364	-,003	,599
V25	I feel confident I will succeed in this subject.	,140	,629	,380	-,050	,562
V26	I listen and pay attention when attending the lectures.	,093	,162	,397	-,010	,192

Table 54: Internal consistency reliability (construct 1)

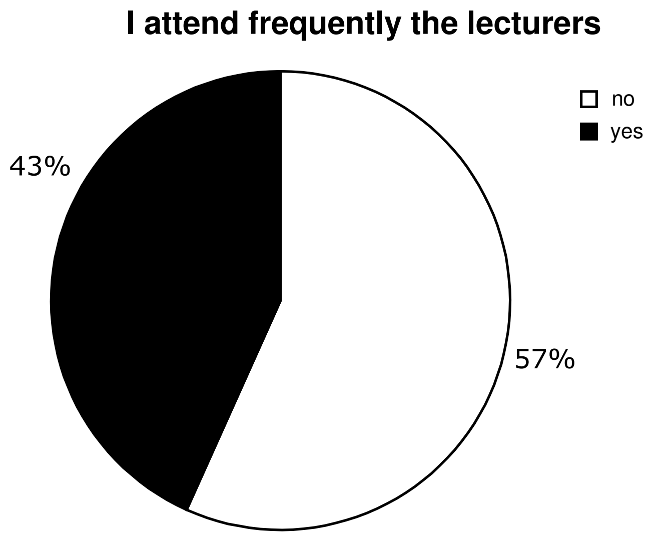
Factors		Number of items	Code	Cronbach's alpha
Factor 1	Teaching effectiveness	10	1, 2, 4, 5, 6, 7, 8, 9, 13,14	.87
Factor 2	Expectations	4	16, 18, 24, 25	.75

4.1.3 Data results

4.1.3.1 Students' attendance at lectures and students' motivation for the course (descriptive analysis)

57 per cent of the students did not attend lectures frequently. Just 43 per cent admitted to go to lectures in a more regular basis (figure 8).

Figure 8: Students' attendance at lectures (construct 1)



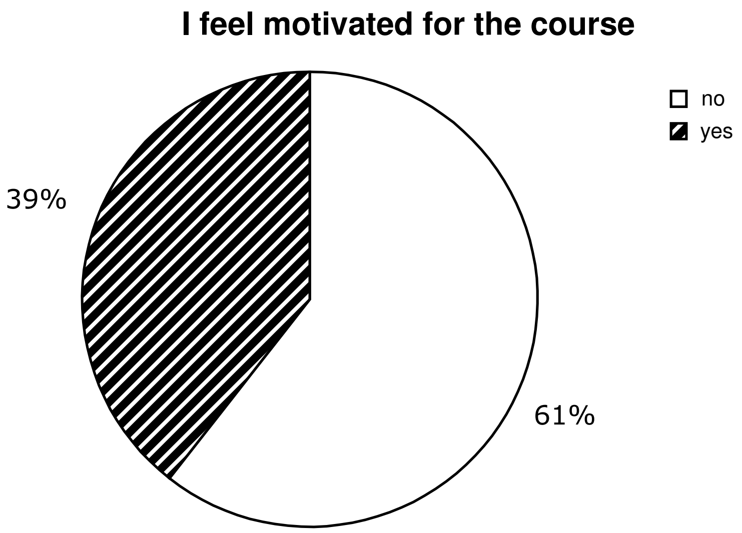
Furthermore, students were asked about the reasons for not attending the lectures (Table 55). The strongest indicator was related to the lecturer. Indeed, 45 per cent of the students admitted not to attend the lectures because lecturers did not motivate their interest for the subject. The second indicator was related to the students' learning autonomy. 35 per cent of the students preferred to look for information in the books (rather than listening to the lecturer). The third indicator was related to the students' intrinsic motivation for the course. 13 per cent of the students admitted not to feel interested for the course al all. The lowest indicator was related to the preferences of students for attending private classes (13 per cent).

Table 55: Students' reasons for not attending the lectures (construct 1)

		Frequency	Valid Percent	Cumulative Percent
Valid	no interest for the course	37	13,3	13,3
	prefer to attend private classes	19	6,8	20,1
	the lecturer does not motivate my interest in the subject	124	44,6	64,7
	prefer to use the books for study	98	35,3	100,0
	Total	278	100,0	
Missing	System	214		
Total		492		

In addition, students were asked if they feel motivated for the course. 61 per cent admitted to feel motivated and 39 per cent not motivated for the course (Figure 9).

Figure 9: Students' motivation for the course (construct 1)



The strongest indicator that explained the students' motivation for the course was related to the Factor of satisfaction (Table 56). Indeed, 51 per cent of the students admitted to feel motivated because they enjoyed the course. The second indicator was related to the necessity to succeed at the course (36 per cent). The lowest indicators were related to the students' needs to be known by the lecturer and because they enjoyed to listen the lecturer's explanations (13 per cent).

Table 56: Students' reasons for feeling motivated for the course (construct 1)

		Frequency	Valid Percent	Cumulative Percent
Valid	I enjoy the course	98	51,3	51,3
	To be succeed at the course	68	35,6	86,9
	To be known by the lecturer	1	,5	87,4
	I enjoy to listen the lecturer's explanations	24	12,6	100,0
	Total	191	100,0	
Missing	System	301		
Total		492		

4.1.3.2 Analysis of the influence of some socio-demographic variables in the students' perception of the TPASQ

This section explores the differences on the students' expectations (Factor 2) according to the socio-demographic variables 'prior programming experience' and 'course'.

4.1.3.2.1 Prior programming experience

To examine if there were significant differences between the students' previous background in Programming regarding their expectations for the course, One-Way analysis of variance (ANOVA) was employed.

The results indicated that there was no significant differences between the students' previous background in Programming in Factor 2 [df (1,485), $F = .26$; $p=0.61$).

4.1.3.2.2 Course

In what concern the mean differences of students' course enrolment in Factor 2, the results determined statistically significant differences [df (18,347), F= 14; p<0.001] Furthermore, the one-way ANOVA post-hoc multiple comparison results (TUKEY HSD) (Table 57) determined that students' enrolment in courses such as Electronics and Telecommunication, and Computers and Telematics Engineering perceived to have higher expectations than students who were enrolled in courses such as Chemistry, Industrial and Management Engineering, Biology, Civil Engineering, Chemistry and Bio-chemistry, Industrial Chemistry and Management, Analytic Chemistry, Planning and Tourism Management, Biology and Geology (Teaching), and Mathematics (teaching). Students from Computers and Telematics Engineering had higher expectations than students from Mathematic Applied to Computing and Geological Engineering. Students from Physics perceived to have higher expectations than students from Industrial Chemistry and Management, and Analytic Chemistry.

Table 57: Differences between the means of Factor 2 related to the course: multiple comparisons test (construct 1)

	Courses																		
	1 (24)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Courses	**Mean differences**																		
	Factor 2: expectations																		
1	-	-0.35	-0.23	-0.04	-1.18*	-0.05	-0.38	-0.29	0.30	0.10	-0.71*	-0.60	-0.21	-1.45*	-1.01	0.05	-0.19	0.09	-0.55
2	-	-	0.13	0.31	-0.82*	0.31	-0.03	0.06	0.65	0.46	-0.36	-0.24	0.15	-1.09*	-0.66	0.40	0.17	0.45	-0.20
3	-	-	-	0.19	-0.95*	0.18	-0.16	-0.06	0.52	0.32	-0.48	-0.37	0.01	-1.23*	-0.79	0.27	0.03	0.32	-0.33
4	-	-	-	-	-1.14*	-0.005	-.034	-0.25	0.34	0.14	-0.67	-0.56	-0.17	-1.41*	-0.97	0.08	-1.15	0.14	-0.51
5	-	-	-	-	-	1.13	0.79*	0.88*	1.47*	1.28*	0.47	0.58	0.97*	-0.27	0.16	1.23*	0.99*	1.28	0.62
6	-	-	-	-	-	-	-0.34	-0.25	0.34	0.15	-0.66	-0.55	-0.16	-1.41	-0.97	0.09	-0.14	0.14	-0.51
7	-	-	-	-	-	-	-	0.09	0.69	0.49	-0.32	-0.21	0.18	-1.06*	-0.63	0.43	0.20	0.49	-0.17
8	-	-	-	-	-	-	-	-	0.59	0.40	-0.42	-0.30	0.08	-1.16*	-0.72	0.34	0.11	0.39	-0.26
9	-	-	-	-	-	-	-	-	-	-0.19	-1.00*	-0.89	-0.50	-1.75*	-1.31*	-0.25	-0.48	0.20	-0.85
10	-	-	-	-	-	-	-	-	-	-	-0.81*	-0.70	-0.31	-1.55*	-1.12*	-0.6	-0.29	0.00	-0.66
11	-	-	-	-	-	-	-	-	-	-	-	0.11	0.50	-0.74*	-0.30	0.75	0.52	0.80	0.15
12	-	-	-	-	-	-	-	-	-	-	-	-	0.39	-0.86	-0.42	0.64	0.41	0.69	0.04
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-1.24*	-0.80	0.25	0.02	0.30	-0.35
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.44	1.50*	1.26*	1.55	0.90
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.06	0.83	1.11	0.46
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.24	0.05	-0.60
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	-0.37
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.65
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend: 1- EE: Environment Engineering; 2- CH: chemistry; 3- IME: Industrial and Management Engineering; 4- BIO: Biology; 5- ETE: Electronics and Telecommunication Engineering; 6- PSH/Q: Physics and Chemistry (teaching); 7- CE: Civil Engineering; 8- CB: Chemistry and Bio-chemistry; 9- ICM: Industrial Chemistry and Management; 10- QA: Analytic Chemistry; 11- MAC: Mathematic Applied to Computing; 12- ME: Mechanical Engineering; 13- PTM: Planning and Tourism Management; 14- CTE: Computers and Telematics Engineering; 15- PYS: Physics; 16- BIO/G: Biology and Geology (Teaching); 17- Maths: Mathematics (teaching); 18- GE: Geological engineering; 19- CGE: Ceramics and Glass Engineering.

* Pearson correlation is significant at the 0.05 level (2-tailed)

4.1.4 Hypotheses and results

4.1.4.1 Hypothesis 1

Hypothesis 1 holds that parents' educational background could predict the students' expectations for the course. The co-ordinator of the course believed that the educational background of the parents might be a key determinant for the students' expectations. Through the multiple regression analysis it was established the relations between the variables[25]. Furthermore, we considered the students' expectations (Factor 2) as the criterion variable and the educational background of the mother and father as predictor variables.

The educational background of the parents explained 1.5 per cent of the variability in this criterion, [coefficient of multiple determination R^2 = .015; coefficient of multiple regression r = .124; F (2, 466) = 3.64, p= .027] magnitude considered low, based on the conventional values of interpretation of these measures (Cohen, 1988). The analysis related to the contribution of each predictor to the total variability indicated that the results were no statistically significant related to both the educational background of the students' father and mother [we obtained a standard regression coefficients of .111 and .016 for the educational background of the father and mother, p=.113, and p=.820, respectively].

4.1.4.2 Hypothesis 2

Hypothesis 2 holds that there are significant differences between students' attendance at lectures and motivation for the course regarding their expectations for the course.

To examine if there were significant differences we employed One-Way analyses of variance (ANOVA).

[25] Nevertheless, it is important to mention that this method of analysis does not allow establishing a relation of causality between variables but just allowing inferring that causality.

There were significant differences between the students' attendance at lectures and expectations for the course [df (1,490), F= 14; p<0.001). Indeed, students attending more frequently the lectures had higher expectations for the course than students who did not attend lectures frequently (Table 58).

Table 58: Mean item scores and standard deviations for Factor 2 analysed by students' attendance at lectures (construct 1)

	Students' attendance at lectures						
	yes (n = 213)		No (n = 279)		Total (N = 492)		
	M	SD	M	SD	M	SD	F(1, 490)
Factor 2: Attendance at lectures	2.69	0.87	2.40	0.80	2.52	0.84	14.43

* Pearson correlation is significant at the 0.05 level (2-tailed)

There were also significant differences between the students' motivation in Factor 2 [df (1,490), F= 297; p<0.001]. Indeed, students who felt more motivated for the course had higher expectations than the unmotivated ones (Table 59).

Table 59: Mean item scores and standard deviations for Factor 2 analysed by students' motivation for the course (construct 1)

	Students' motivation for the course						
	yes (n = 213)		No (n = 279)		Total (N = 492)		
	M	SD	M	SD	M	SD	F(1, 490)
Factor 2: Attendance at lectures	3.16	0.73	2.11	0.62	2.52	0.84	297,064

4.1.4.3 Hypothesis 3

Hypothesis 3 holds that academics influenced differently the students' perception of teaching effectiveness. To test this hypothesis we employed the One-Way analysis of variance (ANOVA). The results indicated significant differences between the lecturers and students' perception of their teaching practice [$F (19, 472) = 11, 438$, $p < 0.001$].

4.1.5 Limitations of the construct 1

This construct revealed to be insufficient to measure what was planned for, especially in what concerns the students' learning approaches.

The closed and multiple-choice questions demonstrated not to be the most appropriate one. The fact of having some control over the responses restricted the information that was been looking for.

The findings need to be interpreted with limitations, since this construct is limitative in terms of reliability.

4.1.6 Summary

Findings suggested a higher percentage of students who did not attend lectures frequently because the lecturer did not motivate their interest in the course. In addition, data indicated that best teaching practice influenced the students' expectations for the course and that students would perceive more positively or more negatively the effectiveness of teaching according to different lecturers. These findings can predict, in a way, why some lecturers would have more students in a class than other colleagues.

Data pointed out that the multiplicity of courses attending the PDSA (Programming, Data Structured and Algorithms) course implied different students' expectations for the course. Indeed, students from courses such as Electronics and Telecommunication or Computers and Telematics Engineering perceived to have higher expectations than students who were enrolled in courses such as Chemistry or Industrial and Management Engineering. These findings corroborate the findings collected in the open ended question. Students' suggestions at the end of the questionnaire pointed out to the needs of a curriculum redesign. Indeed, the PDSA course did not seem appropriate to the different first-year courses of science and engineering at the University of Aveiro.

4.2 Construct 2: 'Programming Course Experience Questionnaire'

Construct 2 ($PCEQ_2$[26]) (Appendix nr.3) was primarily designed to validate a scale to be used in further studies. The validation of the construct and the exploratory Factor analyses, contributed for the reliability of the scales to be used in construct 3.

On the other hand, the analyses of some items of the construct were used to better understand the redesign of the course 'Programming, Data Structure and Algorithm' and its implication for the students' academic achievement and motivation for the subject. The $PCEQ_2$ was delivered to a group of students attending three introductory programming courses: 'Introduction to Programming in C', 'Introduction to Programming in Fortran' and 'Programming 1' (N=346).

The specific concern of one member of staff who taught the course 'Introduction to Programming in C' (IPC) lead us to work with a sample of students from this course (N=53). The data analysed in this case study were based on the results of three items of the $PCEQ_1$ (2001/02) and the TPASQ (2000/01), and also through the analysis of the students' assessment scores. The students enrolled in the survey were from the area of Chemistry (Biochemistry and Food Chemistry, Industrial Chemistry and Management, Analytic Chemistry, and Chemistry) and Physics (Physics Engineering). The sample was constituted by 74 students out of a total of 204 (total number of students enrolled in Chemistry and Physic courses) in 2000/01 and by 53 students out of a total of 101 in (2001/02).

This exploratory study intended to compare the academic achievement and motivation of students from the area of chemistry and physics engineering enrolled in IPC with previous results from students enrolled in PDSA.

The question we tried do address was to know if the curriculum transition influenced in any way the students' academic achievement and motivation for programming. Are the students from IPC more successful and motivated than their colleagues of previous years?

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[26] The PCEQ is a construct used in four settings: PCEQ2 – University of Aveiro (2001/02); PCEQ3 – University of Aveiro (2003/04); PCEQ4 – University of Strathclyde (2001/02); PCEQ5 – University of Strathclyde (2003/04). Each construct measures similar scales aiming to a better understanding of first-year students' experience at Introductory Programming courses.

In addition to this micro analysis, the study aimed to analyse a macro comparison of the students' level of confidence to achieve success at introductory programming courses and their passing rates.

4.2.1 Generation of initial pool of items of the construct 'Programming Course Experience Questionnaire' ($PCEQ_2$)

The $PCEQ_2$ was composed by a summated rating scale with 26 items. Respondents used a 5-point scale, on which a '1' represented 'strongly 'disagree' and a '5' represented 'strongly agree'.

4.2.2 Exploratory Validity of the instrument

An internal consistency analysis showed a coefficient α of .80 for the 25 scale. To achieve a higher internal consistency 6 items were removed which contributed to a .87 Cronbach's alpha (Table 60). A principal components, varimax rotation, Factor analysis of the responses of the 346 participants to the 19 items resulted in a scree plot of eigenvalues that showed five Factors (Table 61). The selected Factors accounted for cumulative percentage variance of .62 per cent.

Table 60: Item-scale correlation and coefficient α value if items are deleted (construct 2)

Code	Items	Correlation Item-scale	coefficient α if item deleted
	Items eliminated in the first analysis		
V4	It is possible to succeed in this subject by studying some weeks before the exam.	-,076	,823
V17	The subject content is difficult.	-,078	,821
V19	The time spending at labs is excessive.	-,076	,824
Scale Alpha total = .84			
	Items eliminated in the second analysis		
V23	The continuous evaluation at the labs inhibits my learning.	-,031	,856
V24	I agree with 20 per cent for the continuous evaluation.	,113	,853
V25	The evaluation in this subject should be divided by one final exam and two practical exercises.	,112	,854
Scale Alpha total = .87			

Table 61: Factor analysis and communalities (h^2) (construct 2)

Code	Items	F1	F2	F3	F4	h^2
v1	I feel that the subject contents are important to my future career.	,189	,820	,076	-,128	,730
v2	I feel confident I will be succeeded on this subject.	-,145	,651	,119	,146	,480
v3	I find the course intellectually challenging and stimulating (adapted from Marsh, 1982)	,157	,668	,273	,120	,560
v5	I go frequently to the lectures	,845	,081	,015	,033	,722
v6	I go to the lectures because I like to hear the instructor's explanations.	,833	,082	,226	,083	,759
v7	I go the lectures to better understand the subject content.	,910	,064	,059	,021	,836
v8	I go to the lectures because the instructor motivates my interest in the subject.	,760	,079	,367	,092	,727
v9	I go to the lectures because the subject really interests me.	,715	,437	,159	-,045	,729
v10	I feel motivated because I need to finish my degree.	,107	,185	,385	-,239	,251
v11	I feel motivated because I like the teaching methods used by the instructor.	,195	,244	,794	,109	,740
v12	I feel motivated because the instructor gives helpful feedback on my work (adapted from Ramsden, 1991)	,222	,202	,807	,186	,776
v13	I feel motivated because the instructor provides feedback/solutions to my problems.	,089	,078	,830	,166	,731
v14	I feel motivated because the instructor uses examples that stimulate my interest in the subject.	,087	,338	,720	,138	,660
v15	The objectives for the class are well defined.	,122	,510	,292	,231	,414
v16	The course aims are relevant to my academic growth.	,195	,814	,193	,014	,739
v18	The exercises of the labs are interesting	,200	,465	,241	,304	,407
v20	The assessment evaluates what I have learned.	,099	,067	,152	,714	,547
v21	I agree with the actual assessment for this subject.	-,012	,048	,090	,818	,680
v22	Our performance in the labs should be evaluated.	,029	,132	,042	,628	,415

The first Factor (5 items, coefficient α =.90) represents the students' perception of attendance at lectures. This scale comprises items such as the frequency for attending lectures and the reasons leading for such attendance.

The second Factor (6 items, coefficient α =.81) represents the students' expectations for the course. This scale integrates two new items to the 'expectation' scale extracted in the first construct.

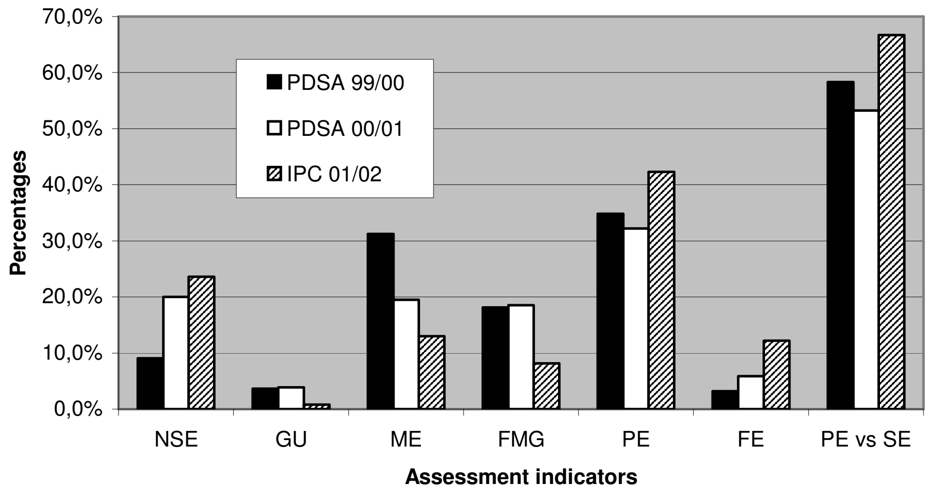
The third Factor (4 items, coefficient α =.87) represents the students' motivation for the course and comprises items related to the teacher. Furthermore, this scale measures the students' motivation regarding teaching methods in general, effective feedback, and interesting examples used by the lecturer.

The fifth Factor is not relevant for analysis since the number of items is not enough to constitute a Factor

4.2.3 Data results

Analysis of the student's final grades in the past 3 years showed a significant improvement of the students' academic achievement (figure 10).

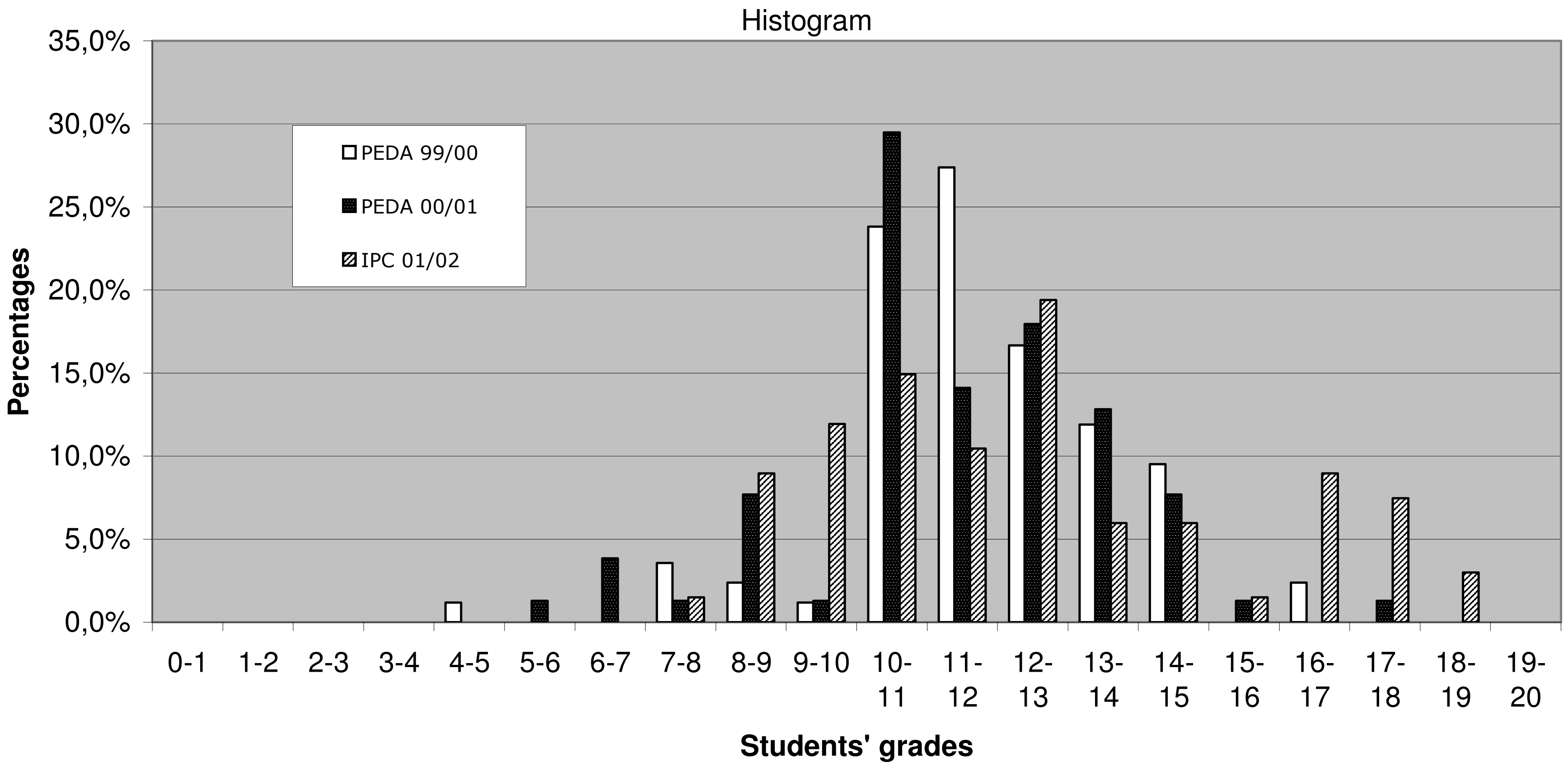
Figure 10: Distribution of students in the assessment (construct 2)



NSE – Not submitted to evaluation
GU – Give Up
ME – Miss at least one exam
FMG – Fail (no minimum grade to go to exam)
PE – Pass students
FE – Fail the exam
PE vs SE – Pass students vs Submitted to evaluation

The passing percentage was not only higher compared to previous years, but students also achieved higher grades (figure 11). The Portuguese system classification grades in Higher Education ranges from 0 to 20.

Figure 11: Percentage of students' grades in the last three years (construct 2)



The comparison of three items of the TPASQ carried out in 2000/01 with the same three items of the $PCEQ_2$ in 2001/02 contributed to better understand how different programming courses influenced the students' motivation for the course. A multivariate test of significance - Wilks' Lambda - was used to identify the connection of the different courses to the students' answers of the following items:

1. I feel motivated because the instructor uses examples that stimulate my interest in the subject

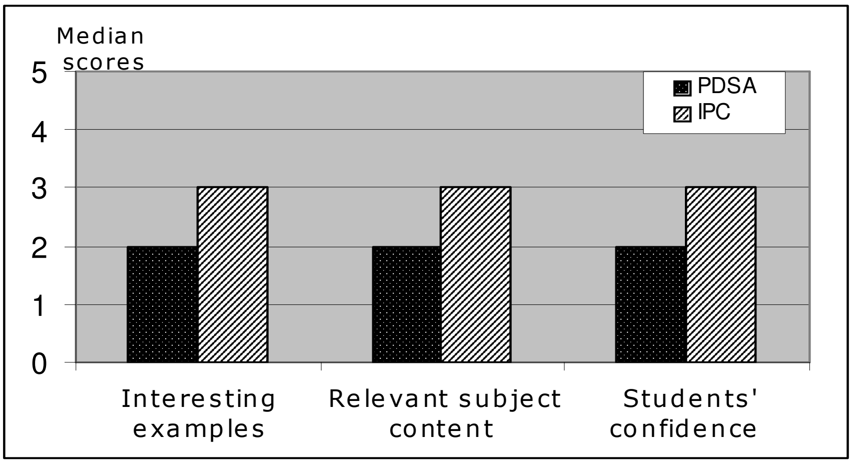
2. I feel that the course contents are important to my future career

3. I feel confident I will be succeeded on this course

There was a significant influence of the courses on the students' perception of the three items of the questionnaire (Wilks' Lambda value 0,54, p=,000) A descriptive analysis of the median scores for each course (figure 12) revealed that students from IPC considered the course content more important for their future career and were more confident to succeed than their colleagues from the previous year. On the other hand, the examples used by lecturers in IPC were considerable more interesting than the ones used in PDSA.

A deep analysis of these values led the author to conclude that the curriculum adjustment of PDSA had an impact on the students' academic improvement.

Figure 12: Median scores of the two courses in study (construct 2)

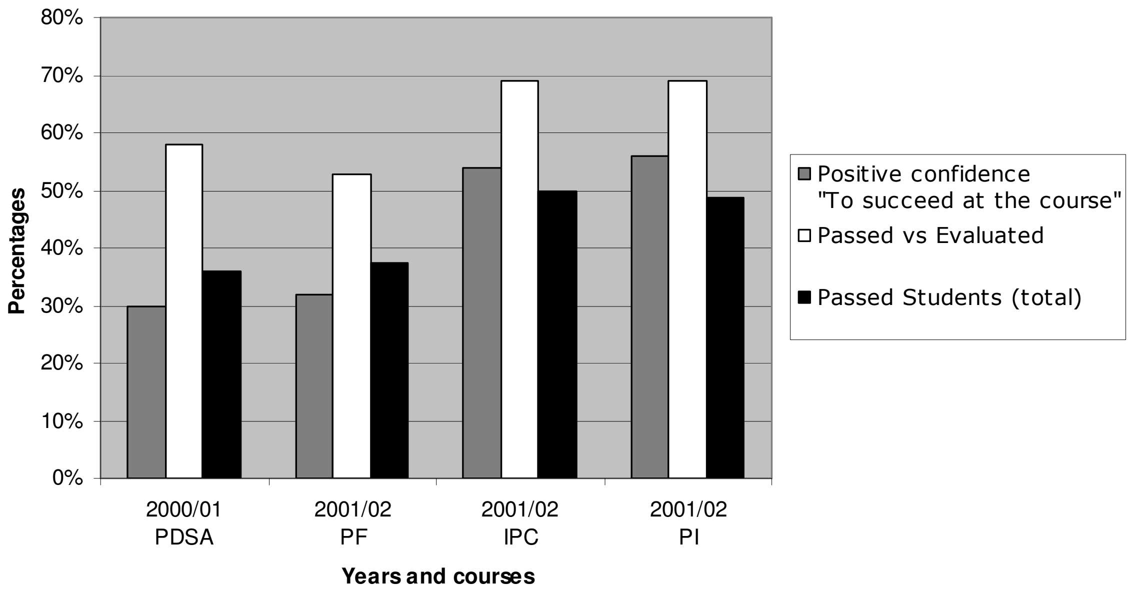


Nevertheless, there were still a higher percentage of students who were not submitted to evaluation (figure 10). 22 per cent of the students enrolled in the course in 2001/02 did not actually attend the classes. These students are so commonly known as ‘ghost’ students and its number is getting higher in the last three years. One of the reasons pointed out by the coordinator of IPC was related to the PDSA ‘myth’. If students found it hard to design and implement their program, using the Pascal programming language, which is closer to the natural language and consequently easier to implement, programming in C was understood as even more difficulty by students. In this perspective, the new course still lives in the shadow of the PDSA course.

The homogeneity of the courses, allowed the development of specific exercises. Students from previous years, complained about the lack of real examples that could be used in their courses and the high level of difficulty of the PSDA course. Having this in mind, the coordinator of the IPC asked Chemistry peers for help in choosing the exercises. This feature intended to motivate the students’ learning for programming.

Data presented in Figure 13 presents a macro study of the students’ confidence and their academic success before and after the curriculum redesign. These findings give a clear idea of the level of students’ confidence to succeed at the course and their actual academic success. After the redesign of the curriculum, students felt more confident to achieve success at the course. In addition, there were also more students submitted to evaluation who passed the course.

Figure 13: Students' confidence to succeed at the course compared with their academic success (comparative analyses)



4.2.4 Summary

The study revealed that students from IPC ('Introduction to Programming in C') considered the course contents more important for their future career and were more confident to succeed than their colleagues from the previous year. Findings also indicated that the examples used by lecturers in IPC were considered to be more interesting than the ones used in PDSA. This reality increased the students' motivation for the course (Huet, Pacheco & Tavares, 2003).

If it is true that students' background knowledge and intrinsic motivation to learn programming influence their academic achievement, it is also true that the curriculum design along with different teaching approaches can make the courses more interesting and appealing to the wider range of students who now enter Higher Education.

The curriculum design is not by itself enough for the students' academic achievement. Faculty teaching practice develops an important role as well. The pedagogical innovation is necessary for continued success.

The understanding of the students' learning process and motivation is not only important for the student himself but also for academics. It is critical that educators are aware of the nature of students' conceptions of learning, since students' epistemological positions will influence the way they go about learning (Marshall *et al.*, 1999). Ramsden (1992), Trigwell, Prosser & Taylor (1994), Trigwell & Prosser (1996), and Marshall *et al.* (1999) refer the importance of understanding the students' conception of learning as developing important implications for teaching and curriculum design. The intentions and strategies of faculty need to be studied and then addressed before substantial improvements in approaches to teaching can be expected (Trigwell *et al.*, 1994).

4.3 Construct 3: $PCEQ_3$

The findings analysed in constructs 1 and 2 contributed to the development of a set of questions that we would like to address, namely:

1. What is the students' perception of teaching effectiveness?

2. How can the students' perception of teaching affect their attendance at lectures, expectations and motivation for the course?

2. How do individual lecturers influence the students' motivation for the course?

These questions complement the findings of previous research. This construct was delivered in the first semester of 2003.

4.3.1 Generation of initial pool of items of the construct

The construct $PCEQ_3$ (Appendix nr.4) with 25 items included the first Factor ('teaching effectiveness') of the TPASQ (2001) and the three Factors of the $PCEQ_3$ (2002) with the purpose of establishing a relationship between students' perception of teaching effectiveness, students' motivation, attendance at the lectures and expectations for the course.

4.3.2 Confirmatory validity of the construct

Four questionnaires that had more than 10 per cent of non respondent items (Bryman & Cramer, 1993) were eliminated. The other missing values were substituted through the Expectation Maximisation Method (Tabachnick & Fidell, 2001). The medium of the missing values was 2.17 per cent. We obtained 315 valid questionnaires.

An internal consistency analysis showed a coefficient α of .91 for the 25-item scale. Table 62 shows the item-scale correlation and the alpha value if the item was deleted. There was no need to remove any item from the scale which reinforced the reliability of the construct.

Table 62: Item-scale correlation and coefficient α value if variables are deleted (construct 3)

Code	Items	Correlation Item-scale	coefficient α if item is deleted
v1p	Instructor's style of presentation motivates my interest during classes (adapted from Marsh, 1982)	,734	,873
v2p	We are encouraged to participate in class discussions (adapted from Marsh, 1982)	,597	,883
v3p	The instructor motivates me to ask questions and expose my doubts.	,748	,871
v4p	The instructor uses examples that motivate my curiosity on the subject.	,595	,883
v5p	The language used by the instructor is clear and objective.	,629	,880
v6p	The lecturer defines the objectives for each lesson.	,476	,890
v7p	The instructor is accessible to answer questions.	,574	,884
v8p	The instructor is dynamic and enthusiastic in conducting the course. (adapted from Marsh, 1982)	,733	,873
v9p	The instructor prepares the classes having in mind we do not have too much knowledge on the subject.	,575	,885
v10p	The instructor gives me feedback on my progress.	,634	,880
v1t	Instructor's style of presentation motivates my interest during classes (adapted from Marsh, 1982)	,560	,866
v2t	We are encouraged to participate in class discussions (adapted from Marsh, 1982)	,612	,864
v3t	The instructor motivates me to ask questions and expose my doubts.	,679	,858
v4t	The instructor uses examples that motivate my curiosity on the subject.	,672	,858
v5t	The language used by the instructor is clear and objective.	,659	,859
v6t	The lecturer defines the objectives for each lesson.	,523	,870
v7t	The instructor is accessible to answer questions.	,531	,870
v8t	The instructor is dynamic and enthusiastic in conducting the course. (adapted from Marsh, 1982)	,650	,859

v9t	The instructor prepares the classes having in mind we do not have too much knowledge on the subject.	,550	,868
v10t	The instructor gives me feedback on my progress.	,595	,864
v11	I go frequently to the lectures	,817	,817
v12	I go to the lectures because I like to hear the instructor's explanations.	,816	,816
v13	I go the lectures to better understand the subject content.	,803	,803
v14	I go to the lectures because the instructor motivates my interest in the subject.	,855	,855
v15	I go to the lectures because the subject really interests me.	,833	,833
v16	I feel motivated because the instructor gives helpful feedback on my work (adapted from Ramsden, 1991)	,856	,856
v17	I feel motivated because the instructor provides feedback/solutions to my problems.	,845	,845
v18	I feel motivated because the instructor uses examples that stimulate my interest in the subject.	,868	,868
v19	I feel motivated because I like the teaching methods used by the instructor.	,857	,857
v20	I feel that the subject contents are important to my future career	,789	,789
v21	I find the course intellectually challenging and stimulating (adapted from Marsh, 1982)	,774	,774
v22	I feel confident I will be successful in this subject.	,798	,798
v23	The objectives for the class are well defined.	,806	,806
v24	The course aims are relevant to my academic growth.	,759	,759
v25	The exercises of the labs are interesting	,806	,806

Looking at the table below (Table 63), the KMO measure is 0.88 which is considered very reasonable by Pestana & Gageiro (2000) and the Bartlett's test of sphericity is significant to proceed for the Factor analysis. The correlation matrix of the 25 variables distinguishes from the identity matrix, indicating inter-correlations different than zero [$\chi 2$ *(595) = 6097.62, p<.001*]. To complement this analysis the anti-image matrix indicates not to exclude variables and makes the application of the *Principal Component Analysis* possible.

Table 63: Results of Bartlett's test of sphericity and KMO Measure of sampling adequacy (construct 3)

KMO sampling adequacy	0.88	
Bartlett's test of sphericity	Chi-square	6097.62
	Df	595
	Sig.	0.000

After a detailed principal component analysis we decided to force the solution into 5 Factors (7 initially) in an orthogonal varimax solution (Table 64).

Table 64: Factor analysis, communalities (h^2) and internal consistency reliability (construct 3)

Code	Items	F 1	F 2	F 3	F4	F5	h2
v1p	Instructor's style of presentation motivates my interest during classes (adapted from Marsh, 1982)	.77	.025	.023	.048	.179	
v2p	We are encouraged to participate in class discussions (adapted from Marsh, 1982)	.775	,030	,046	,085	,251	
v3p	The instructor motivates me to ask questions and expose my doubts.	.655	,052	,055	,037	,086	
v4p	The instructor uses examples that motivate my curiosity on the subject.	.817	,021	,136	,018	,327	
v5p	The language used by the instructor is clear and objective.	.616	,125	,210	,022	,008	
v6p	The lecturer defines the objectives for each lesson.	.775	,140	,279	,019	-,333	
v7p	The instructor is accessible to answer questions.	.655	,047	,164	,006	,140	
v8p	The instructor is dynamic and enthusiastic in conducting the course. (adapted from Marsh, 1982)	.817	,021	,003	,083	,150	
v9p	The instructor prepares the classes having in mind we do not have too much knowledge on the subject.	.616	,123	,104	,029	,058	
v10p	The instructor gives me feedback on my progress.	.681	,084	,077	,087	,060	
Factor 1: Cronbach's alpha = .89							
v1t	Instructor's style of presentation motivates my interest during classes (adapted from Marsh, 1982)	.575	,559	,011	,246	,382	
v2t	We are encouraged to participate in class discussions (adapted from Marsh, 1982)	.668	,670	,010	,026	,350	
v3t	The instructor motivates me to ask questions and expose my doubts.	.795	,782	,108	,034	,166	
v4t	The instructor uses examples that motivate my curiosity on the subject.	.636	,688	,194	,157	,239	
v5t	The language used by the instructor is clear and objective.	.703	,700	,187	,164	,058	
v6t	The lecturer defines the objectives for each lesson.	.087	,607	,254	,188	,330	
v7t	The instructor is accessible to answer questions.	.008	,638	,189	,113	,287	
v8t	The instructor is dynamic and enthusiastic in conducting the course. (adapted from Marsh, 1982)	.020	,695	,052	,139	,197	
v9t	The instructor prepares the classes having in mind we do not have too much knowledge on the subject.	.008	,618	,081	,003	,048	
v10t	The instructor gives me feedback on my progress.	.222	,708	,038	,014	,081	
Factor 2: Cronbach's alpha = .87							

v11	I go frequently to the lectures	.096	,098	,028	,848	,003
v12	I go to the lectures because I like to hear the instructor's explanations.	.114	,355	,046	,706	,315
v13	I go the lectures to better understand the subject content.	.045	,136	,043	,878	,068
v14	I go to the lectures because the instructor motivates my interest in the subject.	.190	,517	,008	,504	,370
v15	I go to the lectures because the subject really interests me.	.030	,032	,282	,741	,126
Factor 4: Cronbach's alpha = .85						
v16	I feel motivated because the instructor gives helpful feedback on my work (adapted from Ramsden, 1991)	.032	,344	,172	,207	,554
v17	I feel motivated because the instructor provides feedback/solutions to my problems.	.110	,321	,200	,149	,572
v18	I feel motivated because the instructor uses examples that stimulate my interest in the subject.	.007	,330	,272	,113	,570
v19	I feel motivated because I like the teaching methods used by the instructor.	.117	,318	,244	,138	,532
Factor 5: Cronbach's alpha = .88						
v20	I feel that the subject contents are important to my future career	.046	,076	,769	,198	,132
v21	I find the course intellectually challenging and stimulating (adapted from Marsh, 1982)	.374	,103	,743	,053	,115
v22	I feel confident I will be succeeded on this subject.	.346	,117	,626	,188	,254
v23	The objectives for the class are well defined.	.283	,175	,584	,062	,127
v24	The course aims are relevant to my academic growth.	.430	,038	,821	,104	,078
v25	The exercises of the labs are interesting	.078	,104	,524	,109	,037
Factor 3: Cronbach's alpha = .81						

The four Factors corresponded to the ones extracted in constructs 1 and 2 which made this final instrument more valid and reliable. The Factors were related to the following dimensions: students' perception of teaching effectiveness at labs (variables 1a to 10a), students' attendance at the lectures (variables 11 to 15), students' motivation for the course (variables 16 to 19) and students' expectations for the course (variables 20 to 24).

This construct had a new Factor: teaching effectiveness at lectures (variables 1b to 10b). Variables 1t, 2t, 3t, 4t, and 5t scored similar values in Factor one and two, but since one of the objectives of the construct was to gather students' perception of teaching effectiveness at lectures and labs, we decided not to remove these five items from the Factor analysis.

The items accounted for cumulative percentage variance of 59 per cent. After the varimax rotation the first Factor presented a value close to 5.78, explaining 16.5 per cent of the variance, the second Factor 5.32, explaining 15.2 per cent of the variance, the third 3.58 and explaining 10.2 per cent of the variance, the fourth 3.23, explaining 9.2 per cent of variance, and the fifth 2.70, explaining 7.7 per cent of the variance

The Factor loadings for each item ranged from .81 to .57 for the Factor 'teaching effectiveness in labs', .78 to .51 for the Factor 'teaching effectiveness in lectures', .82 to .52 for the Factor 'expectations', .87 to .70 for the Factor 'attendance at lectures', and .57 to .53 for the Factor 'motivation for the course'. All the Factors evidenced good levels of internal consistency which demonstrated that the $PCEQ_3$ was a highly reliable construct to measure the students' perception of the course. Table 65 shows the items for each Factor. Factors 1 and 2 have exactly the same items but are referred to a different class structured: lectures and labs. Item-scale correlations confirmed that all items had been assigned to the appropriate scale and that each item made an appreciable contribution to the internal consistency of the construct.

Table 65: Descriptive information for the five Factors (construct 3)

Factors	**Code**	**Factor description**	**Typical variables**
Teaching effectiveness at labs (F1)	V1p to v10p	The students' perception of teaching effectiveness at labs.	The instructor motivates me to ask questions and expose my doubts.
Teaching effectiveness at lectures (F2)	v1t to v10p	The students' perception of teaching effectiveness at lectures.	The instructor motivates me to ask questions and expose my doubts.
Expectations (F3)	v11 to v15	The students' expectations for the subject	The subject aims are relevant to my academic growth
Attendance at lectures (F4)	v16 to v19	The students' perception of the reasons for attending the lectures.	I go frequently to the lectures
Motivation for the course (F5)	v20 to v25	The students' perception of motivation for the course.	I feel motivated because the instructor provides feedback/solutions to my problems.

4.3.3 Description and analysis of the $PCEQ_3$

The results of the $PCEQ_3$ will be presented taking in consideration the central tendency and dispersion measures related to the global scale and to each of the five Factors. The minimum and maximum registered values as well as the mean scores and standard deviation are presented in Table 66.

Table 66: Descriptive analysis of the total scale and the five Factors (construct 3)

	N	Minimum	Maximum	Mean	SD
Global Scale	315	1.40	4.51	2.81	0.54
Factor1: teaching effectiveness at labs	315	1.10	4.80	3.31	0.75
Factor2: teaching effectiveness at lectures	315	1.00	4.80	2.32	0.72
Factor3: expectations	315	1.00	5.00	3.39	0.80
Factor4: attendance at lectures	315	1.00	4.80	2.43	1.03
Factor5: motivation for the course	315	1.00	4.75	2.35	0.90

We verified that the minimum and maximum mean value of the global $PCEQ_3$ scale corresponded to 1.40 and 4.51 respectively which allowed us to say that the mean of the minimum values was closer to the option of answer 1 ('never') and the mean of the maximum values was closer to the option of answer 5 ('always'). The mean score was 2.81 (SD = 0.54). Furthermore, we concluded that students' perception of the Programming teaching experience is satisfactory.

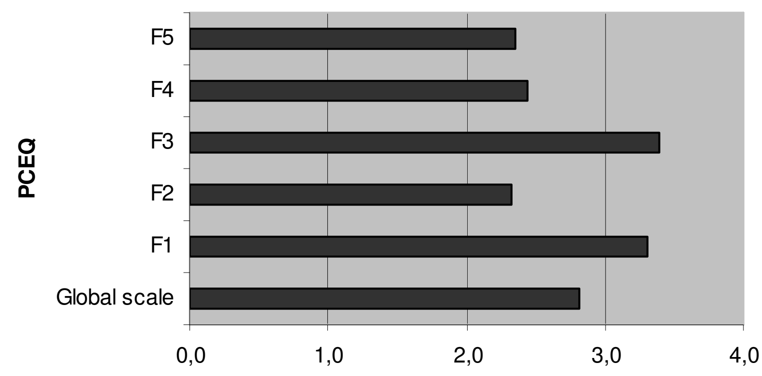
The means of the minimum and maximum values of the answers to Factor 5 ('motivation for the course') and the mean score of 2.35 (SD = 0.90) revealed that students were not feeling very motivated for the course. Since the motivation items were constructed considering the lecturers' teaching methods (e.g. 'I feel motivated because the lecturer provides feedback to my problems') it was plausible to assume that students did not seem very motivated by the teaching methods of their lecturers.

The means of the minimum and maximum values of the answers to Factor 1 ('teaching effectiveness at labs') and the mean score of 3.31 (SD = 0.75) showed us that students' perception of teaching effectiveness at the labs was moderate. The results changed considerably when referring to Factor 2 ('teaching effectiveness at lectures'). The mean score of 2.32 (SD = 0.72) revealed that students did not consider the teaching effectiveness at lectures as effective as the one applied at the labs.

In what refers to Factor 3 ('expectations for the course') the mean of the minimum and maximum values and the mean score of 3.39 indicate that students were relatively sceptic in what concerns, for example, the expectation to succeed in the course ('I feel confident I will succeed in this subject'). The mean of the minimum and maximum values of answers to Factor 4 ('attendance at lectures') and the mean score of 2.43 revealed that students did no attend lectures frequently. Since the reasons for the students' attendance are related to teaching methods (e.g. 'I go to the lectures because I benefit from the instructors' explanations') it was also valid to assume that students do not attend lectures frequently because of the teaching methods adopted by the lecturer.

To conclude this analysis it was relevant to mention that according to the mean scores obtained in the five Factors (Figure 14), students' perceptions were generally low with exception of Factors 1 and 3. Students perceived more positively the teaching effectiveness at labs and had higher expectations for the subject.

Figure 14: Mean score of the students' perception of the $PCEQ_3$ (global scale) and its five Factors (construct 3)



	Global scale	F1	F2	F3	F4	F5
Mean	2,8	3,3	2,3	3,4	2,4	2,4

Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

In spite of the notorious similarity between the mean scores of some Factors, we aimed to verify the differences between the Factors. Table 67 presents the 'Pair Sample T-Test'.

Table 67: Comparison of the mean scores between the Factors of the $PCEQ_2$: paired sample t-test (construct 3)

		Paired Differences		
		Mean	SD	t (314)
$PCEQ_3$ – Factors	***Pairs to compare***			
Factor 1: teaching effectiveness at labs	Factor 1 - Factor 2	0.98	0.92	19.01**
	Factor 1 - Factor 3	-0.08	-1.63	-1.63
	Factor 1 - Factor 4	0.87	1.21	12.79**
	Factor 1 - Factor 5	0.95	0.83	20.25**
Factor 2: teaching effectiveness at lectures	Factor 2 - Factor 3	-1.07	0.92	-20.46**
	Factor 2 - Factor 4	-0.11	1.00	-1.98*
	Factor 2 - Factor 5	-0.03	0.83	-0.69
Factor 3: expectations	Factor 3 - Factor 4	-0.95	1.14	14.86**
	Factor 3 - Factor 5	-1.03	0.94	19.55**
Factor 4: attendance at lectures	Factor 4 - Factor 5	0.07	1.12	1.24

* Pearson correlation is significant at the 0.05 level (2-tailed)

** Pearson correlation is significant at the 0.001 level (2-tailed)

Data indicated no statistically significant differences between Factors 1 and 3, Factors 2 and 5, as well as Factor 4 and 5. It was between Factors 2 and 3, Factors 3 and 5 that higher differences between the means could be found. Students' perception of teaching effectiveness was higher at the labs (F3) than at the lectures (F2). Students' perception of motivation for the course (F5) was higher when compared to their expectations (F3).

Furthermore, we verified the correlations between teaching effectiveness at labs and lectures with the other three Factors using the Pearson Correlation Coefficient analysis. The values of such correlations (Table 68) indicated a positive correlation between teaching effectiveness, both at labs and lectures, with students' expectations and motivation for the course. There was also a positive correlation between teaching effectiveness at lectures and attendance at lectures. These findings suggested that higher teaching effectiveness could bring more students to class, could create more motivated students and could raise students' expectations. Nevertheless, there was no statistically significant correlation between teaching effectiveness at labs and attendance at lectures, which was explained by the fact that staff members lecturing the labs were not the same at lectures. 10.1 per cent of the total scale variability was explained by the interaction between the Factors 'expectations' and 'teaching effectiveness at labs', 6.7 per cent between 'expectations' and 'teaching effectiveness at lectures', 15.2 per cent between 'attendance at lectures' and 'teaching effectiveness at lectures', 26 per cent between 'motivation for the course' and 'teaching effectiveness at labs' and 24.8 per cent between 'motivation for the course' and 'teaching effectiveness at lectures'.

Table 68: Pearson Correlation Coefficient between teaching effectiveness at labs and lectures with expectations, attendance at lectures and motivation for the course (construct 3)

$PCEQ_3$ Factors	Teaching effectiveness at labs	Teaching effectiveness at lectures
Expectations	.319(*)	.260(*)
Attendance at lectures	.107	.391(*)
Motivation for the course	.510(*)	.498(*)

* Pearson correlation is significant at the 0.01 level (2-tailed)

4.3.4 Analysis of the influence of some socio-demographic variables in the students' perception of the $PCEQ_3$

This section explores the differences on the students' perception of the 'Programming Course Experience Questionnaire' according to different socio-demographic variables. The Manova, Kruskal Wallis and Mann Whitney tests carried out in this section aimed to explore if the participants perception on the five Factors of the questionnaire would differ according to their age, sex, enrolment at the course, previous knowledge on programming, and percentage of study time. The study would not be completed without analysing such variables.

4.3.4.1 Gender

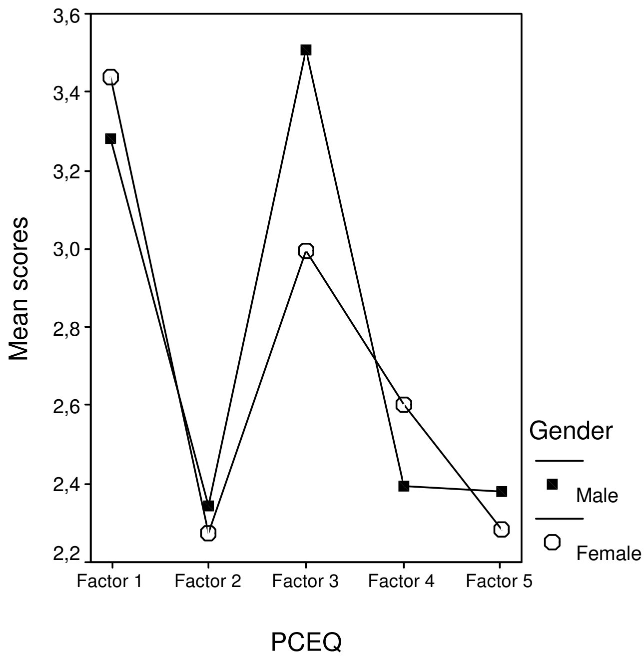
To assess differences between the five Factors (VD_s) of the $PCEQ_3$ scale and the gender (VI) of participants, a one-way multivariate analysis of variance (MANOVA) was employed. Multivariate analysis of homogeneity was significant [*Wilks Λ* = .872, F (5, 309) = 9.07, *p* < .0.001]. The univariate tests (Table 69) revealed that gender was a significant difference in Factor 3 ('expectations'). Males had higher expectations than females. Figure 15 represents the mean scores for gender in each Factor of the $PCEQ_3$.

Table 69: Mean item scores and standard deviations for each Factor analysed by gender: univariate tests (construct 3)

	Gender						
	Male (n = 247)		Female (n = 68)		Total (N = 315)		
	M	SD	M	SD	M	SD	F(1, 313)
$PCEQ_3$ *(global scale)*	2.82	0.54	2.77	0.55	2.81	0.54	
Factor 1: teaching effectiveness at labs	3.27	0.72	3.43	0.87	3.31	0.75	2.33
Factor 2: teaching effectiveness at lectures	2.34	0.73	2.27	0.68	2.32	0.72	0.46
Factor 3: relevance/expectations	3.50	0.77	2.99	0.78	3.39	0.80	23.81*
Factor 4: attendance at lectures	2.39	1.04	2.60	0.98	2.43	1.03	2.12
Factor 5: motivation for the course	2.38	0.90	2.28	0.93	2.35	0.90	0.61

* Pearson correlation is significant at the 0.05 level (2-tailed)

Figure 15: Mean item scores for each Factor analysed by gender (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

4.3.4.2 Age

In what concerns the age variable as influencing the perceptions of participants on the five Factors, we decided to gather the age in cluster (4) as VIs and the five Factors as VDs. The results of the MANOVA determined statistically significant differences associated with students' age [*Wilks Λ* = .872, F (15, 845.13) = 2.85, *p* < .0.001][27] in Factors 3 and 4 (Table 70).

[27] Although the groups differ within themselves (with 201 subjects ranging from 17 to 19 year's old, 84 subjects ranging from 20 to 22, 22 subjects ranging from 23 to 25 and 7 subjects of 26 and above) the test for homogeneity of variance indicates the reliable use of the multivariate analysis. The Levene test assumes that variances are equal across groups [with F values (3,310) of 1.70, 0.74, 0.82, 1.89 e 0.70, p>.10, to Factors 1, 2, 3, 4 and 5].

Table 70: Mean item scores and standard deviations for each Factor analysed by age: univariate tests (construct 3)

	17-19 (n = 201)		20-22 (n = 84)		23-25 (n = 22)		>26 (n = 7)		*Total* (N = 314)		F (3, 310)
	M	DP	M	DP	M	DP	M	DP	M	DP	
$PCEQ_3$ (global scale)	2.84	0.55	2.75	0.48	2.62	0.61	3.06	0.68	2.81	0.54	
Factor 1	3.32	0.55	3.31	0.68	3.08	0.90	3.68	0.67	3.31	0.76	1.26
Factor 2	2.30	0.74	2.36	0.67	2.26	0.62	2.64	0.80	2.32	0.72	0.67
Factor 3	3.49	0.80	3.28	0.71	2.81	0.82	3.69	0.72	3.39	0.79	5.94**
Factor 4	2.58	1.04	2.09	0.95	2.45	0.94	2.37	0.88	2.44	0.90	4.60*
Factor 5	2.36	0.93	2.37	0.85	2.30	0.94	2.50	0.88	2.36	0.909	0.08

* Pearson correlation is significant at the 0.01 level (2-tailed)

** Pearson correlation is significant at the 0.05 level (2-tailed)

Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

To gather information on the differences between the ages in clusters multiple comparison tests were employed. The Tukey HSD (honestly significant difference) test indicated statistically significant differences in Factors 3 and 4 (Table 71).

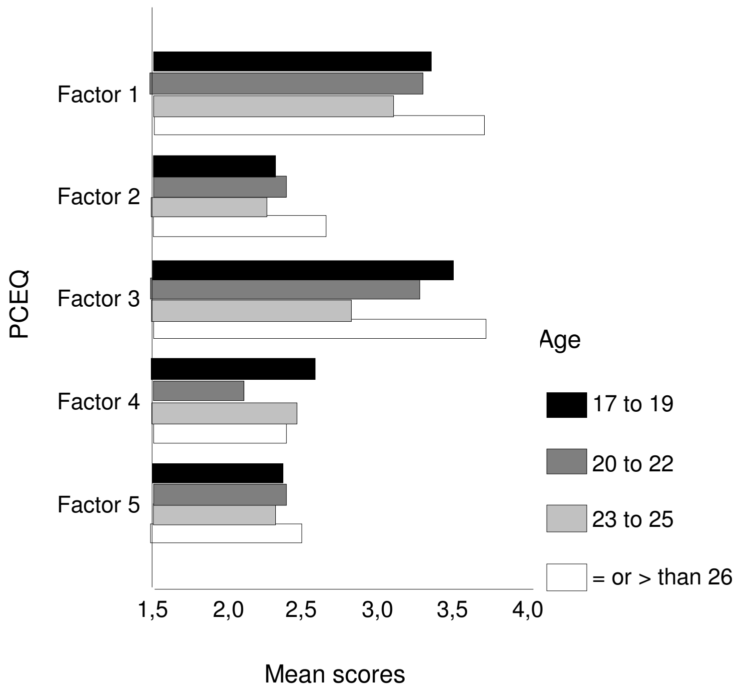
In Factor 3, the youngest students (ranging from 17 to 19 years old) had higher expectations than students ranging from 23 to 25 years old. In Factor 4, the youngest students attended lectures more frequently than students ranging from 20 to 22 years old. Figure 16 represents the mean scores for age in each Factor of the $PCEQ_3$.

Table 71: Differences between the means of Factor 3 related to age: multiple comparison tests (construct 3)

	Age *(clusters)*				
	17-19 (n = 201)	20-22 (n = 84)	23-25 (n = 22)	>26 (n = 7)	*Total* (N = 314)
	Mean differences				
	Factor 3: expectations				
Age *(clusters)*					
17-19	-				
20-22	-0.20	-			
23-25	-0.67*	-0.46	-		
> 26	0.19	0.40	0.87	-	
	Factor 4: attendance at lectures				
Age *(clusters)*					
17-19	-				
20-22	-0.48*	-			
23-25	-0.13	0.35	-		
> 26	-0.21	0.27	-0.08	-	

* Pearson correlation is significant at the 0.01 level (2-tailed)

Figure 16: Mean item scores for each Factor analysed by age (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

4.3.4.3 Course

The homogeneity tests, when proceeding the Manova, indicated that the observed covariance matrices of the dependent variables (5 Factors) differed across groups [Box's M = 103,99; F (75,25399,66) = 1,29, p <0.05]. In addition, the Levene test indicated in Factor 5 the rejection of the null hypothesis (H0) that indicated the variance homogeneity [F (5,309) = 3,59, p= 0.004]. In the other Factors the variances revealed to be homogeny [we obtained reasons F (5,309) of 1.10, 1.99, 1.55, 1.52, p>0.05, to Factors 1, 2, 3 and 4]. Thus, we decided to employ the non-parametric equivalent test of Manova: the Kruskal Wallis. The values are shown in Table 72. The results of the Kuskall Wallis determined statistically significant differences associated with students' courses in Factors 1, 3 and 4. Figure 17 represents the mean scores for course enrolment in each Factor of the $PCEQ_3$.

Table 72: Mean item scores and standard deviations for each Factor analysed by course enrolment: independent samples (construct 3)

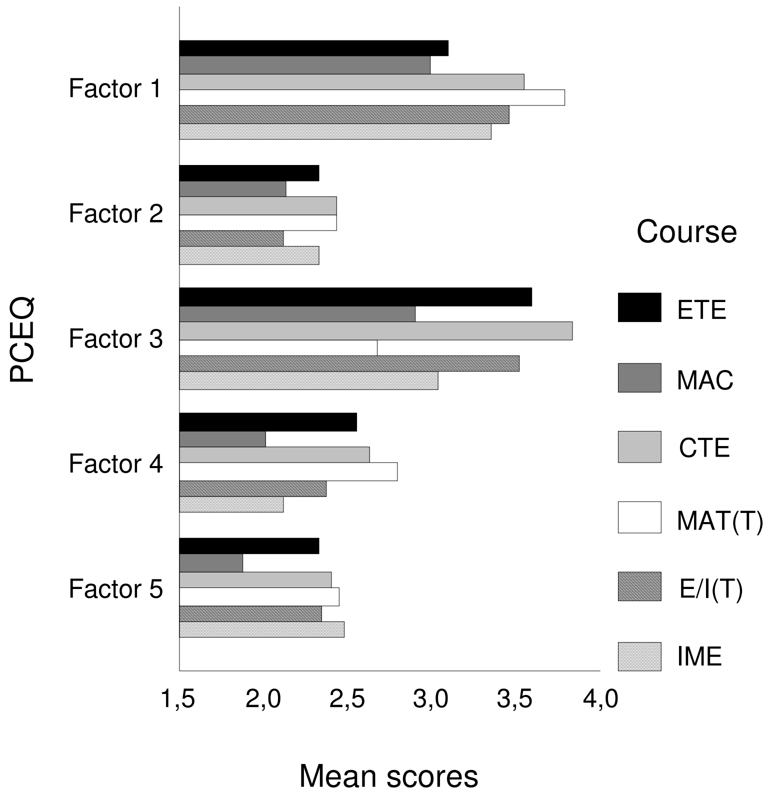
	ETE (n=112)		MAC (n=21)		CTE (n=65)		Math (n=22)		E/I (n=21)		IME (n=74)		Total (n= 314)		χ^2 (5)
	M	DP	M	DP	M	DP	M	DP	M	DP	M	DP	M	DP	
$PCEQ_2$ (global scale)	2.79	0.49	2.45	0.53	3.01	0.60	2.91	0.61	2.80	0.51	2.72	0.50	2.81	0.54	
Factor 1	3.09	0.77	2.98	0.85	3.54	0.65	3.78	0.78	3.46	0.72	3.35	0.66	3.31	0.75	31.49**
Factor 2	2.32	0.67	2.12	0.80	2.43	0.81	2.42	0.78	2.12	0.80	2.32	0.63	2.32	0.72	5.61
Factor 3	3.59	0.64	2.90	0.67	3.83	0.81	2.68	0.80	3.52	0.67	3.04	0.71	3.39	0.80	64.57**
Factor 4	2.56	1.02	2.00	1.09	2.63	1.10	2.79	0.97	2.37	1.01	2.12	0.89	2.43	1.03	18.21*
Factor 5	2.32	0.83	1.86	0.70	2.40	1.07	2.44	1.10	2.34	0.81	2.48	0.84	2.35	0.90	7.81

** Pearson correlation is significant at the 0.001 level (2-tailed)

* Pearson correlation is significant at the 0.01 level (2-tailed)

Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

Figure 17: Mean item scores for each Factor analysed by course (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

To gather information on the differences between the courses a multiple comparison test was employed. The Tukey HSD (honestly significant difference) test indicated statistically significant differences (Table 73). Due to the study objectives, we decided to analyse just the differences related to Factor 3 ('expectations').

Table 73: Differences between the means of Factor 1 related to the course: multiple comparisons test (construct 3)

	Courses						
	ETE (n=112	MAC (n=21)	CTE (n=65)	Math (n=22)	E/I (n=21)	IME (n=74)	Total (314)
	Mean differences						
	Factor 3: expectations						
Courses							
ETE	-	0.69*	-0.24	0.91*	0.07	0.55*	
MAC	-	-	-0.93*	0.22*	-0.62	-0.14	
CTE	-	-	-	1.15*	0.31	0.79*	
Maths	-	-	-	-	-0.84*	-0.36	
E/I	-	-	-	-	-	0.48	
IME	-	-	-	-	-	-	

* Pearson correlation is significant at the 0.05 level (2-tailed)

Legend: ETE: Electronics and Telecommunication Engineering; MAC: Mathematic Applied to Computing; CTE: Computers and Telematics Engineering; Maths: Mathematics (teaching); E/I: Electronics and Informatics (teaching) and IME: Industrial and Management Engineering.

The courses that demanded more skills in programming were the ones where students felt more confident to achieve success. Students enrolled in ETE seemed to have higher expectations than students enrolled in MAC, Maths and IME. CTE students perceived to have higher expectation than MAC students. These results converged with the academic staff opinions.

4.3.4.4 Prior Programming experience

The homogeneity tests when proceeding the Manova indicated that the observed covariance matrices of the dependent variables (5 Factors) differed across groups [Box's M = 31,96; F (15, 379710.2) = 2,09, p =0.008]. In addition, the Levene test indicated in Factor 1 the rejection of the null hypothesis (H0) that indicated the variance homogeneity [F (1,313) = 5,28, p= 0.02]. In the other Factors the variances revealed to be homogeny [we obtained reasons F (1,313) of 0.05, 1.38, 0.28, 0.28, p>0.05, to Factors 2, 3, 4 and 5]. Thus, we decided to employ the non-parametric equivalent test of Manova when the VI has two levels: Mann Whitney Test. The values are shown in Table 74. The results of the Mann Whitney determined statistically significant differences associated with prior programming experience in Factor 3. Students with prior programming experience perceived to have higher expectations for the course than colleagues with no prior experience.

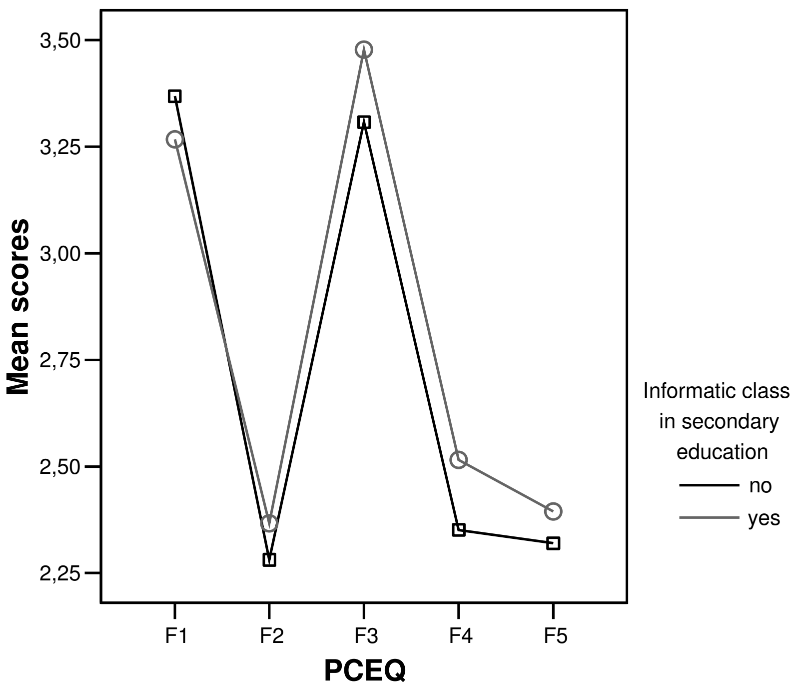
Table 74: Mean item scores and standard deviations for each Factor analysed by prior programming experience: independent samples (construct 3)

	no (n =147)		yes (n =168)		Total (N = 315)		
	M	SD	M	SD	M	SD	Z(9,072)
$PCEQ_3$ *(global scale)*	2.78	0.52	2.84	0.58	2.81	0.55	
Factor 1: teaching effectiveness at labs	3.37	0.71	3.27	0.80	3.31	0.76	-0.97
Factor 2: teaching effectiveness at lectures	2.28	0.72	2.37	0.72	2.33	0.72	-1.05
Factor 3: expectations	3.31	0.75	3.48	0.84	3.40	0.80	-2.40*
Factor 4: attendance at lectures	2.35	1.04	2.52	1.02	2.44	1.03	-1.47
Factor 5: motivation for the course	2.32	0.89	2.39	0.93	2.36	0.91	-0.63

*Pearson correlation is significant at the 0.05 level (2-tailed)

Figure 18 represents the mean scores for prior programming experience in each Factor of the $PCEQ_3$.

Figure 18: Mean item scores for each Factor analysed by prior programming experience (construct 3)



4.3.4.5 Number of registrations

To assess differences between the five Factors (VD_s) of the PCEQ scale and the number of different years that participants registered for the course (VI), a one-way multivariate analysis of variance (MANOVA) was employed. The multivariate test revealed to be statistically significant [*Wilks Λ* = .905, F (10, 616) = 3.15, *p* = 0.001]. The univariate test revealed that the number of registrations represented a significant difference in Factors 3 and 4 (Table 75).

Table 75: Mean item scores and standard deviations for each Factor analysed by registration: univariate tests (construct 3)

	Number of registrations (clusters)								
	1		2		3-4		Total		
	(n =230)		(n =64)		(n=21)		(N = 315)		
	M	SD	M	SD	M	SD	M	SD	F(2, 312)
$PCEQ_3$ *(global scale)*	2.84	0.55	2.74	0.54	2.61	0.48	2.81	0.54	
Factor 1: teaching effectiveness at labs	3.31	0.78	3.37	0.69	3.16	0.71	3.31	0.75	0.59
Factor 2: teaching effectiveness at lectures	2.33	0.72	2.29	0.75	2.35	0.58	2.32	0.72	0.07
Factor 3: expectations	3.48	0.77	3.20	0.83	3.00	0.83	3.39	0.80	5.99*
Factor 4: attendance at lectures	2.57	1.01	2.08	1.04	2.03	0.87	2.43	1.03	7.54**
Factor 5: motivation for the course	2.38	0.91	2.40	0.96	2.00	0.59	2.35	0.90	1.78

* Pearson correlation is significant at the 0.01 level (2-tailed)

** Pearson correlation is significant at the 0.05 level (2-tailed)

Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

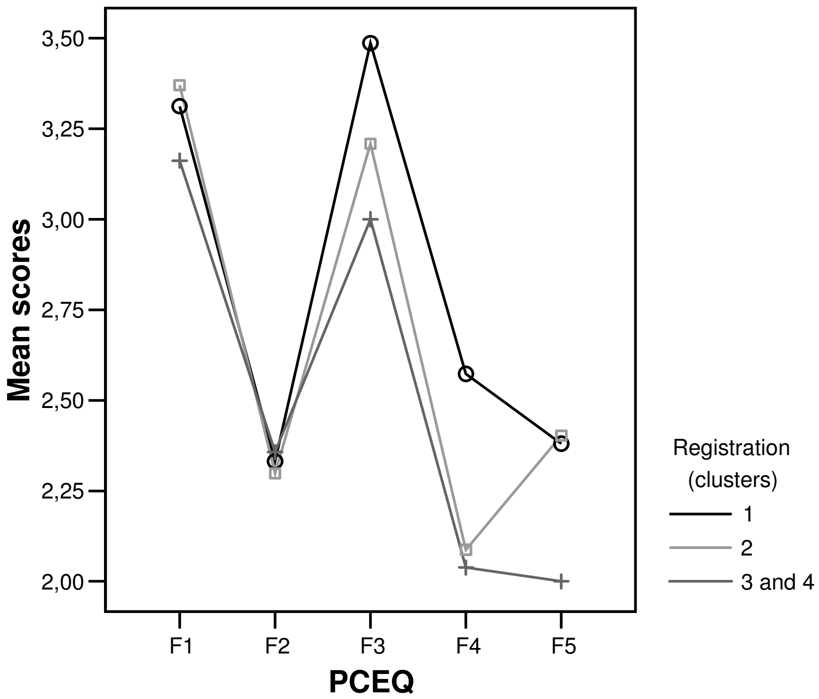
To gather information of the differences between the registration clusters means we employed the multiple comparison test Fisher LSD (List Significant Difference) since the VI had three levels (Table 76). Students with one registration had higher expectations and attended more frequently the lectures than students with two and three or 4 registrations. Figure 19 represents the mean scores for registration in each Factor of the $PCEQ_3$.

Table 76: Differences between the means of Factors 3 and 4 related to number of registrations: multiple comparison tests (construct 3)

	Number of registrations (clusters)			
	1 (n = 230)	2 (n = 64)	3-4 (n = 21)	*Total* (N = 315)
	Mean differences			
	Factor 3: expectations			
Nº of registrations				
1	-	0.28*	0.49*	
2	-	-	0.21	
3-4	-	-	-	
	Factor 4: attendance at lectures			
Nº of registrations				
1	-	0.49*	0.53*	
2	-	-	0.05	
3-4	-	-	-	

Freshmen seemed to have higher expectations for the course and to attend more frequently the lectures than students with 2 or 3 and 4 registrations.

Figure 19: Mean item scores for each Factor analysed by registration (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

4.3.4.6 Study hours per week

The homogeneity tests when proceeding the Manova indicated that the observed covariance matrices of the dependent variables (Factors 3 and 5) differed across groups [Box's M = 18,41; F (9, 10609,87) = 1.97, p =0.04]. In addition, the Levene test indicated in Factor 3 the rejection of the null hypothesis (H0) which means the variance homogeneity [F (3,304) = 5,34, p= 0.001]. In Factor 5 the variance revealed to be homogeny [we obtained reasons F (3,304) of 1.31, p>0.05]. Thus, we decided to employ the non-parametric equivalent test of Manova: the Kruskal Wallis. The results of the Kuskall Wallis (Table 77) determined statistically significant differences associated with study hours per week in Factor 5. Figure 20 represents the mean scores for study time in Factors 3 and 5 of the $PCEQ_3$.

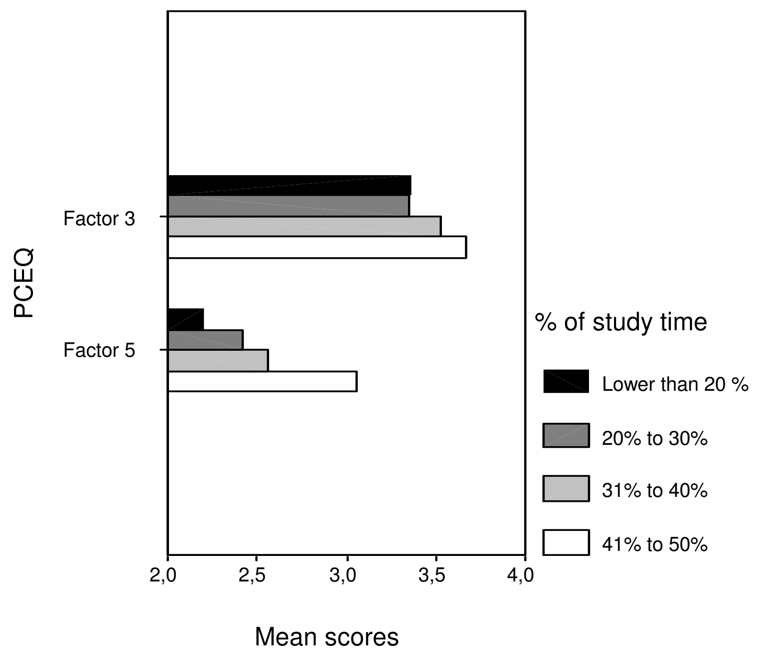
Table 77: Mean item scores and standard deviations for expectations and motivation for the course analysed by study time (clusters) (construct 3)

	Percentage of Study Time (clusters)										
	< than 20% (n=154)		20% to 30% (n=117)		31% to 40% (n=25)		41% to 50% (n=12)		Total (n= 308)		χ^2 (3)
	M	DP	M	DP	M	DP	M	DP	M	DP	
$PCEQ_2$ (global scale)	2.70	0.53	2.86	0.51	2.95	0.58	3.24	0.43	2.80	0.54	
Factor 3	3.36	0.91	3.36	0.68	3.53	0.59	3.67	0.72	3.38	0.80	2.01
Factor 5	2.20	0.93	2.41	0.82	2.56	0.97	3.06	0.71	2.34	0.90	15.47*

* Pearson correlation is significant at the 0.001 level (2-tailed)

Legend: Factor 3: expectations; Factor 5: motivation for the course

Figure 20: Mean item scores for Factors 3 and 5 analysed by percentage of study time (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

To gather information on the differences between the means of Factor 5 the multiple comparison test Tukey was employed since the VI had four levels. Students who spent more time studying for the course perceived to be more motivated (Table 78).

Table 78: Differences between the means of Factor 5 related to study time: multiple comparison tests (construct 3)

	Percentage of study time (clusters)				
	Lower than 20% (n = 154)	20% to 30% (n = 117)	31% to 40% (n = 25)	41% to 50% (n=12)	*Total* (N = 315)
	Mean differences				
	Factor 5: motivation for the course				
Percentage of study time					
Lower than 20%	-	-0.22	-0.36	-0.86*	
20% to 30%	-	-	-0.15	-0.65	
31% to 40%	-	-		-0.50	
41% to 50%	-	-	-	-	

4.3.5 Specific hypotheses and results

The next section addresses the study hypotheses and confirmation.

4.3.5.1 Hypothesis 1

Hypothesis 1 holds that teaching practice predicts the students' attendance at lectures. In order to verify this hypothesis we decided to evaluate to what extent the students' attendance at lectures could be predicted by students' perception of teaching effectiveness. Thus, Factor 4 'attendance at lectures' was considered as the criterion variable and the 'teaching effectiveness', both at labs and lectures (Factors 1 and 2), as predictor variables. Through the multiple regression analysis the relations between the variables[28] were established.

4.3.5.1.1 Teaching effectiveness both at labs and lectures (predictor variables) and attendance at lectures (criterion variable)

The students' perception of teaching effectiveness explained 15.3 per cent of the variability in this criterion [coefficient of multiple determination $R^2 = .153$; coefficient of multiple regression $r = .391$; $F(2, 312) = 28.15$, $p < .001$]. In spite of the two Factors explaining 15.3 per cent of the variability at the level of the criterion variable 'attendance at lectures', each Factor analysed individually would have a different result. Indeed, just Factor 2 contributed in a significant way for the criterion determination. The regression coefficients on Factor 1 did not reach statistically significant values (we obtained for the t-student test the value of 0.355, $p > .70$).

Furthermore, it is valid to assume that students' attendance at lectures might be predicted considering the students' perceptions of teaching effectiveness at lectures in a way that a change of one unit on the predictor variable is associated with a change of .552 (to standard variables the coefficient regression value is 0.386) on the criterion.

4.3.5.2 Hypothesis 2

Hypothesis 2 holds that teaching effectiveness is a key determinant to the students' motivation for the subject. Thus, 'motivation for the course' (F5) was considered as the criterion variable and 'teaching effectiveness', both at labs and lectures, as predictor variables. Through the multiple regression analysis the relations between variables were established.

4.3.5.2.1 Teaching effectiveness both at labs and lectures (predictor variables) and motivation for the course (criterion variable)

The students' perception of teaching effectiveness explained 41.3 per cent of the variability in this criterion [coefficient of multiple determination $R^2 = .413$; coefficient of multiple regression $r = .643$; $F(2, 312) = 109.89$, $p < .001$]. The analysis related to the contribution of each predictor to the total variability allowed to verify that the

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[28] Nevertheless, it is important to mention that this method of analysis does not allow establishing a relation of causality between variables but just allowing inferring that causality.

results were statistically significant related to Factor 1 (teaching effectiveness at labs) and 2 (teaching effectiveness at lectures) [we obtained standard regression coefficients of .418 and .402 for Factors 1 and 2, $p < .001$] (Table 14).

Furthermore, it is valid to assume that Factor 5 might be predicted considering the students' perceptions of teaching effectiveness at labs and lectures in a way that a change of one unit on the predictor variable 'teaching effectiveness at labs' is associated with a change of .500 (unstandardised regression coefficient) on the criterion. In the same way, keeping the Factor 1 constant, a change of one unit on the predictor variable 'teaching effectiveness at lectures' is associated with a change of .506 on the criterion variable 'expectations' (to standard variables the coefficient regression values are .418 and .402 to Factors 1 and 2).

4.3.5.3 Hypothesis 3

Hypothesis 3 holds that teaching effectiveness is a key determinant to the students' expectations for the course. In order to verify this hypothesis we decided to evaluate to what extent the students' expectations for the course could be predicted by the students' perception of teaching effectiveness. Thus, 'students' expectations' (F3) was considered as the criterion variable and 'teaching effectiveness', both at labs and lectures, as the predictor variables. Through the multiple regression analysis the relations between the variables were established.

4.3.5.3.1 Teaching effectiveness both at labs and lectures (predictor variables) and expectations (criterion variable)

The students' perception of teaching effectiveness explained 13.9 per cent of the variability in this criterion, [coefficient of multiple determination $R^2 = .139$; coefficient of multiple regression $r = .372$; $F\ (2, 312) = 25.11$, $p < .001$] magnitude considered high, based on the conventional values of interpretation of these measures (Cohen, 1988). The analysis related to the contribution of each predictor to the total variability allowed to verify that the results were statistically significant related to Factors 1 ('teaching effectiveness at labs') and 2 ('teaching effectiveness at lectures') [we obtained standard regression coefficients of .274 and .198 for Factors 1 and 2, $p < .001$] (Table 79).

Furthermore, it is valid to assume that students' expectations for the course might be predicted from the students' perceptions of teaching effectiveness at labs and lectures in a way that a change of one unit on the predictor variable 'teaching effectiveness at labs' is associated with a change of .289 (unstandardised regression coefficient) on the criterion. In the same way, keeping the Factor 1 constant, a change of one unit on the predictor variable 'teaching effectiveness at lectures' is associated with a change of .219 on the criterion variable 'expectations' (to standard variables the coefficient regression values are .274 and .198 to Factors 1 and 2).

Table 79: Multiple regression analysis considering as predictor variables Factors 1 and 2 of the PCEQ$_3$ and as criterion variables Factors 3, 4 and 5 (construct 3)

Teaching effectiveness											
At labs and lectures			At labs (Factor1)			At lectures (Factor2)			t-student tests	
	F	R^2	B	Std. Error	β	B	Std. Error	β	TeLabs	TeLectures
Factor 3	25.11*	.139	0.289	0.057	0.274	0.219	0.060	0.198	5.073*	3.661*
Factor 4	28.15*	.153	0.026	0.073	0.019	0.552	0.076	0.386	0.355	7.218*
Factor 5	109.89*	.413	0.500	0.053	0.418	0.506	0.056	0.402	9.386*	9.036*

* < 0.001

Legend: F – F de Fisher; R^2 – coefficient of multiple determination; B – unstandardised coefficients regression; β –standard coefficients regression.

4.3.5.4 Hypothesis 4

This Hypothesis refers to individual lecturers as having a differing influence on students' perception of teaching effectiveness at labs, expectations and motivation for the course.

In order to verify this hypothesis we proceeded to the Kruskall Wallis test, having as VD the Factor 1 ('teaching effectiveness at labs'), Factor 3 ('expectations') and 5 ('motivation for the course'), and as VI the staff lecturing the labs. This last variable had seven levels of analysis. The staff members delivering the lectures were removed from the study since just one lecturer was responsible for lecturing.

The homogeneity tests when proceeding the Manova indicated that the three Factors' covariance matrix differed across groups [Box's M = 68.737; F (36, 50613.47) = 1,842, p = 0.002]. In addition, the Levene test indicated in Factor 5 the rejection of the null hypothesis (H0) that indicated the variance homogeneity [F (6, 308) = 2.21, p< .05]. In the other Factors the variances revealed to be homogeny [we obtained F (6, 308) of 1.95 and 0.95, p> .07, to Factors 1 and 3]. Thus, we decided to employ the non-parametric equivalent test of Manova: the Kruskal Wallis Test. The values are shown in Table 80 and summarised in Figure 21. The results of the Kuskall Wallis determined statistically significant differences associated with lecturers in Factors 1, 3 and 5 [χ^2 (6) = 81.14, 16.87 and 19.97, *p* < .01, to Factors 1, 3 and 5].

Table 80: Mean item scores and standard deviations for Factors 1, 3 and 5 analysed by lecturers (construct 3)

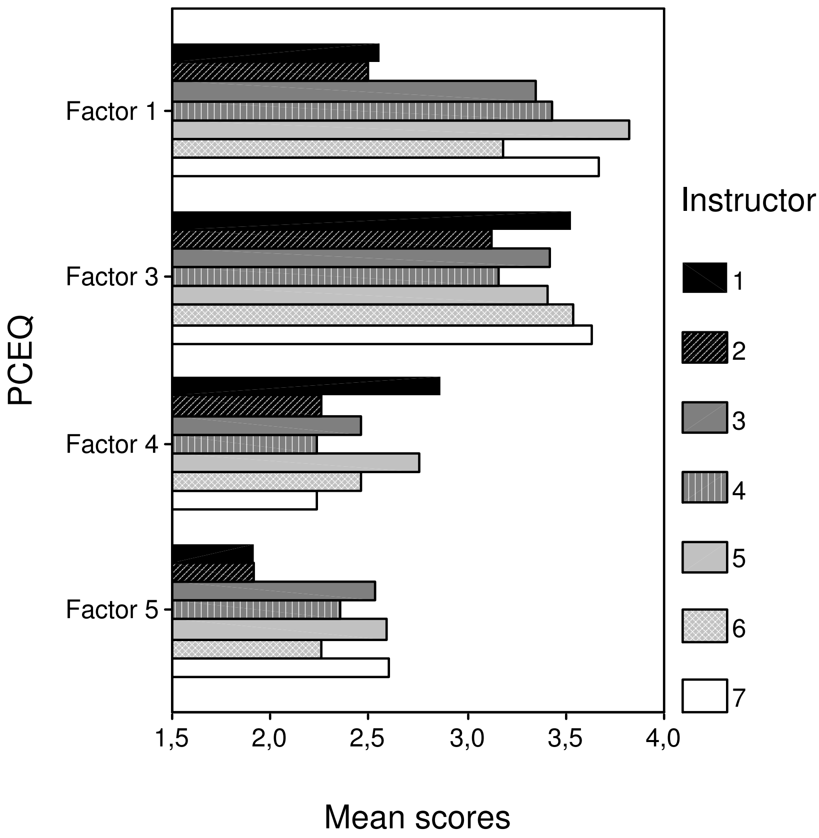
	Academic staff								
	1 n=17	2 n=32	3 n=49	4 n=58	5 n=50	6 n=69	7 n=40	Total n= 315	χ^2 (6)
	Mean scores								
PCEQ$_3$ (global scale)	2.58	2.49	2.86	2.75	3.03	2.78	2.94	2.81	
Factor 1	2.55	2.49	3.34	3.43	3.82	3.18	3.66	3.31	81.14**
Factor 3	3.52	3.11	3.41	3.15	3.41	3.53	3.62	3.39	16.87*
Factor 5	1.91	1.91	2.53	2.34	2.59	2.25	2.60	2.35	19.97*
	Standard Deviation								
PCEQ$_3$ (global scale)	0.49	0.58	0.42	0.51	0.60	0.55	0.49	0.54	
Factor 1	079	0.73	0.53	0.63	0.56	0.74	0.56	0.75	
Factor 3	0.58	0.82	0.70	0.71	0.87	0.81	0.86	0.80	
Factor 5	0.68	0.79	0.75	0.84	1.05	0.93	0.91	0.90	

* Pearson correlation is significant at the .01 level (2-tailed)

** Pearson correlation is significant at the .001 level (2-tailed)

Legend: F1- Factor 1: teaching effectiveness at labs; F3- Factor 3: expectations; F5- Factor 5: motivation for the course.

Figure 21: Mean item scores for each Factor analysed by lecture (construct 3)



Legend: F1- Factor 1: teaching effectiveness at labs; F2- Factor 2: teaching effectiveness at lectures; F3- Factor 3: expectations; F4- Factor 4: attendance at lectures; F5- Factor 5: motivation for the course.

To gather information of the differences between the lecturers it was employed the multiple comparison tests (Table 81). The Tukey HSD (honestly significant difference) tests indicated that, in spite of the equivalent non parametric univariate test to point towards a statistically significant difference in what relates Factor 3 [χ^2 (6) = 16.87, $p < .01$], the results of the Tukey test did not indicate statistically significant differences between the means on this Factor. Furthermore, it is valid to assume that different lecturers did not influence differently the students' expectations.

With respects to Factor 1 data indicated that lecturer identity was a significant factor in influencing students' perception of teaching effectiveness at labs. Furthermore, students attending classes of lecturer 1 and 2 perceived teaching effectiveness less positively than students attending classes of lecturers 3, 4, 5, 6 and 7. If lecturer 5 is compared to lecturer and 6 findings suggested that lecturer 1 had a more positive influence upon students' perception of teaching effectiveness. Nevertheless, the comparison between lecturers 6 and 7 revealed that students who attended classes of lecturer 7 had a more positive perception of teaching effectiveness than students attending classes of lecturer 6.

Furthermore, with respect to Factor 5 'motivation for the course', the Tukey test indicated that students who attended classes of lecturers 3, 5 and 7 perceived to have a higher motivation when compared to students who were taught by lecturer 2.

Table 81: Difference Mean item scores and Multiple Comparison Tests for Factors 1, 3 and 5 analysed by lecturer [Tukey HSD tests] (construct 3)

	Lecturers						
	1 (n=17)	2 (n=32)	3 (n=49)	4 (n=58)	5 (n=50)	6 (n=69)	7 (n=40)
	Mean scores differences						
Lecturer	**Factor 1: teaching effectiveness at labs**						
1	-	.06	-.79**	-.88**	-1.28**	-.631*	-1.11**
2		-	-.85**	-.94**	-1.34**	-.69**	-1.17**
3			-	-.09	-.48*	.16	-.32
4				-	-.39*	.25	-.23
5					-	.64**	.16
6						-	-.48*
7							-
Lecturer	**Factor 3: expectations**						
1	-	.41	.11	.37	.12	-.001	-.10
2		-	-.30	-.04	-.29	-.42	-.51
3			-	.26	.01	-.12	-.21
4				-	-.25	-.38	-.47
5					-	-.13	-.22
6						-	-.09

7							-
Lecturer	**Factor 5: motivation for the course**						
1	-	-.00	-.61	-.44	-.68	-.35	-.69
2		-	-.62*	-.44	-.68*	-.34	-.69*
3			-	.18	-.06	.27	-.07
4				-	-.24	.09	-.25
5					-	.33	-.01
6						-	-.34
7							-

* Pearson correlation is significant at the .05 level (2-tailed)

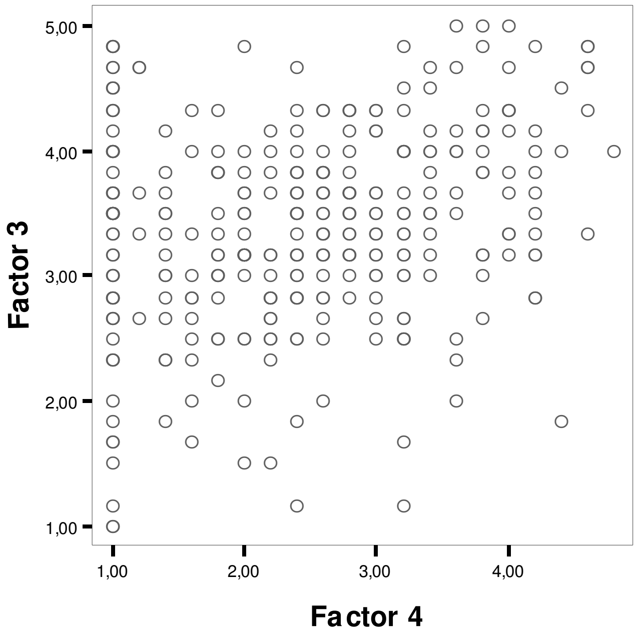
** Pearson correlation is significant at the .001 level (2-tailed)

4.3.5.5 Hypothesis 5

Hypothesis 5 holds that students who perceive to attend more frequently the lectures (F4) have higher expectations for the course (F3). In order to verify this hypothesis we proceeded to a Pearson Correlation Coefficient analysis.

There was a positive correlation between attendance at lectures and expectations (r = .239, p < .001) which meant that higher attendance at lectures correlated with students' expectations for the course (Figure 22). Attendance at lectures developed an important role on the students' learning process, even when it was not recognised by some students (cf. open-ended question at the questionnaires).

Figure 22: Scatterplot of the Pearson Correlation Coefficient analysis (construct 3)



4.3.6 Summary

In conclusion, males had higher expectations than females. Students from Electronics and Telecommunication Engineering or Computers and Telematics Engineering had higher expectations than students enrolled in courses such as Electronics and Informatics (teaching) or Industrial and Management Engineering. Students with prior programming experience perceived to have higher expectations than colleagues with no prior experience. Students with one registration had higher expectations for the course and attended more frequently the lectures than students with two, three or 4 registrations. Students who spent more time studying for the course perceived to be more motivated.

Second, based on the proposition that more effective teaching practice produce greater student satisfaction and higher academic achievement (Ramsden, 1992), we conclude, based on the data analysis, that teaching effectiveness both at labs and lectures predicts students' attendance at lectures, expectations and motivation for the course. In addition, different lecturers influence differently the students' perception of teaching effectiveness. The way lecturers deliver the class content and their teaching approaches influence the students' perception of their teaching. Furthermore, teaching effectiveness is a strong predictor of the students' motivation for the course. This is a reasonable expectation given the plausible impact of teaching behaviour on students' attitudes to their likely success in the class. Finally, students' attendance at lectures leads to higher expectations for the course (Table 82).

Table 82: Summary of the Hypotheses (construct 3)

	Null Hypotheses		**Findings**
H0	Teaching effectiveness, both at labs and lectures does not predict the students' motivation for the course.	Rejected.	Teaching effectiveness, both at labs and lectures predicts the students' motivation for the course (H1).
H0	Teaching effectiveness, both at labs and lectures does not predict students' attendance at lectures.	Rejected.	Teaching effectiveness, both at labs and lectures predicts students' attendance at lectures (H2).
H0	Teaching effectiveness, both at labs and lectures does not predict students' expectations for the course.	Rejected.	Teaching effectiveness, both at labs and lectures predicts students' expectations for the course (H3).
H0	Different lecturers do not influence the way students perceive the teaching effectiveness, expectations and motivation for the course.	Rejected.	Different lecturers influence the way students perceive the teaching effectiveness, expectations and motivation for the course (H4).
H0	Students, who perceive to attend more frequently the lectures, do not perceive to have higher expectations for the course.	Rejected.	Students, who perceive to attend more frequently the lectures, perceive to have higher expectations for the course (H5).

5. University of Strathclyde: quantitative study overview

The two constructs (4 and 5) used at the University of Strathclyde aimed to achieve the same objectives of the constructs used at the University of Aveiro. Also, the finding aimed to generalise the theory that teaching effectiveness promotes the students' attendance at lectures.

The quantitative study will report findings related to the following two questions:

1. What is the students' perception of teaching effectiveness?

2. How can the students' perception of teaching effectiveness affect their attendance at lectures and expectations for the course? Are the results similar to the Portuguese reality?

5.1 Construct 4 ($PCEQ_4$): Generation of initial pool of items

The construct $PCEQ_4$ (Appendix nr.5) delivered to students at the University of Strathclyde in 2002 was slightly adapted from the TPASQ used at the University of Aveiro in 2000. The academic staff added some new items and deleted others according to their teaching and learning backgrounds. A new summating scale was added to measure the students' perception of the course organisation and assessment at the University of Strathclyde.

The Strathclyde questionnaire comprised the 'teaching effectiveness' scale validated at the University of Aveiro with exception of items 11 and 12 and also the 'expectations' scale. The other items focused on the approaches to learning, motivation for the course, attendance at lectures, course organisation and assessment.

The open question was maintained in this questionnaire aiming to gathering suggestions for the course teaching.

5.1.1 Exploratory Validity of the instrument

An internal consistency analysis showed a Cronbach's alpha of .85 for the 40 item-scale. To achieve a higher internal consistency 9 items were removed contributing to a .886 coefficient α. (Table 83).

Table 83: Item-scale correlation and coefficient α value if items are deleted (construct 4)

Code	Items	Correlation Item-scale	coefficient α if item is deleted
	Items eliminated in the first analysis		
V23	I feel motivated because I have to finish the degree as quickly as possible	,130	,853
V29	The content of the class is too long	,048	,854
V30	The content of the class is too difficult.	-,091	,857
V32	The exercises are too simple	,040	,853
V33	The class schedule is too long.	,037	,853
V37	The continuous evaluation throughout the class inhibits my approach to learning	,100	,854
Scale Alpha total = .879			
	Items eliminated in the second analysis		
V3	The lecturer asks questions to the students individually.	,134	,880
V17	This subject challenges my intelligence	,155	,881
V18	It is possible to succeed at this subject by only studying some weeks before the exam.	,124	,882
Scale Alpha total = .886			

The KMO measure was 0.70 which is considered reasonable by Pestana & Gageiro (2000) and the Bartlett's test of sphericity was significant to proceed for the Factor analysis. The correlation matrix of the 31 variables distinguished from the identity matrix, indicating inter-correlations different than zero [$\chi2\ (465) = 1367.35,\ p<.001$]. To complement this analysis the anti-image matrix indicated not to exclude variables and made possible the application of the *Principal Component Analysis.*

Furthermore, we proceeded to the principal components, varimax rotation, Factor analysis of the 101 participant responses to the 31 items. After analysing different hypothesis (seven Factors initially) five Factors were extracted (Table 84). Based on the established criteria to select the salient loading above 0.40, two variables (items 9 and 39) were eliminated. Also, we decided that variable 4 would better contribute to the understanding of Factor one (in spite of having a loading of 0.38 in Factor one and 0.42 in Factor five).

The selected Factors accounted for cumulative percentage variance of .51 per cent. After the rotation the first Factor presented a value close to 7.48, explaining 24.1 per cent of the variance, the second 2.74 and explaining 8.83 per cent, the third 2.35 and explaining 7.5 per cent, the fourth 1.80 and explaining 5.81 per cent and the fifth 1.68 and explaining 5.5 per cent.

Table 84: Factor analysis and communalities (h^2) (construct 4)

Code	**Items**	F1	F2	F3	F4	F5	h^2
v1	The lecturer motivates my interest in the subject.	,752	,071	,183	,043	,258	,673
v2	Students are encouraged to participate in the lectures' discussions	,152	-,151	,229	,096	,535	,393
v4	The lecturer motivates the students to ask questions and expose their doubts.	,387	-,117	,165	,170	,422	,397
v5	The lecturer uses examples that motivate my curiosity in the subject.	,626	,113	,072	,190	,173	,477
v6	The language used by the lecturer is clear and objective.	,456	,240	,009	,054	,411	,438
v7	The lecturer defines the objectives for each lesson.	-,115	,208	,171	,072	,653	,517
v8	The lecturer is accessible to answer questions.	,289	,257	-,075	,182	,406	,353
v9	The lecturer shows enthusiasm for the subject.	,067	,360	-,138	,171	,363	,315
v10	The lecturer is a good communicator.	,687	,211	-,065	-,020	,229	,574
v11	The lecturer prepares the lectures having in mind that we possess less knowledge on the subject.	,349	,185	,176	,358	,459	,525
v12	The lecturer gives me feedback on my progress.	,660	-,088	,025	,105	,043	,457
v13	I feel that the subject contents are important to my future career.	,096	-,073	,329	,566	,233	,497
v14	I feel confident I will succeed in this subject.	,027	,101	-,114	,850	,146	,768
v15	The rate of delivery of content for this class is reasonable.	,217	,203	,068	,520	,104	,374
v16	I understand what I have learned.	,199	,096	-,156	,783	,070	,691
v19	I go frequently to the lectures.	-,063	,040	,726	,035	-,020	,534
v20	I go to the lectures because I benefit from the lecturers' explanations.	,197	,120	,752	-,017	,237	,675
v21	I go the lectures to better understand the subject content.	,083	-,070	,702	-,136	,283	,603

v22	I go to the lectures because the lecturer motivates my interest in the subject	,393	,079	,703	,184	-,058	,692
v24	I feel motivated because I like the teaching methods used by the lecturer.	,556	,119	,443	,379	-,033	,664
v25	I feel motivated because the lecturer provides feedback to my problems.	,614	,068	,161	,179	-,338	,554
v26	I feel motivated because the lecturer uses examples that stimulate my interest in the subject	,535	,164	,299	,465	-,194	,657
v27	The objectives for the class are well defined.	,060	,661	,205	,091	,259	,558
v28	The subject aims are relevant to my academic growth.	,015	,449	,208	,332	,149	,378
v31	The exercises are interesting.	,381	,510	,248	,300	-,103	,567
v34	The actual assessment relates well to the content of the course.	,279	,655	-,150	-,057	,094	,541
v35	I agree with my actual assessment for this class.	,321	,568	-,235	,062	-,037	,486
v36	The students' performance in practical laboratories should be evaluated	-,045	,607	,055	,030	,012	,374
v38	The tutorials would be important to assist my learning.	-,154	,479	,354	-,066	,088	,391
v39	The lectures are an effective way of teaching programming.	,261	,380	,386	,260	,074	,435
v40	The practical work is an effective way to learn programming	,036	,697	,024	,148	-,058	,514

The first Factor (10 items, Cronbach ɑ =.84) represents the scale 'teaching effectiveness at lectures'. Variables 4 and 11, in spite of loading higher in Factor 5, are also closer to the content meaning of Factor one. The reduced number of the sample led the author to accept Factor loadings above .30 (Kline, 1994).

The second Factor (8 items, coefficient ɑ =.77) represents the scale 'course organisation'. The third Factor (4 items, coefficient ɑ =.78) represents the scale 'attendance at the lectures' and the fourth Factor (4 items, coefficient ɑ =.72) represents the scale 'expectations'. The fifth Factor (4 items, coefficient ɑ =.57) was not relevant for analysis since to be composed by three variables and with a very low coefficient ɑ value (.40). The Factors loading were very acceptable (Table 85). The definition of each Factor is defined in Table 86.

Table 85: Internal consistency reliability (construct 4)

Factors		Number of items	Code	Cronbach's alpha
Factor 1	Teaching effectiveness at lectures	10	1, 4, 5, 6, 10, 11, 12 24, 25, 26	.84
Factor 2	Course organisation	8	34, 35, 36, 27, 28, 31, 38, 40	.77
Factor 3	Attendance at lectures	4	19, 20, 21, 22	.78
Factor 4	Expectations	4	13, 14, 15, 16	.72

Table 86: Descriptive information for the four Factors (construct 4)

Factors	Factor description	Typical variables
Teaching effectiveness at lectures	The students' perception of teaching effectiveness at lectures.	The language used by the lecturer is clear and objective.
Course organisation	The students' perception of the course organisation	The tutorials would be important to assist my learning.
Attendance at lectures	The students' perception of the reasons for attending the lectures.	I go frequently to the lectures.
Expectations	The students' expectations for the subject	I feel confident I will succeed in this subject.

5.1.2 Description and analysis of $PCEQ_4$

This section presents the results of the $PCEQ_4$ taking in consideration the central tendency and dispersion measures related to the global scale and to each of the five Factors. The minimum and maximum registered values, as well as the punctuation means and standard deviation are presented in Table 87.

Table 87: Descriptive analysis of the total scale and the five Factors (construct 4)

	N	Minimum	Maximum	Mean	SD
Total scale	101	2.15	4.62	3.40	0.49
Factor 1: teaching effectiveness at lectures	101	1.40	4.50	2,94	0.64
Factor 2: course organisation	101	2.25	5.00	3,85	0.59
Factor 3: attendance at lectures	101	1.00	5.00	3,68	0.79
Factor 4: expectations	101	1.50	5.00	3,37	0.81

Considering the global $PCEQ_4$ scale, the minimum and maximum mean value corresponded to 2.15 and 4.62 respectively. Thus, the mean of the minimum values is closer to the option of answer 2 ('sometimes') and the mean of the maximum values is closer to the option of answer 5 ('always'). The mean score is 3.40 (SD = 0.49). Furthermore, it is valid to assume that students' perceptions of the $PCEQ_4$ are positive.

The means of the minimum and maximum values of the answers to Factor 1 ('teaching effectiveness at lectures') and the mean score of 2.94 (SD = 0.64) reveal that students perceive teaching effectiveness as moderate. Since the items have three references to motivation (e.g. 'I feel motivated because the lecturer provides feedback to my problems') it is valid to assume that students seem moderately motivated by the teaching methods of the lecturer.

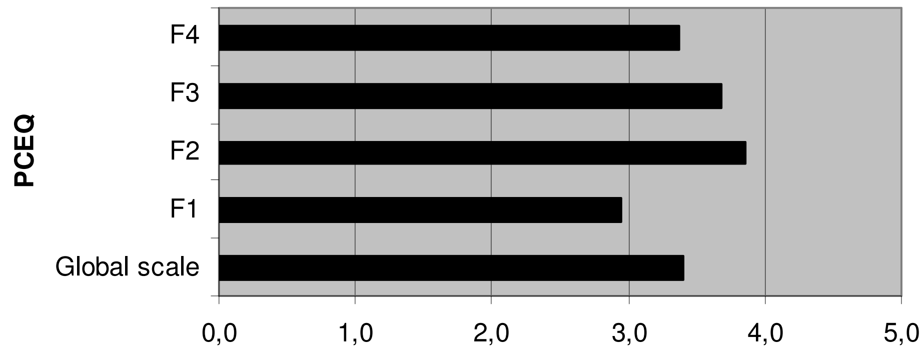
The means of the minimum and maximum values of the answers to Factor 2 ('course organisation') and the mean score of 3.85 (SD = 0.59) revealed that students' perception of course organisation was considerably high. The results changed slightly when referring to Factors 3 and 4 ('attendance at lectures' and 'expectations').

The mean score of 3.68 to Factor 3 (SD = 0.79) revealed that students attend lectures frequently. Since the reasons for the students' attendance at lectures were related to teaching methods (e.g. 'I go to the lectures because I benefit from the instructor's explanations') we assumed that students could attend lectures frequently because of the teaching methods adopted by the lecturer.

In Factor 4 ('expectations') the mean of the minimum and maximum values and the mean score of 3.37 revealed that students are relatively sceptic in what concerns, for example, the expectations for the course ('I feel confident I will succeed in this subject').

To conclude this analysis we assume that according to the mean scores obtained in the four Factors (Figure 23), students' perceptions were generally high with exception to Factor 1.

Figure 23: Mean score of the students' perception of the PCEQ$_4$ (total scale) and its four Factors (construct 4)



	Global scale	F1	F2	F3	F4
■ Série1	3,4	2,9	3,9	3,7	3,4

Legend: F1- Factor 1: teaching effectiveness at lectures; F2- Factor 2: course organisation; F3- Factor 3: attendance at lectures; F4- Factor 4: expectations

In spite of the notorious similarity between the mean scores of some Factors, we aimed to verify the differences between the Factors. Table 88 presents the 'Pair Sample T-Test'.

Table 88: Comparison of the mean scores between the Factors of the $PCEQ_4$: paired sample t-test (construct 4)

		Paired Differences		
		Mean	SD	t (314)
$PCEQ_4$ – Factors	***Pairs to compare***			
Factor 1: teaching effectiveness at lectures	Factor 1 - Factor 2	-0.91	0.68	-13.41**
	Factor 1 - Factor 3	-0.74	0.80	-9.33**
	Factor 1 - Factor 4	-0.44	0.75	-5.85**
Factor 2: course organisation	Factor 2 - Factor 3	0.17	0.89	1.94*
	Factor 2 - Factor 4	0.47	0.85	5.62**
Factor 3: attendance at lectures	Factor 3 - Factor 4	0.30	1.03	2.92*

* Pearson correlation is significant at the 0.05 level (2-tailed)

** Pearson correlation is significant at the 0.001 level (2-tailed)

There were statistically significant differences between all the Factors. It was between Factors 1 and 2 that we registered a higher difference between the means. Students had a higher perception on Factor 2 than in Factor 1.

Furthermore, we verified the correlations between the teaching effectiveness at lectures with the other three Factors using the Pearson Correlation Coefficient analysis (Table 89). Furthermore, there was a positive correlation between teaching effectiveness at lectures with course organisation, attendance at lectures and expectations. 15.5 per cent of the total scale variability was explained by the interaction between the Factors 'teaching effectiveness at lectures' and 'course organisation', 16.4 per cent between 'teaching effectiveness at lectures' and 'attendance at lectures', 23.9 per cent between 'teaching effectiveness at lectures' and 'expectations'.

Table 89: Pearson Correlation Coefficient between teaching effectiveness with course organisation, attendance at lectures and expectations (construct 4)

$PCEQ_4$ Factors	Teaching effectiveness at lectures
Course organisation	.394(*)
Attendance at lectures	.405(*)
Expectations	.489(*)

* Pearson correlation is significant at the 0.01 level (2-tailed)

5.1.3 Analysis of the influence of some socio-demographic variables in the students' perception of the $PCEQ_4$

This section explores the existence of differences on the students' perception of the 'Programming Course Experience Questionnaire' and its five Factors in what concerns the following variables: gender, age, course, programming course at secondary education and study hours per week. The variable 'number of registrations' was not analysed because most of the students were freshman.

5.1.3.1 Gender

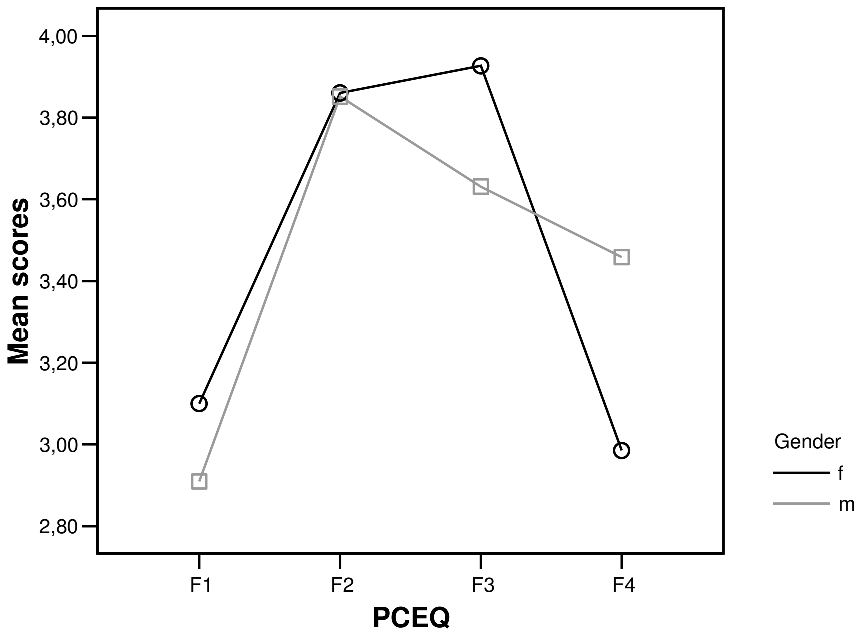
To assess differences between the four Factors (VD_s) of the $PCEQ_3$ scale and the gender (VI) of the participants, a one-way multivariate analysis of variance (MANOVA) was employed. Multivariate analysis of homogeneity was significant [*Wilks Λ* = .881, F (4, 96) = 3.24, p < .0.05]. As can be seen in Table 90, the univariate test revealed that gender was a significant difference in Factor 4 ('expectations'). Males had higher expectations for the course than females. Figure 24 represents the mean scores for gender in each Factor of the questionnaire.

Table 90: Mean item scores and standard deviations for each Factor analysed by gender: univariate test (construct 4)

	Gender						
	Male (n = 84)		Female (n = 17)		Total (N = 101)		
	M	SD	M	SD	M	SD	F(1, 99)
PCEQ$_4$ *(global scale)*	3.39	0.48	3.44	0.56			
Factor 1: teaching effectiveness at lectures	2.90	0.62	3.10	0.73	2.94	0.64	0.46
Factor 2: course organisation	3.85	0.60	3.86	0.55	3.85	0.59	23.81
Factor 3: attendance at lectures	3.63	0.81	3.92	0.66	3.68	0.79	2.12
Factor 4: expectations	3.45	0.77	2.98	0.90	3.37	0.81	0.61**

** Pearson correlation is significant at the 0.05 level (2-tailed)

Figure 24: Mean item scores for each Factor analysed by gender (construct 4)



5.1.3.2 Age

In what concerns the age variable as influencing the participants' perceptions of the four Factors we employed the MANOVA analysis, considering the age in cluster (4) as VIs and the four Factors as VDs. The results of the MANOVA determined no statistically significant differences associated with the students' age [*Wilks Λ* = .961, F (8, 190) = 0.480, *p* = .0.869]

5.1.3.3 Course

According to Nunally (1994) the researcher should not proceed to statistical analysis with less than ten subjects per experimental condition. In five courses (MCS, BIS, CESE, MSF and Phys) the sample represented two or five subjects. Thus, it was decided not to proceed to the analysis of these courses.

In order to analyse the influence of the variable 'course' (VI) on the students' perception of the four Factors of the questionnaire, MANOVA analysis were employed (Table 91). The results of the MANOVA determined statistically significant differences associated with students' courses [*Wilks Λ* = .780, F (8, 142) = 2.34, *p* =<.0.05]. The results of the Manova determined statistically significant differences associated with students' courses in Factors 1 and 2. Figure 25 represents the mean scores for course in each Factor of the questionnaire.

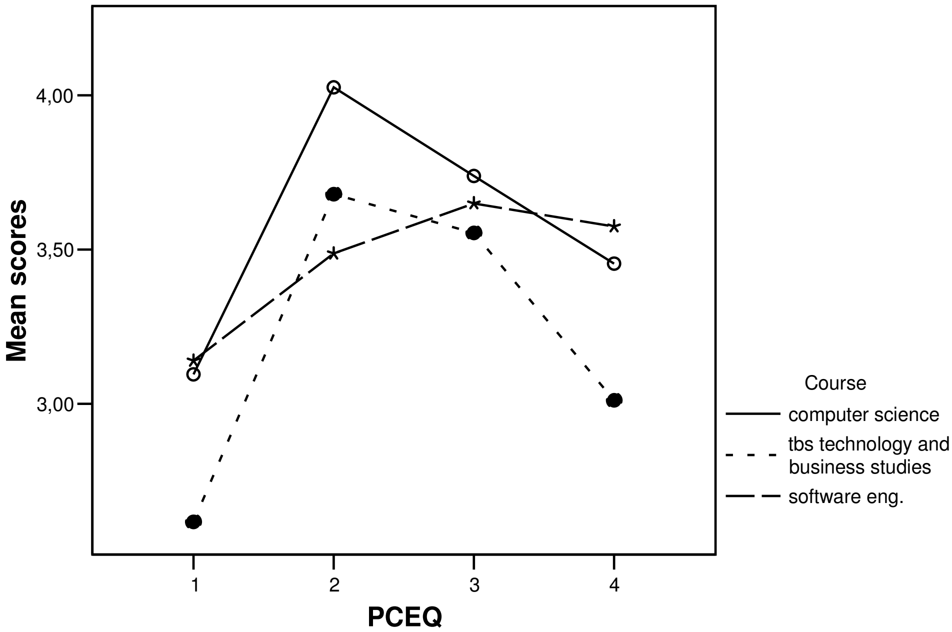
Table 91: Mean item scores and standard deviations for each Factor analysed by the three courses: independent samples (construct 4)

	CS (n=44)		TBS (n=23)		SE (n=10)		Total (n=77)		
	M	SD	M	SD	M	SD	M	SD	F (2, 74)
$PCEQ_3$ (total scale)	3.54	0.49	3.15	0.44	3.39	0.57	3.40	0.51	
Factor 1	3.09	0.65	2.62	0.56	3.14	0.74	2.96	0.67	4.71*
Factor 2	4.03	0.57	3.68	0.65	3.49	0.67	3.85	0.64	4.52*
Factor 3	3.74	0.82	3.55	0.76	3.65	0.78	3.67	0.79	0.40
Factor 4	3.45	0.81	3.01	0.72	3.58	0.88	3.34	0.81	2.88

* Pearson correlation is significant at the 0.05 level (2-tailed)

Legend: CS: computer science; MCS: Mathematics and Computer Science; BIS: Business Information Systems; CESE: Computer and Electronic Systems Engineering; TBS: Technology and Business Studies; MSF: Mathematics, Statistic and Finance; Phys: Physics; SE: Software Engineering.

Figure 25: Mean item scores for the three Factors analysed by course (construct 4)



Legend: F1- Factor 1: teaching effectiveness at lectures; F2- Factor 2: course organisation; F3- Factor 3: attendance at lectures; F4- Factor 4: expectations

To gather information of the differences between the means of the courses we employed the multiple comparison test Fisher LSD (List Significant Difference) since the VI had three levels (Table 92). Students from Computer Science perceived the course as better organised than students from Software Engineering.

Table 92: Differences between the means of Factor 2 related to the course: multiple comparison tests (construct 4)

	Courses			
	CS (n=44)	TBS (n=23)	SE (10)	Total (n=77)
	Mean differences			
	Factor 2: course organisation and assessment			
Courses				
CS	-	0.35*	0.54*	
TBS	-	-	0.20	
SE	-	-	-	

* Pearson correlation is significant at the 0.05 level (2-tailed)

Legend: CS: Computer Science; TBS: Technology and Business Studies and SE: Software Engineering

5.1.3.4 Prior Programming experience

The Levene test assumed that variances were not equal across groups in Factors 3 and 4 [with F values (1, 99) of 4.20 and 4.72, $p<.05$, to Factors 3 and 4]. In the other Factors the variances revealed to be homogeny [we obtained reasons F (1, 99) of 0.02 and 0.007, $p>0.05$, to Factors 1 and 2]. Thus, we decided to employ the non-parametric equivalent test of Manova when the VI has two levels: Mann Whitney Test. The results of the Mann Whitney determined no statistically significant differences associated with prior programming experience.

5.1.3.5 Study hours per week

To assess differences between the VD_s 'attendance at lectures' (F3) and 'expectations for the course' (F4) and the 'study hours per week' (VI), a one-way multivariate analysis of variance (MANOVA) was employed. Multivariate analysis of homogeneity was not significant [*Wilks* Λ = .950, F (8, 190) = 0.62, p = .762)]. We conclude that Factors 3 and 4 did not differ according to the percentage of time students spent on studying for this subject.

5.1.4 Hypotheses and results

5.1.4.1 Hypothesis 1

Hypothesis 1 holds that students' perception of teaching effectiveness predicts the students' attendance at lectures. In order to verify this hypothesis we decided to evaluate to what extent the students' attendance at lectures (F3) could be predicted by the students' perception of teaching effectiveness (F1). Thus, Factor 3 was considered as the criterion variable and Factor 1 as the predictor variable. Through a simple linear regression analysis we established the relations between the variables.

5.1.4.1.1 Teaching effectiveness at lectures (predictor variable) and attendance at lectures (criterion variable)

The students' perception of the teaching effectiveness explained 16.4 per cent of the variability in this criterion, [coefficient of multiple determination $R^2 = .164$; coefficient of multiple regression $r = .405$; $F (1, 99) = 19.47$, $p< .001$]. The analysis related to the contribution of the predictor to the total variability indicated that the results were statistically significant [we obtained standard regression coefficients of .405, $p < .001$].

Furthermore, it was valid to assume that Factor 4 ('attendance at lectures') might be predicted from the students' perceptions of teaching effectiveness at lectures in a way that a change of one unit on the predictor variable 'teaching effectiveness at lectures' was associated with a change of .502 (unstandardised regression coefficient) on the criterion variable. Table 93 shows the regression coefficients for each Factor, the standard error and the significant statistical tests.

5.1.4.2 Hypothesis 2

Hypothesis 2 holds that teaching effectiveness predicts the students' expectations for the course. In order to verify this hypothesis we decided to evaluate to what extent the students' expectations for the course (F4) could be predicted by the students' perception of teaching effectiveness (F1). Thus, Factor 4 was considered as the criterion variable and Factor 1 as the predictor variable. Through a simple linear regression analysis the relations between the variables were established.

5.1.4.2.1 Teaching effectiveness at lectures (predictor variable) and expectations (criterion variable)

The students' perception of teaching effectiveness explained 23.9 per cent of the variability in this criterion, [coefficient of multiple determination $R^2 = .239$; coefficient of multiple regression $r = .489$; $F(1, 99) = 31.13$, $p < .001$] magnitude considered high, based on the conventional values of interpretation of these measures (Cohen, 1988). The analysis related to the contribution of the predictor to the total variability revealed that the results were statistically significant [we obtained standard regression coefficients of .489, $p < .001$].

Furthermore, it was valid to assume that students' expectations might be predicted from the students' perceptions of teaching effectiveness at lectures in a way that a change of one unit on the predictor variable 'teaching effectiveness at lectures' was associated with a change of .247 (unstandardised regression coefficient) on the criterion variable. Table 93 indicates the regression coefficients for each Factor, the standard error and the significant statistical tests.

Table 93: Multiple regression analysis considering as predictor variables Factor 1 of the $PCEQ_4$ and as dependent variables Factors 3 and 4 (construct 4)

Teaching effectiveness at lectures (Factor 1)						
	F	R^2	B	Std. Error	β	t-student tests
Factor 3	19.473*	.164	0.502	0.114	0.405	4.413*
Factor 4	31.134*	.239	0.247	0.618	0.489	5.580*

* < 0.001

Legend: F – F de Fisher; R^2 – coefficient of multiple determination; B – unstandardised coefficients regression; β –standard coefficients regression.

5.1.4.3 Hypothesis 3

Hypothesis 3 holds that students who attend more frequently the lectures (F3) have higher expectations for the course (F4). In order to verify this hypothesis we proceeded to a Pearson Correlation Coefficient analysis.

There was no statistically significant correlation between attendance at lectures and expectations (r = .169, p = .091) which meant that higher attendance at lectures did not correlate with students' expectations for the course.

5.1.5 Summary

In conclusion, Males had higher expectations for the course than females. Students from Computer Science perceived the course as being better organised than students from Software engineering and Technology and Business Studies. Prior programming experience did not influence students' expectations for the course or attendance at lectures. Students' expectations for the course did not differ according to the percentage of time students spent on studying.

Second, teaching effectiveness at lectures predicts the students' expectations for the course and attendance at lectures. Finally, and in contrast to the findings at the University of Aveiro, students' attendance at the lectures is not correlated with higher expectations for the course (Table 94).

Table 94: Summary of the Hypotheses (construct 4)

	Null Hypotheses	Findings	
H0	Teaching effectiveness at lectures does not predict students' attendance at lectures.	Rejected.	Teaching effectiveness at lectures predicts students' attendance at lectures (H1).
H0	Teaching effectiveness at lectures does not predict students' expectations for the course.	Rejected.	Teaching effectiveness at lectures predicts students' expectations for the course (H2).
H0	Students, who perceive to attend more frequently the lectures, do not perceive to have higher expectations for the course.	Not Rejected.	Students, who perceive to attend more frequently the lectures, do not perceive to have higher expectations for the course (H3).

5.2 Construct 5: Generation of initial pool of items

The PCEQ$_5$ (Appendix nr.6) uses the Factor 'teaching effectiveness', validated in 2002, (construct 4). Construct 5 uses also the other three Factors validated in 2002, namely: Factor 2 ('organisation and assessment'), Factor 3 ('attendance at lectures') and Factor 4 ('expectations').

CHAPTER 6 - DISCUSSION AND CONSIDERATIONS

1. Introduction

The findings of the study generated a number of issues for discussion and consideration. This chapter presents some of these issues, aiming to explore the impact that the overall findings can have on teachers' attitudes towards teaching and students' learning in introductory programming courses.

This thesis considers how student academic success and motivation may be influenced by teaching best practices. The study does not take account of other variables, such as the social or psychological factors that may affect academic success.

In the first chapter, we explained the reasons behind the choice of working mainly with two variables: the teacher and the curriculum organisation of the courses. The complex structure of the academic success and the multiplicity of factors that contribute to its understanding could not be fully analysed in just one study. Nevertheless, the choice to work mainly with two variables does not imply that the other variables are not so relevant as well. The student, the institution, and its policies are extremely important for the overall understanding of this process.

2. Academics and teaching best practices

> *Good teaching and good learning are linked through the students' experiences of what we do. It follows that we cannot teach better unless we are able to see what we are doing from their point of view.*
>
> *(Ramsden, 1999, p.86)*

Working with engineering staff was challenging work. The idea that engineering academics are not sensitive to educational research or pedagogy was not evident from this study. From the outset, academics exhibited concern with the causes of student retention and academic failure. Academics also demonstrated a strong interest in knowing how their foreign colleagues approached teaching, how different courses and curriculum designs could affect teaching approaches and what would be the impact of teaching best practices for the student learning outcome.

3. Effective teaching

> *We help our students understand engineering concepts and go beyond the knowledge level to higher levels of thinking. We help them to apply, analyze, and synthesize, to create new knowledge, and solve new problems. So, too, as teachers, we need to recognize our challenge to go beyond knowledge about effective teaching. We need to apply these strategies, analyze what works, and take action to modify or synthesize our learning to help our students learn in a way that works for us as individuals and teams of teachers.*
>
> *(Balaraman, Khan, Fleming, et al, 1995, p. i)*

One of the questions addressed in this study was whether students' perception of teaching effectiveness would affect their attendance at lectures, expectations and motivation for the course. Findings from both universities suggest that such perception affects both students' attendance at lectures and their expectations of the course. In addition, at the University of Aveiro, different lecturers influenced students' perception about teaching and consequently their attendance at lectures and motivation for the course. Husbands (1997) came to a similar conclusion. This situation helps to explain why some lecturers would have more students in the class than others. The association of best teaching practice to students' motivation and academic success was also pointed out in studies carried out by Huet & Tavares (2004), Tavares (2003), Gonçalves (2002, 2000), Jesus (2002[1], 2002[2]), Rego (2003,2000), Vieira (2002), Entwistle, Skinner & Entwistle (2001), Huet & Tavares (2001), Gibbs (1995), Jesus (1996), and Ramsden (1992).

If it is accepted that effective teaching can promote the quality of student learning, academics have then a great responsibility in this process (Prosser, Ramsden, Trigwell & Martin, 2003; Cross, 1990). Furthermore, it is important to ask the following question: What is the role of university teachers in Higher Education and what characterises an effective teacher?

According to the Portuguese university teachers education law (law Nº. 448/79, November 13th), university teachers have to accomplish three main objectives, namely: i) to deliver classes that are established by the department; ii) to develop, individually or in group, scientific research, and iii) to contribute to the democratic organisation of the university.

The first objective should imply scientific and pedagogical preparation. Of course, university teachers are expected to be scientifically accurate and pedagogically efficient. An effective teacher is expected to encourage students to find questions worth pursuing, to engage students in continuous work and to encourage deep learning.

These goals are not always easy to achieve, especially when the majority of engineering academics have never attended a formal course in education and have no deep knowledge of students' approaches to learning. This situation is present both in Portugal and UK. The scientific content is important but the academic performance is crucial for the students' understanding of a specific issue. Wankat & Oreovicz (1993) characterise a good teacher when he or she is able to conciliate a good performance with a good scientific content. What is considered a good performance? According to Lowman (1985) and Wankat & Oreovicz (1993) a good performance requires from the academics an effort to stimulate the students' interest in the subject. Furthermore, effective academics should be clear, well-organised, approachable, and enthusiastic, as well as valuing learning, and to promote a student-centred orientation to learning.

Academics do consider the relevance of educational training (Wankat & Oreovicz, 1993). For example, some of the interviewees suggested that effective teachers were born and not made and that it was difficult to turn less effective teachers into effective teachers. Nevertheless, experience in teaching engineering students how to teach reveals that everyone can improve their teaching skills (Wankat & Oreovicz, 1984). Wankat & Oreovicz (1993) conclude that '*even those born with an innate affinity for teaching or research can improve by study and practice*' (p.3). Nevertheless, most of the academics value teaching training and accept that effective teaching can promote student learning and motivation.

4. Auto and hetero evaluation of best teaching practices

> *(..) develop instructional routines that include teaching, reflection on information about successes and failures, and then teaching again, with attempts to make changes based on feedback… . Many college teachers do this naturally. They solicit information as feedback; they reflect on*

> *their expectations, beliefs, and values; d they experiment with different ways of teaching.*
>
> (Menges, 1991, p. 27)

Student views on best teaching practices gave lecturers an idea of their performance as teachers, but this insight does not necessarily improve teaching. Ideally, lecturers should actually reflect upon that information and make necessary changes (Cohen, 1980).

In this study, the students' views about teaching best practices were discussed individually with academics. The aim of this intervention was to provide diagnostic feedback to faculty about the effectiveness of their teaching and to create an opportunity to reflect on their practice.

Some authors suggest that appropriate feedback can promote students' learning ad motivation (Higgins, Hartley & Skelton, 2001; Young, 2000; Falchikov, 1995; Butler & Nisan, 1986). In addition, instructional feedback can also modify instruction (Shannon, Twale & Hancock, 1996). This study took in consideration the need to deliver feedback to teachers regarding the students' evaluation of their teaching practice. The students' feedback was extremely helpful in providing sufficient detail to help academics determine what was and was not working in their instruction. On the other hand, this feedback allowed academics to be more participative in the research. The first stage of interviews revealed that academics felt disappointed with some educational research, namely through the lack of feedback from the questionnaires that were circulated in the classes.

According to one lecturer, the questionnaire data are pertinent when leading to a reflective process. Statistical data indicate a tendency on the students' answers. Therefore, it is important to reflect and discuss that tendency and implement strategies to overcome some of the negative results.

Five of the lecturers in Aveiro admitted they did not dedicate much of their time to reflecting on this issue or even to exchanging information with colleagues who teach the same subject. From this perspective the interaction with the lecturers was crucial to initiate a turning point in their attitude towards teaching.

The academics' perception on their teaching was slightly different from the students. Lecturers had difficulty in understanding students' learning process and motivation. Enthusiasm for lecturing was also discussed. Only two lecturers considered enthusiasm for the subject important to grab the students' motivation and interest in the lectures. Other members of staff played down the influence of this variable on students' behaviour.

5. Teaching philosophies

We believe that attitudes towards teaching derive from theories of teaching that each member of staff has developed over time. The same idea is shared by Trigwell, Prosser & Waterhouse (1999) and McKenzie (1999).

Three lecturers at the University of Aveiro believe that student learning outcome depends mainly upon students themselves and that teaching does not necessarily enhance learning if students are not intrinsically motivated to learn. There is still a prevalent idea that a substantial part of university learning can take place '*apart from lectures and other formal classes*' (Ramsden, 1992, p. 88). This implies that teaching is not so relevant after all. If students are motivated and keen to learn, teaching might be considered secondary since students will seek information from other sources. Ramsden (1992) emphasises the idea that there is a myth in the culture of university teaching and that '*learning is something separate from teaching*' (p. 88).

We have found out that the majority of surveyed academics attribute to the learner the major role for his or her learning achievement, followed by the design of the course and curriculum. Teaching will enhance learning if these conditions are satisfied. Teaching is important in conjunction with the design of the course and curriculum. These academics feel constrained in adjusting their teaching if the course design and curriculum are not the most suitable one. Indeed, data revealed a significant correlation between the curriculum design, student motivation and academic achievement (Huet, Pacheco & Tavares, 2003). We also conclude that the curricular redesign of introductory programming at the University of Aveiro courses results in different teaching approaches which thereby enhanced student learning.

In addition, academics described teaching as facilitating, helping or guiding, not just as telling or transmitting. These academics considered teaching as student-centred (Biggs, 1999), aiming to guide students in their learning process, even when some of the teaching techniques at lectures do not necessarily promote this approach.

6. Relevance of teaching training for university teachers

> *Few engineering schools explicitly prepare their graduate students to teach, and new professors consequently join faculties equipped with a Ph.D. in their discipline but no background in pedagogy. Also, most colleges and universities have few criteria to screen prospective candidates for their teaching ability; much of the emphasis in hiring is on perceived potential as a researcher. Candidates often give seminars on their research, and if they can give a passable performance and can answer a few questions without complete intellectual collapse, then their teaching skills are judged 'good enough.' As time passes, some of those hired become good teachers by instinct and others learn their craft by years of trial-and-error effort, but some never rise above mediocrity or worse.*
>
> *(Stice, Felder, Woods & Rugarcia, 2000, p.124)*

The lecturers who participated in the study had no teaching training before or during their stay in academia. One lecturer at the University of Aveiro had professional training in teaching at secondary level. Curiously, this academic considered his early experience in teaching as very useful for dealing with first-year students. Indeed, teaching training was considered useful for university teachers. During the interviews, academics mentioned the importance of pedagogical training to improve their skills in teaching. The youngest lecturers affirmed that initial training would have been extremely useful, especially for delivering a theoretical or practical class.

If teaching training is fundamental for secondary teachers, why is it so often neglected in Higher Education? Initial training of university teachers is now established in countries such as the UK, Norway, USA and Australia, but not so common in Portugal. Gibbs & Coffey (2004) refer to their article as the first '*published study that combines psychometric data from a number of training programmes and includes a control group so as to be able to measure impact*' on teaching and student learning (Gibbs & Coffey, 2004, p.88). Indeed, previous research on training of universities teachers concluded that there is little evidence on the impact of such training on teaching skills, approaches to teaching and student learning (Gilbert & Gibbs, 1998). After the work of Gibbs & Coffey (2004) teaching training can be more credible in academia since there is evidence that connects teaching training both to positive changes in teachers and student learning.

In this study, data gathered from interviews revealed that workshops and seminars would be the most suitable means of promoting teaching best practices. Nevertheless, most lecturers questioned the value of workshops and seminars delivered by educational experts with no scientific or engineering background. Too much theory, not applied to practice, was the negative point of many of these seminars and workshops. Indeed, the same view is shared by students when they complain about the amount of theory delivered in lectures with no real life examples to make theory more understandable and classes more motivating. Furthermore, students' and lecturers' learning approaches are similar. When academics feel unmotivated in a seminar with no clear connection between theory and practice, this lesson should be applied when the same academics are delivering a lecture.

This reflection was important in the future planning of more successful training modules for academics or a set of workshops to discuss teaching best practices. Academics need to open their views in other areas of knowledge in order to enrich their practice. The University of Aveiro, under the programme FADES, will offer continuous professional development modules to their teachers. These modules will take place between September 2005 and March 2006 and will focus on the following topics: i) University Pedagogy and Curriculum Development; ii) ICT, and iii) Collaborative Learning. These activities are crucial for the development of academics' lifelong learning, but need to be carefully thought in order to reach the proposed objectives. A well planned follow-up will be crucial to evaluate the impact of the courses in the teaching practices.

7. The purpose of teaching evaluation

Sharing the ideas of Borges de Almeida (1999) and Botelho (2000), research or even institutional measures to enhance teaching excellence, and consequently a higher level of student academic success, seem very scarce. It is true that evaluation methods based on questionnaires to students and teachers may be too incipient and rudimentary to produce a concrete effect on teaching and learning (Bal & Wilkinson, 1994). What is the purpose of evaluation if it has no 'real' impact? Lectures have fewer and fewer students. This research concludes that one objective reason for this situation is the effect of teaching best practices on motivating the students. The traditional style of lecturing seems not to be best suited to grabbing student attention and interest. Students ask for more theoretical and practical lectures. But what is actually changing as a consequence of these results?

Some problems extracted from these evaluations should be overcome. Nevertheless, individual initiatives from some members of staff make us think that change is possible. The traditional stereotype of university teachers (focused on their own area of knowledge) is changing, and more frequently we find academics looking for other areas of knowledge. Different experiences are taking place at universities. The conclusions of such experiences are published and discussed between peers (Huet, Tavares, Weir, Ferguson & Wilson, 2003; Dias, 2002; Santos, 2002; Malaquias, 2002; Rocha, 2001; Sousa, Sousa, Lemos & Januário, 2001; Gomes, Cacho Teixeira & Cacho Teixeira, 2001). Thus, we are still at the beginning of a process that requires persistence and the recognition of the institution.

Among the questions we planned to address was whether teaching evaluation would be accepted by lecturers and what would be most effective for carrying out this evaluation.

Findings suggest that teaching evaluation is well accepted by lecturers in both institutions. Indeed, teaching evaluation would imply a system that recognises teaching quality. Consequently, lecturers would put more effort into teaching with higher recognition by academia.

During interviews, lecturers admitted that the most effective methods for evaluating teaching quality would be those leading to reward. Literature suggests that the use of '*rewards and instrumental satisfactions*' (Katz & Kahn, 1966) induce required behaviours, such as:

(1) System rewards earned through membership or seniority

(2) Individual rewards such a pay incentives and promotion on the basis of individual merit.

(3) Instrumental identification with organisational leaders in which followers are motivated to secure the approval of leaders.

(4) Affiliation with peers to secure social approval from own group

In Portuguese and Scottish institutions, best teaching practice is not yet rewarded by academia as a factor in professional promotion. The traditional role of the teacher is still too powerful to be questioned. Despite this, the teaching practice is starting to be taken into consideration by members of academic juries in Portugal and there is growing concern with pedagogical issues at the juries' evaluation committees.

8. Academic motivation and satisfaction for teaching

The study reported here indicates the presence of both highly and lowly motivated academics at the University of Aveiro. Without motivated lecturers how can students be motivated? Some students are by nature already intrinsically motivated. They do not need further incentives from instructors. Even extrinsically motivated learners can accomplish certain tasks and be successful. Study into students' motivation reveals that motivating the unmotivated is the biggest challenge for lecturers (Luce, 1990). But how can we motivate the unmotivated academics? The higher failure rates at the University of Aveiro lead some academics to feel unmotivated to teach, especially in first-years.

Data from interviews at the University of Aveiro points towards a motivation and satisfaction for teaching based on the 'Motivational System Theory' framework developed by Ford (1992) and the theoretical framework for faculty role performance and achievement defended by Blackburn & Lawrence (1995). The premise underlining such theories explains that motivation is the key issue for achieving satisfaction at work and to improve productivity.

The interviewees demonstrated interest and satisfaction for teaching, but this enthusiasm could easily disappear when the 'environmental context' (Ford, 1992) or the 'environmental conditions, responses and social contingencies' (Blackburn & Lawrence, 1995) are not supportive.

For example, academics who have dedicated most of their work in preparing teaching activities, admitted to be disappointed with the educational system and policies (e.g. organisation of the curriculum, the non existence of penalties for students with consecutive retention years), the non-recognition by academia for their work (e.g. career progression), and with the students (e.g. the passivity and no responsibility of students in Higher Education, higher failure rates). Studies revealed that academics seem to gain significant intrinsic rewards from working in a stimulating, collegial atmosphere, from contact with their students and a sense that they are contributing to their overall growth and development (Ramsden, Margetson, Martin, E., & Clarke, 1995).

The idea of a reward system that values teaching in terms of career progression is the central theme of discussion among academics at both universities. At the University of Aveiro some lecturers admitted that would not put so much effort into teaching in the next years, since their work was not recognised by academia. Also, the time devoted to preparing teaching activities did not leave much time for research. Academics motivation for teaching is in this sense regulated by external ('environmental') factors.

As a consequence, of these 'environmental conditions' many academics tend to be more motivated by external rewards. Still, many academics dedicate their time and effort to preparing a lecture or a practical class, with no external reward expectations. Indeed, literature suggests that academics who spend time in preparing their classes seldom expect any reward other than personal satisfaction (Froh, Menges & Walker, 1993; Deci & Ryan, 1985; McKeachie, 1979, 1982). As in any other profession, motivation can not be easily measured. Several factors influence individual behaviour and cannot be easily analysed.

Data related to the University of Strathclyde did not point towards an explicit lack of motivation of academics for teaching. The reasons for such behaviour were not specifically addressed in the interviews. Nevertheless, the differences between academics' satisfaction can be explained through a different educational and cultural system. Individuals in each country interpret and react to situations according to their set of values and beliefs (Haviland, 1990). Culture has an important factor on behaviour so that students or teachers belonging to the same ethnic or cultural group and speaking the same language are more likely to share similar reactions and to behave in a similar way. In addition, the cultural believes will influence the educational policies.

The student autonomy at Strathclyde (e.g. not compulsory labs, exercises divided by tasks), the actual law of Higher Education fees in the UK (e.g. payment of the studies after getting a first job), the pedagogical support for new members of staff (e.g. professional training modules at Strathclyde for new staff members), and the recognition of teaching by academia (especially by peers), can easily make the difference between academics' satisfaction for teaching.

During the last four years we realised that first-year students can easily demotivate academics for teaching. The irresponsibility of first-year students and their lack of goals and objectives can make the teaching of first-year courses a difficult task to perform, especially for teachers lacking previous training in educational issues.

9. Students attendance and attention at lectures

> *I sat in the back of the classroom, observing and taking careful notes as usual. The class had started at one o'clock. The student sitting in front of me took copious notes until 1:20. Then he just nodded off. The student sat motionless, with eyes shut for about a minute and a half, pen still poised. Then he awoke, and continued his rapid note-taking as if he hadn't missed a beat.*
>
> *(Middendorf & Kalish, 1996)*

Students' perception of attendance at lectures is considerably higher (mean score of 3.68) at the University of Strathclyde (US) than at the University of Aveiro (UA) (mean score of 2.43). These quantitative data corroborate instructor opinions regarding the student attendance at lectures. At Strathclyde academics have more students at lectures than at Aveiro, which does not imply that all the students listen to what the lecturer is saying.

In both institutions the author sat in on the lectures and realised that students usually listen while the teacher talks (at the lectures). In addition, students tended to leave the class after the first 30 minutes (especially the ones who sit at the back) or start to play games on cellular phones while the lecturer is speaking.

Other studies with university students (Palmer, 1998; Middendorf & Kalish, 1996; Johnstone & Su, 1994; Johnstone & Percival, 1976) found that a lapse in attention occurred some 10-18 minutes after the lecture had started. Research developed by Johnstone and Percival (1976) points out that students' attention is not regular, as presented in Figure 26. The clock shows approximations of attention lapses and alertness during a typical 50 minute class period.

Figure 26: Students' attention lapse and alert in a 50th minute lecture

In: 'Keeping students' attention in lectures' Faculty Innovation Center [http://fic.engr.utexas.edu/how/files/KeepingAttention(FIC).pdf]

The factors contributing to this situation are diverse. A study carried out by the same authors (1976) with first-year chemistry studies revealed that the most important factors affecting the rate of decline were attributed to difficulty of subject, delivery rate, and lecturer personality.

One explanation for the lapses of students' attention is that the amount of information delivered in traditional lectures '*does not match what current cognitive science research tells us of how humans learn*' (Middendorf & Kalish, 1996, p. 1). The brain is not a videocassette recorder. Information is gathered in categories that are then processed into new knowledge. This process is not linear. The mental structures of the brain must often connect the old knowledge with the new knowledge. Once a new concept has been introduced students need the opportunity to practice thinking in terms of that concept. This process is difficult for students who have to process a lot of new information in a lecture of 60 minutes. Indeed, academics need to change their teaching approach in order to capture the students' attention. Middendorf & Kalish (1996) call this the '*change-up in lectures*'. Since, students have some problems to be concentrated in lectures, it is necessary to adopt different teaching approaches. In another words, academics need actively to engage the learner in the construction of knowledge and enable them to retain information and transfer learning. This way, students can develop a perspective on the kinds of critical thought that are central to understanding a specific discipline.

10. Teaching approaches in engineering

There are numerous approaches to the teaching of programming and the evaluation of programming ability (Male, Lawrance & Flintoff, 2002). Each of these approaches has benefits and drawbacks (Chamillard & Braun, 2000). In spite of the time allocated for labs, the traditional style of lecturing is still the most common method for teaching engineering at the Universities of Aveiro and Strathclyde.

Through non-participant observation of lectures and labs at the Universities of Aveiro and Strathclyde, and also from interviews with faculty, we concluded that teaching methods in lectures across the two institutions are very similar. Lecturers frequently use laptop computers to provide live examples that illustrate lecture points or shed light on exercises. Traditional lectures, more exposition than interaction, predominate in both institutions, in spite of some efforts to make lectures more interactive.

The differences lie in the delivery of practical content. Before 2002 at the University of Aveiro, 90 minutes lectures allowed an exposition of the main theoretical concepts followed by a discussion of some practical exercises and also an introduction to the forthcoming lab exercises. With the shift to 60 minute classes, lecturers claim to go faster over the content in spite of students' protests. Effectively, the curriculum is the same, with one hour less per week available in lectures.

In Aveiro during 2003/04, the coordinator of 'Programming I' gave instructions to avoid addressing theoretical concepts at the labs. This measure aimed to bring more students to lectures. Two lecturers affirmed that this change was not helping the students' performance at the labs and these lecturers believed that student motivation and achievement would be higher if they approached some of the theory at the beginning of the practical class.

At Strathclyde the labs are not viewed as the place for theoretical exposition of course content, rather they provide an opportunity to practice and provide help in the resolution of the exercises. Students come to the lab and have to do a required number of exercises to get a grade. A lecturer marks completed exercises whereupon the students may leave the lab. They are, in a certain way, more autonomous in their learning than students at the University of Aveiro. The question is: Are they able to manage their autonomy?

According to one demonstrator at Strathclyde, students do not know how to manage their study time or do not have the best study habits. In the view of this demonstrator, some students attend the labs to present already completed exercises. This situation can lead to cheating, since students may be colluding to produce a solution prior to the lab. Nevertheless, the lecturers are not too worried with this situation because the students who work during the semester are those who are likely to pass the final exam. Autonomy does not always imply responsibility and students have to manage their autonomy in order to be successful.

This model is also defended by one Portuguese lecturer who sees the labs as a place where students should work and look for assistance. Meanwhile, academics would have more time for research and to help other students who need help.

A significant number of students from both institutions express a preference for fewer lectures and more practical sessions. One Strathclyde student suggested that lectures should be held in labs '*so everyone could program during lectures, this way we could see our program running rather than that of the lecturer*'.

With such student behaviour and student requests for more labs or lectures with a strong practical component, we may wonder at the long term future of lectures.

During informal conversation, most of the academics reveal that delivering a lecture is a challenge. They reported trying different teaching approaches in the class without success. Academics accepted the need to talk to their colleagues about the most effective methods to use in the classroom.

10.1 Problem-based learning (PBL)

The students' suggestion for teaching the course revealed that academics should present 'real-world examples' in which future engineers were required to understand the phenomena and solve the problem (PBL- Problem-based Learning). The preparation of PBL is a teaching strategy crucial for developing skills and confidence in students designing a problem. These students '*are learning a process which will be an essential part of their work as professionals*' (Ramsden, 1992, p.50). The ability to think autonomously and in cooperation with other students is an essential characteristic for engineering students. The exercises thought and planned for each course should relate the subject to the real world, so that students have a stake in solving the problem.

The importance of flow of information is identified by students and by lecturers and is seen as a consequence of the curriculum organisation of the course. Nevertheless, the delivery of information should follow the steps of scientific method: (i) induction, (ii) inference from facts, observations or data, (iii) generalities (rules, theories, mathematical models), and (iv) deduction.

The balance between concrete information (facts, observations, experimental data and applications) and abstract information (concepts, theories, mathematical formulas and models) should be balanced in delivering the courses. Academics often refer to the difficulty of introducing abstraction. When abstraction is introduced in a class without considering the cognitive structures of the individuals, it is unlikely that that the new material will be transferred to long term memory (Felder, Woods et al; 2000, Glaser, 1984).

Much research supports the notion that an inductive teaching approach promotes effective learning (Felder & Silverman, 1988) which includes increased academic achievement and enhanced abstract reasoning skills, longer retention of information, improved ability to apply principles, confidence in problem-solving abilities and increased capability for inventive thought.

Indeed, the findings suggest that academics should provide effective concrete material in class for students with more difficulties to engage in the learning process. Visual illustrations and demonstrations are perceived as more effective than verbal information by the students (sensor learners). Sensors are more comfortable with concrete information than with abstraction and the converse is true of intuitors. Most engineering undergraduates are sensors and most engineering professors are intuitors (Rosati, 2003; Rosati, Dean & Rodman, 1988). Furthermore, lectures should balance abstract and concrete information in a way that all learners engage actively in the class. The balance is the most difficult teaching goal.

10.2 Cooperative versus Individual work

The majority of Portuguese lecturers share the opinion that first-year students acquire knowledge through practice and reflection and not by working with a colleague in a laboratory, since most of the time one student relies too much on his/her colleague. Co-operative work is useful outside the class but not during practical classes. But if lecturers do not give specific tasks and orientation for cooperative work outside classes, then they are never promoting cooperative learning. As already explored in Chapter 2, students' autonomy and self-regulation is often discussed among lecturers. Authors such as Tavares (2003), Bessa (2000), and Mäkinen & Olkinuora (1999) agree that academics should guide students through their learning process. The transition to University implies from students a number of adaptations in their study and work habits. First-year students need more guided teaching, a 'bridge' between the secondary and Higher Education teaching methods. Of course, lecturers often claim students do not work outside classes, but what are the teaching strategies used by academics to promote a more autonomous and independent learning? Small PBL activities could engage students more actively in their learning process (Reid, 2002). Instead of spending time allocated to mini-tests, students could be evaluated by work or/ tasks developed during the semester.

Two lecturers at the University of Aveiro shared this opinion, but admitted not putting it into practice. At the University of Strathclyde, students are engaged in this kind of activity throughout the year. Each semester students have to accomplish a set number of exercises and small projects to obtain a grade. Laboratories become a space for working, with monitors available to answer for questions. This autonomy raises some concerns, particularly the scope for cheating. But lecturers are not so concerned with this issue. Academics share the view that students who rely upon their colleagues to solve exercises will not develop the necessary skills to pass the course.

Continuous work is essential for promoting successful engineering students, but it also requires more time for teaching and class preparation. Academics know this, but the non-recognition of teaching generates some reluctance to putting these ideas into practice.

Strathclyde academics believe that working in pairs is a cooperative learning technique that can positively develop the skills necessary for students entering working life. In the words of one Strathclyde student: 'practical test for pair work would assess group working skills that would give a little insight into how, as engineers we would have to work in teams to come up with a solution to a given problem quickly and under pressure'.

11. Partnerships of learning

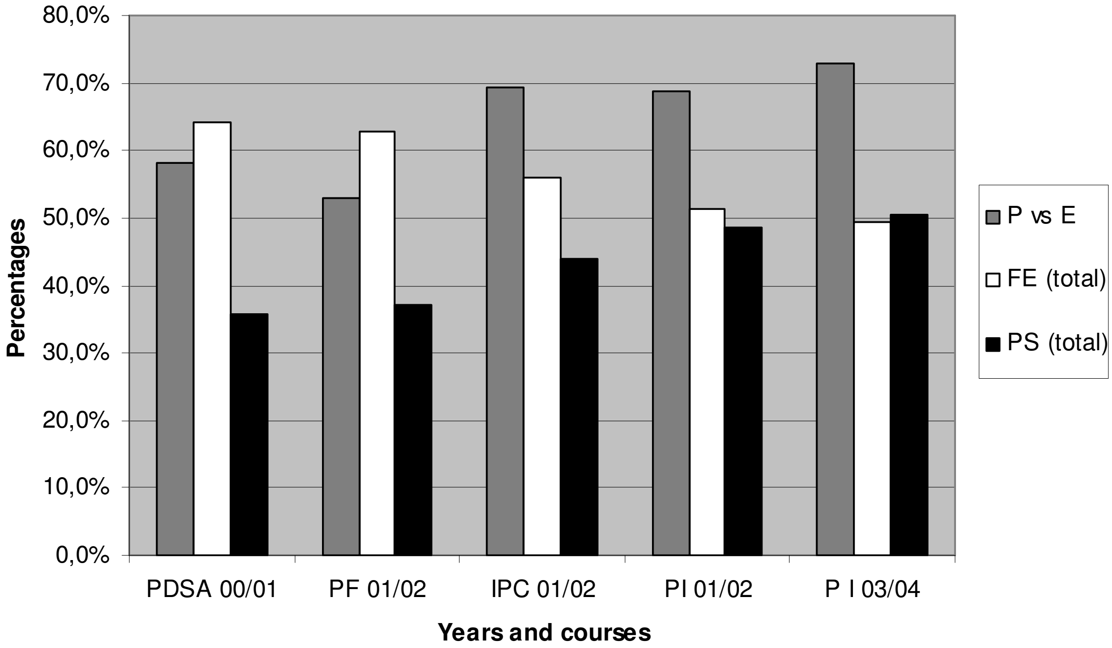
From the outset of this study, lecturers from both institutions expressed interest in being updated with results of the research and sought to discuss the findings with the researcher. In addition, appropriate feedback was given through the organisation of seminars and individual meetings (Appendix nr.10). One major objective addressed in this study was accomplished, since academics showed an increased interest in pedagogical issues, and some actually participated in educational research projects. As an outcome of this activity, we have three papers published at international conferences, involving engineers, and seminars have been held at the Universities of Aveiro and Strathclyde (Huet, Pacheco & Tavares, 2003; Huet, Tavares, Weir, Ferguson & Wilson, 2003; Huet, Cabral & Makinnen, 2003). This joint work proved positive since it has established opportunities for lecturers to reflect on teaching practice and consider strategies for improving their teaching performance. This premise is also supported by Goody & Ingram (2001).

We strongly believe that discussion of teaching practice with academic staff, the perception they have of student motivation and possible strategies to improve student learning (institutional or pedagogical changes), is the best intervention to promote academic success.

12. Students' expectations and achievement at introductory programming courses (University of Aveiro)

Student achievement in introductory programming courses has been improving since the redesign of the course in 2001/02 (Figure 27).

Figure 27: Students' achievement in introductory programming courses (University of Aveiro)



More students are submitted to evaluation which means students are making an effort to succeed at the course. The study carried out during this past 4 years lead us to reach some conclusions that can explain the higher level of students' success.

First, before the redesign of the course, students from science and engineering attended the same introductory programming course (PDSA). Academics had some problems to adapt the exercises to such a heterogeneous audience. The practical examples did not reach the students interest. Furthermore, students felt unmotivated, which led to a higher rate of dropping out and failure rates at the exams. The class had created an atmosphere of fear among first-year students who must often decided to attend the classes on the 3rd or 4th year of studies.

Second, the curriculum redesign of the PDSA course in 2001/02 created different introductory programming courses. This structure allows academics to adapt the programming language according to the objectives of each course. For example, students from Chemistry and Physics learn Programming in C, students from Electronics and Telecommunication learn Pascal and students from Civil Engineering learn Fortran.

Third, the redesign of the course created a block of three hours at the labs and a reduction at lectures[29]. This decision matched the students and academics interests. Nonetheless, it was pointed out by one academic that less theoretical classes did not allowed an effective delivery of the class contents.

Fourth, teaching strategies would focus on the students' interests since academics were working with a reduced number of students and could create more interesting exercises and examples. The introductory programming courses were now more adjusted to the students' interests. Furthermore, students turned to be more motivated and confident to achieve success in the course.

13. Summary

This study reflects the aims expressed by Melo, Silva, Gomes, & Vieira (2000, p. 145): (i) to contribute to a better consciousness of students and teachers regarding the factors that influence the quality and success of teaching; (ii) to promote a more participative and responsible attitude among students, and (iii) to provide accurate data to teachers in order to readjust contents and teaching methods, aiming for a reflective and self-critical attitude towards teaching.

What were the practical consequences of the study for the academic community? The most important was to create an opportunity for engineering academics to discuss issues related to teaching and learning.

Some academics participated more actively than others, but the majority accepted the relevance of the study toward a better understanding of academic success in introductory programming courses. Do we now have more reflective teachers? I believe we have. Faculty spent hours over the last three years discussing and reflecting on these issues. Literature suggests that such attitudes help in recognising the learning needs of students.

Students' evaluation of teaching practice is accepted by several authors as giving students a more participative and responsible attitude towards learning (Marsh, 1982, 1984). Students are '*extremely astute commentators on teaching*' (Ramsden, 1992, p. 89). Indeed, these students spent some of their time responding to questionnaires but they had no more active role in the study. We aimed to collect students' feedback as a complement to the study.

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[29] 51 Hours/Lectures turned to 24 H/L and 34 H/Labs turned to 36 H/L.

We believe that the evaluation of teaching by peers and students, along with external audits, are essential requirements for valuing teaching in Higher Education. This idea is also shared by Melo, Silva, Gomes, & Vieira (2000), who defend teaching evaluation as essential for attributing meaning to university pedagogy and to dignify the job of teaching in Higher Education.

Teaching practices might influence students' motivation towards learning either positively or less positively. Findings from the present study, as well as from Rego (2000), demonstrate that less effective academics can have a negative effect on student motivation, while more effective academics can enhance student motivation. These finding emphasise the relevance of teaching for student motivation and consequently, for their academic success. Furthermore, the work developed with academics regarding teaching practice is essential for improving the quality of learning in Higher Education.

Students in this study do not question the scientific knowledge of academics but may doubt their pedagogical expertise. This issue is an important problem in Portuguese and Scottish Universities.

The effort of teachers to demystify the course near the students will take some years to overcome. Faculty is although optimistic and believes the percentage of students' success will increase.

14. Further work

This study created the opportunity for reflection on the topic of learning and teaching in Higher Education. It has also allowed discussion with peers regarding ideas for developing further work.

This section addresses some of these ideas. First, a relevant study would be the analysis of teaching best practices for helping academics (e.g. a handbook of teaching best practices). The main objective would be to develop a practical approach to enhance teaching practices across a range of academic disciplines. This may derive from a set of case-studies on strategies for teaching best practices and how these strategies could help academics in each institution. This work could create partnerships of learning and research between national and international institutions.

The proposed study would also seek to understand how these strategies could contribute to an effective mobility of teachers and students in the European Community (with an eye to the Bologna Process). We may consider the principles of the Bologna process in relation to the following research questions:

1. What will be the direct impact of the Bologna Process on the teaching process?

2. How do academics perceive the process for enhancing the students' learning?

3. Are academics ready for such change in the educational system?

4. How can the mobility of students, teachers, and researchers contribute to more autonomous students and effective teachers?

The Bologna declaration aims mainly to increase mobility of students and staff across the European Higher Education Area. Achieving this goal will require identification and solution of a number of political, institutional, and social issues. The Portuguese Report (2004/05) clarifies some of these barriers. They are as follow:

> *For preparing the new structure of Higher Education the Minister organised the universe of The Bologna Process is inducing a number of very significant changes in the Higher Education and R&D systems. New pedagogical methods and degree structures will have to be adopted. The former will particularly require very significant effort of academics both in reviewing their courses and teaching paradigms, and in thinking of student competence, transnational co-operation and concepts of longlife learning.*
>
> *The response of the academics, their behavioural acceptance of such changes and the related commitment for these changes to occur represent a major challenge. Also, structuring a system for longlife learning and leading the society to understand the need to promote such pattern of education will have to be taken as a major objective for sustained development.*
>
> *Regarding research & development, the major challenge is to bring together or closer researchers and the society, leading the private companies to increase significantly the investment in innovation, research and development (…).*

> *Academics need to participate in 'reviewing their courses and teaching paradigms, and in thinking of student competence, transnational co-operation and concepts of lifelong learning'. Traditional teaching approaches need to be revised, academics need to pursue continuous professional development and to be committed in building the new educational structure.*
>
> (National reports 2004-05: Portuguese contribution)

Second, an important study would be to analyse the impact of teaching and research in Higher Education institutions (Portugal and UK)[30]. Internationally many universities see the interconnection between teaching and research as one of the central characteristics of a university (Elton, 2001). Although the relevance of linking research and teaching is perceived as of central importance by many authors, empirical findings suggest that research does not always influence the teaching quality and vice versa (Jenkins, Breen, Lindsay & Brew, 2003; Gibbs, 2002; Hattie & Marsh, 1996). The reasons for such situation are often attributed to the lack of well conceived institutional policies, course design and teaching and assessment practices that seek to maximise how universities and academics relate teaching and research.

In Europe such issues of university identity and what distinguishes a higher degree are now of particular importance in the context of the Bologna process of the harmonisation of degree structures (Azevedo, 2005). Within this research framework, a future research could compare, at a macro level analysis, the policies applied in selected institutions in the United Kingdom and Portugal to manage research and teaching and at a micro level analysis the academics' conception of the 'teaching and research nexus' (Neumann, 1994).

The purpose of the study would be to analyse how institutional policies can help or hinder academics to link their teaching and research and how academics perceive the teaching/research nexus with the broader objective to enhance quality teaching and learning in Higher Education. A possible comparative focus of Portuguese and United Kingdom institutions would help to illuminate our research and policy understanding of both systems: while such comparative European studies are of particular importance given the moves through the Bologna process to harmonise national degree structures and enable more transparent understandings of what is a degree.

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[30] This Project was submitted to the FCT (Fundação para a Ciência e Tecnologia) and accepted for funding.

This study would answer the following research questions:

1. How do university policies conceive the relationships between teaching and research – and how do they in fact manage that relationship?

2. How do university policies conceive of teaching/research relations in the context of the Bologna process of degree harmonisation?

3. Does the research conducted by academics connect to their teaching practices? Do academics link research to teaching and vice versa?

4. How can the research conducted by academics enhance teaching and learning? What differences can we find when looking to different university cultures and policies?

5. What is the impact that research can have upon teacher motivation for teaching? (research motivation-teaching motivation, motivation feedback loop)

References

- Alarcão, I., & Gil, V. M. S. (2004). Teaching and learning in Higher Education in Portugal: an overview of studies in ICHED. In I. Alarcão, V. M. S. Gil & H. Hooghoff (Eds.), *Challenges in Teaching & Learning in Higher Education*. Aveiro: University of Aveiro.
- Alarcão, I. (2000, 30 August - 2 September). *Qualitative changes in curriculum development in a learning organisation setting. The case of the University of Aveiro.* Paper presented at the Innovations in Higher Education, Helsinki.
- Alarcão, I. (1996). Reflexão crítica sobre o pensamento de D. Schön e os programas de formação de professores. In I. Alarcão (Ed.), *Formação Reflexiva de Professores: Estratégias de Supervisão* (pp. 9-39). Porto: Porto Editora.
- Alarcão, I. (2000). Para uma conceptualização de fenómenos de insucesso/sucesso escolares no ensino superior. In J. Tavares & R. A. Santiago (Eds.), *Ensino Superior. (In) Sucesso Académico*. Porto: Porto Editora.
- Alarcão, I. (1991). Reflexão crítica sobre o pensamento de D. Schön e os programas de formação de professores. In *Cadernos CIDInE* (Vol. 1, pp. 5-22).
- Alferes, V. R. (1997). *Investigação Científica em Psicologia: Teoria e Prática*. Coimbra: Almedina.
- Ames, R., & Ames, C. (1984). Introduction. In R. Ames & C. Ames (Eds.), *Student Motivation - Research on Motivation in Education* (Vol. 1, pp. 1-37). London: Academic Press, Inc.
- Anderson, C. (1997). Enabling and shaping understanding through tutorials. In M. Ference, D. Hounsell & N. J. Entwistle (Eds.), *The Experience of Learning. Implications for Teaching and Studying in Higher Education* (2nd ed.). Edinburgh: Scottish Academic Press.
- Argyle, M. (1983). *The Psychology of Interpersonal Behaviour* (4th ed.). London: Penguin.
- Atkinson, E. S. (2000). An investigation into the relationship between teacher motivation and pupil motivation. *Educational Psychology, 20* (1), 45-57.
- Austin, A., & Baldwin, R. G. (1991). *Faculty Collaboration: Enhancing the Quality of Scholarship and Teaching* (ASHE-ERIC Higher Education Report No. 7).

- Azevedo, S. F. (2005). Towards the European Higher Education Area: Bologna Process. National Reports 2004-2005: Portugal: FEUP, FCT, OCT.
- Bal, R., & Wilkinson, R. (1994). The use and abuse of performances indicators in UK higher education. *Higher Education, 27*, 417-427.
- Ball, S. (1977). *Motivation in Education*: Academic Press.
- Balaraman, P., Khan, M., Fleming, M., Nowicki, D., Lacey, J., & Courter, S. (1995). *Strategies for Effective Teaching. A Handbook for Teaching Assistants.* Wisconsin: University of Wisconsin.
- Baltes, P. B., & Brim, O. G. (1984). *Life-span Development and Behavior* (Vol. 6). New York: Academic Press.
- Bassey, M. (1999). *Case Study Research in Educational Settings*. Buckingham: Open University Press.
- Berendt, B. (1994). Higher Education teaching development networks: the experience of the European network on staff development in Higher Education (ENSDHE). In United Nations Educational & S. A. C. Organization (Eds.), *Higher Education Staff Development: Directions for the Twenty-First Century* (pp. 77-92).
- Bessa, J. (2000). *Níveis de Ajustamento e Auto-Regulação Académica em Estudantes Universitários.* Unpublished Master Thesis, Universidade de Aveiro, Aveiro.
- Bessa, J., & Tavares, J. (2003): *Descontinuidades nas abordagens e métodos de estudo: os efeitos das experiências pessoais e contextuais em 'caloiros' universitários na auto-regulação e sucesso académico*. Poster apresentado no Encontro Internacional Ensino e Aprendizagem: na transição do Secundário para o Ensino Superior (Ponta Delgada, 21 e 22 de Março de 2003).
- Biggs, G., & Habeshaw, T. (2002). *Recognising and Rewarding Excellent Teaching. A Guide to Good Practice.* London: Open University Press.
- Biggs, J. (1999). *Teaching for Quality Learning at University.* Buckingham: The Society for Research into Higher Education & Open University Press.
- Blackburn, R. T., & Lawrence, J. H. (1995). *Faculty at Work*. Baltimore: The Johns Hopkins University Press.
- Bligh, D. (2000). *What's the Use of Lectures?* San Francisco: Jossey-Bass Publishers.

- Brawner, C. E., Felder, R. M., Allen, R. H., & Brent, R. (2002). *How important is effective teaching to engineering faculty and administrators.* Paper presented at the American Society for Engineering Education Annual Conference & Exposition.
- Brown, G. (1989). *'The CVCP code of practice on academic staff training. The responses of the universities'.* A Report submitted to the Committee of Vice-Chancellors and Principals. Routledge, Sheffield.
- Brown, G., & Atkins, M. (1996). *Effective Teaching in Higher Education*. London: Routledge.
- Brown, G., & Bakhtar, M. (1983). *Styles of Lecturing Research and Faculty Perspectives*. Loughborough: Loughborough University of Technology.
- Brown, G. A., & Daines, J. M. (1981). Learning from lectures. In E. Oxtoby (Ed.), *Higher Education at the Crossroads*. Buckingham: Society for Research in Higher Education.
- Bruce, C., & Gerber, R. (1995). Towards university lectures' conceptions of students learning. *Higher Education, 30*, 1-11.
- Bryman, A., & Cramer, D. (1999). *Quantitative data analysis with SPSS release 8 for Windows. A guide for social scientists*. London: Routledge.
- Butler, R., & Nisan, M. (1986). Effects of no feedback, task-related comments, and grades on intrinsic motivation and performance. *Journal of Educational Psychology, 78* (3), 210-216.
- Cabral, A.P., & Tavares, J. (2003). *Higher education basic learning skills: reading comprehension and writing. A diagnosis-intervention research project at the University of Aveiro*. International Conference Teaching and Learning in Higher Education: New trends and Innovations (p. 64). Aveiro: University of Aveiro, Portugal.
- Cabral, A. P., Tavares, J. (2002). *The promotion of effective college Reading and Writing: a freshman intervention experience*. Proceedings of the Fifteenth International Conference on the First-Year Experience, Bath: UK.
- Cannon, R. (2001). Pedagogy: a point of view. *Teaching in Higher Education, 6* (3).
- Cattell, R. B. (1966). The meaning and the strategic use of factor analysis. In R. B. Cattell (Ed.), *Handbook of Multivariate Experimental Psychology*. Chicago: RandMcNally.

- Cashin, W. E. (1996). *Developing an effective faculty evaluation system* (No. 33 - Idea paper). Manhattan: Kansas State University-Center for Faculty Evaluation and Development.
- Cashin, W. E. (1995). *Student ratings of teaching: the research revisited* (No. Idea Paper No. 32): Kansas State University.
- Cashin, W. E. (1990). *Student ratings of teaching: recommendations for use* (No. 22 - Idea paper). Manhattan: Kansas State University-Center for Faculty Evaluation and Development.
- Centra, J. (1993). *Reflective Faculty Evaluation: Enhancing Teaching and Determining Faculty Effectiveness*. San Francisco: Jossey-Bass.
- Centra, J. A., & Bonesteel. (1990). College teaching: an art or a science? *New Directions for Teaching and Learning, 43*, 7-15.
- Chamillard, A. T., & Braun, K. A. (2000). *Evaluating programming ability in an introductory computer science course.* Paper presented at the Thirty-First SIGCSE Technical Symposium on Computer Science Education, Austin, Texas.
- Christensen, C. R., Garvin, D. A., & Sweet, A. (1991). *Education for Judgment: the Artistry of Discussion Leadership*. Boston, Mass: The Harvard Business School Press.
- Clarke, J. A. (1998). Students' perceptions of different tertiary learning environments. *Higher Education Research and Development, 17*, 107-117.
- Clarke, J. A. (1995). Tertiary students' perceptions of their learning environments: A new procedure and some outcomes. *Higher Education Research and Development, 14*, 1-12.
- Clark, C. M. (1988). Asking the right questions about teacher preparation: contributions of research on teacher thinking. *Educational Researcher, 17*(2), 5-12.
- Coffey, A., & Atkinson, P. (1996). *Making Sense of Qualitative Data. Complementary Research Strategies.* London: Sage Publications.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioural Sciences* (2nd ed.). New York: Academic Press.
- Cohen, L., & Manion, L. (1994). *Research Methods in Education* (4th ed.). London: Routledge.

- Cohen, P. A. (1981). Student ratings of instruction and student achievement: a meta-analysis of multi-section validity studies. *Review of Educational Research* (51), 281-309.
- Cohen, P. A. (1980). Effectiveness of student-rating feedback for improving college instruction: a meta-analysis of findings. *Research in Higher Education* (13), 321-341.
- Collins, A. (1991). Portfolios for biology teacher assessment. *Journal of Personnel Evaluation in Education, 5*(2), 147-168.
- Colbeck, C., Cabrera, A., & Marine, R. (2002). *Faculty motivation to use alternative teaching methods.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.
- Covington, M. V. (2000). Goal theory, motivation, and school achievement: an integrative review. *Annual Review Psychology, 51*, 171-200.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. In *Psychometrika* (Vol. 16, pp. 297-334).
- Cross, P. (1990). Teaching to improve learning. *Journal on Excellence in College Teaching, 1*, 9-22.
- De Greene, K. B. (1997). Field-theoretic framework for the interpretation of the evolution, instability, structural change, and management of complex systems. In L. D. Kiel & E. Elliott (Eds.), *Chaos Theory in the Social Sciences: Foundations and Applications* (pp. 273-294). Ann Arbor: University of Michigan Press.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-determination in Human Behaviour*. New York: Plenum Press.
- Deci, E. L. (1975). *Intrinsic Motivation*. New York: Plenum Publishing Co.
- Denzin, N. K. (1988). Triangulation. In J. Keeves (Ed.), *Educational Research Methodology and Measurement: An International Handbook* (pp. 511-513).
- Dewey, J. (1933). *How we Think*. London: D. C. Heath.
- Dias, J. T. (2002). O primeiro ano de Química na Universidade de Aveiro. In J. Tavares, I. Brzezinski, A. Cabral & I. Huet Silva (Eds.), *Pedagogia Universidade e Sucesso Académico* (pp. 73-80). Aveiro: Universidade de Aveiro.

- Dorman, J. (2000). Validation and use of an instrument to assess university-level psychosocial environment in Australian universities. *Journal of Further and Higher Education, 24* (1), 25-38.
- Dunkin, M. J., & Biddle, B. J. (1974). *The study of teaching*. New York: Holt, Reinhart and Winston, Inc.
- ECIU. (1994). *ECIU*, 1994, from < http://www.eciu.org/index.php >
- Elton, L. (2001). Research and teaching: conditions for a positive link. *Teaching in Higher Education, 6* (1), 43-56.
- Entwistle, N. (1998). *Conceptions of learning, understanding and teaching in higher education.* Paper presented at the SCRE Fellowship, University of Edinburgh.
- Entwistle, N., Skinner, D., & Entwistle, D. (2001). *Student teachers' conceptions of 'good teaching'*. Edinburgh: University of Edinburgh.
- Entwistle, N. J., & Ramsden, P. (1983). *Understanding Student Learning*. London: Croom Helm.
- Evans, M. (2000). Planning for the transition to tertiary study: A literature review. *Journal of Institutional Research, 9* (1), 1-21.
- Falchikov, N. (1995). Improving feedback to and from students. In P. Knight (Ed.), *Assessment for Learning in Higher Education* (pp. 157-166). London: Kogan Page.
- Fallows, S., & Kemal, A. (1999). *Inspiring Students. Case Studies in Motivating the Learning.* London: Kogan Page.
- Felder, R., & Silverman, L. (1988). Learning and teaching styles in engineering education. *Engineering Education, 78* (7), 674-681.
- Felder, R. M., Stice, J. E., & Rugarcia, A. (2000). The future of engineering IV. Making reform happen. *Chemical Engineering Education, 34* (3), 208-215.
- Felder, R. M., Woods, D. R., Stice, J. E., & Rugarcia, A. (2000). The future of engineering education II. Teaching methods that work. *Chemical Engineering Education, 34* (1), 26-39.
- Feldman, K. A., & Paulsen, M. B. (1991). Faculty motivation: the role of a supportive teaching culture. In M. Theall (Ed.), *Motivations from Within:*

Approaches for Encouraging Faculty and Students to Excel. New Directions for Teaching and Learning (pp. 71-78).

- Feldman, K. A. (1978). Course characteristics and college students' ratings of their teachers: what we know and what we don't. *Research in Higher Education, 9*, 199-242.
- Feagin, J., Orum, A., & Sjoberg, G. (Eds.). (1991). A Case for Case Study. Chapel Hill, NC: University of North Carolina Press.
- Fontana, A., & Frey, J. M. (2003). The interview: from structured questions to negotiated text. In N. K. Denzin & Y. S. Lincoln (Eds.), *Collecting and Interpreting Qualitative Materials* (2 ed., pp. 61-106). California: Sage Publications.
- Fonte, R., & Vasconcelos, R. (2002). A formação pedagógica de docentes universitários: experiência na Escola de Engenharia da Universidade do Minho. In C. C. Oliveira, J. P. Amaral & T. Sarmento (Eds.), *Pedagogia em Campus*.
- Ford, M. E. (1992). *Humans: Goals, Emotions and Personal Agency Beliefs.* Newberry Park, CA: Sage.
- Frazer, M. (1991). *Quality assurance in Higher Education.* Paper presented at the International Conference Quality Assurance in Higher Education, Hong Kong.
- Freeman, S. F., Jaeger, B. K., & Brougham, J. C. (2002). *Pair programming: more learning and less anxiety in a first programming course*. Retrieved January 24th, 2004, from <http://gemasterteachers.neu.edu/resources/pairprog03.pdf >
- Froh, R. C., Menges, R. J., & Walker, C. J. (1993). Faculty work through intrinsic rewards. In R. Diamond (Ed.), *New Directions in Higher Education* (Vol. 81, pp. 87-95). San Francisco: Jossey-Bass..
- Ghiglione, R., & Matalon, B. (1993). *O Inquérito. Teoria e Prática.* Oeiras: Celta Editora.
- Gibbs, G. (1995). How can promoting excellent teachers promote excellent teaching? *Innovations in Education and Training International, 32* (1), 74-84.
- Gibbs, G. (1992). *Improving the Quality of Student Learning*. Bristol: Technical and Educational Services.
- Gibbs, G. (2002). Institutional strategies for linking research and teaching, Exchange, 3, 8-11.

- Gibbs, G., & Coffey, M. (2004). The impact of training of university teachers on their teaching skills, their approach to teaching and the approach to learning of their students. *Active Learning in Higher Education, 5* (1), 87-100.
- Gibbs, G., & Coffey, M. (2000). *What is training of university teachers attempting to achieve, and how could we tell in it makes any difference?* Paper presented at the International Consortium for Educational Development Conference, Bielefeld.
- Gil, V. M. S., Alarcão, I., Sarrico, C., Oliveira, J. M., Azevedo, M. R., Borges, A. R., et al. (2003). *What makes a good university teacher.* Paper presented at the International Conference on Teaching and Learning in Higher Education: New Trends and Innovations.
- Gilbert, A., & Gibbs, G. (1998). *A proposal for a collaborative international research programme to identify the impact of initial training on university teaching.* Paper presented at the Annual International Conference HERDSA, Aukland.
- Gilbert, J. K., Watts, M. D., & Osborne, R. J. (1985). Eliciting student views using an interview about instances technique. In L. H. T. West & A. L. Pines (Eds.), *Cognitive Structure and Conceptual Change* (pp. 11-27). Orlando, FL: Academic Press.
- Glaser, R. (1984). Education and thinking. The role of knowledge. *American Psychologist, 39* (2), 93-104.
- Gomes, M. R., Teixeira, I. C., & Teixeira, J. P. C. (2001). *Em direcção a um novo modelo pedagógico no ensino de engenharia.* Paper presented at the III Simpósio - Pedagogia na Universidade, Lisboa.
- Gomes, A., Tavares J., & Azevedo, M. H. P. (2003). *Sleep and academic functioning of university students during examinations*. Poster presented at the International Conference on Teaching and Learning in Higher Education: New trends and innovations (University of Aveiro, Portugal, 13-17).
- Gomes, A. A., Tavares, J. & Azevedo, M. H. P. (2002). *Sleep quality during examinations in university students: Preliminary results*. In I. Leal, T. Botelho & J. P. Ribeiro (Eds.). Proceedings of the 16th Congress of the European Health Psychology Society. Health psychology through the life cycle: a life span perspective (pp. 179-184). Lisbon: I.S.P.A.

- Gonçalves, F. (2002). O professor eo o sucesso académico no ensino superior. In J. Tavares, I. Brzezinski, A. Cabral & I. Huet Silva (Eds.), *Pedagogia Universitária e Sucesso Académico* (pp. 63-72). Aveiro: Universidade de Aveiro.
- Gonçalves, F. R. (2000). Sucesso académico no ensino superior: a pedagogia universitária como sistema de promoção do sucesso dos alunos. In J. Tavares & R. A. Santiago (Eds.), *Ensino Superior. (In) Sucesso Académico* (pp. 25-48). Porto: Porto Editora.
- Goody, A., & Ingram, D. (2001). *Learning partnerships: a comprehensive approach to academic staff development.* Paper presented at the 24th International HERDSA Conference, NewCastle.
- Gorsuch, R. L. (1983). *Factor Analysis*. Hillsdale: Lawrence Erlbaum Associates Publishers.
- Hamel, J., Dufour, S., & Fortin, D. (1993). *Case Study Methods*: Sage publications.
- Hammersley-Fletcher, L., & Orsmond, P. (2004). Evaluating our peers: is peer observation a meaningful process? *Studies in Higher Education, 29* (4), 489-503.
- Harvey, D., & Reed, M. (1997). Social science as the study of complex systems. In L. D. Kiel & E. Elliott (Eds.), *Chaos Theory in the Social Sciences: Foundations and Applications* (pp. 295-324). Ann Arbor: University of Michigan Press.
- Hashweh, M. (2003). Teacher accommodative change. *Teaching and Teacher Education, 19*, 421-434.
- Hattie, J., & Marsh, H. W. (1996). The relationship between research and teaching: a meta-analysis. Review of Educational Research, 66, 507-542.
- Haviland, W. A. (1990). *Cultural Anthropology* (6 ed.). Fort Worth: Holt, Rinehart & Winston, Inc.
- Havita, N. (1998). Lack of clarity in university teaching: A case study. *Higher Education, 36*, 353-381.
- Herzberg, F., Mauser, B., & Snyderman, B. (1959). Hygiene factors/satisfiers: policies, supervision, work conditions, salary, peer relations, subordinate relations, status, security. In *The Motivation to Work.* New York: John Wiley.
- Higgins, R., Hartley, P., & Skelton, A. (2001). Getting the message across: the problem of communicating assessment feedback. *Teaching in Higher Education, 6* (2), 269-275.

- Holmes, B., Tangney, B., FitzGibbon, A., & Savage, T. (2001). *Communal constructivism: students constructing learning for as well as with others.* Paper presented at the 12th International Conference of the Society for Information Technology and Teacher Education.
- Huet, I., Pacheco, O., Tavares, J., & Weir, G. (2004, 20-23 October). *New challenges in teaching introductory programming courses: a case study.* Paper presented at the 34th Frontiers in Education Conference, Savannah.
- Huet, I., & Tavares, J. (2004, 30 September-2 October). *Students' motivation at an introductory programming course: the lecturer and teaching practice.* Paper presented at the 9th International Conference on Cognition, Motivation and Affect: their interdependence and interrelations, Lisboa.
- Huet, I., & Tavares, J. (2004, 22-25 September). *Methods for Improving Teaching Quality in Higher Education: the Views of Engineering Staff Members at the University of Aveiro.* Paper presented at the European Conference of Educational Research (ECER), University of Crete.
- Huet, I., & Tavares, J. (2004, 5-7 Abril). *A Qualidade do Ensino nas Universidades. Estudo de caso.* Paper presented at the I Congresso Internacional Luso-Brasileiro e II Congresso CIDInE (Produção sobre conhecimento profissional e docência nos sistemas educativos português e brasileiro: dinâmicas e tendências), Florianópolis.
- Huet, I., & Tavares, J. (2004). A Qualidade do Ensino nas Universidades. Estudo de caso [texto baseado na comunicação apresentada no II Congresso CIDINE]. *Docência e Aprendizagem no Ensino Superior (D@es - <http://webct2.ua.pt/public/leies/daes_qualidadensino.pdf>).*
- Huet, I., Tavares, J., Weir, G., Ferguson, J., & Wilson, J. (2003). *Co-operation in education: the teaching and learning of programming at the Universities of Aveiro and Strathclyde.* Paper presented at the International Conference on Higher Education, Aveiro, Portugal.
- Huet, I., Cabral, A. P., & Makinnen, J. (2003, 17-20 September). *Intervention programs in Higher Education: innovative approaches and strategies.* Paper presented at the European Conference of Educational Research (ECER), University of Hamburg.

- Huet, I., Pacheco, O., & Tavares, J. (2003). *Effects of curriculum adjustments on first-year programming courses: students' performance and achievement.* Paper presented at the 33rd Frontiers in Education Conference, Boulder, Colorado.
- Huet, I., & Tavares, J. (2003, 21-22 Março). *O envolvimento do professor universitário no processo de ensino-aprendizagem. Estudo de caso.* Paper presented at the Encontro Internacional Desenvolvimento e Aprendizagem: na transição do Ensino Secundário para o Superior, Universidade dos Açores.
- Huet, I., & Tavares, J. (2002, 1-5 July). *The first- year students' perception of the Programming teaching practice. How do lecturers react to this evaluation?* Paper presented at the Fifthteenth International Conference on the First-Year Experience in Higher Education Conference, Bath, UK.
- Huet, I., & Tavares, J. (2001, 21-25 September). *Higher Education pedagogy and academic success. Case-study: the teaching of computers' programming at the University of Aveiro.* Paper presented at the ISATT Conference: Connecting Policy and Practice: Challenges for Teaching and Learning in Schools and Universities, University of Algarve, Portugal.
- Huet, I., & Tavares, J. (2001). *Sucesso académico no ensino superior. Um olhar sobre o professor universitário.* Paper presented at the Simpósio Pedagogia na Universidade, Lisboa.
- Husbands, C. T. (1997). Variations in students' evaluations of teachers' lecturing in different courses on which they lecture: a study at the London School of Economics and Political Science. *Higher Education, 33*, 51-69.
- Jenkins, T., & Davy, J. (2002). Diversity and motivation in introductory programming. *Italics Electronic Journal, 1* (1).
- Jenkins, A., Breen, R., Lindsay, R., & Brew, A. (2003). Reshaping Teaching in Higher Education. Linking Teaching with Research, Routledge Taylor Francis.
- Jesus, S. N. (2002[1]). La motivación de los profesores. Revisión de la literatura. In D. G.-V. T. Freixas (Ed.), *El estrés en la ensênanza*. Madrid: Magisterio Español.
- Jesus, S. N. (2002[2]). *Pedagogia e Apoio Pedagógico no Ensino Superior*. Coimbra: Quarteto Editora.
- Jesus, S. N. (2002). Práticas pedagógicas que possibilitem uma educação de qualidade: a motivação no ensino superior. In S. L. Garrido, M. I. d. Cunha & J.

G. Martini (Eds.), *Os Rumos da Educação Superior* (pp. 113-123). São Leiopoldo: UNISINOS.

- Jesus, S. N. (2002). Relação pedagógica e motivação do professor e do aluno no ensino superior. In S. N. Jesus (Ed.), *Ensino superior: pedagogia, apoio psicológico e investigação científica*. Coimbra: Quarteto Editora.
- Jesus, S. N. (1996). *Influência do professor sobre os alunos* (1997/2ª Ed.; 1999/3ª Ed.; 2000/4ª Ed. ed.). Porto: Edições ASA.
- Jesus, S. N. (1996). *A motivação para a profissão docente. Contributo para a clarificação de situações de mal-estar docente e para a fundamentação de estratégias de formação de professores.* Aveiro: Estante Editora.
- Johnson, R. (2000). The authority of the student evaluation questionnaire. *Teaching in Higher Education, 5* (4), 419-434.
- Johnstone, A. H., & Su, W. Y. (1994). Lectures - a learning experience? *Education in Chemistry, 31* (1), 75-79.
- Jones, H. A. H. (1979). *Student perception of the reasons for academic success and failure.* Paper presented at the Fifteenth Annual Conference of the Society for Research into Higher Education.
- Jung, C. (1971). Psychological types. In W. McGuire (Ed.), *The Collected Works of C. G. Jung* (Vol. 6). Princeton, N.J.: Princeton University Press.
- Katz, D., & Kahn, R. L. (1966). *The Social Psychology of Organizations*. New York: John Wiley.
- Kelly, H., & Thibaut, J. (1969). Group problem solving. In G. Lindsey & E. Aronson (Eds.), *The Handbook of Social Psychology* (2nd ed.). Reading MA: Addison-Wesley.
- Keig, L., & Waggoner, M. D. (1994). *Collaborative peer review: the role of faculty in improving college teaching.* (No. 2). Washington, D.C.: George Washington University - School of Education and Human Development.
- Kemmis, S. (1985). Action research and the politics of reflection. In D. Boud, R. Keogh & D. Walker (Eds.), *Reflection: Turning Experience into Learning*. London: Kogan Page.
- Kim, D., & Branch, R. M. (2002). *The relationship between teachers' approaches to teaching, students' perceptions of course experiences, and students' approaches to studying in electronic distance-learning environment.* Paper

presented at the Annual Meeting of the American Educational Research Association, New Orleans.

- King, P. (1998). To accredit, or not to accredit? In J. Doidge, B. Hardwick & J. Wilkinson (Eds.), *Developing Support and Allied Staff in Higher Education* (pp. 49-62). London: London: Kogan Page.
- Kline, P. (1994). *An Easy Guide to Factor Analysis*. London: Routtledge.
- Kohn, M. L. (1989). Cross-national research as an analytic strategy. In M. L. Kohn (Ed.), Cross-National Research in Sociology (pp. 77-104). Newbury Park, CA: Sage Publications.
- Kolb, D. A. (1984). Experiential Learning: Experience as the Source of Learning and Development. New Jersey: Prentice-Hall Inc.
- Kuri, N. P., & Truzzi, O. M. S. (1998). Learning styles of freshmen engineering students. Retrieved 02.03.04, from <http://science.donntu.edu.ua/konf/konf7/o003.pdf>
- Leonard, N. H., Beauvais, L. L., & School, R. W. (1995). A self concept-based model of work motivation. Paper presented at the Academy of Management Annual Meeting, Vancouver, B.C.
- Levinson, D. J., Darrow, D., Klein, E. B., Levinson, M. H., & McKee, J. B. (1978). The Seasons of a Man's Life. New York: Alfred A. Knopf.
- Lewis, P. (1993). Performance-related pay in Higher Education. Education and Training, 35 (2), 11-15.
- Lindsay, R., Breen, R. and Jenkins, A. (2002). Academic research and teaching quality: the views of undergraduate and postgraduate students. Studies in Higher Education, 27 (3), 309-27.
- Lowman, J. (1985). Mastering the Techniques of Teaching. San Francisco: Jossey-Bass.
- Luce, R. W. (1990). Motivating the unmotivated. Innovation Abstracts, 15 (9).
- Mäkinen, J., Olkinuora, E., & Lonka, K. (2002). Orientations to studying in Finnish Higher Education. Comparison of study orientations in university and vocational Higher Education. In E. Pantzar (Ed.), Perspectives on the Age of the Information Society (pp. 51-60). Tampere: Tampere University Press.
- Malaquias, I. (2002). A Física no 1º ano das licenciaturas em ciências e engenharias. In J. Tavares, I. Brzezinski, A. Cabral & I. Huet Silva (Eds.),

Pedagogia Universitária e Sucesso Académico (pp. 85-92). Aveiro: Universidade de Aveiro.

- Male, S., Lawrance, W., & Flintoff, S. (2002). Support schemes for first year computing students and electrical and computer engineering students at Curtin University of Technology. Paper presented at the Teaching and Learning Forum 2002: Focusing on the Students.
- Marsh, H. W. (1987). Students' evaluations of university teaching. International Journal of Educational Research, 11, 253-388.
- Marsh, H. W. (1986). Applicability paradigm: students' evaluations of teaching effectiveness in different countries. Journal of Educational Psychology, 78 (8), 465-473.
- Marsh, H. W. (1984). Student's evaluations of university teaching: dimensionality, reliability, validity, potential biases, and utility. Journal of Educational Psychology, 76 (5), 707-754.
- Marsh, H. W. (1983). Multidimensional ratings of teaching effectiveness by students from different academic settings and their relation to students/course/instructor characteristics. Journal of Educational Psychology, 75 (1), 150-166.
- Marsh, H. W. (1982). Validity of students' evaluations of college teaching: a multitrait-multimethod analysis. Journal of Educational Psychology, 74 (2), 264-279.
- Marshall, C., & Rossman, G. B. (1995). Designing Qualitative Research. Thousand Oaks: Sage.
- Marshall, D., Summers, M., & Woolnough, B. (1999). Students' conceptions of learning in an engineering context. Higher Education, 38, 291-309.
- Martinez, P., & Munday, F. (1998). 9,000 voices: student persistence and drop-out in further education. FEDA report, 2 (7).
- Martin, E., & Ramsden, P. (1993). An expanding awareness: how lecturers change their understanding of teaching. Research and Development in Higher Education, 15, 148-155.
- Marton, F. (1988). Describing and improving learning. In R. S. Ronald (Ed.), Learning Strategies and Learning Styles (pp. 53-81). New York: Plenum Press.

- Marton, F., & Säljö, R. (1997). Approaches to learning. In F. Marton, D. J. Hounsell & N. J. Entwistle (Eds.), The Experience of Learning (2 ed., pp. 39-58). Edinburgh: Scottish Academic Press.
- Marton, F., & Booth, S. (1997). Learning and Awareness. New Jersey: Lawrence Erlbaum.
- Marton, F., Dall'Alba, G., & Beatty, E. (1993). Conceptions of learning. International Journal of Educational Research, 19, 277-300.
- McBer, H. (2000). Research into teacher effectiveness, <http://www.brunel.ac.uk/faculty/ed/ed5175.pdf>
- McGivney, V. (1996). Staying or leaving the course: non-completion and retention of mature students in further and Higher Education. Leicester: National Institute of Adult Continuing Education.
- McInnis, C. (2001). Researching the first year experience: where to from here? Higher Education Research & Development, 20 (2), 105-114.
- McInnis, C. (2000). Changing academic work roles: the everyday realities challenging quality in teaching. Quality in Higher Education, 6 (2), 143-152.
- Mclnnis, C., Hartley, R., Polesel, J., & Teese, R. (2000). Non-Completion in Vocational Education and Training and Higher Education. Canberra: Australian Government Publishing Service.
- McKeachie, W. J. (1982). The rewards of teaching. In J. L. Bess (Ed.), Motivating Professors to Teach Effectively. San Francisco: Jossey-Bass.
- McKeachie, W. J. (1999). McKeachie's Teaching Tips: Strategies, Research, and Theory for College and University Teachers (3rd ed.). New York: Houghton Mifflin.
- McKeachie, W. J. (1979). Perspectives from psychology: financial incentives are ineffective for faculty. In D. R. Lewis & i. E. Becker (Eds.), Academic Rewards in Higher Education. Jr. Cambridge: Mass: Ballinger.
- McKenzie, J. (1996). Changes in university teachers' conceptions of teaching. Paper presented at the HERDSA, Perth.
- Melo, M., Silva, J., Gomes, Á., & Vieira, F. (2000). Concepções de pedagogia universitária – uma análise do questionário de avaliação do ensino ministrado na Universidade do Minho. Revista Portuguesa de Educação, 13, 125-157.

- Menges, R. J. (1991). The real world of teaching improvement: a faculty perspective. In M. Theall & J. Franklin (Eds.), Effective Practices for Improving Teaching. San Francisco: Jossey-Bass.
- Merriam, S. B. (1991). Case Study Research in Education: a Qualitative Approach. San Francisco, CA: Jossey-Bass Publishers.
- Merrill, B. (2001). Learning and teaching in universities: perspectives from adult learners and lectures. Teaching in Higher Education, 6 (1), 23-31.
- Middendorf, J., & Kalish, A. (1996). The 'change-up' in lectures. The National Teaching & Learning, 5 (2), 1-6.
- Miller, C. W. (1970). Factors in School Achievement and Social Class. Journal of Educational Psychology, 61, 260-269.
- Monteiro, S., Pereira, A.M.S, Gomes, A., Tavares, J., Gomes, A. (2005). Promoção da Saúde e Bem-Estar no Ensino Superior (PSBEES). In A. Pereira & E. Motta (Eds), *Acção Social e Aconselhamento Psicológico no Ensino Superior: Investigação e Intervenção. Actas do Congresso Nacional*. Coimbra: SASUC Edições, pp. 299-303
- Neuman, W. L. (1997). Social Research Methods: Qualitative and Quantitative Approaches. Toronto, ON: Allyn & Bacon.
- Neumann, R (1994). The teaching–research nexus: applying a framework to university students' learning experiences. European Journal of Education, 29 (3), 323–39.
- Nowak, S. (1989). Comparative studies and social theory. In M. L. Kohn (Ed.), Cross-National Research in Sociology. Newbury Park, CA: Sage Publications.
- Null, L. (1997). TQM and collaborative learning: a perfect match. Paper presented at the 1997 ASEE/IEEE Frontiers in Education Conference, Pittsburgh, PA.
- Nunnally, J., & Bernstein, I. (1994). Psychometric Theory. New York: McGraw Hill.
- Paulsen, M., & Feldman, A. (1995). Taking teaching seriously: meeting the challenge of instructional improvement (ASHE-ERIC Higher Education Report No. 2). Washington, D.C.

- Peggy, J., & Panizzon, D. (2001). A professional development process to enhance student learning outcomes in tertiary science: cross-faculty collaboration. Research & Development in Higher Education, 24, 129-136.
- Pereira, A.M.S., & Motta, E. (Eds) (2005). *Acção Social e Aconselhamento Psicológico no Ensino Superior: Investigação e Intervenção. Actas do Congresso Nacional*. Coimbra: SASUC Edições.
- Pervin, L. A. (1989). Persons, situations, inter-actions: the history of a controversy and a discussion of theoretical models. Academy of Management Review, 14 (3).
- Pestana, M. H., & Gajeiro, J. N. (2000). Análise de Dados para Ciências Sociais. A Complementariedade do SPSS. Lisboa: Edições Sílabo Lda.
- Pintrich, P. R., & Schrauben. (1992). Students' motivational beliefs and their cognitive engagement in classroom academic task. In D. H. Schunk & J. L. Meece (Eds.), Student Perceptions in the Classroom (pp. 149-183). New Jersey: Hillsdale.
- Pozo-Muñoz, C., Rebolloso-Pacheco, E., & Fernández-Ramírez, B. (2000). The 'ideal teacher'. Implications for student evaluation of teacher effectiveness. Assessment & Evaluation in Higher Education, 25 (3), 253-263.
- Prosser, M., Ramsden, P., Trigwell, K., & Martin, E. (2003). Dissonance in experience of teaching and its relation to the quality of student learning. Studies in Higher Education, 28 (1), 37-48.
- Ramsden, P. (1992). Learning to Teach in Higher Education. London: Routledge.
- Ramsden, P. (1991). A performance indicator of teaching quality in Higher Education: the course experience questionnaire. Studies in Higher Education, 16 (2), 129-150.
- Ramsden, P. (1987). Improving teaching and learning in Higher Education: the case for a relational perspective. Studies in Higher Education, 12 (3), 275-286.
- Ramsden, P., & Entwistle, N. J. (1981). Effects of academic departments on students' approaches to learning. In British Journal of Educational Psychology, 51, 368-383.
- Ramsden, P., Margetson, D., Martin, E., & Clarke, S. (1995, April). Recognising and rewarding good teaching in Australian Higher Education (final report).

Retrieved January 13, 2003, from <http://www.autc.gov.au/pubs/caut/rrgt/default.htm>

- Rego, A. (2003). Citizenship behaviours of university teachers: the graduates' point of view. Active Learning in Higher Education, 4 (1), 8-23.
- Rego, A. (2001). Comportamentos de cidadania docente universitária: operacionalização de um construto. Revista de Educação, 10 (1), 87-97.
- Rego, A. (2000). Cidadania docente universitária: sua relação com o desempenho dos estudantes. Revista Portuguesa da Educação, 13, 199-219.
- Rego, A., & Sousa, L. (2000). Impactos dos comportamentos de cidadania docente sobre os alunos universitários: a perspectiva dos estudantes e dos professores. Linhas Criticas, 6 (10), 9-19.
- Reid, K. (2002). Implementing active and collaborative techniques: lectures, labs, grading and more. Paper presented at the Annual Conference & Exposition of the American Society for Engineering Education.
- Ribeiro, S., Teles, L., Vasconcelos, R., & Hattum, N. V. (2002). Formação Pedagógica (Contínua) no Contexto da Escola de Engenharia da Universidade do Minho. Braga: Universidade do Minho.
- Robertson, M. E. (1998). Changing perceptions on university teaching. International Journal of University Teaching & Learning, 1 (1).
- Rocha, C. (2001). O ensino da Matemática numa escola de engenharia. Paper presented at the III Simpósio - Pedagogia na Universidade, Lisboa.
- Rosati, P. (2003). Students' psychological type and success in different engineering programs. Paper presented at the ASEE/IEEE Frontiers in Education Conference, Boulder, Colorado.
- Rosati, P., Dean, R. K., & Rodman, S. M. (1988). A study of the relationship between students' learning styles and instructors' lecture styles. IEEE Transactions on Education, 31 (3), 208-212.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: classic definitions and new directions. Contemporary Educational Psychology, 25 (54-67).
- Sá-Chaves, I. (1991). A Construção de Conhecimento pela análise Reflexiva da Praxis. *Cadernos CIDInE* (1), 23-30.

- Sadler, M. (1979). How far can we learn anything of practical value from the study of foreign systems of education. In J. H. Higginson (Ed.), Selections From Michael Sadler. Liverpool: International Publishers Ltd.
- Säljö, R. (1979). Learning in the learner´s perspective I. Some common sense conceptions (Reports from the Department of Education): University of Göteborg.
- Sander, P., Stevenson, K., & Coates, M. K. D. (2000). University students' expectations of teaching. Studies in Higher Education, 25 (3), 309-323.
- Santos, V. (2002). Relato de uma experiência realizada nas disciplinas de Cálculo do 1º ano comum da Universidade de Aveiro. In J. Tavares, I. Brzezinski, A. Cabral & I. Huet Silva (Eds.), Pedagogia Universidade e Sucesso Académico (pp. 81-85). Aveiro: Universidade de Aveiro.
- Saroyan, A., & Amundsen, C. (2001). Evaluating university teaching: time to take stock. Assessment & Evaluation in Higher Education, 26 (4), 341-353.
- Saroyan, A., & Snell, L. S. (1997). Variations in lecturing styles. Higher Education, 33 (1), 88-104.
- Schmeck, R. (1988). Learning Strategies and Learning Styles. New York & London: Plenun Press.
- Schneider, W., & Pressley, M. (1989). Memory Development between 2 and 20. New York: Springer-Verlag.
- Schön, D. (1992). Formar professores como profissionais reflexivos. In A. Nóvoa (Ed.), Os Professores e a sua Formação. Lisboa: D. Quixote e IIE.
- Schön, D. (1987). Educating the Reflective Practioner. São Francisco: Jossey-Bass.
- Schön, D. (1983). The Reflective Practitioner. London: Basic Books.
- School, R. W. (2002). Sources of Motivation Approaches. Retrieved 30/07/04, from <http://www.cba.uri.edu/School/Notes/Sources_Motivation.htm>
- Seldin, P. (1984). Changing Practices in Faculty Evaluation. San Francisco: Jossey-Bass.
- Serrazina, L. (1998). Teacher's professional development in a period of radical change in primary mathematics education in Portugal. Universidade de Londres, Londres.

- Shannon, D. M., Twale, D. J., & Hancock, G. R. (1996). Use of instructional feedback and modification methods among university faculty. Assessment & Evaluation in Higher Education, 21 (1), 41-53.
- Sims, R., & Serbrenia, J. (1995). The Importance of Learning Styles. Understanding the Implications for Learning, Course Design, and Education. London: Greenwood Press.
- Smith, K. A. (1999). Characteristics of an effective case study. Retrieved February, 18th, 2002, from <http://www.nsti.tec.tn.us/seatec/pages_resources/forum_papers_pdf/smith.pdf>
- Smith, K. A., Johnson, D. W., & Johnson, R. T. (1992). Cooperative learning and positive change in Higher Education. In M. M. A. Goodsell, V. Tinto, B.L. Smith, & J. MacGregor (Ed.), Collaborative Learning: A Sourcebook for Higher Education (pp. 34-36). University Park, PA: National Center on Postsecondary Teaching, Learning & Assessment.
- Soo, S. C., Tan, Y. O., & Jamieson, P. (2001). Developing learning partnerships across cultures and online: how off-shore academics experience a flexible staff development program. Paper presented at the HERDSA, Australia.
- Sousa, B. d., Sousa, E. d., Lemos, F., & Januário, C. (2001). Análise do sucesso e insucesso na UTL. Paper presented at the III Simpósio-Pedagogia na Universidade, Lisboa 173-180.
- Souza, D. N., & Tavares, J (2003): *Student's perception of teaching methodology in the subjects of calculus I and elements of physics at the University of Aveiro.* Poster apresentado na International Conference Teaching and Learning in Higher Education: New Trends and Innovations (University of Aveiro, Portugal, 13-17 April 2003);
- Spaulding, C. (1992). Intrinsic and extrinsic motivational orientations. In C. Spaulding (Ed.), Motivation in the Classroom (pp. 50-61). New York: McGraw-Hill, Inc.
- Spaulding, C. (1992). Motivation in the Classroom. New York: McGraw-Hill, Inc.
- Spector, P. (1992). Summated Rating Scale Construction. Newbury Park, CA: Sage publications.

- Stake, R. (1995). The Art of Case Research. Thousand Oaks, CA: Sage Publications.
- Stenhouse, L. (1997). Case study methods. In J. P. Keeves (Ed.), Educational Research Methodology and Measurement: An International Handbook (2nd ed., pp. 49-53). New York: Pergamon.
- Stice, J., Felder, R. F., Woods, D. R., & Rugarcia, A. (2000). The future of engineering education IV. Learning how to teach. Chemestry Engineering Education, 34 (2), 118-127.
- Suárez, J. M., Cabanach, R. G., & Valle, A. (2001). Multiple-goal pursuit and its relation to cognitive, self-regulatory, and motivational strategies. Journal of Educational Psychology, 71, 561-572.
- Tabachnick, B. G., & Fidell, L. S. (2001). Using Multivariate Statistics. Boston: Allyn and Bacon.
- Tavares, J., Brzezinski, I., Pereira, A., Cabral, A. P., Fernandes, C., Huet, I., *et al.* (2004). Docência e aprendizagem no ensino superior. Investigar em Educação, 2.
- Tavares, J., Gomes, A., Pereira, A., Cabral, A. P., Huet, I., Neri, D., Bessa, J., *et al.* (2003, 13-17 April). Higher Education study and intervention lab. Paper presented at the Teaching and Learning in Higher Education: New Trends and Innovation (ICHED), Lisboa.
- Tavares, J., Gomes, A., Pereira, A., Cabral, A. P., Huet, I., Carvalho,R., *et al.* (2003). Internet-based learning tools: development and learning psychology (DLP) experience. Journal of Systemics, Cybernetics and Informatics, 1 (6).
- Tavares, J. (2003). Formação e Inovação no Ensino Superior. Porto: Porto Editora.
- Tavares, J., Brzezinski, I., Huet, I., Cabral, A., & Neri, D. (2001). 'Having coffee' with professors and students to talk about Higher Education pedagogy and academic success. Paper presented at the 24th International HERDSA Conference, NewCastle, Australia.
- Tavares, J., Brzezinski, I., Cabral, A., Huet, I., (eds.) (2002). II Jornadas sobre Pedagogia Universitária e Sucesso Académico. Aveiro: Universidade de Aveiro.

- Tavares, J., & Huet, I. (2001). Sucesso académico no ensino superior – um olhar sobre o professor universitário. In Actas do III Simpósio Pedagogia na Universidade (pp. 149-154). Lisboa: Universidade Técnica de Lisboa.
- Tavares, J., & Huet, I. (2001). Sucesso académico no ensino superior – um olhar sobre o professor universitário. Paper presented at the III Simpósio Pedagogia na Universidade, Universidade Técnica de Lisboa.
- Tavares, J., & Santiago, R. (2000) (eds). Ensino Superior. (In) Sucesso Académico. Colecção CIDInE (13), Porto Editora.
- Taylor, J. (2001). Improving performance indicators in Higher Education: the academics' perspective. Journal of Further and Higher Education, 25 (3).
- Taylor, J., & Bedford, T. (2004). Staff perceptions of factors related to non-completion in Higher Education. Studies in Higher Education, 29 (3), 375-395.
- Teichler, U. (2003). The future of Higher Education and the future of Higher Education research. Tertiary Education and Management, 9 (3), 171-185.
- Thomas, R. M. (1990). The nature of comparative education. How and why are education systems compared? In R. M. Thomas (Ed.), International Comparative Education: Practices, Issues & Prospects (pp. 1-21). New York: Pergamon Press.
- Thomas, L., Ratcliffe, M., Woodbury, J., & Jarman, E. (2002). Learning styles and performance in introductory programming sequence. SIGCSE Bulletin, 34 (1), 33-37.
- Tinto, V. (1993). Leaving College: Rethinking the Causes and Cures of Student Attrition (2nd ed.). Chicago: University of Chicago Press.
- Trethewey, A. (1976). Introducing Comparative Education. London: Pergamon.
- Trigwell, K., Prossel, M., & Taylor, P. (1994). Qualitative differences in approaches to teaching first year university science. Higher Education, 27, 75-84.
- Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. Higher Education, 37, 57-70.
- Trigwell, K., & Shale, S. (2004). Student learning and the scholarship of university teaching. Studies in Higher Education, 29 (4), 523-536.

- Trigwell, K., & Prosser, M. (1996). Changing approaches to teaching: a relational perspective, Studies in Higher Education, 21, 275-84.
- Trigwell, K., & Prosser, M. (1991). Improving the Quality of Student Learning: the influence of learning context and student approaches to learning on learning outcomes. Higher Education, 22, 251-266.
- Van Rossum, E. J., & Schenk, S. M. (1984). The relationship between learning conception, study strategy and learning outcome. British Journal of Educational Psychology, 54 (1), 73-85.
- Van Rossum, E. J., & Taylor, I. P. (1987). The relationship between conceptions of learning and good teaching: A scheme of cognitive development. Paper presented at the AERA, Washington DC, USA.
- Ventura, J. (2001). Pedagogia no ensino superior - Um 'não problema'. Paper presented at the III Simpósio - Pedagogia na Universidade, Lisboa 65-67.
- Vieira, F., Gomes, A., Gomes, C., Silva, J. L., Moreira, M. A., Céu Melo, M., *et al.* (2002). Concepções de pedagogia universitária. Um estudo na Universidade do Minho. Braga: Centro de Estudos em Educação e Psicologia. Universidade do Minho.
- Vieira, F., & Marques, I. (2002). Supervising reflective teacher development practices. English Language Teacher – Education and Development, 6.
- Vieira, F. (2002). Para a caracterização da investigação da docência no ensino superior em portugal: um estudo introdutório. Paper presented at the Conferência Internacional de Investigação em Educação, Instituto Politécnico de Viana do Castelo.
- Vriend, N. J. (1994). Self-organized markets in a decentralized economy (No. 94-03-013). Santa Fé: Santa Fé Institute.
- Vygotsky, L. S. (1978). Mind in Society. Cambridge: Harvard University Press.
- Wachtel, H. K. (1998). Evaluation of college teaching effectiveness: a brief review. Assessment & Evaluation in Higher Education, 23 (2), 191-211.
- Wankat, P., & Oreovicz, F. (1984). Teaching prospective faculty members about teaching: a graduate engineering course. Engineering Education, 84.
- Wankat, P., & Oreovicz, F. (1993). Teaching Engineering. New York: McGraw-Hill.

- Watkins, D., Marsh, H. W., & Young, D. (1987). Evaluating tertiary teaching: a New Zealand perspective. Teaching & Teacher Education, 3 (1), 41-53.
- Weston, J. M. (1998). Higher Education and the Student Profile: A Reconceptualised Model of Retention and Attrition. Toowoomba: University of Southern Queensland.
- Wilkinson, D., & Birmingham, P. (2003). Using Research Instruments: A Guide for Researchers. London: Routledge Falmer.
- Williams, L., Wiebe, E., Yang, K., Ferzli, M., & Miller, C. (1991). In support of pair programming in the introductory computer science course. Retrieved 2001, May, 11th, from <http://collaboration.csc.ncsu.edu/laurie/Papers/PP%20in%20Introductory_CSED.pdf>
- Woods, D. R., Felder, R. M., Stice, J. E., & Rugarcia, A. (2000). The future of engineering education II. Developing critical skills. Chemical Engineering Education, 34 (2), 108-117.
- Yin, R. (1994). Case Study Research: Design and Methods (2nd ed.). Beverly Hills, CA: Sage Publishing.
- Yorke, M., & Knight, P. (2004). Self-theories: some implications for teaching and learning in higher education. Studies in Higher Education, 29 (1), 25-37.
- Young, P. (2000). 'I might as well give up': self-esteem and mature students' feelings about feedback on assignments. Journal of Further and Higher Education, 24 (3), 409-418.
- Yourke, M. (1999). Leaving Early: Undergraduate Non-Completion in Higher Education. London: Palmer Press.
- Zeichner, K., & Liston, D. (1996). Reflective Teaching: An Introduction. New Jersey: Hillsdale

Appendices

Representações dos Alunos sobre a Disciplina de Programação (RADP)

Autores: Isabel Huet, José Pereira Tavares
Universidade de Aveiro, 2003

Este estudo realiza-se no âmbito de um projecto de doutoramento que visa compreender o impacto da prática pedagógica no sucesso académico.

Nota: As afirmações que se seguem estão relacionadas com as tuas aulas de Programação

Identificação	
1. Curso:	
2. Nº de matriculas à cadeira:	
3. Idade:	
4. Sexo:	

A. Tive uma disciplina de informática no ensino secundário: não sim

B. Qual a percentagem de tempo de estudo semanal que dedico a esta disciplina?

< 20% 20%-30% 31%-40% 41%-50% > 50%

Instrução: Assinala com uma cruz, em cada opção, o número que corresponde ao teu grau de desacordo ou acordo com a afirmação. A tua resposta pode ir de 1 (discordo totalmente) até 5 (concordo totalmente).

		AULAS P	AULAS T
1	A forma do professor dar as aulas motiva o meu interesse pelas mesmas.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
2	Somos encorajados a participar em discussões sobre a matéria a leccionar.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
3	O professor incentiva o meu interesse a colocar questões e a expor as minhas dúvidas.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
4	O professor utiliza exemplos que despertam a minha curiosidade para o tema em estudo.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
5	A linguagem utilizada é clara e objectiva.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
6	O professor define os objectivos para cada aula.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
7	O professor disponibiliza-se para esclarecer dúvidas sempre que necessário.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
8	O professor é dinâmico e entusiástico a dar as aulas.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
9	O professor prepara a aula partindo do pressuposto de que possuímos pouco conhecimento da matéria.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
10	O professor dá-me feedback sobre a minha aprendizagem	① ② ③ ④ ⑤	① ② ③ ④ ⑤
11	Venho com frequência às aulas teóricas.	① ② ③ ④ ⑤	
12	Venho às aulas teóricas porque gosto de ouvir as explicações do professor.	① ② ③ ④ ⑤	

13	Venho às aulas teóricas para compreender melhor a matéria.	① ② ③ ④ ⑤
14	Venho às aulas teóricas porque o professor motiva o meu interesse pela matéria.	① ② ③ ④ ⑤
15	Venho às aulas teóricas porque tenho interesse pela matéria.	① ② ③ ④ ⑤
16	Estou motivado pela cadeira porque sinto necessidade de acabar o curso.	① ② ③ ④ ⑤
17	Estou motivado pela cadeira porque o professor incentiva o meu trabalho.	① ② ③ ④ ⑤
18	Estou motivado pela cadeira porque o professor me dá sugestões para conseguir resolver as minhas dificuldades.	① ② ③ ④ ⑤
19	Estou motivado pela cadeira porque o professor utiliza exemplos que despertam a minha curiosidade para o tema em estudo.	① ② ③ ④ ⑤
20	É-me dado tempo para compreender aquilo que aprendo.	① ② ③ ④ ⑤
21	Os conteúdos abordados nas aulas são importantes para a minha profissão futura.	① ② ③ ④ ⑤
22	Esta cadeira estimula a minha capacidade de raciocínio.	① ② ③ ④ ⑤
23	Sinto-me seguro(a) dos meus conhecimentos e sei que irei ter sucesso nesta cadeira.	① ② ③ ④ ⑤
24	Os objectivos estão bem definidos.	① ② ③ ④ ⑤
25	Os objectivos da disciplina são importantes para a minha formação.	① ② ③ ④ ⑤

Sugere algumas propostas para o ensino da disciplina em anos futuros.

A equipa de investigação agradece a tua colaboração.

Programming Course Experience Questionnaire - PCEQ

Isabel Huet, José Tavares & George Weir | 2002

This questionnaire is integrated in a study aiming to analyse the teaching best practices and its impact on the student academic success.

Identification

Identification			
1. Course: 2. Age: 3. Gender:			
4. Is this your first time enrolled in the class?	No	Yes	
5. Did you have any Programming subject at the secondary school?	No	Yes	
6. Parents education			
6.1 Father	Secondary	Further	Higher
6.2 Mother	Secondary	Further	Higher

7. Which percentage of your study time do you spend on this subject?

7.1. **< 20%** **20%-30%** **31%-40%** **41%-50%** **> 50%**

Instruction: To what extent do you agree with each of the following statements? Your answer can go from ① **(strongly disagree)** to ⑤ **(strongly agree)**.

1	The lecturer motivates my interest in the subject.	① ② ③ ④ ⑤
2	Students are encouraged to participate in the lectures' discussions	① ② ③ ④ ⑤
3	The lecturer asks questions to the students individually.	① ② ③ ④ ⑤
4	The lecturer motivates the students to ask questions and expose their doubts.	① ② ③ ④ ⑤
5	The lecturer uses examples that motivate my curiosity in the subject.	① ② ③ ④ ⑤
6	The language used by the lecturer is clear and objective.	① ② ③ ④ ⑤
7	The lecturer defines the objectives for each lesson.	① ② ③ ④ ⑤
8	The lecturer is accessible to answer questions.	① ② ③ ④ ⑤
9	The lecturer shows enthusiasm for the subject.	① ② ③ ④ ⑤
10	The lecturer is a good communicator.	① ② ③ ④ ⑤
11	The lecturer prepares the lectures having in mind that we possess less knowledge on the subject.	① ② ③ ④ ⑤
12	The lecturer gives me feedback on my progress.	① ② ③ ④ ⑤
13	I feel that the subject contents are important to my future career.	① ② ③ ④ ⑤
14	I feel confident I will succeed in this subject.	① ② ③ ④ ⑤
15	The rate of delivery of content for this class is reasonable.	① ② ③ ④ ⑤
16	I understand what I have learned.	① ② ③ ④ ⑤

17	This subject challenges my intelligence.	① ② ③ ④ ⑤
18	It is possible to succeed at this subject by only studying some weeks before the exam.	① ② ③ ④ ⑤
19	I go frequently to the lectures.	① ② ③ ④ ⑤
20	I go to the lectures because I benefit from the lecturers' explanations.	① ② ③ ④ ⑤
21	I go to the lectures to better understand the subject content.	① ② ③ ④ ⑤
22	I go to the lectures because the lecturer motivates my interest in the subject.	① ② ③ ④ ⑤
23	I feel motivated because I have to finish the degree as quickly as possible.	① ② ③ ④ ⑤
24	I feel motivated because I like the teaching methods used by the lecturer.	① ② ③ ④ ⑤
25	I feel motivated because the lecturer provides feedback to my problems.	① ② ③ ④ ⑤
26	I feel motivated because the lecturer uses examples that stimulate my interest in the subject.	① ② ③ ④ ⑤
27	The objectives for the class are well defined.	① ② ③ ④ ⑤
28	The subject aims are relevant to my academic growth.	① ② ③ ④ ⑤
29	The content of the class is too long.	① ② ③ ④ ⑤
30	The content of the class is too difficult.	① ② ③ ④ ⑤
31	The exercises are interesting.	① ② ③ ④ ⑤
32	The exercises are too simple.	① ② ③ ④ ⑤
33	The class schedule is too long.	① ② ③ ④ ⑤
34	The actual assessment relates well to the content of the course.	① ② ③ ④ ⑤
35	I agree with my actual assessment for this class.	① ② ③ ④ ⑤
36	The students' performance in practical laboratories should be evaluated.	① ② ③ ④ ⑤
37	The continuous evaluation throughout the class inhibits my approach to learning.	① ② ③ ④ ⑤
38	The tutorials would be important to assist my learning.	① ② ③ ④ ⑤
39	The lectures are an effective way of teaching programming.	① ② ③ ④ ⑤
40	The practical work is an effective way to learn programming.	① ② ③ ④ ⑤

Suggestions to the teaching of this subject in future years.

The research team appreciates your collaboration.

Programming Course Experience Questionnaire - PCEQ

Isabel Huet, José Tavares & George Weir | 2003

This questionnaire is integrated in a study aiming to analyse the teaching best practices and its impact on the student academic success.

Identification

Identification				
1. Course: 2. Age: 3. Gender:				
4. Is this your first time enrolled in the class?	No	Yes		
5. Did you have any Programming subject at the secondary school?	No	Yes		
6. Parents education				
6.1 Father	Secondary	Further	Higher	
6.2 Mother	Secondary	Further	Higher	

7. Which percentage of your study time do you spend on this subject?

7.1. **< 20%** **20%-30%** **31%-40%** **41%-50%** **> 50%**

Instruction: To what extent do you agree with each of the following statements? Your answer can go from ① **(strongly disagree)** to ⑤ **(strongly agree)**.

1	The lecturer motivates my interest in the subject.	① ② ③ ④ ⑤
2	The lecturer uses examples that motivate my curiosity on the subject.	① ② ③ ④ ⑤
3	The lecturer is a good communicator.	① ② ③ ④ ⑤
4	The lecturer gives me feedback on my progress.	① ② ③ ④ ⑤
5	I feel motivated because I like the teaching methods used by the lecturer.	① ② ③ ④ ⑤
6	I feel motivated because the lecturer provides feedback to my problems.	① ② ③ ④ ⑤
7	I feel motivated because the lecturer uses examples that stimulate my interest in the subject.	① ② ③ ④ ⑤
8	I go frequently to the lectures.	① ② ③ ④ ⑤
9	I go to the lectures because I benefit from the lecturers' explanations.	① ② ③ ④ ⑤
10	I go the lectures to better understand the subject content.	① ② ③ ④ ⑤

11	I go to the lectures because the lecturer motivates my interest in the subject.	① ② ③ ④ ⑤
12	I feel that the subject contents are important to my future career.	① ② ③ ④ ⑤
13	I feel confident I will be succeeded on this subject.	① ② ③ ④ ⑤
14	The rate of delivery of content for this class is reasonable.	① ② ③ ④ ⑤
15	I understand what I have learned.	① ② ③ ④ ⑤
16	The objectives for the class are well defined.	① ② ③ ④ ⑤
17	The subject aims are relevant to my academic growth.	① ② ③ ④ ⑤
18	The exercises are interesting.	① ② ③ ④ ⑤
19	The actual assessment relates well to the content of the course.	① ② ③ ④ ⑤
20	I agree with my actual assessment for this class.	① ② ③ ④ ⑤
21	The students' performance in the labs should be evaluated.	① ② ③ ④ ⑤
22	The tutorials would be important to assist my learning.	① ② ③ ④ ⑤
23	The practical work is an effective way to learn programming.	① ② ③ ④ ⑤

The research team appreciates your collaboration.

AUTO-PERCEPÇÃO SOBRE PRÁTICA PEDAGÓGICA E SUCESSO ACADÉMICO

Autores: Isabel Huet, José Pereira Tavares
Universidade de Aveiro, 2003

Este estudo realiza-se no âmbito de um projecto de doutoramento que visa: a) analisar o impacto da prática pedagógica no sucesso académico, b) identificar a motivação dos alunos e as consequências que daí decorrem para o seu aproveitamento escolar. A auto-percepção dos professores será comparada com a percepção dos alunos e discutida posteriormente com cada docente individualmente.

Identificação

1. Nome	
2. Idade	
3. Anos de experiência como docente de Programação I	

Instrução: sublinhe, em cada opção, o número que corresponde ao seu grau de desacordo ou acordo com a afirmação. A sua resposta pode ir de 1 (discordo totalmente) até 5 (concordo totalmente).

1	A minha forma de dar as aulas motiva o interesse dos alunos	1	2	3	4	5
2	Encorajo os alunos a participar em discussões sobre a matéria a leccionar.	1	2	3	4	5
3	Incentivo o interesse dos alunos a colocar questões e a expor as suas dúvidas.	1	2	3	4	5
4	Utilizo exemplos que despertam a curiosidade dos alunos para o tema em estudo.	1	2	3	4	5
5	A linguagem que utilizo é clara e objectiva.	1	2	3	4	5
6	Defino os objectivos para cada aula.	1	2	3	4	5
7	Disponibilizo-me para esclarecer dúvidas sempre que necessário.	1	2	3	4	5
8	Sou dinâmico e entusiástico a dar as aulas.	1	2	3	4	5
9	Preparo as aulas partindo do pressuposto de que os alunos possuem pouco conhecimento da matéria.	1	2	3	4	5
10	Dou feedback sobre a aprendizagem dos alunos.	1	2	3	4	5
11	O aluno está motivado porque gosta da forma como dou as aulas.	1	2	3	4	5
12	O aluno está motivado porque incentivo-o no seu trabalho.	1	2	3	4	5
13	O aluno está motivado porque lhe dou sugestões para conseguir resolver as suas dificuldades.	1	2	3	4	5
14	O aluno está motivado porque utilizo exemplos que despertam a sua curiosidade para o tema em estudo.	1	2	3	4	5
15	Os conteúdos abordados nas aulas são importantes para a futura profissão dos alunos.	1	2	3	4	5
16	Esta cadeira estimula a capacidade de raciocínio dos alunos.	1	2	3	4	5

17	Sinto que os alunos estão seguros dos seus conhecimentos e que irão ter sucesso nesta cadeira.	1	2	3	4	5
18	Os objectivos estão bem definidos.	1	2	3	4	5
19	Os objectivos da disciplina são importantes para a formação dos alunos.	1	2	3	4	5

Sugestões para o ensino da disciplina em anos futuros

ACADEMICS' PERCEPTION ABOUT THEIR TEACHING PRACTICE, STUDENTS' EXPECTATIONS AND CLASS ORGANISATION

Isabel Huet e Silva, José Pereira Tavares, George Weir
University of Aveiro, 2003

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2. Age	
3. Years of experience as lecturer	

Please, underline for each option your perception in a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

1	I motivate the students' interest in the subject.	1 2 3 4 5
2	I encourage students to participate in the lectures' discussions	1 2 3 4 5
4	I motivate the students to ask questions and expose their doubts.	1 2 3 4 5
5	I use examples that motivate the students' curiosity in the subject.	1 2 3 4 5
6	The language I use in the lectures is clear and objective.	1 2 3 4 5
7	I define the objectives for each lesson.	1 2 3 4 5
8	I'm accessible to answer questions.	1 2 3 4 5
9	I'm enthusiastic for the subject.	1 2 3 4 5
10	I'm a good communicator.	1 2 3 4 5
11	I prepare the lectures having in mind that students have less knowledge on the subject.	1 2 3 4 5
12	I give feedback to students about their progress.	1 2 3 4 5
13	The class contents are important to the students' future career.	1 2 3 4 5
14	Students feel confident they will succeed in the class.	1 2 3 4 5
15	The rate of delivery of content for this class is reasonable.	1 2 3 4 5
16	Students understand what they have learned.	1 2 3 4 5
24	Students feel motivated because they like the teaching methods I use.	1 2 3 4 5
25	Students feel motivated because I provide feedback to their problems.	1 2 3 4 5
26	Students feel motivated because I use examples that stimulate their interest in the subject.	1 2 3 4 5
27	The objectives for the class are well defined.	1 2 3 4 5
28	The class aims are relevant to the students' academic growth.	1 2 3 4 5
31	The exercises are interesting.	1 2 3 4 5
34	The actual assessment relates well to the content of the course.	1 2 3 4 5
35	I agree with the actual assessment for this class.	1 2 3 4 5
36	Students' performance in practical laboratories should be evaluated	1 2 3 4 5
38	Tutorials would be important to assist the students' learning.	1 2 3 4 5
39	Lectures are an effective way of teaching programming.	1 2 3 4 5
40	Practical work is an effective way to learn programming.	1 2 3 4 5

Questionário sobre Pedagogia Universitária e Sucesso Académico – QPUSA

Autores: Isabel Huet, José Pereira Tavares
Universidade de Aveiro, 2001

Este estudo realiza-se no âmbito de um projecto de doutoramento que visa analisar o impacto da prática pedagógica no sucesso académico e identificar o processo de aprendizagem dos alunos e as consequências que daí decorrem para o seu aproveitamento escolar.

Nota: As afirmações que se seguem estão relacionadas com as tuas aulas de Programação

Identificação					
1. Curso: 2. Nº de matriculas à cadeira: 3. Idade: 4. Sexo:					
5. Nível de escolaridade dos pais: 5.1 pai:	4ª classe	6º ano	9º ano	12º ano	ens. superior
5.2 mãe	4ª classe	6º ano	9º ano	12º ano	ens. superior

A. Tive uma disciplina de informática no ensino secundário: não sim

B. Qual a percentagem de tempo de estudo semanal que dedico a esta disciplina?

6.1. < 20% 20%-30% 31%-40% 41%-50% > 50%

Instrução: Assinala com uma cruz, em cada opção, o número que corresponde ao teu grau de desacordo ou acordo com a afirmação. A tua resposta pode ir de ① (**discordo totalmente**) até ⑤ (**concordo totalmente**).

1	A forma do professor dar as aulas motiva o meu interesse pelas mesmas.	① ② ③ ④ ⑤
2	Somos encorajados a participar em discussões sobre a matéria a leccionar.	① ② ③ ④ ⑤
3	O professor questiona individualmente os alunos.	① ② ③ ④ ⑤
4	O professor incentiva o meu interesse a colocar questões e a expor as minhas dúvidas.	① ② ③ ④ ⑤
5	O professor utiliza exemplos que despertam a minha curiosidade para o tema em estudo.	① ② ③ ④ ⑤
6	A linguagem utilizada é clara e objectiva.	① ② ③ ④ ⑤
7	O professor define os objectivos para cada aula.	① ② ③ ④ ⑤
8	O professor disponibiliza-se para esclarecer dúvidas sempre que necessário.	① ② ③ ④ ⑤
9	O professor é dinâmico e entusiástico a dar as aulas.	① ② ③ ④ ⑤
10	Um bom professor é um bom comunicador.	① ② ③ ④ ⑤
11	Os métodos de ensino que o professor utiliza são importante para o nosso sucesso académico.	① ② ③ ④ ⑤
12	Os professores universitários deveriam ter formação pedagógica.	① ② ③ ④ ⑤
13	O professor prepara a aula partindo do pressuposto de que possuímos pouco conhecimento da matéria.	① ② ③ ④ ⑤
14	O professor dá-me feedback sobre a minha aprendizagem	① ② ③ ④ ⑤
15	Para ser bem sucedido nesta cadeira necessito de uma boa memória.	① ② ③ ④ ⑤
16	É-me dado tempo para compreender aquilo que aprendo.	① ② ③ ④ ⑤
17	É possível fazer esta cadeira estudando apenas umas semanas antes do exame.	① ② ③ ④ ⑤

18	Os conteúdos abordados nas aulas são importantes para a minha profissão futura.	① ② ③ ④ ⑤
19	Frequentemente memorizo conceitos sem realmente os perceber.	① ② ③ ④ ⑤
20	Antes de iniciar a resolução de um problema penso na melhor estratégia para o resolver.	① ② ③ ④ ⑤
21	Para compreender melhor um conceito tento relacioná-lo com um exemplo real onde o possa aplicar.	① ② ③ ④ ⑤
22	Não gosto de memorizar conceitos, pois esqueço-me deles rapidamente.	① ② ③ ④ ⑤
23	Quando estudo para esta cadeira resolvo pelo menos 2 exercícios sobre um determinado problema.	① ② ③ ④ ⑤
24	Esta cadeira estimula, desenvolve e desafia a minha capacidade de raciocínio.	① ② ③ ④ ⑤
25	Sinto-me seguro(a) dos meus conhecimentos e sei que irei ter sucesso nesta cadeira.	① ② ③ ④ ⑤
26	Quando vou às aulas teóricas estou com atenção.	① ② ③ ④ ⑤

			Sim	Não
27	Venho com frequência às aulas teóricas.			
	27.1 Se respondeste não indica a principal razão do teu absentismo:			
	a)	não tenho interesse pela matéria		
	b)	frequento um centro de explicações		
	c)	o professor não motiva o meu interesse pela disciplina		
	d)	prefiro estudar pelos livros		

			Sim	Não
28	Sinto-me motivado/interessado pela cadeira.			
	28.1 Se respondeste sim indica o principal motivo dessa motivação:			
	a)	estou no curso que gosto		
	b)	sinto necessidade de fazer a cadeira para acabar o curso		
	c)	quero ser conhecido pelo professor		
	d)	gosto da forma como o professor aborda a matéria		

Sugere algumas propostas para o ensino da disciplina em anos futuros.

A equipa de investigação agradece a tua colaboração.

Representações dos Alunos sobre a Disciplina de Programação (RADP)

Autores: Isabel Huet, José Pereira Tavares
Universidade de Aveiro, 2002

Este estudo realiza-se no âmbito de um projecto de investigação que tem como objectivo analisar a reestruturação curricular da disciplina de PEDA e a percepção sobre a aprendizagem e motivação dos alunos.

Nota: As afirmações que se seguem são relacionadas com as tuas aulas de Programação

Identificação	
1. Curso:	
2. Nº de matriculas à cadeira:	
3. Idade:	
4. Sexo:	

5. Tive uma disciplina de informática no ensino secundário: não   sim
6. Qual a percentagem de tempo de estudo semanal que dedico a esta disciplina?

6.1. < 20%   20%-30%   31%-40%   41%-50%   > 50%

Instrução: Assinala com uma cruz, em cada opção, o número que corresponde ao teu grau de desacordo ou acordo com a afirmação. A tua resposta pode ir de ① (**discordo totalmente**) até ⑤ (**concordo totalmente**).

1	Os conteúdos abordados nas aulas são importantes para a minha profissão futura.	① ② ③ ④ ⑤
2	Sinto-me seguro(a) dos meus conhecimentos e sei que irei ter sucesso nesta disciplina.	① ② ③ ④ ⑤
3	Esta cadeira estimula, desenvolve e desafia a minha capacidade de raciocínio.	① ② ③ ④ ⑤
4	É possível fazer esta cadeira estudando apenas umas semanas antes do exame.	① ② ③ ④ ⑤
5	Venho com frequência às aulas teóricas.	① ② ③ ④ ⑤
6	Venho às aulas teóricas porque gosto de ouvir as explicações do professor.	① ② ③ ④ ⑤
7	Venho às aulas teóricas para compreender melhor a matéria.	① ② ③ ④ ⑤
8	Venho às aulas teóricas porque o professor motiva o meu interesse pela matéria.	① ② ③ ④ ⑤
9	Venho às aulas teóricas porque tenho interesse pela matéria.	① ② ③ ④ ⑤
10	Estou motivado pela cadeira porque sinto necessidade de acabar o curso.	① ② ③ ④ ⑤
11	Estou motivado pela cadeira porque gosto dos métodos de ensino dos professores.	① ② ③ ④ ⑤
12	Estou motivado pela cadeira porque o professor incentiva o meu trabalho.	① ② ③ ④ ⑤
13	Estou motivado pela cadeira porque o professor me dá sugestões para conseguir	① ② ③ ④ ⑤

	resolver as minhas dificuldades.	
14	Estou motivado pela cadeira porque o professor utiliza exemplos que despertam a minha curiosidade para o tema em estudo.	① ② ③ ④ ⑤
15	Os objectivos estão bem definidos.	① ② ③ ④ ⑤
16	Os objectivos da disciplina são importantes para a minha formação.	① ② ③ ④ ⑤
17	O programa é difícil.	① ② ③ ④ ⑤
18	Os problemas das aulas práticas são interessantes.	① ② ③ ④ ⑤
19	A carga horária das aulas práticas é excessiva.	① ② ③ ④ ⑤
20	A actual forma de avaliação permite testar aquilo que aprendi.	① ② ③ ④ ⑤
21	Concordo com a actual forma de avaliação.	① ② ③ ④ ⑤
22	O nosso desempenho nas aulas práticas deve ser avaliado.	① ② ③ ④ ⑤
23	A avaliação contínua nas aulas práticas constitui um factor inibidor da minha aprendizagem.	① ② ③ ④ ⑤
24	Concordo que a avaliação contínua conte 20% da nota final.	① ② ③ ④ ⑤
25	A avaliação no final do semestre devia ser apenas constituída por um exame teórico mais dois exercícios práticos.	① ② ③ ④ ⑤

A equipa de investigação agradece a tua colaboração.

Local: Sala do complexo pedagógico, Universidade de Aveiro

Duração: 30 minutos

Data: 02/02/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?
P1: Acho que os métodos são importantes mas mais importante que isso acho que é a motivação e trabalho dos alunos.

Entrevistador: Considera necessária a existência de formação pedagógica para os professores do ensino universitário?
P1: Acho que é importante mas antes da pedagogia é importante garantir a competência técnica ou seja para se ensinar programação tem de ser ter bastante tempo de experiência de programação/ ou seja tem de saber 10 vezes mais do que um aluno.

Entrevistador: Portanto em primeiro lugar está a componente cientifica/
P1: Sem dúvida nenhuma/ primeiro a componente cientifica/ se podermos integrar as duas melhor mas eu acho que é preferível ter uma pessoa que saiba verdadeiramente do que está a ser dado do que passar ideias incorrectas apesar da pedagogia// dos alunos acharem as aulas magnificas e que aprendem tudo/

Entrevistador: O ensino na universidade devia ser avaliado?
P1: Acho que sim// mas há componentes que// não/ acho que sim/

Entrevistador: Que métodos considera mais pertinentes para a avaliação do ensino: (1) questionários a alunos; (2) pares; (3) auto-avaliação; (4) experts na área da educação?
P1: Acho que há uma mistura das várias/ a avaliação dos alunos é importante porque dá uma ideia de como eles percebem o que está a ser dado e ver qual é a perspectiva e atitude perante a cadeira/ se eles se queixam que a qualidade de ensino é má porque não têm resumos/ acho que isso não deve contar para uma classificação/ é preciso preparar os alunos de maneira a que não reajam logo ao professor mas que também trabalhem por eles/ no que respeita aos colegas/ penso que é um bocado complicado e artificial por colegas a observar outros colegas/ a colocar experts eu

colocaria a importância de uma certa experiência pedagógica mas muito mais a do ponto de vista técnico// porque há assuntos que são muito complicados e por muita pedagogia que uma pessoa aplique vão ser sempre bastante complicados para os alunos/ podemos por colegas que tenham alguma experiência pedagógica/ não digo propriamente cursos de pedagogia mas experiência em dar aulas/ pessoas com mais experiência e não necessariamente que tenha um título de pedagogia/ a auto-avaliação é importante nem que seja para uma pessoa ver o historial ao longo do tempo/ para ver exactamente aquilo que funcionou ou não/ obriga a fazer paragens/.

Entrevistador: O que considera mais importante na sua carreira profissional neste momento? A investigação ou o ensino?
P1: Eu acho as duas// o que eu acho em termos práticos é que a investigação para mim é importante porque gosto da investigação e também gosto de dar aulas agora acho que nem uma coisa nem outra é feita de uma forma correcta// quer dizer como eu gostaria/ acho que devia ter mais tempo para a investigação porque a carga horária dificulta-me muito// a minha produtividade aumenta nas férias.

Entrevistador: O que pensa sobre a organização das aulas teóricas e práticas?
P1: Gosto de dar aulas TP mas preferia aulas em que os alunos apareciam para tirar dúvidas/ apareciam só os alunos interessados/ era melhor do que ter 24 alunos ou mais em que metade deles não estão motivados/ uma pessoa acaba nas aulas TP por ter de descer ao nível desses alunos/ porque eles não trabalham em casa ou não avançam// preferia se calhar ter menos horas práticas e ter a obrigatoriedade de haver um horário onde obrigatoriamente os professores estariam lá e se não estivessem eram penalizados e onde os alunos fossem ter/ porque ter alunos desinteressados nas aulas TP só porque têm faltas e podem não passar o ano sinceramente é contra producente// eu sinceramente não vejo problema nenhum que um aluno que saiba de programação que não vá às aulas práticas/ ele é avaliado pelo exame e por outros componentes de avaliação// os alunos com menos experiência e que querem que tenham sempre um professor sempre à disposição em horários pré-definidos/ agora obrigar os alunos que estejam 3 horas dentro de uma sala de aula// acho que os alunos deviam ser responsabilizados/ ou seja o fixa-se um nível de exigência/ os alunos têm acesso a testes modelo/ têm acesso aos professores/ agora/ se eles não procuram os professores/ não acedem à informação e não estudam a responsabilidade é deles// embora seja difícil deve haver uma quebra entre a tradição liceal para a universidade/ as pessoas que vão para a universidade é porque querem ser bons numa determinada área e serem bons dá trabalho e exige esforço/

Entrevistador: Acha que isso deve começar logo no primeiro ano?

P1: Sim/ provavelmente/ acharia que se devia apresentar um nível de exigência bastante grande para ser mais condescende na nota final/ ou seja exigir 150% e no fundo entre 0 e 100/ garantíamos que ao exigir bastante teríamos um nível mínimo aceitável para a frente/ porque em cadeiras de programação se eles fazem programação I num regime sem precedências eles na prática nem deveriam ir ao 2º semestre mas como estão inscritos vão a maior parte desses alunos ficam pelo caminho/ quer dizer enchem as salas mas//

Entrevistador: Considera a motivação dos alunos um factor primordial para o seu sucesso?

P1: Sim muito importante.

Entrevistador: No seguimento daquilo que temos vindo a falar indique dois factores que motivem o aluno.

P1: Eu não sei se será motivador numa 1ªfase mas eu acho que dar um trabalho complicado/ e já tive essa experiência a uma outra cadeira de iniciação à programação/ a primeira atitude foi de pânico/ ou seja é muito difícil muito complicado/ mas o facto de darmos tempo e acompanhamento o que é um facto é que em termos de motivação no fim do trabalho/ mesmo quem não tinha completado os objectivos totalmente/ pelo menos ficou com uma noção que tinha conseguido resolver o problema e// antes de aprender uma linguagem de programação é preciso saber aprender a pensar e penso que este princípio passou mais nessa cadeira [IPF] que dei do que nesta/ devido ao grau de exigência// quem não está motivado eu acho que é mais por falta de empenho/ há sempre casos de pessoas que têm dificuldades mas para isso é que eu acho que os professores deveriam estar disponíveis/ e não é numa aula prática que as pessoas tiram dúvidas/ para muito seriam um fio condutor para terem sempre alguém a acompanhar/ mas não seriam obrigatórias/ digamos que seria uma aula de laboratório numa aula prática.

Entrevistador: Considera que os professores têm um dos principais papéis para a motivação do aluno?

P1: Depende/ varia muito com o perfil do aluno/ o perfil do aluno que chega ao ensino superior com mais autonomia/ pode ter um bocadinho mais de dificuldade mas ao final das primeiras aulas aparece com as coisas feitas e faz perguntas/ quem vem com uma formação de liceu/ o professor é essencial porque eles estão habituados a ter uma figura que guia// acho que o professor é importante mas sinceramente acho que sinceramente é o trabalho que está por detrás/ eu falo pela minha experiência como aluno/ quando estudei tive uma cadeira de programação no 1º ano/ no 1º mês deram-nos as bases/ tipo o alfabeto as letras e ao fim dessas primeiras aulas existia uma aula de laboratório em que as pessoas teriam uma lista de exercícios/ cada um andava à sua velocidade e com uma pessoa para tirar dúvidas e tínhamos uns trabalhos/ havia pessoas que precisavam mais ou menos ajuda dos professores mas basicamente a partir dai havia uma certa autonomia.

Entrevistador: Refira as duas principais estratégias só para resumir.
P1: Tirando o regime de faltas embora eu não concorde com esse regime há muitos alunos que vêm às aulas T por causa das faltas// por exemplo numas aulas extras que se deram por causa de uns feriados só apareceram os alunos mais interessados e porquê? / Estão motivados acharam que necessitavam daquilo e vieram às aulas/ grande parte dos outros não.

Entrevistador: Deixe-me fazer um breve resumo daquilo que acabou de dizer/ portanto/ no fundo o regime de faltas obriga o aluno a ir às aulas mas //
P1: exacto mas não assegura a motivação/ no meu ponto de vista aumenta a carga de trabalho do professor// duma forma que se calhar não é tão rentável// ou seja em termos práticos mais facilmente asseguraria aulas de laboratório onde no fundo uma pessoa teria mais tempo para gerir a investigação mas também ao mesmo tempo teria mais disponibilidade// para tirar duvidas/

Entrevistador: troca ideias com os colegas?
P1: sim/

Entrevistador: a linguagem que utiliza em sala de aula é compreendida pelos seus alunos?
P1: Julgo que sim/ nestas cadeiras iniciais os termos não são muito complicados/ o mais complicado é os alunos entenderem o raciocínio do que compreenderem a linguagem/

Entrevistador: Concorda com a organização das aulas? Será um resumo daquilo que já falámos.
P1: Aulas P não deviam ser obrigatórias e deviam funcionar como um laboratório/ as aulas T deviam assegurar os assuntos principais ou seja para quem não quisesse

andar por si ou não tivesse experiência tinha a exposição oral dos vários aspectos mas não com a preocupação exaustiva de cobrir tudo// porque não há tempo ou seja é preferível cobrir objectivos essenciais/ conceitos essenciais que são dados na cadeira/ dar referências para o texto e tudo o que sejam detalhes e pormenores que sejam direccionados para os laboratórios ou para os professores/ no fundo as teóricas organizavam o conhecimento para quem não tenha noção do que aparece pela frente ter uma noção do mapa e ouvir pela primeira vez os conceitos// para orientar/as questões de pormenor serem dadas por um professor que normalmente tenha um grupo de 2 ou 3 alunos/ numa aula de 24 não dá/

Entrevistador: Práticas inovadoras
P1: é engraçado/ mas uma coisa que já vem do liceu/ os alunos vêm todos muito bem ensinados/ o que resulta muito bem com estes alunos/ para melhorar o seu desempenho nas aulas é terem trabalhos de casa/ como eles estão habituados a ter trabalhos de casa/ quer dizer uma pessoa não diz que eles são obrigados/ mas complementa de uma certa forma a avaliação contínua/ mas só o facto de dizermos que eles têm trabalho de casa para entrega eles têm muito mais produtividade na aula seguinte/ eu dou uma vista de olhos nos trabalhos mas acho que seria mais produtivo fazer isso a um só trabalho final/ ou seja em vez de apresentarem um trabalho em cada aula apresentavam um trabalho no final do semestre/ no inicio não teriam todas as ferramentas mas iriam adquiri-las ao longo do tempo que os obrigasse a pensar no que é que falta para resolver o problema e terem a necessidade de procurar informação/ se encontrarem por eles melhor/ se precisarem da ajuda do professor é para isso que nós estamos aqui/ defendo também uma avaliação oral/ com uma apresentação oral uma pessoa vê logo se o aluno fez o trabalho ou não e se percebe os conceitos essenciais ou não// para mim o essencial é realmente termos uma avaliação oral/ a diferenciação das notas pode ser dada por um exame/ se um aluno tivesse uma nota negativa no exame mas se o trabalho e a avaliação oral fossem boas eu não teria problema nenhum em passar o aluno/é muito importante que os alunos saibam pensar e analisar um problema/ e representá-lo numa forma consistente utilizando uma linguagem que neste caso é o pascal// na prática se eles não conseguem pegar no problema complexo e decompô-lo esse aluno não deve passar.

Entrevistador: Sente-se motivado enquanto docente?
P1: Acho que também já respondi anteriormente// sinto que enquanto docente existe uma carga horária bastante grande// para o que eu acho que seria útil/ eu não me importaria de dar a mesma carga horária se tivesse turmas motivadas ou até mesmo

menos alunos/ porque 24 alunos é muito complicado/ não quero descriminar mas há diferenças entre os alunos/ não digo entre os cursos/ por exemplo alunos de engenharia e telemática eu estaria há espera de pessoas mais motivadas// mas sinto que essa falta de motivação tenha a ver com o enquadramento// geralmente são alunos mais autónomos// acho que gastariam o mesmo tempo ou mais se não tivessem entre as 3 e a 6 numa sala de aula/ a exigência ai era importante para obrigá-los a estruturar o tempo// o aluno tem de ser responsável.

Entrevistador: Então quer dizer que a forma como as aulas estão organizadas não o motiva muito.

P1: Eu gosto de dar aulas mas/ por exemplo uma coisa que acho que não funciona bem e noutro tipo de disciplinas pode funcionar é a segmentação de matérias/ por exemplo grande parte dos alunos não percebem que podem utilizar linguagens diferentes para descobrir o mesmo tipo de princípios// ou não vou estudar isto porque não vai sair no teste// acho que tem de se dar liberdade ao aluno/ porque em programação não existe uma só maneira de fazer as coisas// e eles saem daqui com a ideia de que é tudo compartimentado/ ou seja se eu quiser fazer um teste difícil é criar um problema que obrigue a dar cabo de todos os modelos/ aprender os modelos eles aprendem muito bem/ mas na programação não existem modelos embora na prática a avaliação acaba por ser feita com padrões repetitivos.

Local: Sala do complexo pedagógico, Universidade de Aveiro

Duração: 20 minutos

Data: 15/02/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos seus alunos?
P2: Eu acho que sim porque se o aluno for para a sala de aula já desmotivado ou tiver algum motivo para entrar em colisão com o professor ou com a matéria que o professor dá eu acho que fica desmotivado e não aprende o que devia aprender e vai por obrigação e não por interesse.

Entrevistador: E acha que de alguma forma o professor pode ajudar o aluno a sair desse estado?
P2: Pode até pela própria forma de estar na aula vá lá fomentando não sou a favor da quebra total das regras e de formalismos mas fomentando uma aproximação entre o professor e o aluno para ele se desinibir especialmente nestes primeiros anos de (…) a gente nota que muitas vezes eles têm dúvidas e não as põem e depois as dúvidas vão-se acumulando e gera-se ali um efeito de bola de neve que se houvesse uma maior abertura dos professores com os alunos se eles sentissem vá lá quase uma relação de amizade não queria chegar a tanto porque isso depois gera afectos e pode influenciar a questão da avaliação mas se estivessem desinibidos na aula acho que facilitava muito

Entrevistador: E considera necessária a existência de formação pedagógica dos professores?
P2: Eu acho que sim concordo.

Entrevistador: E o ensino na sua universidade deve ser avaliado?
P2: Eu acho que sim deve ser avaliado por entidades que sejam independentes e que não tenham a ver com a própria universidade

Entrevistador: Que é que métodos considera então mais pertinentes para essa avaliação? E eu tenho aqui 4 opções e gostava que me dissesse uma ou várias: a avaliação feita pelos alunos que pode ser feita através de questionários ou de entrevistas focadas / através dos colegas/ através da auto-avaliação do docente/ ou através dos 'experts' da educação?

P2: Eu iria talvez para uma mistura da primeira com a última/ os alunos e depois auditorias feitas externamente / os tais peritos externos contactarem eles próprios com os alunos porque// se forem os próprios colegas é uma questão muito subjectiva um acha que o método que ele usa é o melhor outro acha que o método que o colega utiliza que podia ser melhorado por outro lado se formos só para os alunos também há aquela questão gostam do professor simpatizam com o professor dizem muito bem não simpatizam dizem mal e então há que manter uma certa distância e acho que aí é o papel dos auditores externos que percebem que têm conhecimentos para fazer a tal avaliação que seria importante.

Entrevistador: E o que é que considera mais importante neste momento na sua carreira profissional a investigação ou o ensino?

P2: Na minha carreira profissional eu estou também a acabar o doutoramento neste momento considero as duas coisas importantes // vá lá / neste momento eu diria que seria 50% mas/ depois eu considero que mesmo depois de acabar o doutoramento que a questão das aulas a gente vai ganhando experiência não vai levando tanto tempo mas que há necessidade de ir ajustando os métodos às realidades como elas vão evoluindo neste caso das questões das programações estar atento ao que se passa no mercado do software / vá lá mesmo hardware para não acontecer coisas que às vezes acontecem que a gente chega lá à sala de aulas e vê os alunos com dispositivos que nós nunca vimos na frente portanto/ deve-se estar atento a tudo o que se passa à volta da informática e estar atentos à realidade da alteração dos currículos dos cursos para adequar o nosso método de ensino ao que os cursos exigem mas a investigação também acho que é importante porque é uma das vertentes das universidades se distinguem que têm da fomentar e portanto é fundamental a investigação / eu acho que são as duas vertentes importantes

Entrevistador: E considera a motivação dos alunos um factor primordial para o sucesso académico?

P2: Eu acho que sim / é o mais importante/ se um aluno está motivado// as pessoa não nascem ensinadas / para conseguirem atingir determinadas metas é preciso sempre ter trabalho / umas pessoas têm mais capacidade outras têm menos mas de qualquer das formas é preciso trabalhar estudar e se a pessoa vai estudar porque é obrigada a estudar vai despender maior esforço e não vai retira tanto rendimento como se fizer as coisas com gosto/ portanto se houver maior motivação para os assuntos que são tratados durante o plano do curso eu acho que o aluno tira melhor notas/ anda mais satisfeito e não despende de um esforço tão grande como se não andasse.

Entrevistador: Acha que os professores têm um papel fundamental para essa motivação?
P2: Têm mas não é só na altura da aula/ na altura em que são planeados o que vai ser dado/ e a sequência dos assuntos que vão ser abordados bem como os exemplos que vão ser utilizados para explicar a matéria o professor tem um papel fundamental mas é preciso que o aluno também ajude/ se vai para lá logo à partida porque vou fazer porque tenho de fazer não há motivação para aquilo se consiga dar.

Entrevistador: Indique dois factores que motivem o aluno na sua opinião na aprendizagem e contribuam para o seu sucesso?
P2: É precisamente uma das coisas que eu digo aí num inquérito atrás a motivação será adequar os problemas que eles estão a resolver nas aulas neste caso estamos a falar na programação nos cursos que eles estão a frequentar // se os problemas que eles resolverem num semestre tiverem a ver com o que vão aprender no futuro eu acho que eles se sentem muito mais motivados porque dá aquela ideia de que estão a aprender coisas novas sem estarem a dar a programação pela programação // eu lembro-me que quando fui aluno aqui da Universidade na altura que estava a aprender inglês ia com mais interesse para as aulas não pelo inglês em si mas porque os textos que eram tratados durante as aulas tinham a ver com as telecomunicações e falavam com os aspectos da propagação na Ionosfera que dava para comunicar a longas distâncias e sem querer estava a aprender o inglês.

Entrevistador: Troca ideias e experiências com os seus colegas?
P2: Nem por isso/ isso é uma falha minha eu também estou a começar agora/ é uma coisa que eu quero ver se corrijo mas umas vezes por não haver mais reuniões entre nós outras vezes mesmo a minha maneira de ser é um bocado fazer o meu trabalho mas é um dos aspectos que queria corrigir com o tempo será esse trocar experiências / porque é importante mesmo para universalizar os métodos de ensino porque no final não nos podemos esquecer que eles vão ser avaliados e não acho justo que um sejam ensinados com um determinado nível de cuidado e outros vão ser avaliados/ os valores vão ter a mesma importância tendo sido ensinados com menos cuidado// estas são cadeiras com muitos docentes e alunos e por isso torna-se um bocadinho difícil arranjar reuniões e reunir consensos.

Entrevistador: E que pensa da actual organização das aulas práticas e teóricas.
P2: Está-se a querer referir à duração das aulas? // a nível dos conteúdos eu acho que quer das teóricas quer das práticas haveria vantagens em agrupar os alunos por cursos de forma a poder motiva-los com exemplos que tenham a ver com aquele curso especifico e mesmo nas praticas talvez fosse vantajoso elaborar um guião de problemas que tivesse a ver com as cadeiras futuras deles // o aluno iria ficar motivado porque no caso de programação sem querer estava a aprender a programar e depois estava a ter aquela sensação que estava aprender coisas à frente e que lhe dizem muito mais interesse partindo de que as pessoas vêm para os cursos motivadas.

Entrevistador: sente-se motivado como professor neste momento?
P2: Sinto-me motivado de fazer cada vez melhor mas não gosto da situação dos alunos lutarem para o valor mínimo/ não me desmotiva mas leva-me a querer lutar contra isso na medida do possível.

Entrevistador: E a linguagem que utiliza na sala de aula é compreendida pelos seus alunos?
P2: Sabe que a programação vive um bocado à base de um calão informático / alguns compreendem mas como eu lhe disse à bocado os alunos do primeiro ano têm um bocado aquela inibição de quando não sabem ficarem calados e de não quererem mostrar que não sabem porque pensam que a única missão do professor na sala de aulas é avaliá-los/ por isso é que eu tento na medida do possível / na alturas penso que não devia ter feito isso/ tento aproximar o professor do aluno o mais possível nuca deixando passar que o aluno está ali para fazer o que o professor diz agora não estamos no ensino secundário não posso obrigar ninguém a fazer aquilo que não quer/ se não conseguem devem dizer quais as dúvidas que têm e dizer por que não conseguem.

Entrevistador: Têm ideia de algo diferente que tenha sido adoptado para melhorar o sucesso no ensino?
P2: Não diferente não. A única coisa que eu tentei fazer na aula foi criar um espírito agradável /as pessoas não sentissem um ambiente militar claro que não permitia que fizessem barulho/ inovador não propus nada porque como lhe disse é o primeiro ano/ inovador a preocupação que eu tinha era de preparar as aulas antes de as leccionar de modo a introduzir aos alunos os conceitos necessários para levar aquela aula a bom termo que eu apresentava em acetatos nunca muitos com informação mais concisa

possível sobre os aspectos que eles precisavam de saber/ tanto que no final eles vinham pedir os acetatos mas eu não lhes podia entregar por ordens superiores/ trouxe benefícios àqueles alunos que faltavam às aulas teóricas/ para aqueles que vão às aulas teóricas era uma questão relembrar e localizarem.

Entrevistador: Quais serão as duas principais estratégias que considera importantes para prender a atenção do aluno e a sua ida às aulas?

P2: A questão do bom ambiente/ de estar ali descontraído mas com interesse por estudar e a questão dos conteúdos serem / para estarem motivados para os problemas que vão resolver/haver uma certa cumplicidade entre professor a ajudar o aluno nas dificuldades / claro que isso se as turmas forem muito grandes não dá para implementar se forem mais pequenas é mais fácil/ eles sentirem que estão a resolver coisas que no futuro vão lhe ser precisas e combater aquele conceito que há/ o mesmo estereótipo que a matemática que é uma coisa inacessível.

Local: Sala do Complexo Pedagógico

Duração: 26 minutos

Data: 05/02/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?
P3: Sim claramente

Entrevistador: Considera necessária a existência de formação pedagógica para os professores do ensino universitário?
P3: A questão pedagógica é importante/ agora ou com formação ou com selecção ou com a entrada do parâmetro pedagogia ou com capacidade pedagógica da pessoa para os critérios de recrutamento das pessoas/ sim // formação é assim acrescenta sempre alguma coisa mas não me parece que seja o caminho que vai resolver o problema.

Entrevistador: O ensino na sua universidade deve ser avaliado?
P3: Claro

Entrevistador: Dos métodos que vou enumerar quais são aqueles que considera mais pertinentes para a avaliação da qualidade do ensino: a avaliação feita pelos alunos/ através dos pares/ através de uma auto-avaliação ou através de 'experts' da educação?
P3: Ora bem os especialistas são um bom método mas só pode ser utilizado de vez em quando porque os custos que acarreta a obrigar contratar bons especialistas a estarem aqui bastante tempo e a fazerem uma avaliação concreta e válida de todos os anos parece-me um cenário pouco viável portanto é bom para fazer de vez em quando. O que eu julgo que seria a opção melhor seria a avaliação feita pelos alunos depois mediada pelos pares/ ou seja os alunos faziam a avaliação deles/ depois os colegas faziam uma interpretação segundo parâmetros rigorosos daquilo que os alunos decidem. Pode haver algumas cessações também/ os alunos são bons avaliadores mas não são 100 por cento infalíveis.

Entrevistador: E o que considera mais importante neste momento na sua carreira profissional é o ensino ou é a investigação?

P3: É claramente a investigação / o ensino não conta para nada em termos de carreira numa universidade portuguesa. O sucesso ou o insucesso pedagógico dos professores conta 0/ é muito frustrante que isso não tenha peso nenhum quando nós gastamos muito do nosso tempo a dar aulas.

Entrevistador: E considera a motivação dos alunos um factor primordial para o seu sucesso?
P3: Sim claro/ não sei se é o primeiro factor mas é um dos mais importantes.

Entrevistador: E acha que os professores desempenham um papel importante para esta motivação?
P3: É um papel importante agora se fazemos aquilo que devemos para os motivar isso já tenho algumas dúvidas/ depende de uma maneira ou de outra e também diria de uma pessoa ou outra/ mas quer a maneira como se ensina quer quem ensina altera drasticamente a motivação dos alunos.

Entrevistador: Indique dois factores que motivam o aluno na sua aprendizagem e contribuam para o seu sucesso?
P3: Há muitos factores que podem motivar/ um deles é a percepção do professor claramente/ outro é a percepção que eles têm da utilidade que aquilo que estão a aprender vai ter ou da sua vida futura profissional ou mesmo da sua vida académica dentro da universidade/ estes são talvez aqueles que me vêm mais à memória.

Entrevistador: Refira as duas principais estratégias que considere importantes para prender a atenção do aluno e a assiduidade às aulas?
P3: Eu acho que a principal de todas é gerir as cadeiras para que seja essencial para grande parte dos alunos o que aprendem nas aulas. Ou seja se os alunos chegam à conclusão que indo às aulas ou não indo o sucesso deles é mais ou menos o mesmo porque eles estão mais preocupados com o processo que tenha ido na pauta/ não estão muito preocupados se a quantidade de conhecimentos que aprendem é muita ou pouca//estão preocupados é com a pauta. Para que haja interesse genuíno em ir às aulas e não ir lá só para não ter faltas tem de haver uma remodelação nas cadeiras para que o aluno não indo às aulas dificilmente consiga saber o suficiente para fazer a cadeira. As cadeiras têm na minha opinião um nível de exigência um bocado desadequado.

Entrevistador: É a favor do trabalho de grupo ou o trabalho individual?

P3: Em termos das cadeiras informáticas são 100% a favor do trabalho individual nas aulas portanto eu não concordo nada com 2 alunos por computador acho que nas disciplinas de programação só se aprende fazendo/ olhando para o colega a programar não se aprende rigorosamente nada mesmo que estejam a perceber/ só que como não fizeram quando têm que fazer não sabem fazer/ acho que uma universidade que tem boas condições não ter aumentado um bocadinho mais o parque informático/ nomeadamente ter um aluno por computador e depois o trabalho de grupo é muito importante mas devia ser fora de aula/ as aulas são só 3 horas por semana e portanto devia ser o aluno a desempenhar o máximo possível/ e assim o número de alunos nem me importava que fosse grande como é sinceramente 22 ou 24 alunos/ nós temos 24 alunos é muita coisa/ é muito aluno para estar individualmente mas consegue-se.

Entrevistador: Então estávamos que tem a ver normalmente com a mobilidade não é/ que se calhar a mobilidade de professores possivelmente iria ser benéfica.
P3: E depois há outras coisas toda a gente sabe que numa universidade americana/ estou a falar delas porque acho que são aquelas que estão mais desenvolvidas/ em Portugal não está tudo mal nem de perto «nem de longe mas podia estar muito melhor com o dinheiro que se gasta. As pessoas são propostas a escrever x artigos por ano/ ou a orientar x alunos por ano/ ou não sei que mais/ aqui é assim/ o que é que acontece se eu não escrever depois temos o doutoramento/ até lá// mas depois de ter o que é que acontece não saio daquele patamar senão fizer (…)

Entrevistador: Troca usualmente experiências de ensino com os colegas?
P3: Sim é um dos assuntos recorrentes de conversa.

Entrevistador: A linguagem que utiliza na sala de aulas é compreendida pelos seus alunos?
P3: Faço por ser mas não utilizo linguagem de crianças do 10.º ano mas faço por não ser demasiado hermético.

Entrevistador: Acha que eles compreendem o que diz de uma forma geral.
P3: Não eu não disse isso eles compreendem a linguagem falta quererem saber/ há alunos que estão completamente a leste do que se está a passar e não percebem nada do que eu estou a falar/ mas isso não percebem o contudo do que eu digo é diferente.

Entrevistador: E que pensa da organização das aulas praticas e teóricas?

P3: Já respondi a grande parte disso. Em termos de programação à uma coisa que eu discordo frontalmente que é dois alunos por computador acho que é um contra senso.

Entrevistador: Entre o trabalho de grupo e o trabalho individual o que é que prefere?
P3: O trabalho individual/ só se aprende a programar programando e portanto como um deles não programa não aprende/ é errada a ideia de que o colega está a ver o colega a programar e está a perceber// errado ele até pode perceber no momento mas não sabe fazer.

Entrevistador: Práticas inovadoras que tenha aplicado com sucesso ou não no ensino da sua disciplina?
P3: Sinceramente nenhumas/é assim há uma coisa que eu já fiz e que normalmente não é muito bem vista pelas pessoas responsáveis pelas cadeiras e nomeadamente na cadeira de programação 1 ficou ponto assente eu não fazer e acho que os resultados pioraram por causa disso na minha opinião que é no início das aulas fazer uma pequena introdução à matéria/ porque é que os regentes não querem isso/ eu percebo porque os alunos assim deixam de ir às teóricas por outro lado temos um caso em numa aula de três horas em que cinco sabem o que estão a fazer e outros 10 que não sabem do que é que eu estou a falar ou do que se pede no exercício se eu tenho 3 horas o que é que me custa a mim ter 10 minutos e fazer com que eles estejam mais dentro da matéria.

Entrevistador: Sente-se motivado em realizar docência neste momento?
P3: É assim nós pudemos sempre ambicionar a mais coisas/ mas eu gosto muito desta universidade/ de qualquer forma um problema é o sistema/ numa universidade americana as pessoas formam-se numa universidade vão dar aulas para outra e saltam de um sitio para outro mesmo em Inglaterra em França na Alemanha que são países muito mais conservadores também saltam/ em Portugal a pessoa forma-se no Porto dá aulas no Porto até morrer/ forma-se em Aveiro dá aulas em Aveiro até morrer. Mas isso é muito mau para uma Universidade porque ela se torna um ciclo fechado.

Local: Sala do complexo pedagógico/ Universidade de Aveiro

Duração: 48 minutos

Data: 26/01/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?

P4: Sim/ o problema é que há muitos alunos desmotivados e não percebo porquê/ sinceramente e portanto os métodos às vezes tornam as coisas mais interactivas/ por exemplo/ há uns anos atrás tentei superioridades dinâmicas / com animação e os alunos ficam com muito mais atenção porque se vê uma coisa a aparecer/ do que por exemplo estar só a explicar o código/ às vezes mais do que perceber o código é preciso perceber as acções das coisas/ portanto a animação introduz / a animação infelizmente dá muito trabalho a fazer/ mas eu tenho tentado fazer isso/ isso e tentar criar as aulas mais teórico-práticas/ apresentar um exemplo para mostrar a necessidade de certas coisas para ver se eles se sentem mais motivados.

Entrevistador: Isso diz respeito às aulas teóricas/

P4: Sim/ nas práticas é de facto muito difícil motiva-los eu acho que as 3 horas assustam-nos/ eles têm uma atitude de pzt/ são três horas/ isto vai dar tempo para tudo/ e então não fazem nada/ estão sempre nas calmas/ nas práticas não sei como se há-de fazer/ Se calhar a ideia era teórico-práticas/ por tudo no papel/ o problema é que eles não conseguem chegar à solução e depois começam oh professor não sei o que é que hei-de fazer devia haver uma componente teórico-práticas e a aula prática era mais para ver se ele foi à aula TP e se percebeu de facto e era um laboratório.

Entrevistador: Essas aulas seriam obrigatórias ou facultativas?

P4: Obrigatórias/ até porque o 1º semestre (…)

Entrevistador: Considera necessária a existência de formação pedagógica para os professores do ensino universitário?

P4: Ao nível do 1º ano e do 2º ano talvez/ mas isso é um aspecto que nós vamos aprendendo com as asneiras que fazemos e com os comentários dos alunos/ enfim às vezes a gente apercebe-se que // por exemplo quando se tem duas regências/ já me aconteceu/ em função dos alunos eu mudar certas coisas porque cheguei à conclusão que os alunos a uma dada altura não perceberam onde é que eu estava/ mas enfim mas acho que isso se adquire um pouco com a experiência/ mas não se perde nada em aprender umas coisas/ eu aprendi umas coisas na tropa/ métodos de abordagem e exposição de problemas/ nós dávamos aulas de comunicação aos soldados e por isso tive algumas aulas em como mostrar coisas aprendemos/ por exemplo/ como usar acetatos e coisas do género/ nunca tinha aprendido.

Entrevistador: Nunca tinha aprendido?

P4: Nunca tinha aprendido/ mas depois vim para aqui assim/ não é? e aprendi com a experiência/ tive de aprender com a experiência.

Entrevistador: O ensino na sua universidade deve ser avaliado?

P4: Devia ser avaliado e devia contar para a progressão na carreira universitária/ acho que é uma lacuna/ não ter // ser considerado uma coisa com um certo desprezo/ por exemplo ouvi uma vez um comentário de nomeação definitiva/ o professor que disse que a pessoa em questão tinha publicado muitos textos de apoio para os alunos mas que aquilo não tinha interesse nenhum/ não tem interesse nenhum? então quer dizer/ é só fazer papers/ então e a qualidade do ensino? Nós estamos aqui para quê? Ser professores ou investigadores? e portanto devia ser avaliado nesse sentido/ devia ter algum peso na progressão da carreira/ por exemplo uma coisa que não é feita em Portugal é livros escritos por professores universitários em várias áreas e quando são escritos/ são muito maus/ uma pessoa não devia estar x anos numa disciplina sem ter publicado um livro // não podia ser 'full' professor e portanto não chegava a catedrático nem a topo de carreira se não tivesse publicado progressivamente ao longo da carreira livros para os alunos estudarem.

Entrevistador: uhm/uhm/ que métodos considera mais importantes para a avaliação do ensino/ vou-lhe dar alguns exemplos: avaliação feita pelos alunos/ pelos pares/ auto-avaliação ou experts na área da educação?

P4: Eu tenho uma certa desconfiança nos experts da educação [risos]

Entrevistador: Destas hipóteses qual é a que considera mais pertinente?

P4: Acho que na auto-avaliação/ a gente muitas vezes cai num erro e não sai dali/ agora as duas primeiras com um certo nível de peso/ porque os alunos às vezes quando não agem por mal são capazes de dizer umas coisas úteis/ mas outras vezes só porque estão chateados dizem as piores idiotices que lhes vêem à cabeça e portanto a opinião deles às vezes é importante porque de facto eles os receptores da mensagem mas às vezes acho que há alunos que a gente quando começa a conversar sobre isto ou aquilo vê que eles têm uma visão distorcida das coisas/ os colegas em principio/ supostamente/ quer dizer os nossos colegas devem estar interessados na qualidade do ensino/ portanto/ comentários são sempre bem vindos/ alguns é que são muito susceptíveis de ouvir comentários/ ficam muito mal dispostos.

Entrevistador: O que considera mais importante na sua carreira profissional? A investigação ou a docência?

P4: É o ensino porque a minha investigação // [risos] é uma desgraça.

Entrevistador: Acha então que está mais vocacionado para o ensino? Ou é o mais importante na sua carreira profissional?

P4: Eu gostava que fosse o mais importante/ mas não pode ser/ quando se está ao nível do 1º ou 2º ano/ com cadeiras de centenas de alunos nós não temos tempo de fazer mais nada/ especialmente quando temos colaboradores que são uma desgraça/ não fazem as coisas atempadamente.

Entrevistador: Admite então que dedica mais tempo ao ensino/

P4: Eu neste momento não dedico tempo nenhum à investigação há quase 5 anos/ o que me vai custar/ um dia destes.

Entrevistador: Considera a motivação dos alunos um factor primordial para o sucesso académico?

P4: Acho que sim/ eu já fui aluno e aquilo que eu quis aprender/ tinha motivação/ gostava de aprender/ aprendia/ quando não queria aprender não aprendia/ quando à partida as pessoas estão com uma atitude de desinteresse/ não aprendem mas eles não percebem isso/ acham que há alguma varinha mágica/ que as coisas mais tarde ou mais cedo fazem sentido.

Entrevistador: Quais são os dois factores que motivem o aluno na sua aprendizagem e contribuam para o seu sucesso? O que motiva os seus alunos a aprender e ter sucesso?

P4: Em 1º lugar estar no curso que gostam ou que querem/ acho que isso é muito importante e hoje já começa a ser verdade e portanto eu vejo que os alunos de ECT e Electrónica/ por exemplo/ têm um interesse maior pela programação do que os outros/ principalmente digamos aqueles que entram de facto na 1ª opção e que têm boas notas // por outro lado // só conheço a motivação nesses países em que as pessoas são irresponsáveis que é a repressão pura e simples/ que às vezes também é preciso por as pessoas em sentido e de facto começamos a ter um sistema de ensino que nunca obrigou o aluno a ser responsável/ nos somos um país de irresponsáveis/ até ao mais alto nível e portanto às vezes acho que faltam medidas que obriguem os alunos a tomar certos tipos de comportamentos e isso em certas universidades é tabu/ as prescrições e uma série de coisas/ há alunos que faltam e chumbam por faltas às vezes por mera distracção/ habituam-se a faltar// depois a questão da desmotivação é geral/ acho que há uma grande desmotivação da sociedade Portuguesa e hoje em dia anda completamente // os pais habituam os filhos a fazerem tudo o que querem e não há responsabilidade nenhuma/ desde tenra idade.

Entrevistador: Acha que os professores têm um papel fundamental para a motivação do aluno?

P4: Deveriam ter mas até acredito que na secundária e na primária seja um bocado possível mas agora quando chegamos à universidade e temos jovens de 18 ou 20 e muitos anos/ eles são completamente mal-educados uma pessoa está a tentar tirar-lhes uma dúvida e eles respondem logo mal e tratam-nos mal/ uma pessoa às vezes mas para é que eu estou para aqui a tentar fazer alguma coisa por ti se tu próprio não estás interessado portanto às vezes neste nível já é muito difícil/ o aluno já // vem tão mal educado e arrogante que já não conseguimos fazer nada dele/ acho que às vezes já é tarde de mais para alguns alunos.

Entrevistador: Perante este cenário sente-se motivado?

P4: Não e cada vez menos/ cada vez menos e começo a ficar cansado/ não me deixam fazer nada/ os colegas tive um grande azar/ um foi contratado/ tinha pouca iniciativa e dedicava-se mais ao doutoramento e não estava para // outros são pessoas muito antigas/ estão há muito tempo no departamento e têm umas ideias completamente diferentes de mim/ estão mais para estorvar do que para ajudar/ começa a ser complicado/ uma pessoa cansa-se/ falei com um colega meu e ele disse-me assim: -vou de sabática e volto // posso até voltar para o 1º ano/ eu até gosto de dar aulas aos jovens/ para estar junto de pessoas jovens mas não vou dar teóricas/ os mais novos que dêem! porque o trabalho que eu tenho a dar teóricas e a corrigir centenas de testes com a ajuda/ está bem que tenho tido ajuda de colegas/ mas eu já tenho 40 e tal anos e já não tenho capacidade para certas doses de trabalho quer dizer/ eu também tenho outras coisas na minha carreira/ não é eles andarem a fazer carreiras empíricas e eu andar aqui a penar/ uma determinada altura posso até dar a cadeira mas não quero dar teóricas/ ás vezes a gente ouve tantas críticas / os outros também que se cheguem à frente e que façam currículo/// não é? Às vezes dá-me vontade de dizer assim ai não gostam disto? Então //

Entrevistador: Essa desmotivação é mais relacionada com os colegas do que com os alunos?

P4: Os alunos fazem aquilo que lhe deixamos fazer/ se mudássemos as regras do jogo se calhar as coisas mudavam agora há colegas que por interesse/ como dedicam mais tempo investigação/ não querem ter trabalho e quando se querem discutir algumas mudanças no departamento de electrónica mais ou menos óbvias ninguém quer pensar nada obviamente que não são eles que tomam conta do trabalho/ eu corrigi 50 testes abaixo de 5 valores porque os senhores/ colegas disseram aos alunos que era a melhor das duas notas // quer dizer eu corrige 50 testes/ um quinto do meu trabalho foi perda de tempo/ os professores não vão ao webct? não sabem as regras para se ir à recorrência? E depois claro a culpa não é do aluno mas foi do colega/ um aluno chega atrasado/ mete-se numa turma e arma tremenda confusão/ não quer fazer teste e depois vem dizer que está a ser prejudicado/ quando não estuda e não faz nada e depois diz que a culpa é nossa/ isso também desmotiva/ porque a gente até se esteve a esforçar para ensinar alguma coisa e depois ele não quer aprender e ainda me trata mal? Não vale a pena/ não é? Portanto é toda a conjuntura do ensino ao nível do 1º ano acho que ou se muda qualquer coisa ou de facto as pessoas começam a ficar fartas desta situação e depois é a crítica dos nossos colegas dizem ah! os nossos alunos chegam aqui ao departamento/ estiveram no 1º ano mas chegam aqui sem saber nada/ então o que é que vocês lá fizeram?// então nós fizemos o que pudemos/ nós não podemos obrigar os alunos a aprender/ depois eles caiem no 2º ano inevitavelmente e chegam ao 2º ano sem saberem nada/ mas caramba e depois ouvem-se as críticas não aprenderam nada/ como quem diz/ vocês não sabem o que andam a fazer nas cadeiras dos colegas/ então dá-me vontade de dizer vão lá para o 1º ano a ver se consegues fazer melhor/ todo o esquema está todo muito mau.

Entrevistador: Refira as duas principais estratégias que considera importantes para prender a atenção do aluno e aumentar a assiduidade

P4: A primeira é a repressão pura e dura/ por exemplo abolir o actual regime de faltas para os obrigar a ir às aulas/ outra é arranjar aulas/ as tais teórico-práticas que os obrigassem a perceber que se sentassem // a outra é as práticas serem de facto mais curtas e se calhar mais de avaliação contínua ou seja o aluno devia perceber que uma aula de laboratório/ como os laboratórios de electrónica ou física/ o aluno tem um trabalho e no fim da aula é avaliado pelo trabalho que fez.

Entrevistador: O que não acontece/

P4: O que não acontece/ há a avaliação contínua através da realização de 3 mini-teste e há a percepção do professor/mas se eu disser ao aluno este trabalho está mal/este algoritmo está errado/ faça isto de esta outra forma e corrija este programa e veja que isto é melhor/ ele faz? Não faz/não acaba o exercício na aula já não acaba/ temos alunos que vêm para uma aula e não acabaram o exercício da aula anterior e portanto já estão a trabalhar sobre um défice de conhecimentos/como é que a gente resolve isto? Já experimentámos isso em tempos que é obrigar os alunos a ter avaliação/ quer dizer cada aula há uma nota/ agora os alunos sentem-se muitas vezes perdidos e levam-nos a copiar/ pensam que já que tenho de dar rendimento vou copiar e para isso é que eu acho que temos de dar aulas para ensinar as pessoas a fazer coisas a preparar o trabalho da aula laboratorial/ temos de fazer a tal aula teórico-prática/ porque é preferível eles aprenderem connosco do que copiarem soluções erradas que vêm não sei de quem/

Entrevistador: A linguagem que utiliza em sala de aula é compreendida pelos seus alunos?

P4: Eu penso ser muito simples até porque nunca fui uma pessoa muito das literaturas portanto tento ser simples e tento evitar usar muitas vezes os termos ingleses e portanto utilizar a terminologia portuguesa/ não sei muito bem/ não tenho feedback dos alunos/ os alunos dizem apenas que os meus textos de apoio são muitas páginas para ler e eu digo olhem os livros têm muitas mais páginas e estão em inglês/ mas de facto nunca ouvi um aluno dizer professor não gosto desta figura ou não percebi isto/ apercebo-me realmente que eles têm dificuldade em perceber certos tipos de coisas/ nós por vezes falamos algumas coisas e eles não sabem/ é de facto desconhecimento cientifico deles.

Entrevistador: Não tanto a nível de linguagem mas mais a nível da compreensão

P4: A área do rectângulo/ do perímetro/ o aluno diz-me ai não sei o que é o perímetro/ falta de conceitos.

Entrevistador: Troca geralmente ideias e experiências de ensino com os colegas?

P4: Infelizmente ninguém quer fazer isso/converso basicamente com um colega/quando quero escrever qualquer coisa discuto com ele porque a maior parte das pessoas pensam muito no seu próprio interesse/ essa é a grande percepção que eu tenho /os professores não ligam muito a isso.

Entrevistador: Cada um prepara as suas aulas e não debate com os colegas/ é isso?

P4: Sim é isso/ muitas pessoas têm a atitude de que isto é para fazer e depois não há muita discussão com pessoas que vêm de fora/ as pessoas responsáveis pelas disciplinas deviam juntar-se e discutir/ ou porque as pessoas têm muito trabalho ou porque não querem/ acaba-se por nunca se discutir as coisas/ não há ninguém que diga vamos então criar aqui um modelo que toda a gente se sinta bem/ as cadeiras por vezes mudam de 8 para 80 porque de facto não há uma discussão pública.

Entrevistador: Que pensa sobre a actual forma de organização das aulas práticas e teóricas?

P4: Está completamente errada/ defendo 3 modelos de aulas teóricas teórico-práticas e práticas/ devido ao estado intelectual dos alunos eles não têm nem vontade nem capacidade de fazer a ligação teórica à prática portanto ter teóricas teórico-práticas e práticas é fundamental/ agora acho é que há um peso completamente desmedido/ portanto as teóricas são insuficientes/ duas horas teóricas mas através de exemplos para apresentar coisas não é suficiente/ o 1º semestre tem 11 semanas/ nós devíamos abordar os conceitos simples médio e o mais avançado para os alunos verem qual o interesse daquilo e a gente ou fica pelo médio e pelo simples ou começa pelo médio e eles não percebem porque não começamos pelo simples/ e portanto não há tempo para dar as coisas com calma/ e eles dizem oh professor o professor fala muito depressa nas aulas/ tenho 20 horas teóricas para dar o que querem que eu faça? Estudem e venham discutir os problemas comigo/ em contrapartida nas aulas práticas os alunos queixam-se e eu também que as aulas teóricas de 3 horas são insuportáveis/ e as turmas estão cheias de alunos/ eu saiu de lá exausto e com a sensação de que não consegui fazer nada e eu este ano decidi marquem um intervalo a meio de 15 minutos/ porque de facto os alunos começam a ser insuportáveis a partir de uma determinada altura/

Entrevistador: Pode-me referir alguma prática inovadora que tenha aplicado com ou sem sucesso?

P4: Eu tentei fazer testes diferentes do ano passado e não só fazia mecanização dos exercícios mas depois perguntava o porquê desse resultado/ tentar que os alunos que vão ser professores ou engenheiros tenham de saber escrever em português qualquer coisa/ vejo que os alunos têm muita dificuldade em se conseguir exprimir assim como não conseguem pegar num conceito abstracto e explicar como é que aquilo se faz/ tenho isto no teste final e fez com que os alunos tivessem muita dificuldade/continua a haver notas muito boas nos mini-testes que não reflectem o conhecimento dos alunos/ muitos alunos com médias de 17 18 19 20 na avaliação contínua que é basicamente feita através de mini-testes e tenho caso de alunos com 17 que vão ao exame prático e tiram 2 3 ou 4.

Entrevistador: Podia explicar melhor a estrutura do exame prático e teórico?

P4: O exame prático é feito no computador/ os alunos têm de resolver os problemas e explicar/ Não há condições para fazer outro tipo de inovações/ neste momento nós estamos completamente amarrados.

Entrevistador: Considera que não tem possibilidades de se libertar dessa estrutura devido à conjuntura ou por falta de iniciativa?

P4: eu não sei se há qualquer coisa que eu não tenha tentado/ nós já experimentámos quase tudo/ se às vezes as coisas não funcionam é por causa de uma questão de meios/ acho por exemplo que se as aulas práticas fossem um aluno por computador/se calhar obrigava o aluno a trabalhar/ acho que muitos alunos estão à espera que o colega faça o trabalho/ mas isso ai não está ao nosso alcance/ alguém decidiu que as aulas teriam 24 alunos dois alunos por computador e algumas já têm 26 ou 27/ portanto há coisas que a gente não pode mesmo fazer porque não nos deixam/ nas teóricas já tentei fazer algumas animações mas ainda não consegui criar uma ferramenta/ alguns anos atrás fizemos um cd-rom mas que agora está desactualizado e foi abandonado/ já não há muitas mais voltas a dar/ parece que não há mais ideias inovadoras/ gostava de saber o que se passa lá fora/ porque se calar até podem ter ideias que nós nunca nos tenhamos lembrado/ mas desconfio que muitas delas nunca poderemos aplicar/ tem a ver com a logística com os interesses que há no primeiro ano/ acho que as pessoas gastam muito dinheiro no 1º ano de facto mas ainda não se aperceberam que se calhar com menos dinheiro conseguiam melhores resultados.

Local: Sala do complexo pedagógico/ Universidade de Aveiro

Duração: 48 minutos

Data: 5/02/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?

P5: Bom /na minha perspectiva eu olho para isto a// vários níveis primeiro entendo que as/ metodologias e actividades escolhidas pelo professor são importantes para obter por parte dos alunos a motivação que pode levar ao sucesso é preciso ter alunos motivados e para os motivar é preciso escolher actividades e usar metodologias que permitam ter o público-alvo motivado/ e isto é tão ou mais importante actualmente e ao longo da minha carreira tenho notado isso porque em cada ano que passa os alunos têm no mundo exterior um conjunto tão grande de atracções que/ o que existe aquilo que nós temos para lhe oferecer é cada vez menos atractivo e portanto/ da mesma forma que no cinema se usam os efeitos especiais/ nós temos que criar os nossos próprios efeitos especiais para tornar as aulas interessantes apesar de tudo de forma que eles venham de forma a que aprendam de forma a que tenham sucesso / por outro lado esta é a vertente da motivação por outro lado as metodologias e as actividades que se têm ao longo do semestre devem também e diz-me a minha experiência devem também colocar alguma nomeadamente criando mecanismos de avaliação periódicos por forma a que o aluno se sinta com necessidade de rever os conceitos principais por um lado e por outro lado seja capaz de aferir se a aprendizagem está a decorrer de acordo com as expectativas / em 3º lugar é importante nas disciplinas como as de informática nomeadamente as da programação em que a linguagem que se utiliza é nova é uma nova linguagem é importante encontrar mecanismos de comunicação e isso tem tudo a ver com os métodos usados mecanismos de comunicação que permita entendimento nomeadamente à custa de // a// de situações reais existentes no dia a dia nomeadamente o que tem a ver com a desmistificação do que é que é realmente // construir um algoritmo porque os alunos ou a sua vida a sua curta vida são jovens já por vezes construíram algoritmos para resolver problemas da vida completa do dia a dia deles só que não os sabem formalizar mas resolvê-los na cabeça deles são capazes de encontrar a solução para o problema e usando as metodologias que estudam na programação decomposição do problema para encontrar no conjunto sub-problemas mais simples não sabem é formalizar e portanto aquilo que nós procuramos aquilo que eu acho que o professor deve ter cuidado é encontrar a metodologia certa para mostrar que de facto o problema no seu todo já foi encontrado pelos alunos e o que é necessário é saber formalizar para depois saber serem capazes de reescrever esta linguagem esta solução perdão para a linguagem de programação que estamos a usar/ eu diria que nestas três vertentes por um lado a comunicação por outro lado a motivação e por outro lado a auto-avaliação e a pressão e a pressão da avaliação por forma a que se trabalhe ao longo do semestre são três vertentes em que a metodologia e as actividades usados ao longo do ensino devem ser a aaa/ moldadas de forma a ir ao encontro do sucesso.

Entrevistador: E considera necessária a existência de formação pedagógica ao nível dos professores do ensino universitário?

P5: A resposta que eu dou a esta pergunta é obviamente uma resposta enviesada / e é enviesada porque eu a única coisa que tenho é a minha experiência e não tenho noção de como é que eu daria aulas se tivesse formação pedagógica isto é eu não formação pedagógica eu sei como faço e até onde chego com a formação que tenho// e portanto se me perguntarem assim aaa se a pergunta for acha que no final que as suas aulas com os conhecimentos que tem e portanto não tendo conhecimentos não tendo formação pedagógica acha que as suas aulas são atractivas são bem construídas são/ enfim são boas aulas? Eu estou-me a auto-avaliar mas acho que sim e não tenho a percepção de como seriam as minhas aulas se eu tivesse tido formação pedagógica (fp)/ eu acho que não depois isto é/ eu falo pela minha formação e falo pelo caso que melhor conheço que é o meu até porque já deixei de frequentar aulas há muitos anos ee aa os meus professores universitários também não tiveram fp tive bons comunicadores e menos bons comunicadores e a minha dúvida é os maus comunicadores ou os menos bons comunicadores seriam melhores professores se tivessem fp? Aa estou a ser interlocutor estou a fazer a pergunta dizendo assim a formação a qualidade de um professor é algo que é inato ou pode ser melhorado custa da formação? Pode ser com certeza melhorado não vou ser fundamentalista a dizer que não/ agora acho que a capacidade de comunicar também é algo que tem muito de inato eu por exemplo acho que sou um bom professor e estou-me a auto-avaliar modéstia à parte porque tenho boas capacidades de comunicação e portanto provavelmente se tivesse formação específica poderia ser melhor não digo que não agora não senti falta até agora mas é o meu caso particular dizem-me também alguém que não seja um bom comunicador que não tenha talento natural para ser professor mesmo com formação pedagógica se calhar também não atinge os níveis que poderia atingir porque isto de ser professor também tem muito de talento como tem outras profissões que existe com certeza.

Entrevistador: E o ensino na universidade deve ser avaliado ou não?

P5: O ensino deve claramente ser avaliado na minha perspectiva toda a nossa actividade enquanto professores universitários e enquanto profissionais das mais variadas áreas deve estar sempre sujeito a avaliação tudo o que nós fazemos deve ser avaliado // sem fundamentalismos o que eu quero dizer com isto é que a avaliação não pode impedir deve ser algo feito com bom censo não deve impedir que não se faça mais nada senão avaliar é para não ir de um extremo ao outro também é verdade que a avaliação o ensino deve ser de alguma forma avaliado e não deve andar à solta isto é sem nenhum mecanismo de correcção e portanto nem o extremo da super avaliação formal em que estamos permanentemente todos a ser avaliados nem o extremo de não haver avaliação Deve haver avaliação como toda a actividade profissional deve ser avaliada recuso-me a ser avaliado por quem eu avalio recuso-me a ser avaliado pelos alunos que eu passo ou reprovo acho que não é um bom critério não são os alunos que têm que me avaliar provavelmente terão que ser os meus pares terá que haver um mecanismo qualquer que não sei qual é que me vai avaliar com certeza que a opinião dos alunos através de inquéritos é importante agora a avaliação (...) recuso-me a ser avaliado por quem eu tenho que avaliar isto é há situações e eu conheço-as nesta universidade de disciplinas em que os resultados são muito maus porque houve mau enquadramento e uma disciplina que deveria ter sido dada de uma determinada forma no ano anterior e não foi dada/ enfim não interessa aqui explorar as razões e depois os alunos a páginas tantas aparecem a culpabilizar o colega que deu a aula que é um mau professor o que não é se calhar deu a disciplina errada aos alunos errados mas a culpa não é dele ele deu aquilo que tinha que dar que estava no programa com muito talento com muito profissionalismo com muita seriedade ok e portanto se fossemos só a olhar para a avaliação que os alunos fazem desse professor é muito negativa e ele foi estupendo eu não aceito isto agora acho que deve existir avaliação do ensino.

Entrevistador: Então... é um pouco a continuação da outra questão que vem a seguir/ que métodos considera mais pertinentes para a avaliação do ensino? Já referiu que a avaliação feita pelos alunos possivelmente não pode ser//

P5: Euu// entendo que é no conjunto dos vários métodos que me referi anteriormente que estaria a virtude isto é se eu fizer um questionário aos alunos e os resultados serem negativos para o professor bom isso não quer dizer nada mas quer dizer que temos que levantar uma bandeira de aviso e se calhar temos que ir indagar e ver o que é que se passou isto é o primeiro tipo de avaliação a feita pelos alunos por questionários ou por entrevistas de grupo focadas seja o que for pode ser instrumento para no conjunto das centenas de (...) que existem a universidade seleccionar pontos críticos que necessitam de análise mais profunda pode ser um princípio mas não mais que isso isto é/ verificou-se que há ali um caso que parece não ser normal vamos aprofundar e depois auto-avaliação ou os pares a universidade através da reitoria ou do conselho pedagógico pode ter uma comissão de avaliação foi focado um alerta numa determinada disciplina essa disciplina um supor tem dois mecanismos naturais de avaliação a auto-avaliação que o professor faz em que é por exemplo uma reflexão sobre a forma como a forma como decorreu a disciplina e será a/ realização de uma tabela de resultados // e portanto a análise desses resultados sucesso ou insucesso e a reflexão de como as coisas correram vai permitir ter uma leitura de como correu a disciplina em paralelo feito de uma forma automática por exemplo os alunos respondem a inquéritos se quer de um lado quer do outro não existir nada para pra/ eu estou aqui a propor sem pensar muito sobre o assunto // deveriam ser sempre os pares e não uma avaliação externa.

Entrevistador: E o que é que considera mais importante na sua carreira profissional neste momento é a investigação ou é o ensino?

P5: A minha avaliação enquanto professor e a minha progressão na carreira nesta universidade é avaliada essencialmente em 95% dos casos pela minha actividade como investigador ponto/ como qualquer docente a minha passagem de professor auxiliar para professor associado e daí para professor catedrático está dependente do meu desempenho enquanto investigador e não como professor / se me perguntarem se eu concordo com isto eu discordo completamente eu acho que a UA tal e qual como outras universidades do país já o fizeram e a do Minho é um exemplo deveria estabelecer pontuações para as diferentes actividades nomeadamente as do ensino e de gestão para além da investigação e os profissionais deveriam saber exactamente como é que é valorizado para a sua carreira tudo o que fazem quer seja de ensino quer seja de investigação quer seja na gestão da vida académica (...) o grupo devia tomar a posição o único problema é que o ECDU invoca a parte de investigação agora eu penso que tendo em atenção que lei é lei eu entendo que se deveria estabelecer regras no fundo definir qual a importância que existe no ensino nos órgãos de gestão etc etc quando me perguntam nos últimos 5 anos o que é que me absorveu mais tempo onde é que eu estive mais empenhado foi claramente no ensino houve anos que assumi duas regências de programação e estruturas de arte e algoritmos que representou ter à minha conta 600 700 alunos ok e tenho estado sempre ligado a cadeiras com 2000 alunos por ano e portanto isto quer queira quer não absorveu grande parte do meu tempo como professor na UA e depois aqui um contra-senso eu perdi eu gastei mil tempo enquanto profissional naquilo que não me vai dar qualquer retorno em termos de carreira e portanto eu só tenho algo a concluir eu sou burro // quanto a isso não tenho mais nada a dizer/ sou burro.

Entrevistador: Considera a motivação dos alunos um factor primordial para o sucesso académico?
P5: É importantíssimo e se olharmos para a primeira pergunta eu falei exactamente da motivação é evidente que se o público-alvo estiver motivado é muito mais fácil atingir-mos os nossos objectivos (...) é o aluno ter as competências que nós achamos essenciais e a atribuição dessas competências é muito mais fácil quando do outro lado temos pessoas motivadas.

Entrevistador: Mas considera que os professores têm um papel fundamental para a motivação dos alunos.
P5: O que eu comecei logo a dizer é evidente que eu acho que há factores que são alheios ao professor/ eu falo isso porque com a existência do ano comum eu tive alunos das várias áreas da Ciência e das Engenharias e portanto eu tive sempre alguma dificuldade e portanto eu tive alguma dificuldade em explicar a alunos vindos da área de GPT/ alunos vindos da área da Biologia que uma cadeira de programação podia ser importante para o futuro deles/ é difícil porque o enquadramento não era o melhor/ se calhar até pode ser importante/ mas se fosse mesmo importante porque é que eles já não têm a disciplina/mas para mim como professor é difícil motivá-los para isso/ e portanto há ocasiões em que o professor por muito que queira tem alguma dificuldade de motivar os alunos porque o enquadramento não é o melhor mas é importantíssimo que o professor assuma esse papel e que tente também trabalhar essa parte da motivação.

Entrevistador: Indique 2 factores que motivem o aluno para a aprendizagem e que contribuam para o sucesso?
R: Um dos factores que eu tenho usado é mostrar-lhes como na sua vida académica ainda e profissional/ mas sobretudo profissional aquilo que eu lhes estou a transmitir vai ter importância. Em relação à programação em C/ eu fiz esse trabalho e que aliás correu muito bem/ isto é a mensagem que eu pretendo passar é que os alunos nomeadamente aquele caso em que o público-alvo são alunos de Química é tentar-lhes fazer perceber que nos últimos anos designadamente no projecto é preciso desenvolver módulos com programas para resolver aqueles problemas específicos ou para incorporar noutros programas que já existem e em soluções que já existem e

portanto aquelas competências que eles estão a adquirir vão ser usadas nos próximos anos. E portanto esse é um factor importante que é usar um discurso no sentido de demonstrar a importância de ter aquelas competências. O outro mecanismo de motivação que eu muitas vezes procuro usar é encontrar problemas que vão ao encontro da área específica de formação dos alunos e eles vão encontrar problemas que têm a ver com a sua área de formação Química Física seja lá de onde os alunos vêm. A utilização deste assunto permite que o aluno no fundo esteja a resolver problemas novos mas dentro de contextos que ele conhece e acha isso mais interessante.

Entrevistador: Acha que estes factores que enunciou podem fazer aumentar a assiduidade dos alunos às aulas nomeadamente às aulas teóricas?
P5: Podem/ mas eu acho que há outros mecanismos para / e aí entro por um campo diferente. Até agora a minha perspectiva era motivar/era puxar pelos alunos / quando me falam de aumentar a assiduidade e prender a atenção do aluno eu entro já noutro campeonato/ os alunos não vão não porque as aulas não sejam interessantes e eu falo das minhas porque eu sei que são porque me esforço para isso/ eles deixam de ir às minhas aulas ou às dos meus colegas essencialmente porque alguém passa a mensagem que elas não servem para nada/ essencialmente porque é melhor estar a apanhar sol do que a aturar o professor e essencialmente porque se chumbarem às disciplinas têm mais duas oportunidades para realizar exames este ano e têm mais 10 anos sem qualquer custo acrescido para realizarem a disciplina. A universidade tem que ter um custo de toda a gente/ quer dizer um aluno que está inscrito na Universidade de Aveiro tem um custo e esse custo se calhar é um investimento quando o aluno em cinco anos faz o seu curso e vai para a vida profissional e o país fica a ganhar com isso/ este custo é um custo para alguém que vem para aqui e que não tem as competências e que falta às aulas/ esse é um custo/ é dinheiro que não serve para nada e portanto eu gostaria que fosse possível co-relacionar assistir às aulas teóricas com o desempenho/ eu gostaria que os alunos quando passassem pelo Anfiteatro passassem o seu cartãozinho e ficasse registado a sua presença na aula ou não/ e no final eu iria confrontar os resultados obtidos com o número de presença em aulas teóricas e práticas/ porque aquilo que eu já verifico hoje é que os alunos que esgotam as faltas nas aulas práticas chumbam e aqueles que vão às aulas práticas todas normalmente passam. (...) Um aluno que reprova e que não vai às aulas teóricas significa que devia ter ido às aulas e que vai ter de passar a pagar mais pela sua inscrição na Universidade.

Entrevistador: Concorda com a organização em programação 1 em cadeiras teóricas e práticas?

P5: Neste momento eu concordo se entender que eu sempre considerei as aulas teóricas como estando entre as aulas teóricas e as aulas teórico-práticas/ isto é as minhas aulas teóricas são a primeira metade da aula e as teórico-práticas a segunda metade da aula. E portanto eu diria que a carga horária de programação 1 que é 2 horas teóricas e 3 horas práticas/ na prática representa 1 hora teórica/ 1 hora teórico-prática e 3 horas praticas.

Entrevistador: Troca usualmente ideias e experiências de ensino com os seus colegas?

P5: Muito/ Como estava à bocado a falar (...) Introdução à programação em C passou para o meu colega/ o meu colega veio-me perguntar exactamente como é que a coisa ficaria/ veio-me perguntar que alterações é que eu faria/ ficou a pensar nessas supostas alterações/ passado 2 dias veio falar comigo novamente veio com contra-propostas/ eu ajudei a dar o meu ponto de vista sobre as contra-propostas/ enfim /diria que o modelo que vai ser seguido este ano nem sequer é do meu colega é do meu colega e meu. Nos trocamos em programação 1 que é uma equipa grande dezenas de mails na final do ano lectivo a avaliar/ como é que está a correr cada aula pratica. Há muito esse espírito no Departamento de Electrónica/ há muito esse espírito nos colegas que têm estado ligado a essas disciplinas / nós temos promovido o debate não de uma forma organizada / às vezes de uma forma informal (...)

Entrevistador: Refira práticas inovadoras que tenha aplicado com sucesso ou não no ensino da programação? Já referi algumas nomeadamente aquilo que consegui fazer em programação em como tentar arranjar exemplos...

P5: Outra questão é o modelo de aula teórica seguida de aula pratica portanto eu diria que num dos dias da semana a aula pratica demora 3 horas num conjunto de 4 horas é uma mais três. Eu aproveitei o facto de as horas estarem ligadas para fazer com que 1 mais 3 fossem um conjunto em que os problemas que vão ser resolvidos na aula prática vão ser introduzidos na aula teórica (facilitou ter-se juntado as aulas – introduzido pelo Prof. António Raposo).

Entrevistador: E acha que resulta?

P5: Acho que de alguma maneira resultou/ a história do contexto também / a história de criar mecanismos de avaliação contínua ao longo do semestre levando a que os alunos tenham o cuidado de preparar de outra forma as aulas// porque eles têm de

ser forçados a querer aprender. É fundamental que eu crie mecanismos de pressão para que eles queiram a aprender nem que não seja por causa da avaliação. Criar mecanismos de avaliação contínua como eu criei apesar do muito trabalho que dá penso que tem reflexos positivos não é o 0 ou 1 não é ou passam todos ou não passa ninguém. No entanto a avaliação não pode ser mais importante que o processo de aprendizagem senão o aluno vê o professor como um avaliador e não como um professor. O professor está lá para ensinar e só depois para avaliar.
A contextualização a introdução de elementos periódicos/ enfim tem-se introduzido vários mecanismos.

Entrevistador: Sente-se motivado ou não como docente?
P5: Depende quando me fazem a pergunta. Eu tenho que lhe responder de acordo com a minha consciência a 2 tempos/ se a pergunta for feita a meio do semestre em que eu acabo uma aula que me correu excepcionalmente bem em que tenho do outro lado miúdos de 18 19 ou 20 anos cheios de vivacidade que aprenderam aquilo que lhes quis transmitir eu digo-lhe que a minha motivação é a mais fantástica que existe e que estou muito contente/ se me perguntarem agora em que estou a fazer uma reavaliação de toda a minha careira e se eu olhar para a valorização que os pares fazem do meu muito pesado trabalho na docência destas disciplinas no ensino da programação dos primeiros anos se eu vir a valorização que esta carga pesadíssima tem pelos meus pares por exemplo num concurso na minha carreira eu estou profundamente desmotivado e que provavelmente não vale a pena continuar neste processo igual a uma matéria cada vez mais ligeira de final de curso ou de mestrado que incomoda menos os alunos (...) sinto-me pouco valorizado porque estas docências não são valorizadas nos termos de progressão da cadeira/ por outro lado pela motivação e porque tive responsabilidades em disciplinas de final de curso e tive nestas também aí/ a compensação é muito maior no final do curso/ os alunos no final de curso nas cadeiras de final de curso têm se calhar outra responsabilização/ outra atitude/ a relação professor aluno é melhor o professor sente-se mais valorizado também pelos alunos/ há também um entusiasmo genuíno/ quase um agradecimento do aluno/ professor obrigado/ existe um entusiasmo que resulta. Resulta por outro lado porque temos uma turma de 30 ou 40 alunos e no primeiro ano temos muitos e portanto esse tipo de interacção existe. Se me perguntar é mais gratificante ensinar a anos terminais ou a anos iniciais / é mais importante ensinar a anos terminais.

Local: Sala do IETA/ Universidade de Aveiro

Duração: 35 minutos

Data: 17/03/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?
P6: são/ são fundamentais/ parece-me cada vez mais que quando se procura transmitir/ procura-se digamos construir o conhecimento com os alunos/ um elemento essencial é a comunicação que é feita com eles e portanto a adequação da comunicação/ a forma como a informação é passada/ a forma como ela é percebida por eles é essencial para que eles mais tarde possam estabelecer as relações lógicas e transformar a informação em conhecimento// portanto em termos de comunicação esse é um elemento essencial// o outro aspecto que está subjacente a isso são os métodos utilizados agora// em termos de interacção com os alunos como é que nós vamos interagir com eles face à informação que lhes estamos a transmitir para garantir que estamos a auxiliar nessa construção de conhecimento e portanto são dois elementos cruciais primeiro a comunicação segundo a escolha dos métodos adequados/ daí que (esta é um pouco à margem) há três anos a trás foi a reestruturarão curricular na minha universidade que eu tentei sem sucesso introduzir no plano de estudos das licenciaturas de ensino que era uma disciplina da área da teoria da comunicação dada pelo Departamento de Comunicação e Arte que são especialistas nessa área (que acima de tudo um professor tem de ser um comunicador) e essas valências não vêm nem dos Departamentos específicos nem muito menos dos departamentos das didácticas e pedagogias/ tem de ser alguém com perspectivas de Marketing que conheça a mensagem e saiba como a mensagem deve ser introduzida e passada e qual é o seu impacto // esse é um aspecto lógico (…) a questão de como projectar a voz/ como se projecta a voz/ à pessoas que falam para dentro e isso cria um handicap terrível a pessoa tem de aprender a falar para fora a projectar a voz só/ há questões a vários níveis.

Entrevistador: E considera necessária a existência de formação pedagógica para os professores de ensino universitário? Acha fundamental?
P6: Essa é uma pergunta complicada// a minha opinião sobre isso tem vindo a evoluir ao longo do tempo actualmente eu acho importante que haja alguma reflexão sobre metodologias/ sobre pedagogias/ quais são as melhores formas de comunicar e de nos apoiarmos em termos de métodos// agora como é que isso deve ser feito é difícil

porque se você pensar um pouco existe logo uma resistência muito grande à partida e se nós pensarmos em métodos tradicionais à parte de não funcionarem coloca os agente envolvidos logo numa posição de pé atrás ou de relutância/ de forte relutância relativamente a isso e portanto o impacto não ser grande agora é como fazer isso eu acho sobretudo que é importante uma coisa que eu gostaria que se começasse a desenvolver aqui na Universidade de Aveiro que é a possibilidade de começar a divulgar boas práticas porque existem situações pouco conhecidas de extremo sucesso e era importante que a Universidade começasse de uma forma rotineira a desenvolver seminários e workshops em que eram divulgadas exames de boas práticas e talvez esse fosse o caminho inicial de levar as pessoas a esclarecer-se (…) Esse é um aspecto há depois o outro que tem/ a ver com elementos mais formais que é importante mas aí é mais complicado/ dizer-lhe que eu assisti já a três ou quatro workshops na minha vida sobre aspectos relacionados com práticas pedagógicas viradas para o ensino e os dois três primeiros pouca utilidade tiveram eram centrados e forma colocados essencialmente por psicólogos e por elementos de departamentos tradicionais de educação e a passagem da visão que eles têm da racionalidade que eles têm para os problemas para a visão digamos da engenharia por exemplo ou das áreas das ciências que é completamente diferente/ não consegue criar impactos e ser relevante/ contudo o último que assisti foi extremamente interessante foi dado por um professor e suponho que ele é de Strathclyde não me recordo agora o nome dele que era um professor de Engenharia Civil que aos cinquenta e tal anos decidiu vira-se para a área da educação e esteve cá uns há uns três ou quatro anos a fazer um seminário na área da educação não me recordo agora do nome isso para mim/eu fui para lá novamente relutante pensei que era mais um daqueles workshops que me iria fornecer pouca informação e de facto foi uma revelação porque/primeira coisa que ele colocou e a ideia central foi esta / se nós queremos ensinar os alunos numa área qualquer a primeira coisa que temos de clarificar claramente é que competências é que queremos desenvolver nos alunos e segundo aspecto quando nós clarificamos quais são as competências como vamos avaliar especificamente essas competências/ e portanto numa visão perspectiva de engenharia de eficácia se você quiser/ a forma como os problemas vão ser colocados vão ter um impacto extremamente grande digamos esse workshop exactamente por essa visão e isso foi uma revelação portanto a uma visão também a esse nível que é necessário ensina-los// mas conhecemos/ com uma linguagem adequada a cada área e não (…) O problemas das workshops tem a ver com a linguagem utilizada nalguns tipos de comunicação porque o que tem de ser adaptado e essa é a grande dificuldade é encontrar uma linguagem adequada a cada tipo de audiência e digamos na área da ciência e da engenharia a objectividade e eficácia são dois elementos fundamentais em que os docentes são sensíveis.

Entrevistador: E o ensino na sua universidade deve ser avaliado ou não?
P6: Tem sido avaliado e deve continuar a ser avaliado inclusivamente nós estamos a apresentar uma proposta à Reitoria para aprofundar os mecanismos de avaliação.

Entrevistador: Mas até ao momento o ensino é realmente avaliado/ ou seja a pratica docente é avaliada?
P6: A prática docente individual não é avaliada a prática de docente institucional em termos de um curso e da qualidade de valência e de competências fornecidas aos alunos e os meios utilizados para conseguir obter essas competências é avaliado desde à cinco seis anos a trás. Já houve dois ciclos de avaliação com resultados publicados e alguns deles até comparativos entre as várias universidades portuguesas.

Entrevistador: E a última foi agora na reestruturação curricular.
P6: Foi em simultâneo começou em 1990 e ainda se está a prolongar. Não são todas as licenciaturas avaliadas em simultâneo. A reestruturação começou em 2000 foram as primeiras em ensino de Electrónica e em Electrónica e telecomunicações avaliada nessa altura/ o caso de Engenharia de Computadores e Telemática que é outro curso da nossa responsabilidade só vai ser avaliada para o próximo ano porque entretanto existe um conjunto de regras/ é preciso primeiro que os primeiros alunos licenciarem-se e haver mais um ou dois anos antes do processo de avaliação.

Entrevistador: Mas essa avaliação é feita por quem?
P6: É feita por pares. É despoletado pela comissão nacional de educação que tem professores consagrados extremamente competentes a nível nacional e tem elementos do mundo exterior dependendo das áreas/ no caso das engenharias grandes gestores de empresas (sempre membros exteriores às universidades).

Entrevistador: Podemos lhes chamar auditorias?
P6: Pode chamar-lhes auditorias se pensar que são auditorias pedagógicas/ não tanto/ embora lhes reflictam um pouco sobre as condições físicas e a credibilidade institucional para conseguir ministrar esses cursos. Mas tem a ver essencialmente com o desenvolvimento de competências em termos dos alunos fazerem essa perspectivação pedagógica.

Entrevistador: Qual dos seguintes métodos considera mais pertinentes essa avaliação: a avaliação feita pelos alunos/ através de questionários ou através de entrevistas de grupo focadas/ através dos pares/ através de uma auto-avaliação dos corpos docentes ou através de experts sobre educação?
P6: A avaliação terá que ser feita / esse são métodos possíveis eu incluiria mais um outro que é em termos de uma avaliação objectiva do percurso académico dos alunos isto é como é que podemos avaliar a qualidade de um professor num processo mais superficial? será porque o professor tem uma taxa de 100% de sucesso na sua disciplina? a nível superficial seria um bom professor ou seria inclusive um professor excelente/ mas se uns anos mais tarde verificarmos que o percurso académico desse alunos quando vão aplicar esses conhecimentos teriam adquirido nesta disciplina falham gravemente nas disciplinas seguintes isso leva-nos a pensar que há aqui um subversão de valores/ portanto é muito difícil definir como vai avaliar a prática docente/ se é claro o que é uma prática de um docente de qualidade parece que é fácil de uma forma objectiva a partir de objectivos de formação claramente estabelecidos e de competências que são ganhas da frequência de uma dada disciplina através de uma métrica final de avaliação de ostensão dessas competências ou não se pode avaliar a qualidade do desempenho certo. Agora isso é teórico porque isso implicaria que houvesse um mecanismo que possibilitasse que essas provas de avaliação feitas aos alunos fossem feitas por terceiros o que se torna impraticável ser feito directamente no caso de um curso/ o que implica necessidade de utilizar métodos indirectos um deles é o grau de satisfação dos alunos tiveram na frequência da disciplina/ segundo é a opinião de pares que mencionou/ a terceira é o impacto/a evolução do percurso académico dos alunos e que mencionei/ basicamente as coisas girarão à volta disso é claro que você pode ter uma auditoria feita por especialistas nessa área mas aí é um pouco mais complexo porque terão que se basearem estudar a avaliação feita por estes três métodos e a partir daí tirar conclusões que não tão directamente visíveis como nos 3 métodos anteriores.

Entrevistador: Neste momento o que é que considera mais importante na sua carreira profissional o ensino ou a Investigação?
P6: Em termos de carreira profissional essa é uma resposta clara em Portugal é a investigação/ a métrica de evolução na carreira universitária é feita neste momento em Portugal pela investigação.

Entrevistador: A nível pessoal tem alguma preferência neste momento?

P6: Tenho dedicado e desenvolvido um esforço importante em aspectos ligados à docência e ligados à administração em termos de universidade de gestão de tentar alterar práticas a esse nível embora em termos de progressão na carreira isso não tem qualquer afectação/ esse é um dos dramas da situação actualmente em Portugal.

Entrevistador: Na sua opinião a motivação é um factor primordial para o sucesso académico?
P6: É absolutamente mas acrescento uma coisa a seguir que é não compete aos professores nem à instituição universitária fornecer essa motivação aos alunos é assumido os alunos ao atingirem o grau da universidade têm que assumir conscientemente uma coisa ou estão motivados para seguirem um curso para estabelecerem mais tarde uma carreira nessa área e portanto a motivação é uma motivação pessoal própria ou se não a têm não pode ser dada por terceiros/ não é função dos professores/ não é possível alguém motivar terceiros para fazer um sacrifício um esforço numa área de desenvolvimento de curiosidade e de estímulo a esse nível/ tem de ser algo de pessoal/ agora dito isto há um segundo aspecto que é importante é que desde que haja motivação o papel do professor pode auxiliar em muito o desempenho dos alunos se conseguir motivar a partir de um segundo nível se o conseguir entusiasmar/ quem tiver motivação num primeiro nível quando entrar não a vai perder posteriormente/ se souber realmente aquilo que quer/ quem realmente está motivado/ quem realmente sabe o que quer na vida/ está disposto a enfrentar as dificuldades e a avançar/ agora há várias formas de avançar e as mais produtivas são aquelas em que o professor estimula o aluno nesse percurso.

Entrevistador: Diga-me dois aspectos que motivam o aluno?
P6: Isso é uma resposta quase impossível dependo do aluno A ou do aluno B/ genericamente é impossível porque as pessoas são diferentes não há princípios que motivem a aprendizagem porque a motivação tem de partir de nós próprios tem de ser uma vontade uma curiosidade enorme/ a pergunta a fazer deve ser que meios alternativos ou associados devem ser fornecidos aos alunos para os ajudar a percorrer o percurso que é de sacrifício ou de dificuldades de uma forma mais eficaz e mais produtiva possível/ primeiro lugar a informação genérica sobre o curso/ sobre as áreas de conhecimento envolvidas / sobre o impacto que essas áreas vão ter no curso/ mesmo que sejam áreas abstractas e com ligação relativamente longínqua/ isto é estabelecer estas ligações/ mostra-lhes o impacto a importância que isso tem/ o segundo é a proximidade e a disponibilidade/ o professor mostra-se aberto e disponível para conversar com os alunos sobre assuntos variados/ eventualmente

ligados à área ou não/ ajudar os alunos a compreender as várias dificuldades e a definir o seu percurso são estratégias para integrar o aluno na Universidade/ isto é eles chegam de ambientes protegidos e restritos ao mundo desconhecido que não é fácil de lidar que exige deles coisas com que eles não estão habituados a lidar e que para alguns deles são incompreensíveis e tem a ver com integrá-los e ajudá-los nessa situação/ não tem a ver com motivação/ tem a ver com ajudá-los a adaptarem-se a uma nova realidade/ uma das coisa que foi proposta e que eu aposto bastante que é a instituição de um professor conselheiro/ que haja um tutor para cada grupo de 3 ou 4 alunos/ que eles possam sentir dificuldades de adaptação a este novo universo e que possam falar com eles e que ele serva como mediador/ infelizmente ainda não foi aprovado porque existe um problema cultural português quer de professores quer de alunos/ mas eu acho que vale a pena apostar nisso mas que vai demorar muito a conseguir ser institucionalizado mas acho que vai ser um factor importante na adaptação dos alunos.

Entrevistador: Refira-me dois factores que motivem o aluno na sua aprendizagem e assiduidade às aulas?

P6: Uma delas que está a ser experimentada é alterar o tipo de aulas existentes ao nível do primeiro ano os alunos vêm habituados a uma sala relativamente pequena com o mesmo professor nalguns casos durante os 3 anos de ensino secundário em que a matéria é dada de uma forma colocar questões de estudo em primeiro lugar/ depois alguma elaboração teórica e depois novamente exemplos de aplicação/ chegam à Universidade têm uma separação de aulas teóricas em que os professores vão para lá debitar um conjunto de conceitos e depois um conjunto de aulas teórico-práticas nalgumas disciplinas em que são apresentados alguns exercícios e depois aulas práticas de laboratório para resolver problemas concretos/ os alunos não estão habituados a este ritmo de trabalho/ não acompanham as coisas em comum e sentem-se perdidos no meio disto e acabam por ir para as aulas sem ter a eficácia necessária/ portanto o que é que está a ser feito neste momento/ um caso de insucesso ao nível do primeiro ano é o caso da matemática então houve um protocolo entre o Departamento Matemática e a Reitoria no ano passado que procurou instituir novos métodos de ensino ao nível do primeiro ano que partir duma filosofia de marcar direitos e deveres de um lado e do outro. A reitoria fornece mais meios quer humanos quer físicos e os docentes comprometem-se a leccionar determinado tipo de aulas a seguir determinado conjunto de métodos para procurar melhorar a qualidade do ensino/ os resultados em termos de assiduidade foram excelentes porque praticamente não houve faltas concretamente na disciplina de cálculo 1/ esse novo modelo que foi implementado no Cálculo este ano e que é que nos estamos a propor que seja generalizado a todas as disciplinas de primeiro ano que os docentes como docentes de cada disciplina possam protocolar com a Reitoria o modelo que acham que é melhor/ e dizem estes são os custos se quiserem que eu faça isto por favor preciso disto.

Entrevistador: Dentro da programação 1 concorda ou não com a reestruturação das aulas?
P6: Isso desde há cinco anos atrás quando foi criado o Complexo Pedagógico foi proposto e foi aceite em princípio pela Professora Isabel Alarcão que era a Vice-reitora para a acção dos pedagógicos a criação de unidades temáticas isto é havia uma manhã ou uma tarde designada para cada disciplina/ portanto os alunos entravam às 9 da manhã davam uma disciplina até à uma/ entravam à duas e estavam até às seis a tratar só dessa disciplina/ esse foi o primeiro passo e isso era uma questão de horários foi feito e não houve problema nenhum/ o segundo passo que se pediu à Prof. Isabel Alarcão para analisar era/ vamos então alterar as aulas tornar esse modulo um modulo de aula real com características teórico-práticas em que os alunos (…) / ela concordou e era entusiasta da ideia disse lamento mas não podemos fazer nada porque a legislação impede-nos.

Entrevistador: E qual era a sua sugestão?
P6: A sugestão era a transformação disso num mecanismo como foi pensado na altura era o seguinte: eles tinham uma hora de teórica concentrados em que iria lhes ser apresentado um tema teórico novo a seguir teriam entre uma hora e uma hora e meia em que iriam trabalhar nesse tema e vira-lo de pernas para ar para tentar entende-lo e depois tinham duas horas de laboratório em que iriam tentar usá-lo na prática.

Entrevistador: E em relação a regime de faltas nos laboratórios/ como é que acha que se deviam processar as aulas de laboratório? Qual será o modelo de aulas de laboratório porque nós temos um modelo aqui em Aveiro em que no fundo são aulas são 24 alunos ou 28 numa sala com um professor e com um computador.
P6: O problema grave não é esse o problema grave que existe por isso é que eu digo que temos que mudar radicalmente a esse nível / qual é o drama neste momento é que as disciplinas de programação ao nível de p+primeiro ano e não só de programação também de matemática são uma fonte de rendimentos excelente para a Indústria de explicações em Aveiro: Para você perceber o que está envolvido nisso há quatro anos a trás por cálculos grosseiros que eu fiz que não devem estar muito longe

da realidade PEDA forneceu um rendimento à Industria de Explicações aqui em Aveiro qualquer coisa entre 12 a 20 mil contos/ portanto estamos a falar de valores importantes/ isso levou a que fosse criada uma empresa de explicações. O que é resulta disso os alunos estupidamente em vez de tentarem aprender nas aulas e tirarem dúvidas com os professores iam para as em explicações e iam pagar por um serviço que é um serviço de pior qualidade porque além das soluções serem idiotas e em muitos casos concretos ficavam com erros e o que é os alunos iam fazer para aulas? Iam copiar aquilo que tinham feito nas explicações.

Entrevistador: O Professor troca usualmente ideias e experiências sobre ensino com os seus?
P6: Sim.

Entrevistador: A linguagem que utiliza na sala de aula é compreendida pelos seus alunos?
P6: Eu quero o mais possível que seja agora essa só eles é que podem responder/ tenho a preocupação em utilizar uma linguagem que seja compreensível portanto essa é uma preocupação real que eu tenho. Eu acho que sim mas isso é a minha opinião subjectivo é difícil responder teriam que ser eles a vir responder a isso.

Local: Sala do complexo pedagógico, Universidade de Aveiro

Duração: 34 minutos

Data: 29/01/04

Entrevistador: Acha que os métodos e actividades de ensino utilizados pelo professor são importantes para o sucesso académico dos alunos?
P7: Sim/ acho que sim.

Entrevistador: Considera necessária a existência de formação pedagógica para os professores do ensino universitário?
P7: Depende depende se me puser na pele dos alunos se calhar sou capaz de pensar que há alguns alunos que precisam e outros que não/ agora na pele do professor sinceramente não tenho sentido essa necessidade/ mas acredito que se estivesse na pele dos alunos eles dissessem/ este professor precisa/ eu sinceramente/ no meu caso particular não sinto essa necessidade também já tive formação mas foi/ não foi uma formação de professores mas foi uma formação de formadores/ e portanto adquiri alguma sensibilidade mas também já foi há alguns 2 anos/ adquiri alguma sensibilidade para a pedagogia/ mas agora sinceramente não sinto essa necessidade/ não significa que de aqui a alguns anos não vá sentir.

Entrevistador: O ensino na sua universidade deve ser avaliado?
P7: Sim/ isso sim.

Entrevistador: É a favor que o ensino devia ser avaliado/
P7: Não indo contra a corrente sou a favor.

Entrevistador: Que métodos considera mais pertinentes para a avaliação do ensino: (1) questionários a alunos; (2) pares; (3) auto-avaliação; (4) "experts" na área da educação?
P7: Eu penso que as 4 são importantes/ se forem só os alunos uma pessoa pode viciar o sistema/ não digo que os 4 métodos se realizassem todos os anos mas nuns anos eram aplicados uns noutros.

Entrevistador: Destes 4 não tem nenhuma preferência?

P7: Nenhuma/ nem nenhuma preferência nem nenhuma objecção/ Mas acho que os 4 eram importantes e até em simultâneo/ não é necessário os 4 atingirem os mesmos professores num ano mas de uma forma aleatória/ isso.

Entrevistador: O que considera mais importante na sua carreira profissional? O Ensino ou investigação?
P7: Acho as duas acho as duas importantes.
Entrevistador: Neste momento dá o mesmo peso às duas ou favorece uma?
P7: Dou o mesmo peso às duas acho as duas importantes.

Entrevistador: Houve alguma altura na sua carreira que realmente tivesse que optar por exemplo em dedicar mais tempo à preparação das aulas ou por contrário à realização de artigos?
P7: não mantenho/ quer dizer pontualmente isso acontece quando temos deadlines para escrever artigos mas isso é pontualmente por norma dedico o mesmo tempo/ há uma semana ou outra que dedico mais às aulas outra mais à investigação mas não consigo dizer somando isto tudo ao fim do ano se dediquei mais tempo a esta área ou àquela/ isso não consigo/ por exemplo os alunos de último ano de projecto/ nós não temos aulas com eles/ mas isso rouba-nos muito tempo/ de preparação/ ver os trabalhos deles / de apoio/ é investigação mas é investigação aplicada tem ensino também ao mesmo tempo/ não consigo ver onde é que eu dedico mais tempo.

Entrevistador: e preferência tem alguma?
P7: Não/ gosto das duas/ se tivesse que optar// sinceramente não sei.

Entrevistador: Vamos agora passar para um aspecto mais relacionado com a motivação. Considera a motivação dos alunos um factor primordial para o sucesso académico?
P7: Sim por mais que a gente se esforce, faça o pino aqui nas aulas/ se eles não estiverem motivados/ mas também depende porque é que eles não estão motivados não é? Depende mas se eles estão completamente desmotivados e vêm aqui assistir às aulas só por assistir/ até porque é estranho/ só para não reprovarem por faltas/ eles reprovam na mesma/ se estiver desmotivado/ mas acho que a motivação é essencial.

Entrevistador: Indique dois factores que motivem o aluno na sua aprendizagem e contribuam para o seu sucesso.

P7: Sentir que está a dominar os conceitos que estão a ser ensinados/ isso é fundamenta/ ele sentir que está a dominar os conceitos que estão a ser apreendidos/ caso contrário se os alunos sentem que// que estão completamente à nora é difícil/ eu tento sempre repiscar aqueles mais fracos mas às vezes/ por muito que nós puxemos eles já estão de tal forma lá em baixo que é impossível recuperá-los/ mas a forma é essa/ motivá-los a eles sentirem que estão a dominar e a forma de fazer isso é nós tentarmos puxá-los e apoiá-los e dar mais valor àquilo que eles sabem e eles rapidamente passam para outro patamar.

Entrevistador: Uns alunos dominam mais e outros dominam menos.
P7: Exacto e especialmente nesta área/ existem grandes disparidades/ os alunos chegam aqui com um grande 'know how' que já adquiriu e outros que vêm completamente com zero// posso ser um professor muito cativante para um aluno/ sei lá de grau médio/ posso ser um professor bastante/ aborrecido para um aluno que está num nível superior e para um aluno fraco posso ser um docente completamente desmotivante porque também não aprende nada/ é muito difícil gerir esta área porque eles vêm com níveis muito diferentes.

Entrevistador: Pior ainda com PEDA?
P7: Sim/ ainda era pior mas mesmo assim sinto que estou a ser aborrecido para uns mas não há volta a dar ele tem de cá estar e/ por vezes também não têm o desempenho que nós estaríamos à espera/ eles sabem muito mas depois acabam por não aprender essencial// entraram com um 'know how' de 15 e não evoluíram quer dizer/ acontece isso.

Entrevistador: Considera que os professores têm um dos principais papéis para a motivação do aluno?
P7: sim/ um dos principais sim/.

Entrevistador: Refira as duas principais estratégias que considera importantes para prender a atenção do aluno e aumentar a assiduidade?
P7: Uma coisa que faço e sou um bocado duro nisso mas acho que funciona é que eu não dou 15 minutos de tolerância/ eu dou 10 minutos e ao fim de 10 minutos quem entrar tem falta/ eles sabem disso/ ao fim de 2 aulas eles chegam todos à hora certa/ e portanto como sou rigoroso nesse aspecto com os alunos também sou rigoroso para comigo/ e portanto uma coisa que os ajuda a levarem as coisas mais a sério é nós sermos rigorosos e sermos responsáveis connosco e// não sei se isso os motiva ou

não mas o que é certo é que os alunos vêm todos a horas e em pouco tempo estamos a trabalhar/ portanto e depois há o respeito mútuo que procuro sempre/ colocar nas minhas aulas/ se isso motiva ou não/ não sei mas eu procuro colocá-los à vontade para colocarem todas as questões e não se sentirem embaraçados e tenho sentido que dá resultado/ eu saio das minhas aulas a suar/ completamente.

Entrevistador: Compreendo.
P7: Há pessoas com outro tipo de abordagem nas aulas/ mas a minha abordagem é estar acessível/ tirar dúvidas no local e portanto eu até digo muitas vezes quem é que tirou a senha primeiro como se estivéssemos no talho [risos] utilizo isto na brincadeira para motivar os alunos a colocar questões/ mesmo aqueles mais fracos/ mas o que é certo é que até dá para repescar mesmo aqueles mais fracos// no final muitos não conseguem mas/ mas a forma de os motivar é assim primeiro ser rigoroso e depois colocá-los à vontade para tirarem as dúvidas/ nós temos aulas de 3 horas mesmo o intervalo ao meio da aula eu não dou mais do que está estipulado/ quem não cumprir tem falta na mesma/ eles depois começam a cumprir/ e é assim não sei se é motivar ou não mas o que é certo é que// se uma pessoa dá muita rédia eles levam isto pouco a sério/ está a ver? eles assim sentem que têm que cumprir eu também cumpro portanto exijo-lhes o mesmo.

Entrevistador: E troca usualmente ideias e experiências de ensino com os colegas?
P7: Pontualmente// cada um está no seu gabinete e só nos encontramos aqui pontualmente em reuniões da cadeira... pontualmente ou por e-mail trocamos algumas ideias.

Entrevistador: Mas quando tem uma dúvida pontual/ tenta procurar a ajuda ou tenta primeiro... **P7:** Pontualmente porque neste caso pronto a cadeira também não é uma cadeira que para nós seja muito exigente em termos de preparação/ temos cadeiras muito mais complicadas com conceitos muito mais complicados/ mas pontualmente sim/ trocamos e-mails/ como vamos dar isto ou como vamos dar aquilo mas pontualmente não é//

Entrevistador: E a linguagem que utiliza em sala de aula acha que é compreendida pelos seus alunos?
P7: Eu penso que sim eu penso que sim/ tenho uma história engraçada/ houve um ano que dei aulas no ensino secundário dar umas aulas de TIC já foi há uns anos já foi há uns anos/ 7anos e então quando cheguei lá eu só me apercebi mais tarde que

ao fim de algumas aulas é que alguns colegas me vieram dizer que eu usava uma linguagem que os alunos não percebiam/ palavras/ palavras que nós utilizamos naturalmente/ era/ até ao secundário ... 12º não se queixaram mas houve um aluno do 10º ano que se queixou por algumas palavras que nós utilizamos.

Entrevistador: Exacto vocabulário que vocês utilizam normalmente e que para um nível de ensino mais baixo/
P7: E depois temos o problema aqui que nós usamos muito/ alguns professores não estão abertos a isso // que é utilizar estrangeirismos/ tipo sei lá.

Entrevistador: Como por exemplo a palavra 'expert' que utilizei à pouco estava a ler em Português e utilizei esta palavra em inglês.
P7: Exacto [risos] aqui não sinto que isso realmente choque mas lá pelos vistos// sinto é que há uma grande falta de cultura dos alunos/isso sinto/ dou-lhes um enunciado e eles não percebem o alcance do enunciado/ isso é mais grave/

Entrevistador: Na sua opinião isso tem a ver com o quê?
P7: Tem a ver com a compreensão nitidamente/ eles não compreendem o que é que estão a ler ou lêem na diagonal/ não sei/ como é que é possível eu ás vezes pergunto alhos e eles respondem bugalhos// é impossível é impossível// saltam linhas a ler/ não sei.

Entrevistador: É o problema da compreensão leitura e escrita/
P7: É um facto e nós detectamos isso/ eu tento amenizar um problema que tenho que é/ eu falo muito depressa/ e quem não está habituado a ouvir-me falar muito depressa tem alguma dificuldade/ e eu tento repetir ou reduzir um pouco a velocidade/ a experiência que tive no secundário ajudou-me a reflectir sobre isso/ Eu tive poucas horas de aulas no secundário por semana/ estive apenas a substituir um colega/ mas deu-me para compreender que tinha esse defeito e que aqui não se notava quando falava para os meus colegas mas que para os alunos era complicado/ aqui repito mais devagarinho/ mesmo quando vejo a cara deles assim mais/

Entrevistador: Que pensa sobre a actual forma de organização das aulas teóricas e práticas?
P7: Penso que funcionam bem/ mesmo as aulas práticas de 3 horas/ é preferível do que aulas de 2 horas/ eles têm uma quebra a meio da aula/ portanto acho que funciona bem este modelo/ fiz a experiência de dar as aulas de 3 horas sem

intervalo// mas não resultou/ [risos] e não resultou porque// não tiveram coragem de me dizer alguns alunos/ mas depois vim a saber que eu era muito violento com eles.

Entrevistador: práticas inovadoras que tenha posto em prática ao longo da sua carreira, tendo tido sucesso ou não?
P7: Sempre que eu posso/ aconteceu no principio do semestre/ depois não porque os programas são muito complicados mas sempre que eu posso/ é colocar os alunos a escrever no quadro/ não é nada inovador// faço isso noutras cadeiras/ vou dando uma volta pela sala para ver quem terminou e peço a um aluno para ir ao quadro/ a justificação é simples/ é para o aluno justificar com as suas próprias palavras e tentar atingir outros alunos que eu não consigo/ o aluno tira duvidas aos colegas mas na linguagem dele.

Entrevistador: Acha que a estratégia resultou?
P7: Resulta mas não faço sempre porque no final do semestre os exercícios são mais complicados/ por vezes os alunos demoram uma aula inteira a fazer um exercício porque é muito complicado.

Entrevistador: O que acha em relação ao trabalho de grupo ou individual? O que acha que funcionaria melhor?
P7: Individual

Entrevistador: Sem hesitações?
P7: Sem hesitações/

Entrevistador: Porquê?
P7: Porque muitos alunos colam-se ao colega do lado e andam a tentar enganar-se a eles próprios/ porque como não compreendem e o colega do lado compreende um pouco mais eles encostam-se e chegam ao final não têm destreza nem mental/ nem// e até lhes digo/ nem aprendem a utilizar o teclado que também é importante/ é importante terem destreza a escrever porque/ ganham tempo/ se andam à procura das teclas perdem muito tempo/ eu tento sempre que eles a meio da aula troquem de posição mas eles às vezes// o que sabe mais pega no teclado e escreve/ acompanha/ pensa que está a compreender/ naturalmente está a compreender algumas coisas mas não é suficiente/ o aluno explora/ não aproveita o máximo.

Entrevistador: Sente-se motivado enquanto docente?

P7: sim.

Entrevistador: Sente então que está na profissão certa?

P7: Sim

Appendix nr.1: Transcripts of the interviews at the University of Aveiro (2003/04)

Appendix nr.2: Construct 1 'Teaching Practice and Academic Success Questionnaire' (TPASQ)/ 'Questionário sobre Pedagogia Universitária e Sucesso Académico' (QPUSA) - Aveiro

Appendix nr.3: Construct 2 'Programming Course Experience Questionnaire' ($PCEQ_2$)/ 'Representações dos Alunos sobre a Disciplina de Programação' (RADP) - Aveiro

Appendix nr.4: Construct 3 'Programming Course Experience Questionnaire' ($PCEQ_3$)/ 'Representações dos Alunos sobre a Disciplina de Programação' (RADP) - Aveiro

Appendix nr.5: Construct 4 'Programming Course Experience Questionnaire' ($PCEQ_4$)/Strathclyde

Appendix nr.6: Construct 5 'Programming Course Experience Questionnaire', ($PCEQ_5$)/Strathclyde

Appendix nr.7: 'Academics' perception about their teaching practice, students' motivation and expectations'/ 'Auto-percepção dos docentes sobre prática pedagógica e sucesso académico' - Aveiro

Appendix nr.8: 'Academics' perception about their teaching practice, students' expectations and class organization'/Strathclyde

Appendix nr.9: Academics’ auto and hetero evaluation of best teaching practices, motivation and expectations for the course/Aveiro

Figure 1: Academics' and students' perceptions of best teaching practices, motivation and expectations for the course

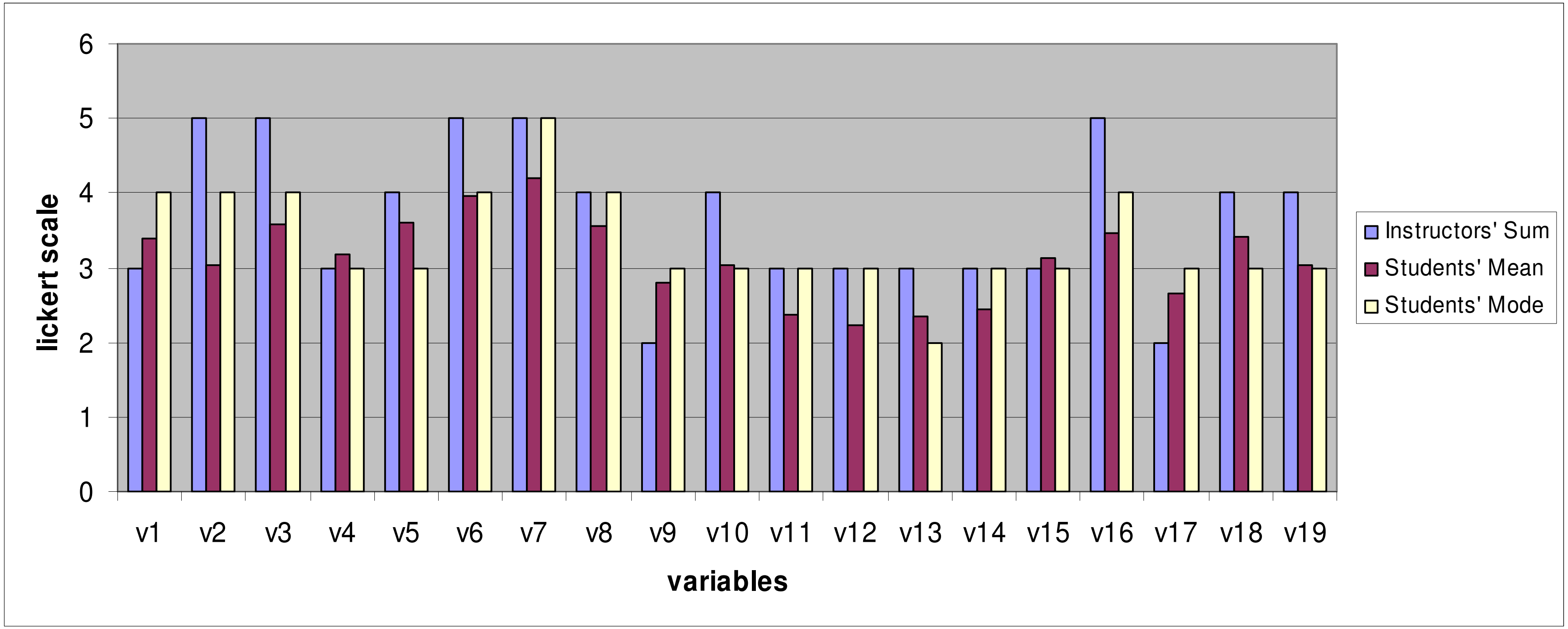


Figure 3: Academics' and students' perceptions of best teaching practices, motivation and expectations for the course

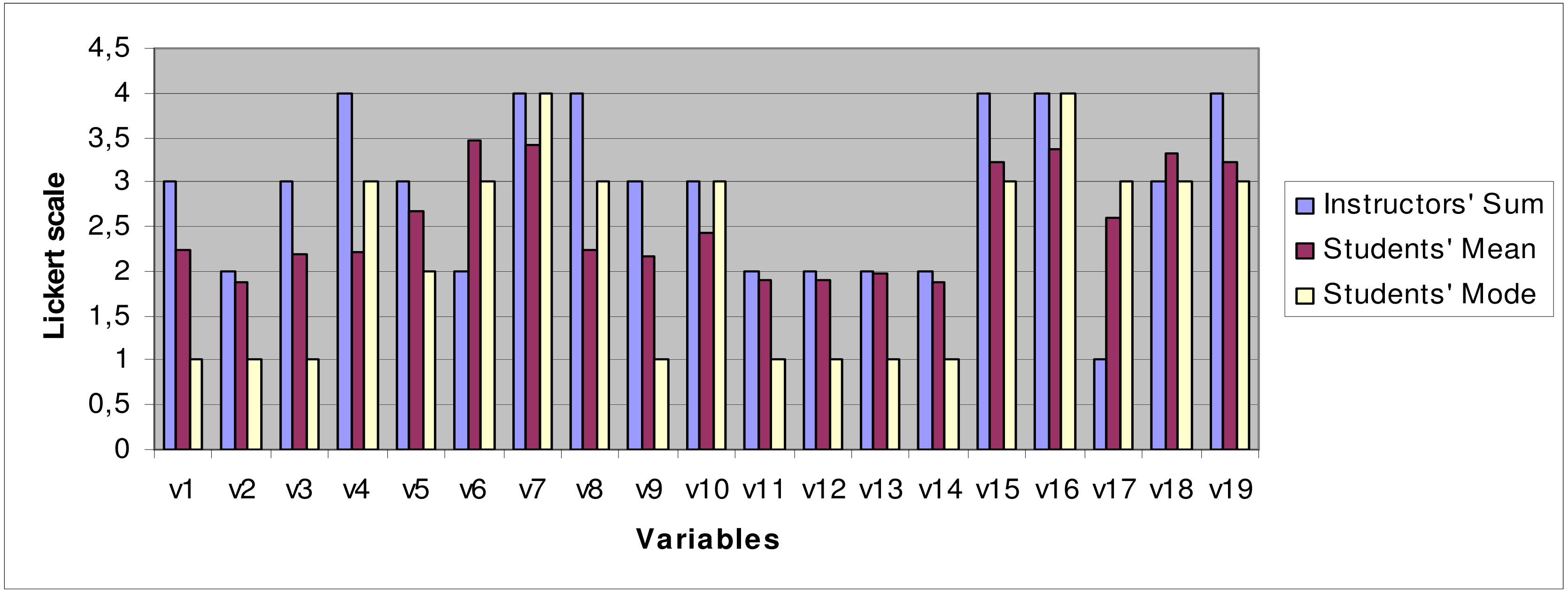


Figure 4: Academics' and students' perceptions of best teaching practices, motivation and expectations for the course

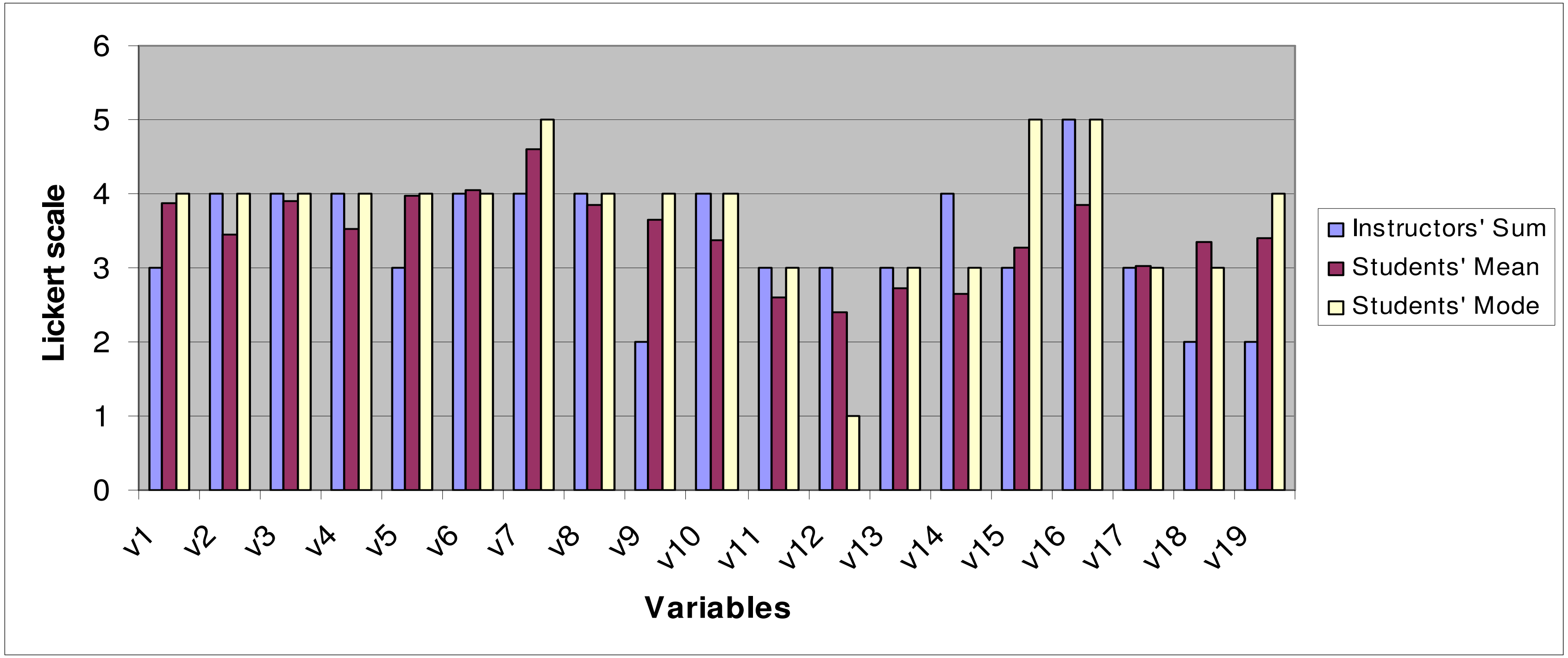


Figure 5: Academics' and students' perceptions of best teaching practices, motivation and expectations for the course

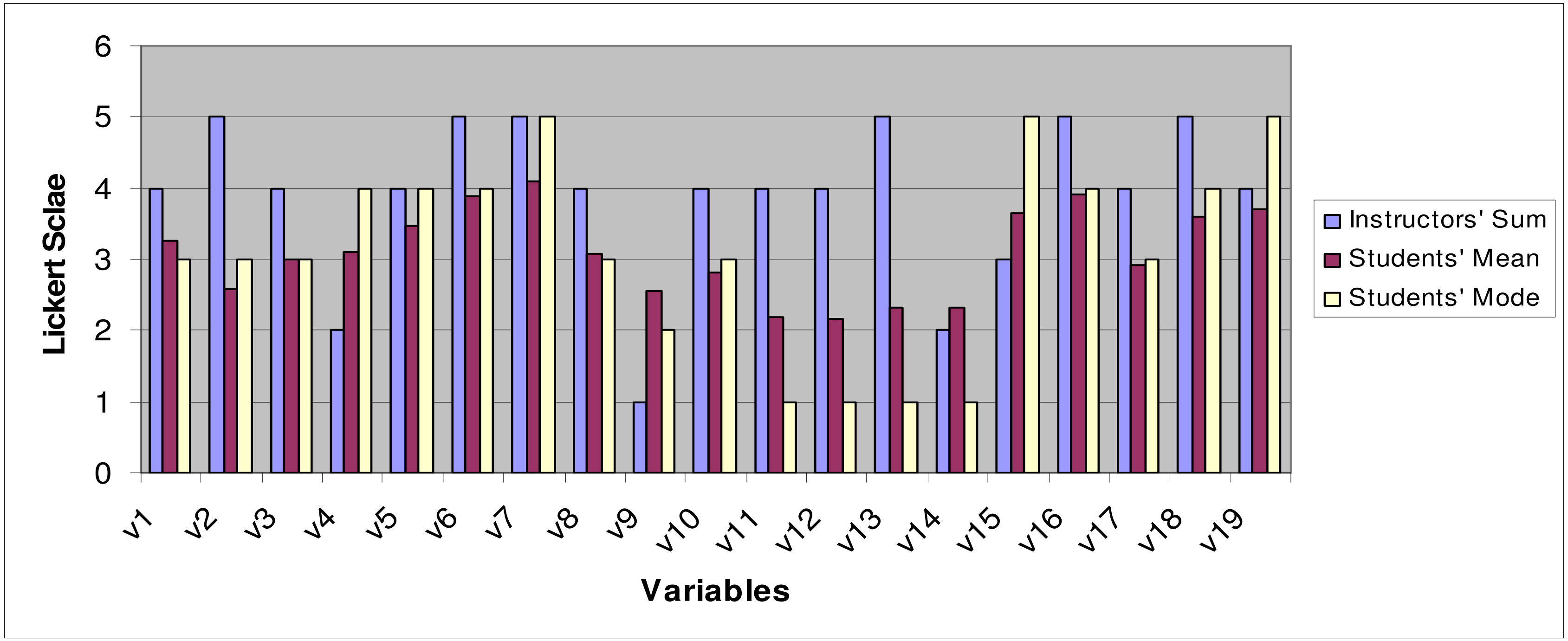
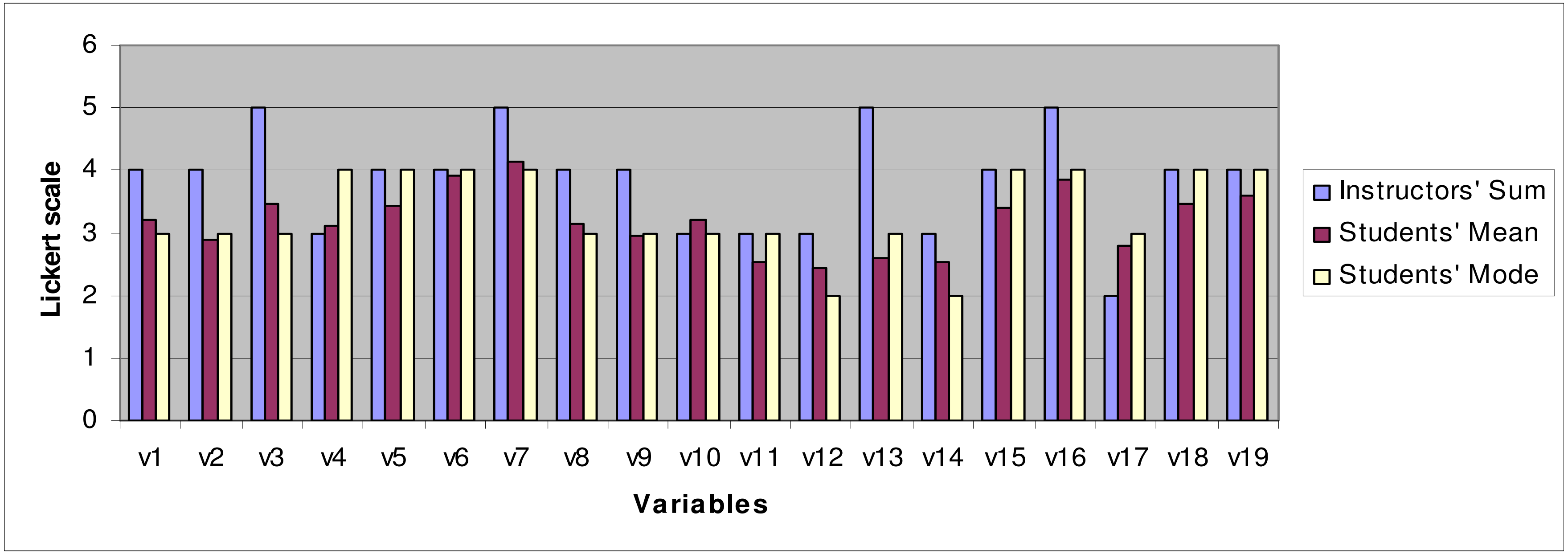


Figure 6: Academics' and students' perceptions of best teaching practices, motivation and expectations for the course



Appendix nr.10: Informative poster: « Thematic Seminar »

Appendix nr.11: Views of academics' about the effectiveness of some processes as ways of rewarding, recognising and ensuring good teaching

Appendix nr.12: Questions underlining the interviews at the University of Strathclyde

UNIVERSIDADE de AVEIRO

informática Universidad de Ciego de Ávila

The University of Strathclyde in Glasgow

Teaching and Learning of Introductory Programming Courses at the Universities of Aveiro, Strathclyde and Ciego de Avila.

New forms of intervention.

11th April 2003
University of Aveiro

The seminars aims to:

- Analyse some features of the teaching and learning of introductory programming courses;
- Discuss the importance of the students' evaluation of faculty and teaching practice;
- Discuss teaching strategies and new forms of intervention

Morning 10.00 -12.30

Seminar: "Teaching and Learning Introductory Computer Programming Courses"

Speakers:

Professor Rui Borges (Electronic and Telecommunication Department, University of Aveiro – Portugal)
Professor George Weir (Computer and Information Sciences Department, University of Strathclyde – Glasgow, UK)
Professor Miguel Angel (Informatics Department, Universidad de Ciego de Ávila – Cuba)

Moderators: Professor José Tavares and Dra.Isabel Huet (Science Education Department)

Afternoon 14.30 – 17.00

Round table discussion: "The students' academic success/failure on introductory Computer Programming Courses. Students' academic skills and faculty teaching practice".

Moderators: ProfessorJosé Tavares and Dra. Isabel Huet

Room: 18.1.08 Science Education Department

For further information, please contact:
Isabel Huet iza@dce.ua.pt 234 372575 / ext.24730

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Research Unit "Development of Pedagogic Knowledge in Education and Training Systems"

Views of academics about the effectiveness of some processes as ways of rewarding, recognising and ensuring good teaching

Adapted from the "Survey of Academic staff" (Paul Ramsden, Don Margetson, Elaine Martin, Sally Clarke, April 1995)
http://www.autc.gov.au/caut/rrgt/Appendix3.html#Appendix%203

	Processes	**No effect**	**Some effect**	**A great effect**
1	Conducting surveys of students' course experiences and satisfaction			
2	Requiring accreditation as a competent university teacher for all academics			
3	Ensuring heads of departments and courses give more praise for teaching innovation and quality			
4	Establishing informal courses in teaching for academic staff about teaching methods and strategies, not leading to a qualification			
5	Making special arrangements (eg time release) for teaching development projects			
6	Taking greater account of teaching in the promotions process			
7	Establishing an effective staff development unit/centre for learning and teaching in every university			
8	Awarding prizes and grants for good teaching to individual academics			
9	Establishing courses for academic staff leading to a teaching qualification			
10	Applying performance indicators of course quality to academic departments			
11	Providing workshops and seminars on teaching and learning based in particular faculties or departments			
12	Providing general workshops and seminars on teaching and learning			
13	Conducting compulsory student ratings of individual teaching performance, linking the results to promotion and/or extra financial rewards			
14	Conducting student evaluation of individual teaching performance, using the results only for feedback to the staff member			
15	Introducing mentoring programs in which experienced teachers help less experienced ones to develop their skills			
16	Providing compulsory orientation programs for less experienced teachers			
17	Undertaking national quality audits of teaching			