Institute for Computer Science

Analysing Prerequisites, Expectations, Apprehensions, and Attitudes of University Students studying Computer Science

Dissertation for the Degree of
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Abstract

The main objective of this dissertation is to analyse prerequisites, expectations, apprehensions, and attitudes of students studying computer science, who are willing to gain a bachelor degree. The research will also investigate in the students' learning style according to the Felder-Silverman model. These investigations fall in the attempt to make an impact on reducing the "dropout"/shrinkage rate among students, and to suggest a better learning environment.

The first investigation starts with a survey that has been made at the computer science department at the University of Baghdad to investigate the attitudes of computer science students in an environment dominated by women, showing the differences in attitudes between male and female students in different study years. Students are accepted to university studies via a centrally controlled admission procedure depending mainly on their final score at school. This leads to a high percentage of students studying subjects they do not want. Our analysis shows that 75% of the female students do not regret studying computer science although it was not their first choice. And according to statistics over previous years, women manage to succeed in their study and often graduate on top of their class. We finish with a comparison of attitudes between the freshman students of two different cultures and two different university enrolment procedures (University of Baghdad, in Iraq, and the University of Potsdam, in Germany) both with opposite gender majority.

The second step of investigation took place at the department of computer science at the University of Potsdam in Germany and analyzes the learning styles of students studying the three major fields of study offered by the department (computer science, business informatics, and computer science teaching). Investigating the differences in learning styles between the students of those study fields who usually take some joint courses is important to be aware of which changes are necessary to be adopted in the teaching methods to address those different students. It was a two stage study using two questionnaires; the main one is based on the Index of Learning Styles Questionnaire of B. A. Solomon and R. M. Felder, and the second questionnaire was an investigation on the students' attitudes towards the findings of their personal first questionnaire. Our analysis shows differences in the preferences of learning style between male and female students of the different study fields, as well as

differences between students with the different specialties (computer science, business informatics, and computer science teaching).

The third investigation looks closely into the difficulties, issues, apprehensions and expectations of freshman students studying computer science. The study took place at the computer science department at the University of Potsdam with a volunteer sample of students. The goal is to determine and discuss the difficulties and issues that they are facing in their study that may lead them to think in dropping-out, changing the study field, or changing the university. The research continued with the same sample of students (with business informatics students being the majority) through more than three semesters. Difficulties and issues during the study were documented, as well as students' attitudes, apprehensions, and expectations. Some of the professors and lecturers opinions and solutions to some students' problems were also documented. Many participants had apprehensions and difficulties, especially towards informatics subjects. Some business informatics participants began to think of changing the university, in particular when they reached their third semester, others thought about changing their field of study. Till the end of this research, most of the participants continued in their studies (the study they have started with or the new study they have changed to) without leaving the higher education system.

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To my lovely daughter:

Zahra

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Chapter 1: Introduction

1.1 Goal of the Research

The main objective of this PhD project is to analyse prerequisites, expectations, apprehensions, and attitudes of students studying computer science, who are willing to gain a bachelor degree. The research will look into the learning styles, difficulties, obstacles, and misconceptions of the students about their study, in an attempt to make an impact on reducing the "dropout" rate among students studying computer science (which is considered in many countries worldwide (and in Europe [1]), as one of the highest dropout rates) and to suggest a better learning environment. It is a widely-discussed topic by the academic authorities within each country and institution, but the intention of this work was to look closely into the determinants that could make students studying computer science, in particular here in Germany, think in changing their study, university, or dropout from their higher education study and to give recommendations, or suggest interventions, if any, to reduce "dropout" rates.

The main research question could be formalized as: '*Why do students drop-out of the Computer Science Department?!'* but because there is no clear data that exists about the reasons that made previous students drop out of the computer science department (usually students who drop out of study are not obligated to give reasons for their decision) and it is usually unknown whether they will continue their study in another university or different field of study or they had dropped-out from the higher education system without the intension to return back later, and also because of the difficulty in contacting such students (due to the confidentiality of their personal data) to ask them about the reasons behind their dropout or change in field and/or university. This all made us focus on finding answers to our research question from the students who are still continuing in their study and to search for what triggers them to think in changing/dropping-out the study and/or changing the university.

1.2 Work Done

The dissertation will start with a background of this research (see *chapter two*), define the term 'University Dropout' and discuss its consequences, possible reasons, its theoretical framework, and other related information.

The following chapters will then consist of the work done to investigate in our research problem and to determine what could have an influence on students' decision in dropping-out/changing their study and/or changing the university. This investigation took place basing on three aspects: cultural, personal and study aspects. See Table 1.1.

Cultural aspects	Personal aspects	Study aspects
Finding answers to questions such as: • Why do some countries do not have high dropout rates?! • What is the influence of the university/college environment, and the admission procedure? • What are the students' attitudes, beliefs, and challenges from a cultural perspective?	Looking into the students' background, financial situation, preferred learning styles, and study skills.	What are the students' expectations about the study they started, their conceptions and misconceptions, apprehensions, and study problems/difficulties (ex.: in lectures, tutorials, and/or study groups)

Table 1.1: The three aspects: cultural, personal and study aspects that could have an influence on students' decision in dropping-out/changing their study and/or changing the university.

As a start for this PhD work and to look into the cultural aspects that could have an influence, an investigation of the attitudes of computer science students started at the University of Baghdad in Iraq (see C*hapter 3).* Students there are accepted to university studies via a centrally controlled admission procedure depending mainly on their final score at school. This leads to a high percentage of students studying subjects they do not want, in particular computer science, with female students being the majority. The purpose was to investigate the attitudes of students studying computer science in such a different environment. Some attitudes and concerns were compared with an earlier study made at the University of Potsdam in Germany (see [21]), their questionnaire was used as a basis for the questionnaire used at the University of Baghdad after some additions and changes made to adjust it to the Iraqi society, teaching and university enrolment procedures. This study was published at the HDI 2012 conference that took place at the University of Hamburg, Germany [51].

In *Chapter 4*, a new study is presented to look into the personal aspects of students studying at the computer science department from the side of their learning style preferences. It took place at the computer science department – University of Potsdam. The main purpose was to look into the learning style preference differences of the students studying different study fields (Computer science, business informatics, and computer science teaching) who usually take some joint courses at the computer science department. It will present and discuss initial results of using the Index of Learning Styles (ILS) questionnaire developed by Felder and Soloman, which is a 44-item questionnaire for identifying the learning styles according to Felder-Silverman's learning style model FSLSM. This study was published at the IFIP / KCICTP – WG3.4 parallel conference stream that took place at the University of Potsdam, Germany, in July 2014 [52].

In *Chapter 5*, a new study is presented to look into the study aspects that could have an influence on students' decision. It was intended to highlight and understand the problems and issues students are facing during their study which may lead them to think in dropping-out/changing their field of study, and/or changing the university. Interviews face to face with a sample of freshman students at the University of Potsdam were mainly used to collect information about the students' attitudes, expectations, apprehensions, problems and issues over several semesters of their study, the interviews provided a closer look to students' attitudes, problems, and issues, making them more open to discuss their problems and issues and in expressing their feelings to what they are going through. The personal aspects of this sample of students was also investigated by looking into the students' background, financial situation, preferred learning styles, and study skills.

In *Chapter 6* a summary of results from the three studies is given and discussed along with some recommendation/suggestions to what is possible to provide a better learning environment that could help to reduce "drop-out"/shrink rate.
Thus this study will focus mainly on the factors that could trigger the student to think in dropping-out/changing his/her study field, and/or changing the university. And what possible procedures/changings within the university/department and/or subject that could make a difference and provide a better learning environment that helps the students to continue their study at the university and graduate successfully (if he/she already has the intension to continue in his/her current study field).

1.3 Research Methodology

The work done in chapters 3 and 4 depends on quantitative evaluations of information gained from questionnaires. Results are listed and discussed depending on the statistics gained through these investigations.

The work done in chapter 5 depends on the information gained from direct interviews with students, along with open-ended questionnaires, by following the same sample of students over more than three semesters. All the recorded interviews and questionnaires were transcripted and then coded using MAXQDA11. The coding process took multiple stages, as there was a first rough initial coding that depended on reading and initializing codes that served the research goal. These codes were organized in different categories according to the area of investigation (like student's background, problems in study, etc..) and each category had multiple subcategories (for example problems in tutorial sections, problems in lecture halls, and so on). A second step was performed to revise the initial codes and categories, adding new ones as needed and dividing and merging others. A third revision was made later to the coding process merging some sub categories with other related ones. Results and conclusions were based on analysing those categories and findings. Finding relations between different categories and with the previous findings from the work about learning styles of students was also under investigation. Further details about research methodology used in this work will be discussed in *chapter 5*, along with related appendices. Also an investigation in some of the research questions was done with some professors and lecturers at the University of Potsdam, through face to face interviews.

Due to time limitation of the PhD study (time constraints from the side of my government), not all aspects of the research have been covered, other relationships and connections between categories and dimensions of the problem need further investigation, this will be my goal in future research.

Chapter 2: Background of the Project

2.1 Introduction

University dropout has been a widely discussed topic by the academic authorities and researchers within many countries and institutions around the world who suffer from this phenomenon [1, 2, 3, 4, 5, 6, 7, 8, 9]. But it is difficult to make comparisons between studies of different universities, especially between different countries as some countries may have different university admission procedures and study regulations, some may have flexibility within their system for the students to change studies and universities, some may not. Besides that, the administration methods used to collect the data related to the "dropout" phenomenon may vary or lack detailed information to analyse this phenomenon, according to Rodríguez-Gómez et al., see [2]: "Universities lack systematized, univocal methods for collecting student dropout data, making measurement problematic. In consequence, the formulas applied to analyse the dropout phenomena differ between countries and it is therefore an immense challenge to perform comparative studies". And according to Heublein in his study entitled 'Student Drop-out from German Higher Education Institutions', see [5], says: "Drop-out is not understood as a result of spontaneous, short-term decisions, but of a prolonged decision making and consideration process in which the different influencing factors accumulate in a constellation of problems that makes leaving the higher education institution seem inevitable". Universities in Germany for example, usually ask the students who want to end their study for a reason. But this is usually optional, students are not obliged to state the reason for their withdrawal, and this little information does not usually reflect the different factors that made this student take the decision to leave his/her study, change it, or change the university. So the reasons for de-registrations remain unknown to the higher education institutions [5].

Dropping out of study, changing it, or changing the university may have an important concern to some universities and colleges since it may have an effect on the flow of registration and graduation rates beside the financial loss to both the students and the institution. Also changing the study could be a waste of time for the student's study life as he/she begins to search for a different field to study and may start from the beginning. Fozdar et al. describes part of the consequences on students as follows, see [4]: "Non-completion can also lead to psychological distress; some fragile students may feel they have

personally failed, when in reality it could be the system that failed them!" More on the consequences of university dropout will be discussed later in section 2.2.1.

2.2 University Dropout (Definition and Characterization)

The term 'university dropout' is commonly used by many studies to describe the situation where students leave their university study before obtaining a formal degree [6]. So changing the study or the university may not be considered as a kind of dropout since the student is still studying within a university inside the higher education system but rather as a different kind of shrinkage. So there could be shrinkage from one university/institute but a growth in a different university/institute within the higher education system. Also there could be shrinkage from one faculty but a growth in a different faculty within the same university/institute. Heublein in his study, see [5], describes this case as follows: "The empirical research on higher education defines student drop-out as a special type of shrinkage that only includes students who leave the higher education system without obtaining a (first) degree and do not complete their studies at a later stage. This narrow understanding of the term has gained ground in research. Hence, the change in degree programme or subject, interruption in studies and the change of institutions are different types of shrinkage."

Larsen et al. , see [6, 7], characterises the university dropout according to whether it is more or less voluntary in character. Due to students failure to meet the academic standards and demands within university in which case dropout should be viewed as involuntary. Or the student decides to drop out for reasons more voluntary in character, for instance, in pursuit of another subject of study and/or another university. Also, and according to Larsen et al., university dropout can also be characterised on the institutional level at which it occurs, that is from either a course/subject of study, a department level, a faculty, a university, or the entire system of higher education, see figure 2.1. Or it can also be characterised on a number of other different parameters, for example on the timing of dropout (early vs. late dropout).

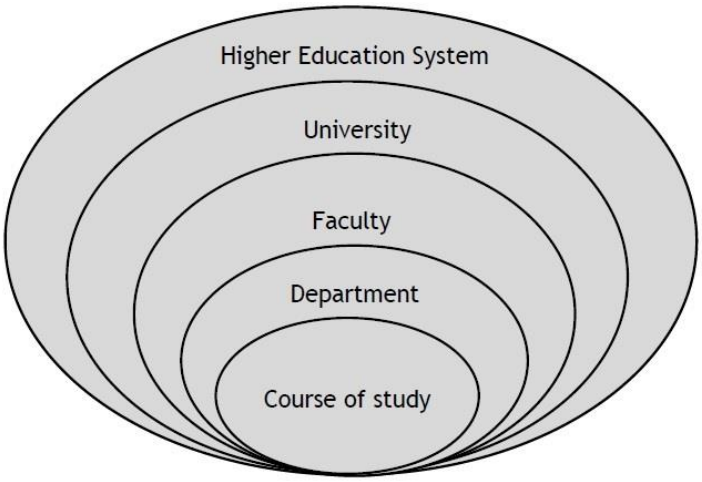

Figure 2.1: Institutional levels university dropouts

2.2.1 Consequences of University Dropout

There are different consequences at many different levels for university dropout, the society, the university (different institutional levels within), and the individual student. And according to Larsen et al., see [6]: "Dropout is essentially associated with negative consequences in the form of a waste in invested capital, structures, time and psychological endeavours."

At the individual student level and according to Larsen et al., see [6, 7], as he was referring to Edwards et al., see [11]: "a dropout (at least concerning the involuntary cases of dropout) is likely to be associated with emotions of personal inadequacy/self-doubts/not belonging". And according to Larsen et al., see [7]: "a dropout is inevitably synonymous with a waste of personal resources, time and money (unless the dropout has happened with the student having acquired useful skills to be used as transfer of credits to another related subject of study or to be used subsequently on the job market)".

At university level, the consequences of dropout can be divided into an economic and an academic part, negative on an economic level for the affected university, especially the ones who depend on self-funding. And on the university pedagogical level where the goal is to get as many students to complete their studies as successfully as possible, dropout must inevitably viewed negatively [6, 7].

At societal level, and according to Larsen et al., see [6], referring to what Bound et al. said, see [8]: "university dropout has socioeconomic consequences because the supply of university graduates affects both the returns to education as well as overall economic

growth". As well as every specific case of dropout could mean a missed opportunity for another potential student to complete that certain university study [7].

Some students at the computer science department at the University of Potsdam in Germany, and according to my observation and/or findings presented later in chapter 5, changed their study at their fourth semester and above, after failing in changing the university within the same field of study, usually in their third semester. Business informatics students for example are the most who seek changing. The rule of transferring points of related subjects from their first study may overcome the problem of wasting time in retaking them again. But the problem of waste of time, money and effort is still a lead along with the continuous anxiety and fear that students keep feeling. See chapter 5 for more details.

Also some students fail in their study, and according to the higher education rules in Germany, they are not allowed to retake the subject again. Some students try to start in a different field of study, but this procedure obviously will cost the related students time, money, and/or negative feelings towards their whole study experience, even if they had gained some learning skills and have passed some subjects that they could benefit from.

2.2.2 The Theoretical Framework of Dropout Phenomena at Universities

The models of Vincent Tinto, see Figure 2.2, is used by many studies to discuss and explain the phenomena of university dropout. His model focuses on the longitudinal and multifactorial process leading to dropout [13, 14, 15, 16].

Tinto's model takes into consideration some attributes that come with the students as they enter the university, attributes that relate to family background, personal characteristics and prior schooling, along with their effect on students' skills/abilities, all directly and/or indirectly, assumed to shape the students' initial intentions, educational goals and institutional commitments upon university enrolment. These initial educational goals and institutional commitments held by each student are then met by the students' institutional experiences within university, which in themselves are divided into two systems (an academic and a social system). The academic system consists of the academic performance of the student within university and his/her interactions with the faculty/staff, the social system consists of the extracurricular activities held by the student as well as his/her peer group interactions. The student's institutional experiences are then supposed to lead the student to

develop a certain level of academic and social integration at university. These levels of integration are then subsequently perceived to lead the student to either engage further in his/her university studies or to make the student be less engaged and, thus, to lead to a weakening of his/her educational goals and institutional commitments. Leading the student to decide whether to stay or leave the university [6, 7]. Factors that are external to university might also play a certain indirect role for dropout and Tinto distinguishes between different types of dropout behaviour involuntary and voluntary [6, 7].

Ulrich Heublein et al. in [17] have refined Tinto's model to work in a European university context [6, 7], see Figure 2.3. Like Tinto, Heublein et al. include both pre-university and within-university factors in their theoretical model. And more clearly point at specific factors that influence dropout and are at work during the course of study, but which are external to the university setting. These external factors include the student's financial situation, the student's living conditions, family and housing situation, advice and/or support from friends/family and other opportunities for counselling as well as the student's own future plans [6, 7].

The focus of the study will be on the factors that could be possible to change by the university/department to provide a better learning environment for the students.

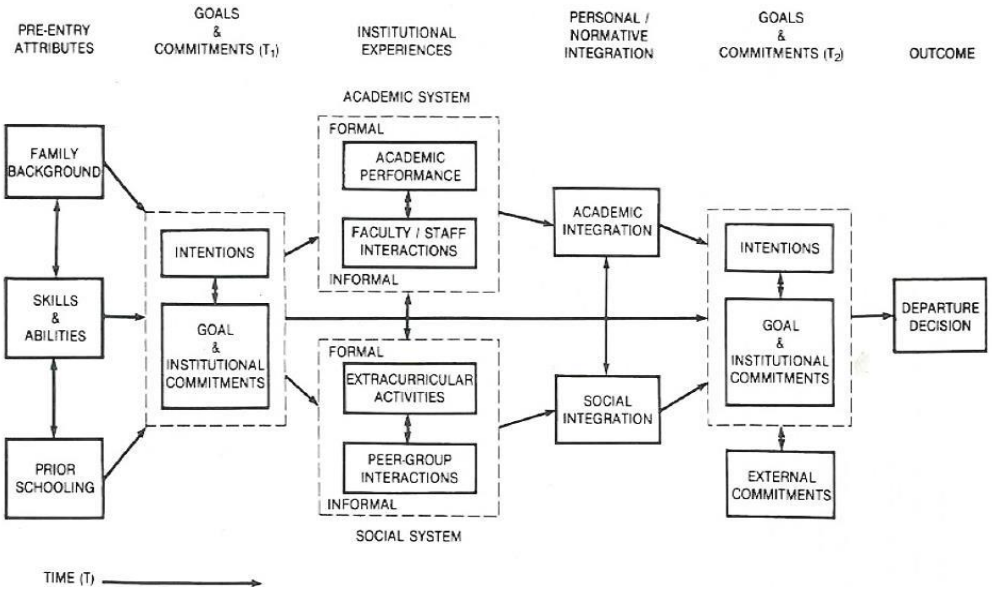

Figure 2.2: Tinto's model of college student dropout [14].

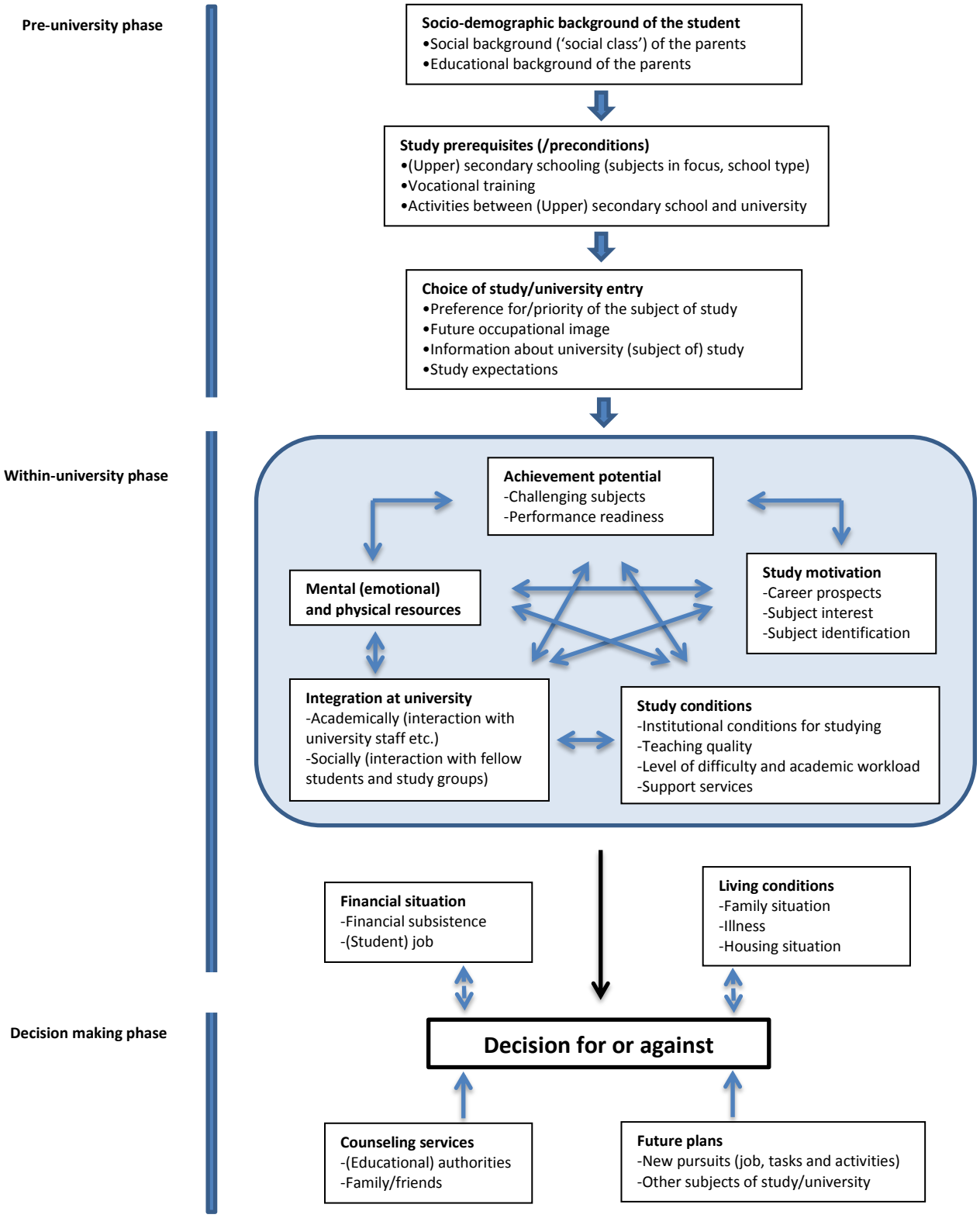

Figure 2.3: Ulrich Heublein et al. refined the model of the dropout process [17]

(Translation from German: [6])

2.2.3 Possible Determinants of University Dropout

There are many factors available to explain or affect (directly, or indirectly) on the determinants of university dropout, such as student's background, academic competencies, motivations for studying, social and academic integration at university, living conditions, etc. [6, 7]. See also the refined model of Ulrich Heublein et al in section 2.2.2, figure 2.3

Behind the problem of dropout lies also the problem of dissatisfaction of students for those who had passion to study a specific field but did not get accepted basically because of specific admission requirements that the students could not fulfil. So in this case motivation plays a tremendous role and an important determinant. A German study by Heublein et al. (see [19]) revealed evidence in Germany that incompatibility between students' expectations, the reality of the programme and students' abilities led mostly to drop-out [18]. This could be recognized in our study in chapter 5 among the sample of students studying at the computer science department at the University of Potsdam in Germany. And according to Hovdhaugen et al., see [18], knowledge and expectations about the study programme play an important role.

The degree of satisfaction with the conditions at university, the teaching and the curriculum, also has an affect [7].

Students may need more attention and more feedback from teaching staff, and the need for workshops (pre-entry preparatory courses) [20]. This was a request/need for many participants at the study presented in chapter 5.

The study of Hovdhaugen et al., see [18], highlight a point that is revealed by many studies about the benefit of studying in small institutions as they have more capacity to engage with students: "The social integration of students at small institutions is stronger as students are more likely to have closer relationships with their teachers than at bigger institutions. Hence, students at small institutions are more likely to complete their studies than students at larger institutions". One of some participants' requests in the study that is presented in chapter 5 was to have smaller tutorial groups in order to have more student-teacher interaction.

According to Hovdhaugen et al., see [18]: "The degree of selectivity of an institution on the other hand has a negative impact on the probability of students to drop out, i.e. the more

selective a higher education institution is, the more likely is study success. Study success is associated with students' prior academic attainment, so institutions with the highest entry requirements have lower rates of drop out in comparison to those at institutions with lower entry requirements". No selectivity procedure is made at the University of Potsdam in Germany, most students applying to the study field usually get accepted as long as there is a student seat in the computer science department, and this could contribute in the problem of drop out, especially for the students who have a weak background. Unlike the situation at the University of Baghdad in Iraq for example which accepts students via a central admission procedure, and usually the computer science department requires an excellent score of the student in the final exam of the secondary school, more to be presented and discussed in chapter 3.

Also, flexibility of the system plays a tremendous role in changing the study and the university/institutions. As long as credit transfers are accepted, students can start one degree and then switch to another. One of the drawbacks of this flexibility is study delays and the increase of time spent in higher education to complete the degree but it could prevent the students from dropping out of the higher education system [18].

Some studies investigated in the effect of students having part-time jobs, they found that such jobs could help students to finance their studies but may threaten their success in return [18].

Both of flexibility of the system and part-time jobs factors were under investigation and are presented and discussed in chapter 5.

2.2.3.1 University Dropout in Germany

According to Ulrich Heublein, see [5], three main at-risk groups in Germany can be identified (see table 2.1). The first includes students who start their studies with poor grades of their upper secondary school education. If they do not receive any support from teaching staff as well as from other students, they quickly face problems to fulfil their study tasks. The second at-risk group starts their studies with false expectations or who are not studying in their preferred subject. And the students of the third at-risk group invest more time in a job during their studies.

Type of drop-outs I	Type of drop-outs II	Type of drop-outs III
Preliminary phase of the programme: - educational deficits/ poor grade point average - poor knowledge about the study demands - extrinsic choice of subject	Preliminary phase of the programme: - wrong expectations/ study content/occupational profile - not the favoured subject - extrinsic choice of subject	Preliminary phase of the programme: - financing of the studies is unclear - long transition to the degree programme
Study situation: - insufficient student support - didactical deficiencies	Study situation: - no motivational support - missing practical relevance	Study situation: - financing through the German federal Law on Support in Education/ occupation - intensive occupation
Study situation: - excessive specialist demand - failure in examinations	Study situation: - decreasing interest in the subject - decreasing willingness to perform - doubts on the study suitability	Study situation: - lack of integration
Drop-out due to performance related reasons	**Drop-out due to motivational reasons/ change in vocational direction**	**Drop-out due to financial reasons**

Table 2.1: Process of drop-out from higher education [5]

Ulrich Heublein, see [5], discusses the background and university-school transition issues of many students as they begin their study: “With the transition to the bachelor degree programme, many problems arose with the reshaping of the curricula. The increasing heterogeneity of the first-year students has also contributed to these problems. In addition to the issues about the fit of after-school preparation and study demands in the first few semesters, problems concerning the study programmes (too much material, too many examinations, and too high demands at the start of the study programme already) began to appear.” It seems that this is one of the common and main issues that freshmen students face here in Germany, as could be found also later in chapter 5, although universities usually provide information about the study online through their official webpages, but many students still start their study with little knowledge about their field of study, having a little knowledge about the kind of material that they are going to study and the required background for it. Some students just want to study a subject because its connection to another related subject/s that they like, for example some students applying to the study field of business informatics at the computer science department had passion to study business administration, but since they did not get accepted there they applied to business informatics, others applied because they like computers but they are unaware of the saturated mathematical and informatics subject that they are required to take to gain their university

degree. The difference between the school system and the university system also plays a major role in students' problems and issues that they usually keep facing during the first three semesters of their study, also according to the findings of the study presented in chapter 5. Students still keep struggling to adjust and get used to the university system, unaware of the "right ways" to study at university. Some find themselves lonely at the beginning of their study with no required attention. Others still want the teacher and/or professor to demand them regularly for solutions of their homework and exercises, as teachers used to do in school. Workshops before freshman studies could be a solution to some of the students problems related to their background and to have a sense of the kind of material that they will need to start to study. Highlight of the "right ways" to study and manage time could be given in such preliminary courses. Investigating the learning styles preferences of students, especially students with different specialties taking joint courses, could have an impact on reducing the dropout rate among students, and to suggest a better learning environment, by meeting most of the students' learning style preferences (this topic will be discussed in the study presented later in chapter 4).

All these early problems along with other study problems related to tutorial sections, teachers and professors, students ability in coping with the study pressure and the amount of study material, and the ability to develop their learning skills, etc. could ultimately lead some students to think in changing the university or the study or both, or change to a study at universities of applied sciences (in German: Fachhochschule). Seeking what is easier to gain and with lighter demands to obtain a degree could be the goal for many of those students who are thinking in changing their study/university. From the researcher's perspective according to the study presented later in chapter 5, dropping out of the higher education system is probably less common, at least at the early semesters, and it usually happens when the students who are facing problems in study have exhausted all their options to change the university and/or study, and usually happens involuntary in character (i.e. due to students failure to meet the academic standards and demands within university [6, 7]).

2.2.3.2 Dropouts among Computer Science Students

A high dropout rate for students in Computer Science field is a worldwide problem [1]. The dropout rate of Computer science students in Germany is about 38 - 40% [7, 21, 22]. And, according to [1], the average student dropout rate in computer science in Europe is around 19%.

Usually students applying to computer science have misconceptions about the study field. Mostly because some of them think about the computer science field from their own perspective and view, being motivated by games or graphics or other visual effects. Or believe that computer science is all about using word processors, spreadsheets, or web browsers. So students want to specialize in computer science ignoring the fact that computer science has a wider and more comprehensive view that should be considered when success is the goal [23].

Mathematics is an essential part of computer science; students usually do not realize the required mathematics skills necessary to study computer science [23, 24]. Achievement in mathematics could be a good predictor of the achievement in computer science [25]. The link between mathematics ability and programming is a widely discussed topic in many studies [26, 27, 28, 29, 30, 31].

As discussed earlier in the previous section (2.2.3.1), the difficulties and problems that arise during the transition phase to university play an essential role in changing or non-completion of study. Usually the nature of a computer science degree programme has a very limited continuity with what the student had studied during school level. Many courses in computer science, especially programming, requires a style of logical thinking that many students may have not experienced before [32, 33].

Teaching methods and abilities of tutorial teachers could also contribute to the problem. Many universities allow students from higher semesters and post-graduate studies to teach low level computer science courses with little or no training. Many problems could arise in this situation due to the lack of experience in teaching and deficiency in student-teacher communication skills [34, 35].

Motivation is often taken as a contributing factor to dropping out. Either the students have no motivation to study at all, or they are not seeing any payoff for what they have invested in study, so they lose motivation. Or maybe because some parts of the courses are too difficult to master, so motivation drops [36].

All of the above points are investigated in the study made at the University of Potsdam in Germany, see chapter 5.

According to Woszczynski et al., see [10]: “The variables that influence success in programming principles can be grouped into the following three categories: individual attributes (personality and ability), organizational attributes, and demographic data.” Personality variables may include beliefs, attitudes, intentions, behaviours, traits and states that could predetermine student success in programming principles courses. The ability variables (academic or achievement variables) have its effect on student success in programming principles. Not recognizing one's own abilities may lead sometimes to unreasonably high self-assessments [37]. Lacking the ability in developing adequate study habits and time management skills also has its effect [35]. Organizational/institutional variables may also influence success as for example providing an environment for the students to encourage them to study computer science. Finally, demographic variables which may include age, gender, ethnicity and marital status could have an effect on performance [10].

It may seem that it is a complex and multi-dimensional problem with no single solution. [32, 33]. But recognizing and highlighting the problems and issues, and investigating in whether high drop-out rates are due to specific conditions in higher education institutions or to factors that are not influenced by the particular higher education institution must keep going [5] especially identifying the specific conditions, issues and problems in universities/institutions which are accessible and possible to be solved by the university/institute or department itself, could be the first step towards reducing “dropout” rates.

Chapter 3:
Attitudes of Computer Science Students at the University of Baghdad

3.1 Introduction

As a start in our work, a survey has been made in the computer science department at the University of Baghdad to investigate the attitudes of computer science students towards the study in a women dominant environment, showing the differences between male and female students in different study years. In Iraq students are accepted to university studies via a centrally controlled admission procedure depending mainly on their final score at school (Appendix A summarizes the Education Policy in Iraq). This leads to a high percentage of students studying subjects they do not want, in particular computer science, with female students being the majority, possibly because of this admission procedure that is used to accept students in colleges and institutes or because female graduate students from secondary schools do not perceive computer science as a male dominated field, and they do not have anxiety towards studying computer science.

The main purpose of this starting study was to investigate the attitudes of students studying computer science in such an environment, and to highlight the points of views of both genders that were collected via a questionnaire. Some attitudes and concerns will be compared with a study made at the University of Potsdam in Germany [21], with their questionnaire used as a basis for the questionnaire used at the University of Baghdad with additions and changes made to adjust it to the Iraqi society, teaching and university enrolment procedures. This study was presented and published at the HDI 2012 conference* that took place at the University of Hamburg, Germany [51].

3.2 Women and Computer Science at the University of Baghdad

The University of Baghdad is one of the five universities in Baghdad city and the largest among 25 universities in Iraq. It has 24 colleges, 4 institutes and 6 research centres and accepts every year about 10,000 students [38, 39].

*HDI 2012 – Informatik für eine nachhaltige Zukunft. 06.–07. November 2012, Universität Hamburg.

The computer science department at the University of Baghdad was established in 1983, in which 30 students have been accepted, 29 graduated in 1987, the number of graduated female students was 21. This high percentage of women studying and graduating from computer science department keeps constant for the following years (Figure 3.1).

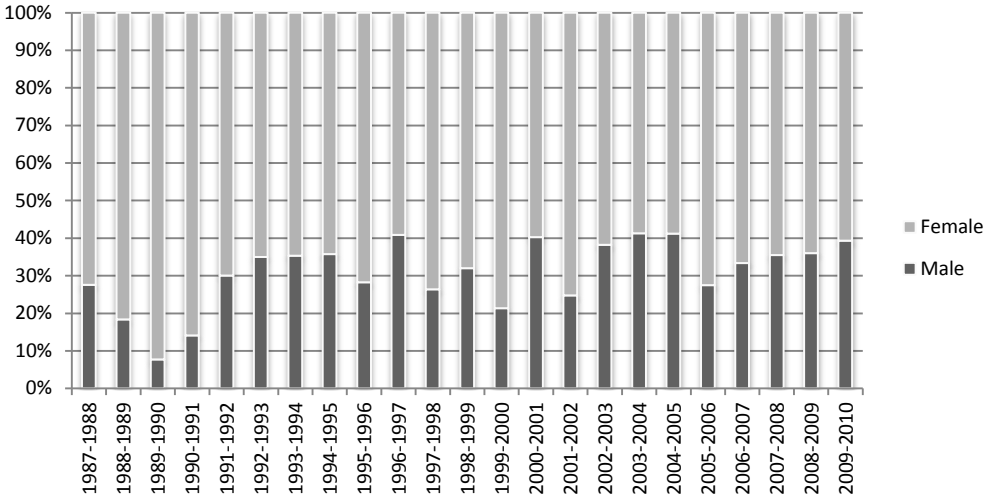

Figure 3.1: Female and male students graduating in the computer science department at the University of Baghdad [40].

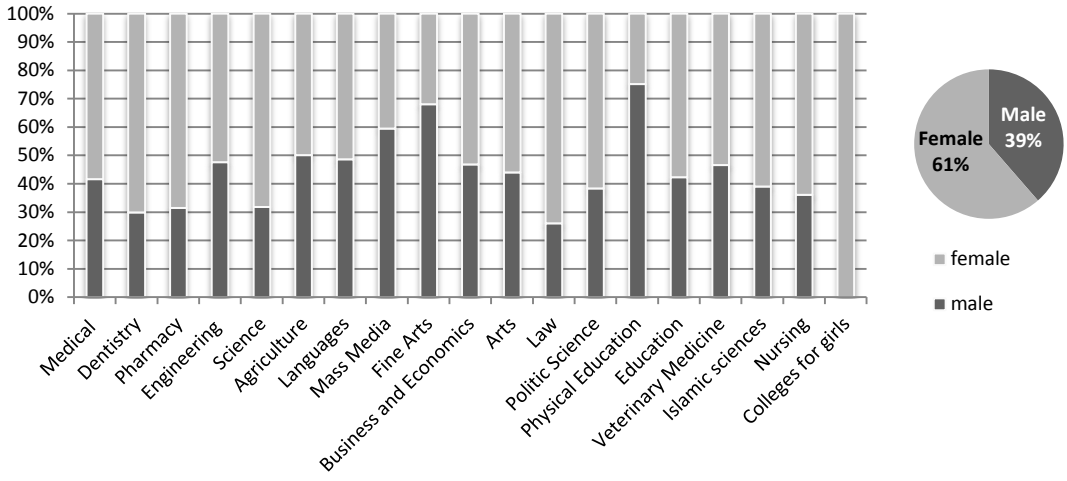

Figure 3.2: Gender distribution according to field of study for study year 2011-2012 [38], among 9151 accepted students, 61% were female students. Since there are specific colleges only for women, which comprise around 22% of all female students accepted in first year studies, these students have been excluded from the picture and counted separately in the rightmost bar. Colleges for women exist in the fields of Science, Education and Physical Education.

This high percentage of women is in part a consequence of the admission procedure to universities in Iraq which is controlled by the Ministry of Higher Education and Scientific

Research (MOHESR) and uses mainly the "Baccalaureate" examination score that the students get in their final exam in secondary school. Since girls usually tend to get higher scores in this exam, they have the highest percentage in almost all branches of study in the University of Baghdad (Figure 3.2).

Female students in computer science also graduate at the top of their classes for most study years (Figure 3.3 [40]):

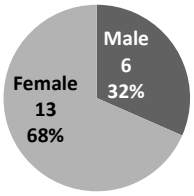

Figure 3.3: Top of the class distribution among, female and male students between 1991 and 2010.

There are 6642 faculty member at the University of Baghdad (47% are female and 53% are male), professors represent 10%, Asst. Professors 20%, lecturers 31% and Asst. lecturers 39% [38]. At the computer science department the majority of the faculty members are female, see figure 3.4 [40]. Moreover there are 34 assistant technician members at the computer science department of whom 91% are females, who work to guide students in the labs of the department.

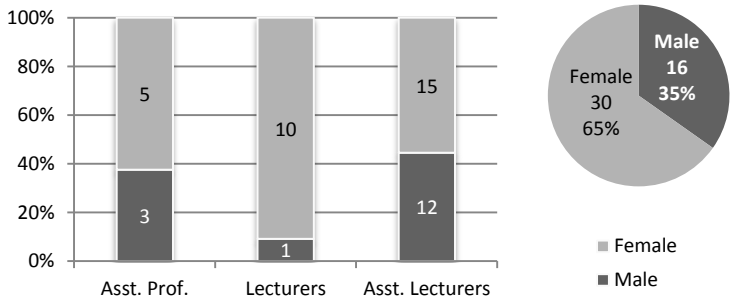

Figure 3.4: Faculty members at the computer science department.

3.3 Methodology

Participants were a volunteer sample of students of the computer science department at the University of Baghdad, 184 students covering every academic year participated in the questionnaire, 119 female students (65%) and 65 male students (35%), see figure 3.5. With the agreement of a lecturer in a class, specific time (about half an hour or more) was taken

from the lecture time at the beginning or the end of the lecture to allow students to answer the questionnaire. In the first 5 minutes, the study purpose was described, and students were asked to volunteer to participate, several questions asked by students regarding the questionnaire were answered. A discussion took place with freshman students (beginning and after work discussion) to discuss issues regarding study conditions and answering different kinds of questions such as studying abroad. The questionnaire has multiple choice questions as well as open questions (see [41]).

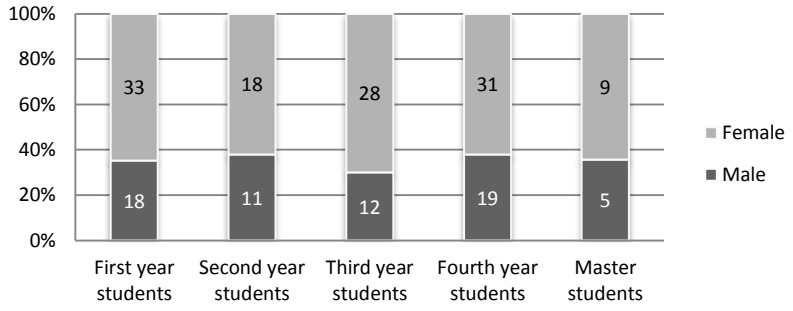

Figure 3.5: Students interviewed by the questionnaire.

3.4 Results and Discussion based on a Comparison between Male and Female Students

3.4.1 Real Passion of Study

Most of the students do not accomplish their dreams to study what they like and have passion for, because of the central acceptance procedures that are controlled by the MOHESR and the college/university. A question in the survey asking the students about their real passion to study after secondary school shows that only 22% of the female students and only 33% of the male students really wanted to study computer science. See figures 3.6A and B for the favourite fields of study of females and males.

Although most students of both genders did not have passion to specialize in computer science, only 25% of female students and 12% of male students regret studying computer science. Second year female students regret most, i.e. 44%. Those who had another favourite field of study were asked why they chose to continue studying computer science. 32% of all female students said that among others it was their family opinion to continue their study versus 21% for male students, while 33% of all male students said that computer science

interferes with the subject they have passion for, versus 20% for female students. Further reasons given were that getting a degree in computer science is considered a society privilege (female: 23%, male: 14%), having no other choice than completing their study (female: 8%, male 15%, this was stated by students in the open answer section). The rest 17% of both genders indicated other different reasons.

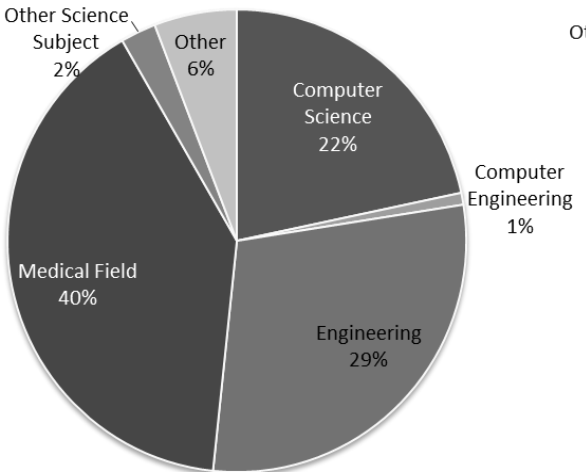

Figure 3.6A: Females' real passions of study.

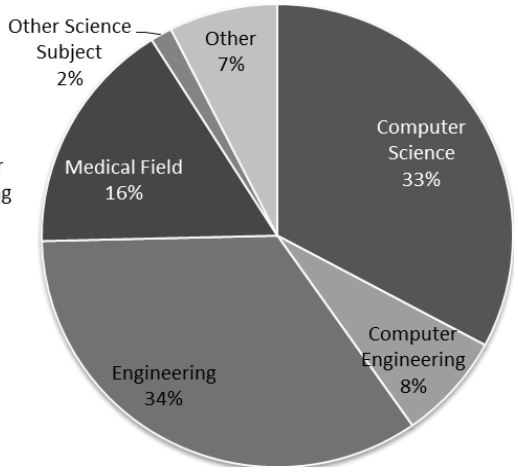

Figure 3.6B: Males' real passions of study.

3.4.2 Computing Lessons in School

Computing lessons with IT-related contents are given in some of the Iraqi schools during secondary education stage. As in figure 3.7 more female than male students attended computing lessons. When students, who have attended computing lessons, where asked about the teachers' influence to study computer science, there was 50% affirmation for males and 45% for females.

3.4.3 Knowledge of a Programming Language

The percentage of female students knowing a programming language before university study was 61% versus 49% for male. PASCAL is the most known programming language before college (Figure 3.8). C++ is known by students who have studied in technical institutes, of which the top ten graduate students of these institutes are allowed to apply to specific college studies after graduation.

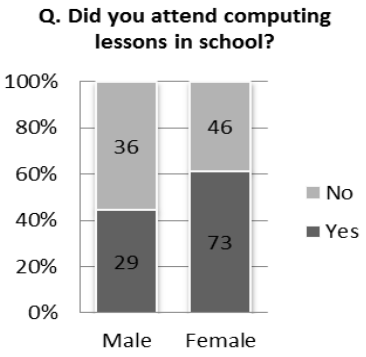

Figure 3.7: Students attendance to computing lessons in school

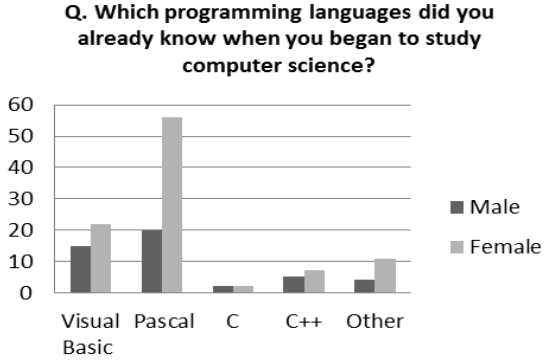

Figure 3.8: Knowledge of a programming language.

3.4.4 Computer Usage and Interaction

Because of sanctions by the United Nations after the Gulf War 1991 - 2003, most Iraqi families did not have the ability to buy a computer. This made a lot of students depend on the computers available at the university departments. Now the situation is much better but still not every student has his/her own PC before coming to the college, and most who own a PC had it since being a teenager. For freshman students this year, the survey shows that 22% of male students and 24% of female students do not have their own PC, 39% of male students and 28% of female students also do not have Internet access at home.

Those freshman students owning a PC had their first PC at a median age of 15.5 years old for male students, versus 17 years old for female students. On the other hand female students had an earlier interaction with computers than males with a median age of 14 years old for females and 15 years old for male students.

Game playing is the first form of interaction with a computer for 45% of the male students and 38% female students, other forms of early interaction varied mainly between application programs and Internet browsing.

In what areas do the students use the computer most? 36% of the male students and 29% of the female students said for programming. Other answers by male students were: 41% Internet, 14% gaming, 8% drawing/image editing, and 1% other application programs, while for female students the answers were: 55% Internet, 5% gaming, 2% drawing/image editing, and 9% other application programs.

What is noticed is that a higher percentage of male students than female students use drawing and image editing application programs, and this was confirmed by a another open question that asks students which application programs they use most, and the answer of male students was 24% for drawing/image editing programs, while only 6% by female students. Programming language editors had the highest percentage of 33% by male students versus only 13% for female students. Female students mostly use Microsoft application programs with a percentage of 51% of all answers, while only 27% of all their answers of male students.

And also in another question that asks the students about what fascinates them most about computers, male students' highest percentage was for programming, with 20%, then comes Internet browsing and chatting with 18%. Female students' highest percentage was Internet browsing and chatting with a percentage of 24%, then comes using a computer to do many things with 18%, and then programming with 12%. Again male students with a percentage of 13% indicated that they are fascinated by using drawing/image editing programs versus only 11% for females, and the percentage of being fascinated by games is 13% for males and only 9% for females.

3.4.5 Computer Science Study and Apprehensions

The main apprehensions concerning study for both genders is being unemployed in the future, it was 50% of all apprehensions of males, and 32% of all apprehensions of female students, see figure 3.9. The high percentage of male students may come because men see themselves responsible providing income to their families, while women are sometimes more dependent on men although they would like to work and participate. The second largest apprehension for female students that was close to being unemployed with a percentage of 31% was that studies might be too difficult for them, while the percentage of male students on this choice was only 10%. Surprisingly, although women are the majority of the computer science students and graduate more often at the top level of class they strongly underestimate their abilities, a cross-cultural phenomenon analysed in many circumstances [42].

The biggest apprehension of being unemployed in the future is due to the fact that Iraq is an oil country and in the past and present most jobs are provided in the government sector but now most government sectors do not hire unless the applicant is on top of the class. And

since 1991 till now there is no strong investment by the private sector due to sanctions, gulf war 1991 - 2003, and from 2003 till now, security issues.

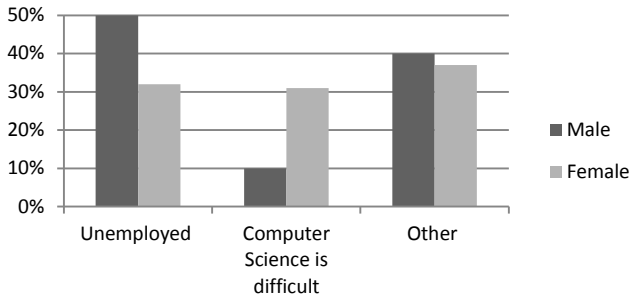

Figure 3.9: Main apprehensions concerning study for both genders.

3.4.6 Women, Men and Computer Science

According to the survey, 68% of the male students and 58% of the female students think that men do better in computer science. But the reasons for this attitude are different in the point of view of each gender; see Figure 3.10A and B.

Female students' attitudes tend to complain about their freedom situation in going out to access knowledge and experience outside the university, like working in the evening and late at night in local software market fields or in Internet cafes as male students do, mainly because of the family opinion willing to protect their daughters. Female students also see men work more as a team than women, and use the computer more often, knowing a lot of stuff about it, with a higher ability to understand scientific subjects. Male students' attitudes tend to assume that men are cleverer and better logical thinkers than women recognizing the issue that women do not have the freedom that men have. But also male students affirm with a higher percentage, that men do better in computer science but without giving a reason.

Of the other 32% of the male students and 42% of the female students who thought that men are not better in computer science than women, about 64% of each thought that there is actually no difference between men and women, it is just a matter of ability and logical thinking regardless of the gender, while 16% of the male students and 8% of the female students thought that women do better in computer science.

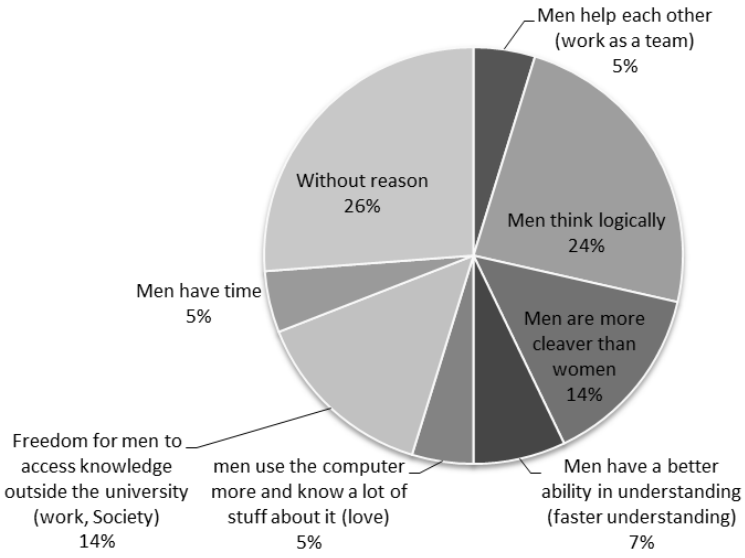

Figure 3.10A: Male students' opinion about men being better in computer science

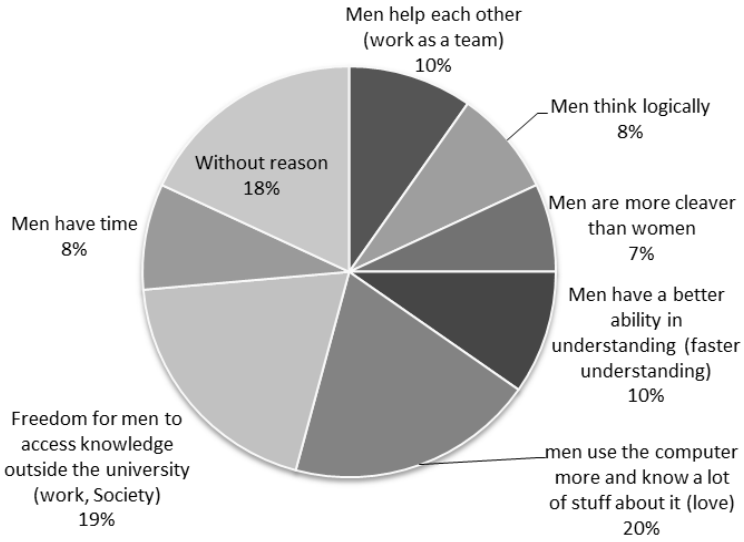

Figure 3.10B: Female students' opinion about men being better in computer science

For which gender the work in the computer science field is better suited? 89% of the male students and 91% of the female students said for both genders, while 11% of the male students and 9% of the female students said for male society. 0% selected "the female society".

To the question "What qualifies you for studying computer science?" 14% of the female students said that they are good in mathematics versus 13% of male students. And also 36%

of female students versus only 31% of male students say they like team working, but male students say with a percentage of 32% that they think in a logical way versus only 22% of the female students.

Regarding a question about what does a student see himself/herself in the future, the highest percentage for first year female students was 24% seeing themselves in the future as professional computer users, versus only 4% of their fellow students in the 4th year. This indicates a change in the attitude about what computer science is. Teaching computer science or about computers and their uses was the most popular profession among the 4th year students of both genders. This percentage grows from year to year from 19% to 42% for the females and stays over the years at around 20-24% for the males.

3.5 Comparison between Freshman Students of the University of Baghdad and the University of Potsdam.

Programming language knowledge, school background, university acceptance procedure, work expectations, and percentage of both genders in computer science studies differ considerably between Iraq and Germany. A restricted student attitude comparison has been made, based on mutual questions that were asked to a group of 45 freshman students at Potsdam University (winter term 2008/2009) (20% female, 76% male and 4% unknown gender) with group of 51 freshman students at the University of Baghdad (65% females, 35% male) can be seen in table 3.1.

Although the gender percentage in both populations is different, there are some similarities in the student answers, but there are differences as well. Ability to think logically and being good in mathematics (point 4 and 6, Table 3.1) is much higher for the Potsdam freshman students. This might be because the majority is studying computer science by free choice, having an idea that these are required properties in this study field, but on the other hand there is a percentage that is afraid that they might have the wrong conception of the studies (point 13, Table 3.1). Owning a PC is also much higher for Potsdam freshman students (point 5, Table 3.1), although owning a PC nowadays is a need for all studies not just for computer science. Students in both universities agree that there is no need to read a lot of books for computer science (point 9, Table 3.1). Computer science freshman students at the University of Baghdad have very high apprehensions about not being employed in the future (point 12,

Table 3.1), as described earlier, and are much more afraid of the study being not appropriate for them (point 11, Table 3.1) due to the acceptance procedure that assigned them to a field and a university. But what is noticeable is that computer science freshman students at Potsdam have higher apprehensions that the studies might be too difficult for them (point 14, Table 3.1).

	Category	Freshman at the University of Potsdam	Freshman at the University of Baghdad
Reason for choosing computer science as a study / continuing in it			
1	Guarantee to get a job later	44.4%	35.3%
2	Diversity of occupational possibilities	42.2%	43.1%
What qualifies a student to study computer science			
3	Like working in a team	48.9%	49.0%
4	Ability to think logically	60.0% ←	39.2%
5	Owning a PC	55. 6% !	29.4%
6	Being good in mathematics	51.1% ←	17.7%
Perspective and expectation a student has for computer science study			
7	Learning to understand many complicated issues	73.3%	49.0%
8	Spending much time using a computer	33.3%	25.5%
9	Reading many books	15.6%	13.7%
10	Learning many programming languages	53.3%	64.7%
Apprehensions concerning choice of study			
11	Computer Science not appropriate “for me”	4.4%	17.7%
12	Being unemployed in future.	2.2%	51.0%
13	Having wrong conception of the studies	35.6% ←	15.7%
14	Studies might be too difficult	57.8%	39.2%

Table 3.1: Some attitudes of freshman students of the computer science departments at the University of Baghdad and the University of Potsdam

3.6 Conclusions

The study in this chapter was initiated for investigating students’ attitudes in studying computer science without real passion and with women dominating the environment, due to the special admission procedure to colleges/institutes in Iraq. 77% of female students did not

want to study computer science, but at the same time only 25% regret doing that and they even usually graduate on top of the class.

Different factors may contribute to the women appealing attitude towards studying computer science, such as the point of view of both genders towards working in the field of computer science (about 90% of both gender said that computer science is for both of them). This may come from the fact there is no preconceived opinion in society toward classifying computer science as a boy thing and there are no misconceptions about working styles of people successful in the field, although 68% of male students and 58% of female students acknowledge that men do better in computer science.

There may be misconceptions about the field in particular for first year female students that showed up when the highest percentage for first year female students (24%) see themselves in the future as professional computer users, but only (4%) of their fellow students in the 4th year see themselves in this role, which shows a progress and understanding of what computer science is about.

Another factor may come from schools being single gender institutions in Iraq, which encourage girls to be more confident towards pursuing in science or technical studies with no boys sitting around them in class trying to affect the computing study environment negatively as described in [43]. Also the high female students' percentage in the computer science department might give them positive attitudes of being the majority in the class.

As described earlier academic and technical staff with a high female percentage provides a positive environment for women to study and progress, considering female lecturers as role models who encourage them to pursue their further study and possibly apply for post graduate studies.

The restricted comparison between freshman students of the University of Baghdad and their counterparts at the University of Potsdam shows that although women represent 65% of freshman computer science students at the University of Baghdad, they see computer science less difficult than the men representing 76% of freshman students at the University of Potsdam. The computer science freshman students at the University of Potsdam clearly state that computer science is appropriate for them, but at the same time are afraid of having the wrong conception of the studies, while the computer science freshman students at the

University of Baghdad have similar concerns on both apprehensions. This indicates that although the admission to the University of Potsdam is based on passion and most believe that computer science is a suitable study for them they have higher concerns about the study.

Most of the students do not accomplish their dreams to study what they like and have passion for, because of the central acceptance procedures that are controlled by the MOHESR and the college/university. Only 22% of the female students and only 33% of the male students really wanted to study computer science. Getting a degree in computer science is considered a society privilege for most of the students families as the computer science department is considered the top department at the college of science in Iraq, so families usually encourage their sons and daughters to continue in the field although they wanted to pursue a study in medical or engineering fields, other options for the student could be a private college or studying abroad but it will be expensive for the family of the student as they are usually responsible for all the expenses of their son/daughter. Another option for the student is to move into a different department or college but it must obey the rule that the department has a seat for the student and it must have accepted students with lower scores than the computer science department, moving to departments in colleges that accepted students with scores higher than the college of science is not possible. So students usually have no choice just to continue in their study and try their best to succeed and graduate to make their families proud about them. The case in Germany is different, students usually pursue their dreams and get accepted in the field that he/she wants, unless that field requires specific demands from the students as for example a higher Abitur* score (final exam in secondary school equal to Baccalaureate in Iraq) so we can find for example business informatics students studying at the computer science department in Germany while they wanted to study business administration but they could not get accepted their because of their Abitur score. But those students have the opportunity to transfer into business administration after collecting some points for succeeding in specific subjects. Such flexibility is not available for Iraqi students. Iraqi pupils could stop attending exams of the final test in secondary school (Baccalaureate) or deliver their exam papers empty after they see themselves not performing good in one or more of the exams, forcing him/her self to fail and remain in the 12^{th} grade (final year of secondary school) to take the final exam again after one year (the student must retake all the subjects again in this case), but this of course puts the student in big pressure in which some could not bear so they choose to continue in the exams of the final test hoping that they will get a decent score at the end. Flexibility in the higher education system in Germany could

encourage students to think in changing their field or the university, which is not likely possible in Iraq where students are forced to do their best otherwise they will keep failing at the same department till they get expelled, but this forcing to study a field that the students did not want could affect the creativity level of students and the willing to know more and to gain experience in their field, making the students more willing to only study to succeed without real passion to learn. Some may choose after graduation to study the field they have passion for, usually in evening studies at Iraqi universities were you have to pay an annual fees.

The students who get accepted at the University of Baghdad mostly have excellent score in their final test in secondary school, beside other students who are accepted also because they were among the top ten graduates in their institutes that relates to computer science. So the students who usually get accepted are clever students, so it is for them easier to manage and cope with the difficulty of the informatics and mathematic subjects, even if computer science was not their first choice. Unlike the situation at the University of Potsdam where students usually get accepted as long as there is a free student seat at the department of computer science, this could lead them to think in changing the study field if they face difficulties in some subjects.

Chapter 4:

Learning Styles of Students at the

Department of Computer Science – University of Potsdam

4.1 Introduction

This work is to understand the learning style preferences of students at the computer science department – University of Potsdam, to be aware of which changes are necessary to be adopted in the teaching methods, in an attempt to make an impact on reducing the dropout rate among students, and to suggest a better learning environment meeting most of the students' learning style preferences.

It is generally agreed that different learning styles exist and there is a general acceptance that the manner "in which individuals choose to or are inclined to approach a learning situation" has an impact on performance and achievement of learning outcomes [44]. So incorporating learning styles in teaching plans may make learning easier and leads to better achievements [45].

Researchers have developed many different models for identification of learning styles. In general, a learning style model classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information [46]. Examples of learning style models: Kolb, Honey and Mumford, and Felder and Silverman. Each proposes different descriptions and classifications of learning styles. In this study, the Felder-Silverman learning style model (FSLSM) is used; most other learning style models classify learners into a few groups, whereas Felder and Silverman describe the learning style of a learner in more detail, distinguishing between preferences in four dimensions, as will be described later. It is based on tendencies, indicating that learners with a high preference for certain behaviour can also act sometimes differently [45]. Also it is easily administered over the web [50, 53], Graf et al. in their paper entitled 'In-Depth Analysis of the Felder-Silverman Learning Style Dimensions', see [45], state: 'The results showed a more accurate description of FSLSM, pointing out relevant characteristics within the dimensions. Especially for the use of learning styles in technology-enhanced learning, such an accurate description is important for relating the leaning style model with the features of the online environment.'

The Index of Learning Styles (ILS), created by Felder and Soloman, is a questionnaire for identifying the learning styles according to FSLSM, where 11 questions are assigned for each dimension. Each question has two answer choices and the respondent should pick the most suitable one. Each choice represents a preference on a dimension. The preference that scores higher is the dominant preference in that dimension and the difference in scores indicates the strength of the preference. When a dimension is in balance, meaning that the score is between -3 and 3, a student can switch between the preferences depending on the teaching style. In practice this means that no matter which preference is used in teaching, such students will manage. The students that need the teacher's attention are those whose preference is moderate or strong (meaning that the score is between -5 and -11 or between 5 and 11). The more students in that category, the more a teacher should adapt the teaching to meet their needs [47, 48, 49].

It is much easier to fill the ILS than the Kolb's Learning Style Inventory (LSI) as Zywno stated, see [54]: 'Kolb's LSI usefulness in a classroom setting may be limited. The author observed that any voluntary survey that took longer than 10 minutes were much less likely to be completed and returned, by students and faculty alike.'

But in the paper of Zwanenberg et al., see [56], and from a psychometric standpoint and conceptualisation basis, there were some doubts: 'From a psychometric standpoint, the low internal reliability of the scales on the Index of Learning Styles is a worrying feature. Doubts also remain over the conceptualisation of learning styles which underlies the ILS, both in the bipolarity of the scales and their definition. Whilst the ILS may have some value, as its authors recommend, as an instrument to assist students, principally those of engineering, to specify their preferences for learning, extension beyond that is not advisable. Certainly, in the current research, the use of the ILS as a predictor in a selection context was not at all successful.'

Felder et al. stated in their paper entitled 'Applications, Reliability and Validity of the Index of Learning Styles' that: as long as the Index of Learning Styles is used to help instructors achieve balanced course instruction and to help students understand their learning strengths and areas for improvement (as opposed to being used to predict students' grades or dictate their course and curriculum choices), then the current version of instrument may be considered reliable, valid and suitable [55].

According to FSLSM, each learner has a preference on four distinct dimensions: active/reflective (ACT/REF), sensing/intuitive (SEN/INT), visual/verbal (VIS/VER), and sequential/global (SEQ/GLO). Active learners learn by trying things out and working together with others, learning through first-hand experimentation in collaboration settings, whereas reflective learners learn by thinking things through and reflecting about them, they prefer to learn alone by personal reflection. Sensing learners like to learn from concrete material like examples, tend to be more practical, and are careful with details, they prefer empirical facts and practical procedures, while the intuitive learners prefer to learn abstract material, like challenges, they prefer conceptual meanings and theories, and they are more innovative. Visual learners remember best what they have seen, prefer things like visualization software, whereas verbal learners prefer lecture or textbook resources, they get more out of words, regardless whether they are spoken or written. Sequential learners prefer learning in a series of steps leading to broader understanding, whereas global learners prefer to work from conceptual frameworks and fill in the gaps and they prefer a higher degree of freedom in their learning process [46, 47, 48, 49, 53].

The main goal of this research is to understand the learning style preferences of students at the computer science department – University of Potsdam, to look into the personal aspects of students from the side of their learning style preferences. And to look into the differences between students of different study fields at the department who usually take some joint courses. knowledge of learning styles can be used to increase the self-awareness of students (and teachers) about the strengths and weaknesses of their own learning and that of others [58]. So this study will present and discuss initial results of using the Index of Learning Styles (ILS) questionnaire developed by Felder and Soloman, which is a 44-item questionnaire for identifying the learning styles according to Felder-Silverman learning style model FSLSM. The study was presented and published at the IFIP / KCICTP – WG3.4 parallel conference stream that took place at the University of Potsdam, Germany, in July 2014.

4.2 Methodology

Participants were a volunteer sample of students of the computer science department at the University of Potsdam, 135 students covering every academic semester with different study specialties (42% Computer Science, 34% Business Informatics, 16% Teaching Computer

Science, and 8% other specialties) participated in filling the ILS questionnaire (a multiple choice questionnaire, see [50]), 116 students filled the questionnaire electronically while 19 students filled a hard copy. 45 female students (33%) and 90 male students (67%) participated in the research (Figure 4.1 shows the number of the students participating in the research according to gender in each specialty and figure 4.2 shows the number of students from each semester).

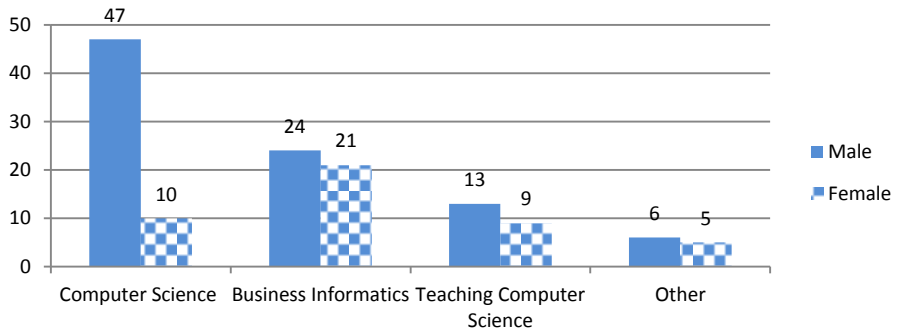

Figure 4.1: Number of the students according to gender of each specialty

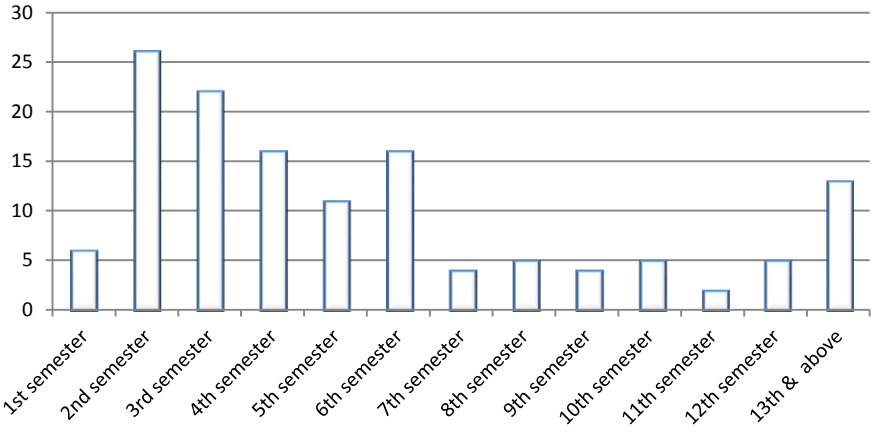

Figure 4.2: Number of students from each semester

4.3 Results and Discussion

From figure 4.3 which shows the preference of all students one can see that students are more active, sensing and visual while more balanced for the sequential/global dimension. The results, for each of the specialities computer science, business informatics, and teaching computer science and according to gender are discussed below.

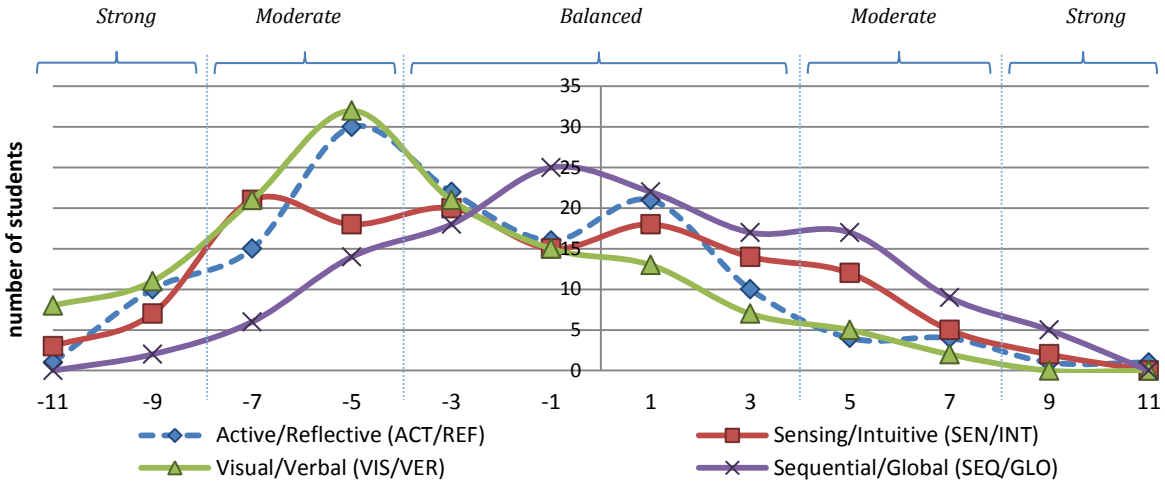

Figure 4.3: Distribution all four dimensions distribution of the students' learning styles

Active/Reflective (ACT/REF) Dimension

Figure 4.4A shows that business informatics students are more active learners than the other students, this is because the female business informatics students are more active learners than the other female students (30% of the female computer science students are moderate active learners, while about 52% of the female business informatics students are moderate or strong active learners, with none of them being moderate or strong reflective learners), see figure 4.4C. The male students are more divided between being "moderate or strong active learners" and being "balanced", see figure 4.4B. The male teaching computer science students are more balanced, while the female teaching computer science students have tendency towards being more active learners, see figure 4.4B and C.

Sensing/Intuitive (SEN/INT) Dimension

Figure 4.5A shows that business informatics students are more sensing learners than the other students, this is because male business informatics students are more sensing learners than the other male students (computer science and teaching computer science), with none of the male business informatics students being moderate or strong intuitive learners, see figure 4.5B. The male teaching computer science students have the tendency in being strong intuitive learners, while the female teaching computer science students are more sensing, see figure 4.5B and C.

In general, the female students are more sensing learners, while the male students are more balanced (except the male business informatics students who are divided between being "moderate or strong sensing learners" and being "balanced").

Visual/Verbal (VIS/VER) Dimension

Figure 4.6A, B, and C show that most students are between balanced and moderate visual learners, with computer science students having a bit more tendency towards being strong visual learners, especially the male computer science students, and the other male students share the same tendency, especially the male teaching computer science students. The female business informatics students are more balanced, while the female computer science students are more moderate visual learners. None of the female computer sciences students and none of the male teaching computer science students are strong or moderate verbal learners.

Sequential/Global (SEQ/GLO) Dimension

Figure 4.7A, B, and C show that most of the students are balanced, but the computer science students have a little bit more tendency towards being global learners.

All dimensions

Since there is a sufficient number of male students (computer science and Business informatics) in our sample let's take another look on their learning style preferences grouping the students on whether they are 'strong or moderate' towards one dimension or being balanced, see figure 4.8. You can notice easily that there are more male computer science students than male business informatics students who are reflective, intuitive, visual, and global learners, with none of the male business informatics students being moderate or strong intuitive learners.

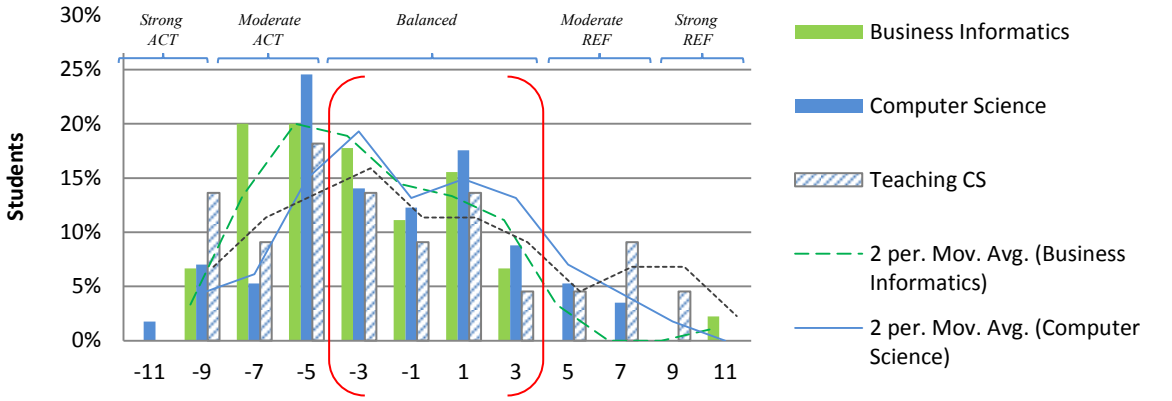

Figure 4.4A: Active/Reflective (ACT/REF) dimension distribution for students

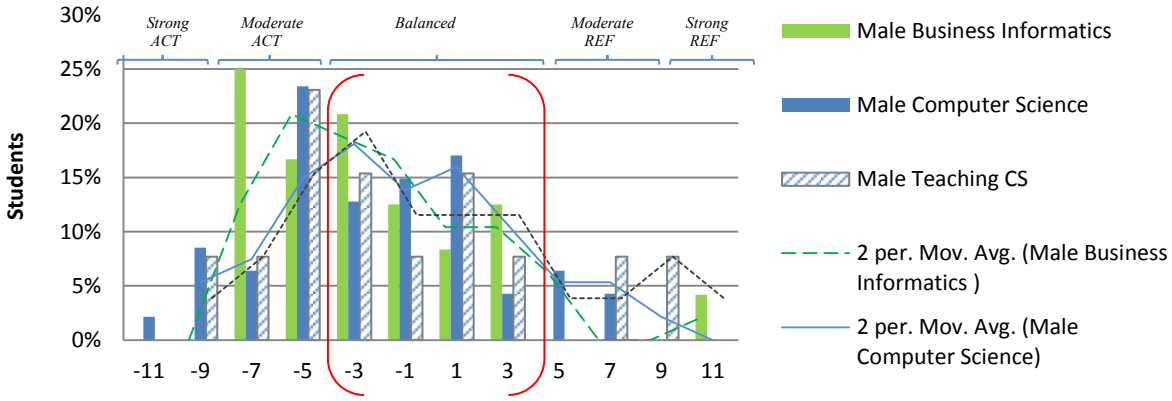

Figure 4.4B: Active/Reflective (ACT/REF) dimension distribution for male students

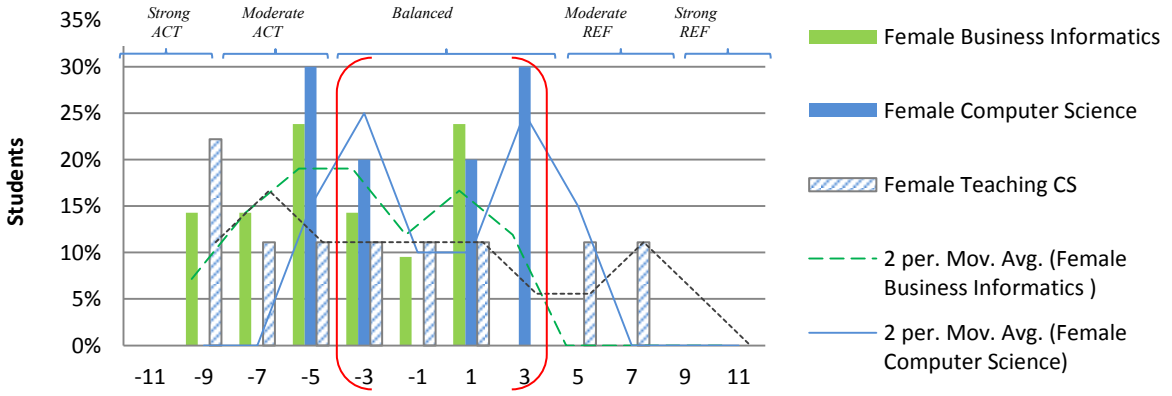

Figure 4.4C: Active/Reflective (ACT/REF) dimension distribution for female students

Figure 4.4A, B, and C: Active/Reflective (ACT/REF) dimension distribution of the students of Business Informatics, Computer Science, and Teaching Computer Science, distinguishing between genders

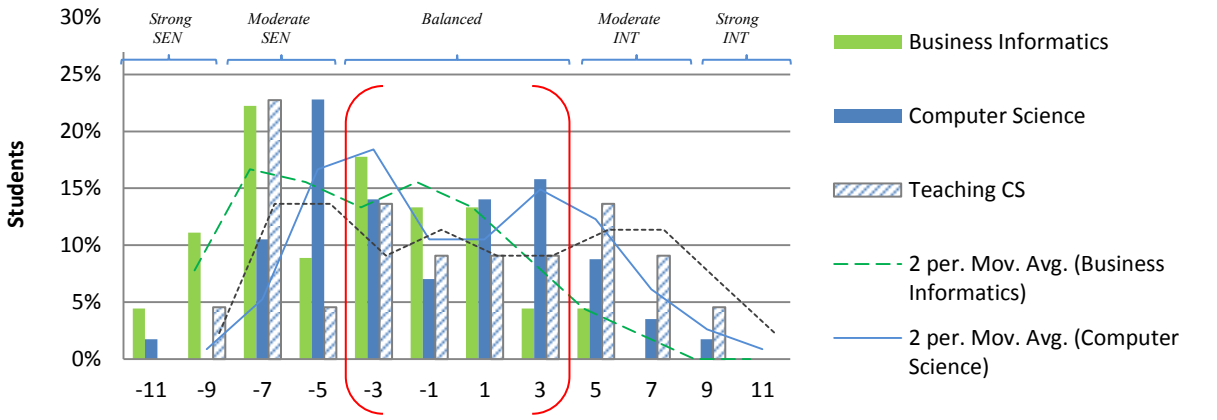

Figure 4.5A: Sensing/Intuitive (SEN/INT) dimension distribution for students

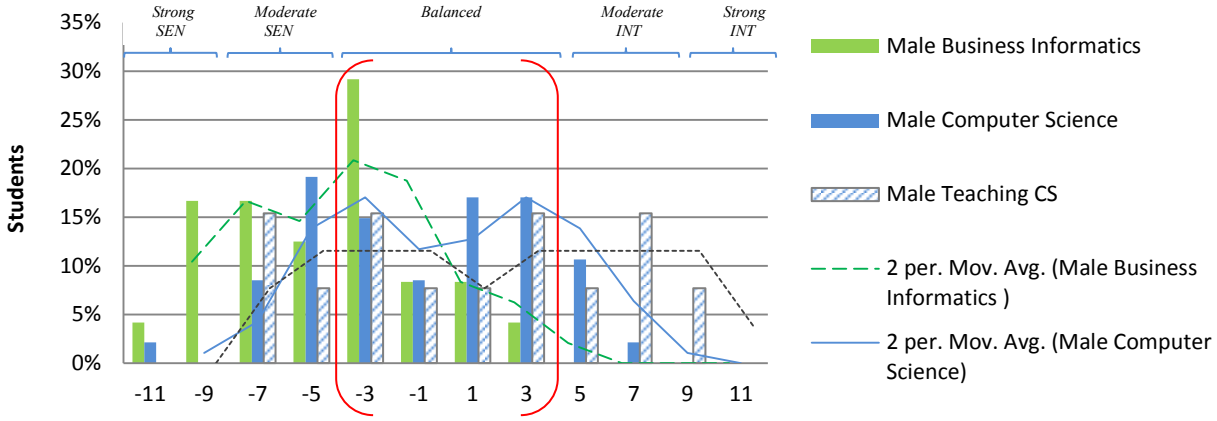

Figure 4.5B: Sensing/Intuitive (SEN/INT) dimension distribution for male students

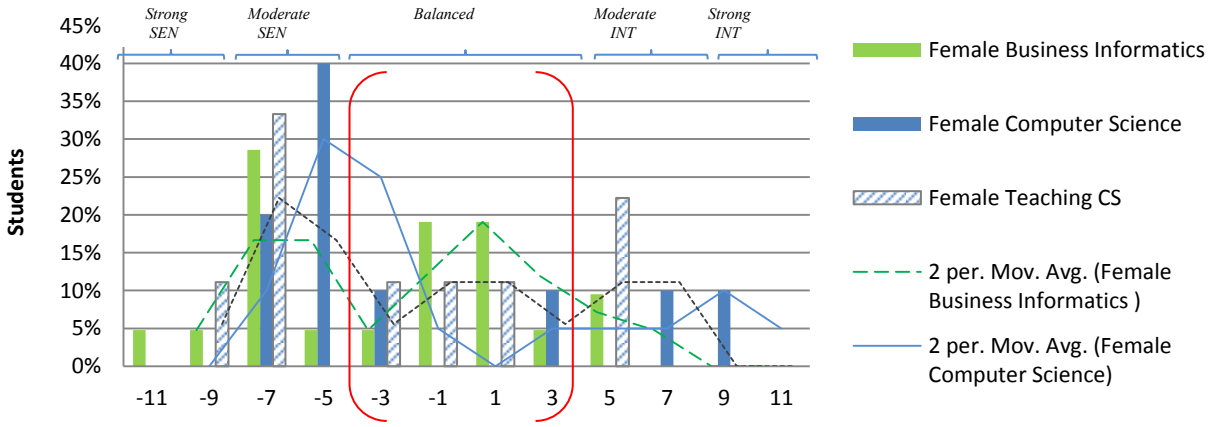

Figure 4.5C: Sensing/Intuitive (SEN/INT) dimension distribution for female students

Figure 4.5A, B, and C: Sensing/Intuitive (SEN/INT) dimension distribution of the students of Business Informatics, Computer Science, and Teaching Computer Science, distinguishing between genders

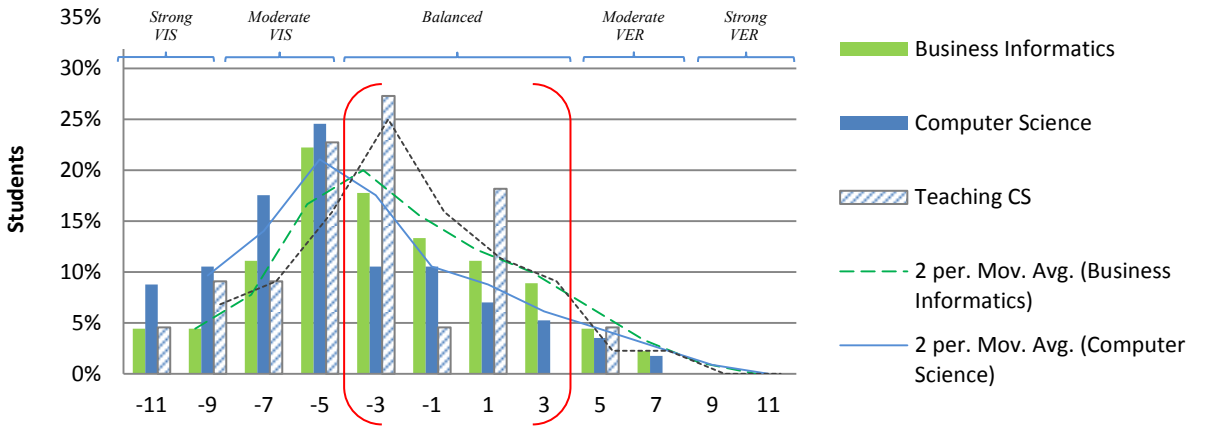

Figure 4.6A: Visual/Verbal (VIS/VER) dimension distribution for students

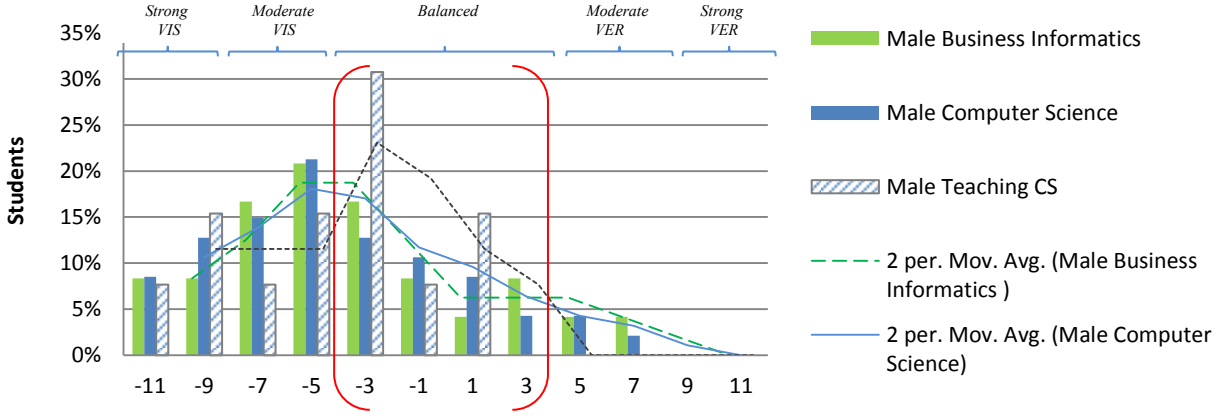

Figure 4.6B: Visual/Verbal (VIS/VER) dimension distribution for male students

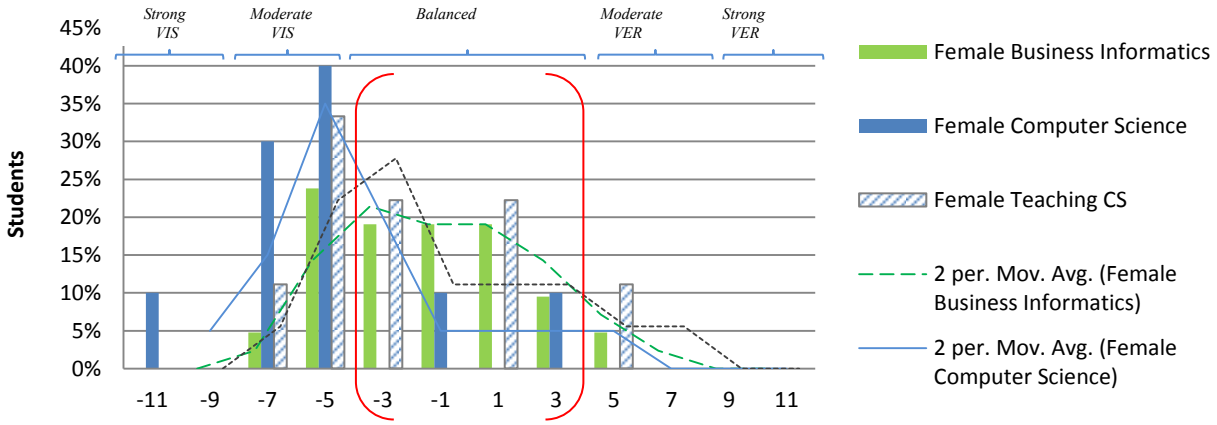

Figure 4.6C: Visual/Verbal (VIS/VER) dimension distribution for female students

Figure 4.6A, B, and C: Visual/Verbal (VIS/VER) dimension distribution of the students of Business Informatics, Computer Science, and Teaching Computer Science, distinguishing between genders

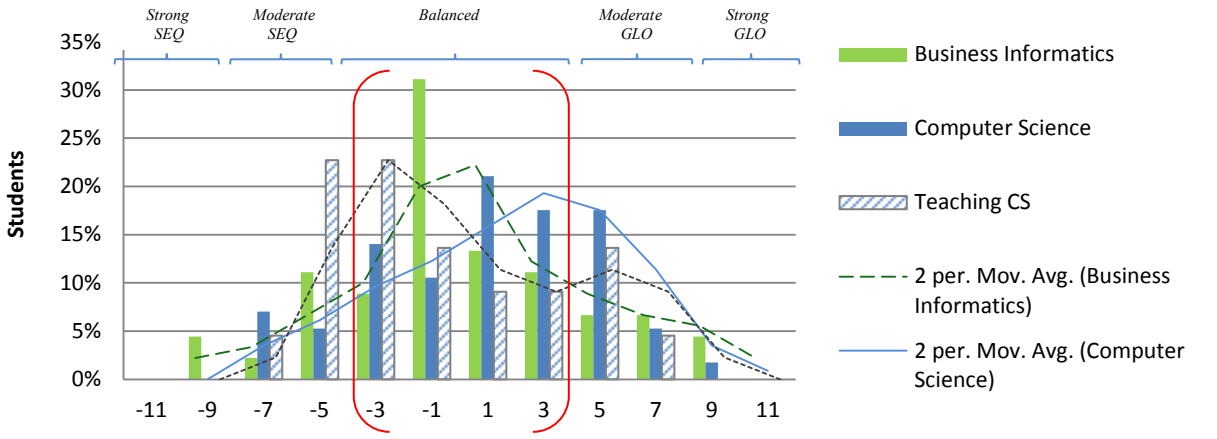

Figure 4.7A: Sequential/Global (SEQ/GLO) dimension distribution for students

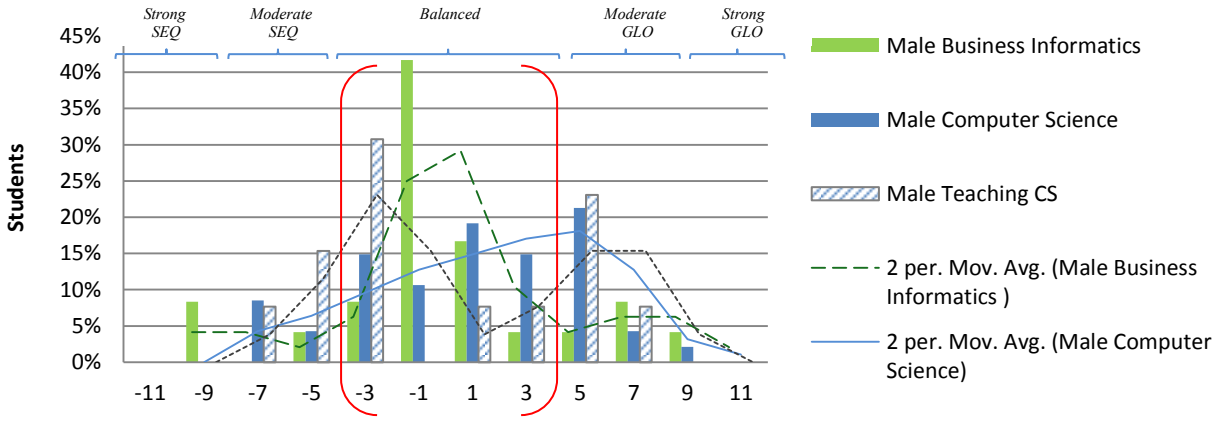

Figure 4.7B: Sequential/Global (SEQ/GLO) dimension distribution for male students

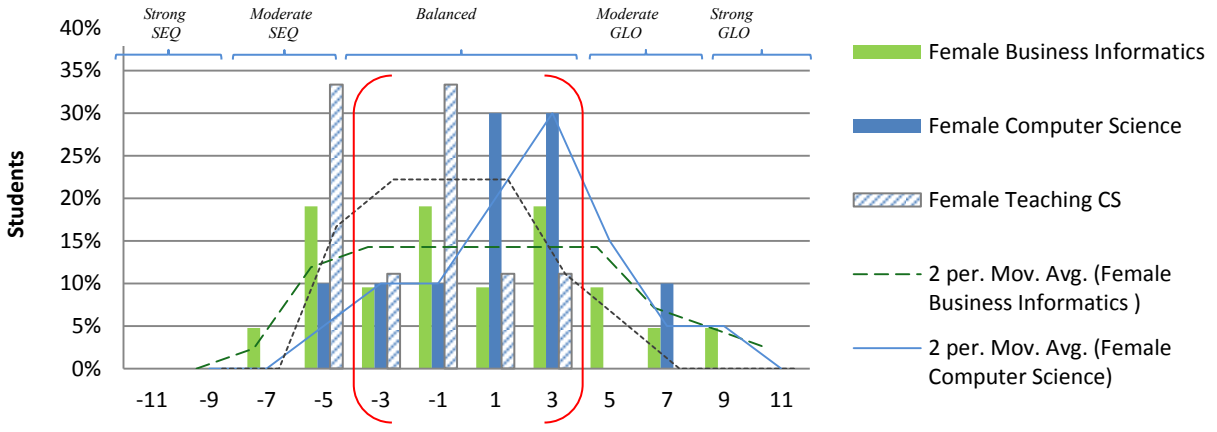

Figure 4.7C: Sequential/Global (SEQ/GLO) dimension distribution for female students

Figure 4.7A, B, and C: Sequential/Global (SEQ/GLO) dimension distribution of the students of Business Informatics, Computer Science, and Teaching Computer Science, distinguishing between genders

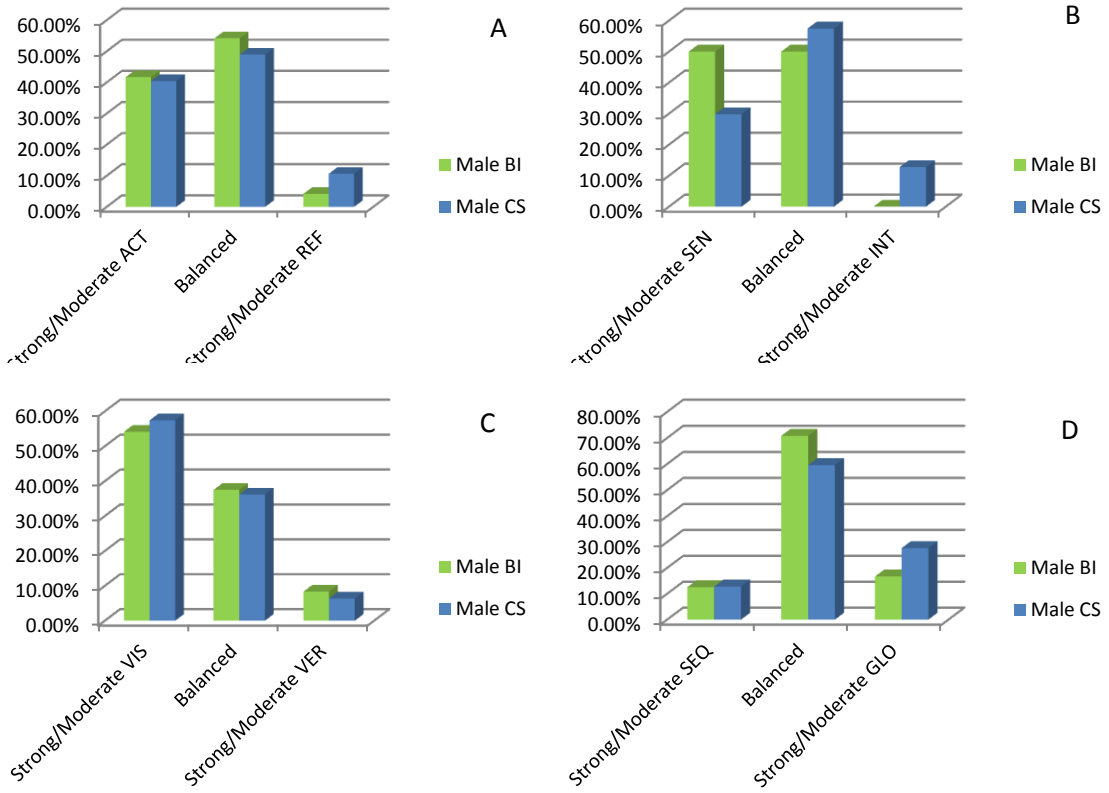

Figure 4.8A, B, and C: All dimension distribution of the male students of Business Informatics and Computer Science, distinguishing between being balanced or being 'moderate or strong' towards a dimension.

Students' Opinions

Students who filled an electronic copy of the questionnaire and who had provided us with a valid email address were sent the personal learning styles results of the first questionnaire (the learning style questionnaire) along with a discussion of its meaning and recommendations, see Appendix B for an example. A second questionnaire was sent later to those who had their results to ask them whether they agree with the results they had received. 19% of them responded, see figure 4.9. Most of them agreed with the results, but in the sensing/intuitive (SEN/INT) dimension students had the biggest doubts whether the results matched their real learning style.

Students who filled a hard copy of the questionnaire (19 students; 8 females and 11 males. 17 of them were business informatics and 2 other computer science students) were asked directly afterwards to give their opinion about their own learning style preferences before giving them the results of the questionnaire. First the students were introduced to each dimension and then

they gave their opinion. There were many mismatches that could vary from being strong mismatches, to minor mismatches. Strong mismatches are the ones who differ a lot from what the student had predicted and the result of the ILS test, 1 strong mismatch for the active/reflective (ACT/REF) dimension was found (a student predicted to be a strong active learner while he was balanced), 3 strong mismatches for the sensing/intuitive (SEN/INT) dimension were found (one student predicted that he was a strong intuitive learner while he was balanced, the other predicted that he was a strong sensing learner while he was also balanced, the last one predicted that she is a moderate sensing learner while she was a moderate intuitive learner). Also 1 strong mismatch for the visual/verbal (VIS/VER) dimension was found (a student predicted that he was a strong visual learner while actually he was balanced according to the ILS test). And finally 1 strong mismatch for the sequential/global (SEQ/GLO) dimension was found (a student predicted to be balanced while he was a strong sequential learner according to the ILS test).

Moderate/Minor mismatches has been found also, as for example some students were predicting to be moderate learners for a specific style while they were actually more balanced or visa verse, or predicting they were strong learners of a specific style while they were moderate over a specific dimension. 5 moderate/minor mismatches were found for the active/reflective (ACT/REF) dimension, 4 moderate/minor mismatches were found for the sensing/intuitive (SEN/INT) dimension, 8 moderate/minor mismatches were found for the visual/verbal (VIS/VER) dimension, and 5 moderate/minor mismatches were found for the sequential/global (SEQ/GLO) dimension.

The reasons behind these mismatches could be because the student did not understand well the meaning of a specific dimension, as in the case of the student who predicted to be a moderate sensing learner while she was a moderate intuitive learner, or it could be because the student exaggerated in expressing their tendency towards one style over the other for a specific dimension, for example some said they predicted to be strong learners of a specific style while they were more moderate or balanced, or others said they were moderate while the test showed that they are more balanced. Or it could be because the students did not really know exactly which style they prefer so he/she chose to say I am balanced while he/she had tendency to a specific style over the other.

Mismatches may also have occurred because the students did not really know which option to choose when taking the test (for each question there are only two options which students had

to choose between), two students said that their choice may differ from one subject to another, and for that they were confused whether they have to choose answer *a* or *b* for some questions, they said both answers could be right depending on the subject they are learning.

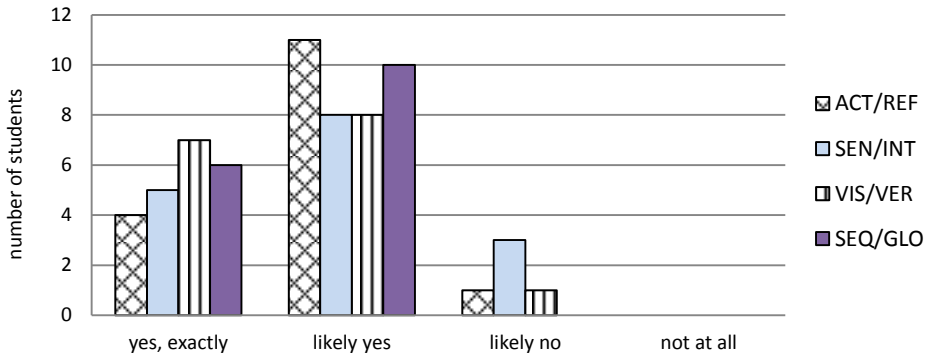

Figure 4.9: Students opinion about the results (21% of who had filled the electronic copy of the ILS questionnaire, and provided a valid email)

4.4 Conclusions

By using the Index of Learning Styles (ILS) questionnaire developed by Felder and Soloman, one can notice differences in the preferences of learning style between male and female students of different study fields at the computer science department, as well as differences between students with different specialties, for example: female business informatics students are more active learners than the female computer science students, and both of them have no moderate or strong preference towards being a reflective learner. When comparing between male students we found that male business informatics students are more sensing learners than the other male students, none of the business informatics students were moderate or strong intuitive learners, while the male teaching computer science students have tendency of being strong intuitive learners. Computer science students have a little bit more tendency towards being strong visual learners, especially the male students, and have a little bit more tendency towards being global learners.

Unfortunately the number of the female computer science students participating in this study is only 10 students while there are 21 female business informatics students, results may have been more precise if more female computer science students had participated.

So why do such differences exist in learning styles? There are differences in learning styles between students of different study fields at the computer science department and differences between male and female students. Students have the choice to apply to which field they desire, except the business informatics students some of whom wanted to study business administration rather than business informatics, but this also made them end up as group of students studying business informatics, so the differences could have happened based on the students desire towards one of the specialities. So a lot of students who have the same learning style preference ended up together in a specific study field at the university. An interesting approach in research could be done by investigating and comparing the learning styles preferences results with students studying computer science without a desire, as in the case of most students who are studying at the University of Baghdad in Iraq (see chapter 3 for details about the acceptance procedure to universities) to see whether there are dramatic or obvious differences in their learning style preferences compared to the computer science students who are studying at the university of Potsdam especially when there are students who wanted to study in the medicine field beside other different fields. Such approach in research could not be achieved in this research due to travel difficulties and expenses. The differences could have also been influenced by the study field itself, but this requires an update on the learning style preferences of the students. The test should be taken every semester on the same sample of students to see if changes occur in the learning style preferences of students, which probably could also happen even without being influenced by the study field.

This study did not look into the relation between students' learning styles and their course performance, but according to a study done by Allert, J. on 211 students taking an Introductory Computer Science Course, see [53], there is a correlation. He concluded that two learning style dimensions were highly correlated with performance (Active/Reflective and Visual/Verbal), Reflective and verbal learning style students achieved top grades more frequently and lower grades less frequently than their scale opposites (active and visual learners respectively). His findings agreed with the results of Chamillard and Karolick study, see [54], and Thomas et al. study, see [55]. Aller, J. executed the Soloman-Felder ILS twice in his study, ten weeks apart, in an effort to test for reliability. Some results with discussion about performance and learning styles on a smaller sample of students can be found in chapter 5, section 5.4.8.

Further research should be conducted in this area to look into these differences in a way that reflects positively on the teaching methods of the subjects that embrace all those students who might differ in the way they learn. More investigation in the ILS questionnaire should also be adopted to overcome some of the problems in distinguishing learning styles, for example the visual/verbal (VIS/VER) dimension. On the other side, we did not go further in our investigation in this area and we chose to do investigation in problems and issues that we thought are more essential to our research question since we believed at that time that any deficiency or ignorance in the type of lecturing (teaching methods) in taking into consideration the different learning styles preferences of students could be remediated by the students themselves through seeking other possible ways in learnings to fulfil their needs in meeting their preferred learning styles (such recommendations and advices were given to our sample of students who wanted a copy of their results, see Appendix B). But we believe that it is a good thing to present the students as well as the lecturers to these learning styles, as we have done, to let them know that such differences in the preferred way of learning do exist, allowing the students to choose the best ways in meeting their desired learning styles and allowing the lecturers to design their lectures in a balanced way that meets most of the students' preferred learning styles. As Maric et al. expressed, see [57]: Better knowledge of learning styles makes students better able to adapt to different situations. The application is the same for the professors to adequately adapt the teaching approach.

Chapter 5:

Student's "Dropouts" from the Department of Computer Science – University of Potsdam

5.1 Introduction

The intent of the study is to understand the problems, difficulties, attitudes and apprehensions students are facing which may lead them to think in changing or dropping out their study or moving to another university, in an attempt to identify possible changes that could be adopted by the University or the department to make an impact on reducing the "dropout"/shrinkage rates among students, and to suggest a better learning environment.

The computer science department at the University of Potsdam accepts students with a non-restrict admission procedure. Different students, with different scientific and performance levels, are accepted at the department in three main study programs (computer science, business informatics, and computer science teacher), which usually have some joint courses. Abitur score (final exam in secondary school) is taken into consideration at first, when students apply to the university study, but usually all students who are applied get accepted due to available study positions. So the investigation took place among a sample of students in this kind of university admission and study environment.

Background of the study is found in chapter two.

5.2 Methodology

Participants were a volunteer sample of students of the computer science department at the University of Potsdam. A total of 57 students (male: 40, female: 17) out of 294 students registered for the course "Fundamentals of Programming 1" responded and agreed to participate in the study. An invitation was sent to these students to participate in the study via an Email with the help of Prof. Dr. Schwill, see Appendix C.

Three credit points in the field of "Key Competencies" (German: Schlüsselqualifikationen) were promised to encourage participation for continuous support in this study. The intention was to make one interview every semester with the same sample of students to follow their

progress and changings in attitudes towards their study as they move from one semester to another.

A second email was sent to these 57 volunteer students to acknowledge their registration in the study and invite them to the first interview, see Appendix D; only 26 students (male: 17, female: 9) responded and registered for the first interview, their study field was: Business Informatics: 21 students, Computer Science: 3 students, and Teaching CS: 2 Students. Registered students who did not respond to the email of invitation to the first interview were sent a second email as a reminder after a few days.

The first interviews occurred between December 19, 2012, and January 30, 2013, on campus, at time arranged with the interviewee via "Doodle"; each volunteer selected two dates accessible for him/her via "Doodle" to arrange for the interview, then an email was sent to each one of them to specify one of the dates suitable for the interview, each student had his/her own code and used it instead of his/her name to select interview dates. The participants provided response to different open-ended questions, see Appendix E.

A questionnaire was sent to the same volunteer sample of students in the following semester, June 22, 2013, see Appendix F. The intention was to follow-up their progress, continuity, and new problems or difficulties in their study. Students also specified which subjects they had passed or failed in the previous semester. Only 23 students (male: 15, female: 8), who were Business Informatics (19), Computer Science (3), Teaching CS (1), responded to the questionnaire.

The second interviews occurred between January 20, 2014, and February 12, 2014, on campus, at time arranged with the interviewee via "Doodle", each student had his/her own code and used it instead of his/her name to select interview dates the same way they did in the first interview but this time he or she selected only one date for the interview, see Appendix H. Only 20 students (male: 12, female: 8), who were Business Informatics (17), Computer Science (3), responded and registered for the second interview. The participants also provided response to different open-ended questions concerning their progress and continuity in study along with their attitudes, see Appendix G.

Before every interview, the researcher took permission from each interviewee to be recorded, reinforcing the fact to the interviewee that all the information he/she shares is confidential.

The interview length varied from one participant to another, the specified time for each interview was about two hours for the first interview, with an average length of approximately thirty-six minutes. And one and a half hour for the second interview with an average length of approximately forty-nine minutes.

Follow-up questions were sent later to the students via an email to see whether or not they were still continuing in their study at the University of Potsdam. All the interviews transcripts and questionnaire data was coded using MAXQDA11, for information about MAXQDA11 and our coding (tags) see Appendix I.

5.3 Study Limitations

The study is limited to the department of computer science at the University of Potsdam in Germany. Students in other institutes/universities in Germany may or may not have the same apprehensions, attitudes, problems and difficulties, due maybe to a different acceptance procedure for its students and/or a different educational approach.

No contact was possible to be made with students who already dropped out of their study (they may have changed field or university), due to the confidentiality of such information at the university system. So the study was limited to the students who registered and continued in this study.

Some volunteers did not respond to questions or attended interviews in this study, so the reasons behind the discontinuity of few of them is unknown and it is only possible to predict it depending on the information they gave before they left this study.

The number of the volunteer computer science students was much less than the number of the volunteer business informatics students, although 16 computer science students agreed early to participate in the study, only three responded to the first interview and continued through this study.

Only two computer science teacher students chose to participate in the study but after they responded to the first interview one of them stopped responding to the following steps of the research without giving a reason and the other said on his second semester that he will not

continue in his computer science study but will change to a different study field because he could not manage to pass the exams. Therefore, this study will not contain their responses.

5.4 Results

5.4.1 Real Passion of Study

Most of the participants did not accomplish their dreams to study what they like, because of their examination score at their final exam in secondary school (in Germany called: Abitur which is equal to Baccalaureate in other countries) was not enough to gain what they wanted. Only 33% of the participants were studying according to their passion, 4% did not have a specific study in mind before they applied to the University of Potsdam, and the others wanted to study business administration or other fields of study, see figure 5.1.

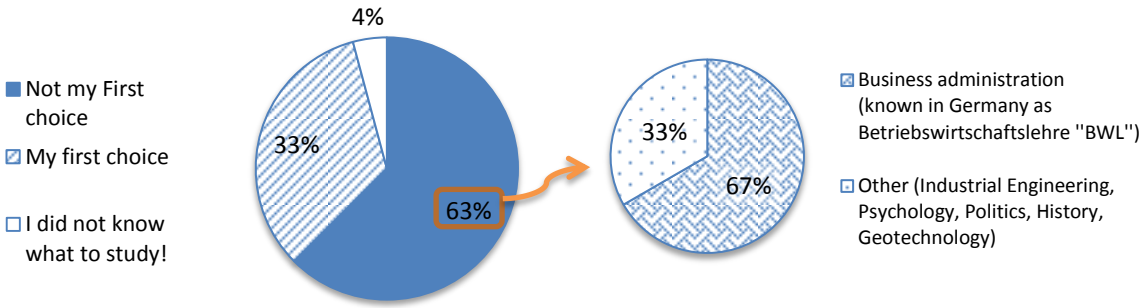

Figure 5.1: Real passion of study

Below are some of the student's answers when they were asked about their real passion of study:

> *'It is a little bit complicated, I thought about studying history, or politics and I have Abitur with 3.1 so I couldn't do anything with it , and I was very good at informatics, always, so I thought about coming here' -Participant code 39, Male, CS*

> *'I did not want to study business information, I wanted to study politics, but my grade was not good to enter this specialist, I had 2.7 while politics requires 1.9, so I was thinking what should I do instead, then my cousin also is studying business information and he told me it is a good field and you can find a job easily with it, not like BWL where a lot of students studying it and it is hard to find a job after graduating from it. So I said OK let's try it.' -Participant code 18, Male, BI*

'..I don't have the opportunity to study psychology, you must have the best marks, I think it is waste for a study place for another student and waste of time for the students who really wants to study psychology ..' -Participant code 15, Male, BI

'BWL <business administration> was my real passion, I didn't accept in it so I choose something related to it. So I choose Wirtschaftsinformatik. <Business informatics>' -Participant code 3, Female, BI

'<Interviewer: Was it your real passion to study here?> No. <interviewer: what did you want to study?> I wanted to study only business but I didn't get accepted in it, I didn't receive any acceptance letter from the universities, I only got an acceptance letter for the business informatics, so I came here.' -Participant code 20, Male, BI

'I first applied to TU in Berlin for <Industrial Engineering> and I didn't get it and just in second try I waited for Wirtschaftsinformatik, so I studied it here, my second choice is not really what I want', '<Interviewer: Do you regret studying here?> mmmm sometimes but it is just hard, just hard. It is great that we can come here.', '<Interviewer: Are you planning to continue in your study?> Yes, but not because it is the best, but just to have something…' -Participant code 35, Male, BI

Although 63% of the participants did have passion to another field of study, most of them in the 1st interview did not show regret, they were just happy to get accepted at the university and to have something to study and look forward for a secure job in the future. Even 5 of the participants said that they maybe do their master later after graduation, while 4 others said that they are sure they will complete their higher studies and get a master degree.

5.4.2 Students Background and Misunderstanding of the Study Field

Participants were asked whether they had attended computing lessons at school, 58% said they did not, although many had computing lessons at school but they chose not to participate, see figure 5.2.

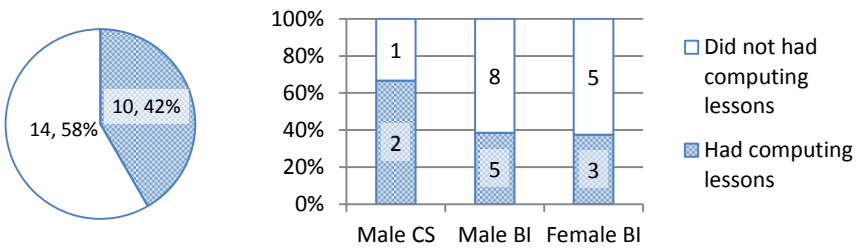

Figure 5.2: Participants attendance to computing lessons in school

Some of the participants who did not have computing lessons at school, or did not have some kind of background in informatics, said that it were difficult for them to start their study at the university, everything was new for them:

> *'I never had in the school informatics, so everything is new, Ok I have a computer at home but it is different.' -Participant code 44, Male, BI*

> *'I think those students who are really good in programming do have like a pre-knowing, or they did it already at home or their free time or at school, whatever way, but I didn't so it was really difficult.' -Participant code 57, Female, BI*

> *'... I didn't study CS at school at all ...', 'I didn't have an idea about the kind of subjects here at the university, I didn't know anything when I first came here, one requires an experience, he must see. If it is difficult and when one does not like it then there is no escape from changing.' -Participant code 20, Male, BI*

Some other participants who did not have computing lessons at school said that one needs to do some extra work to manage his/her study:

> *'I didn't have informatics subjects in the abitur <he means in school> and I don't know the basics.', ' ... On some parts I need the basics but on the other part I teach myself the basics because here at the university you don't learn the basics' - Participant code 31, Male, BI*

> *'The study needs a lot of studying, and me myself don't know anything about the subjects, don't know about Informatics nor programming, I never had anything before related to them. So I must study much more, and here they give us a lot of subjects' - Participant code 3, Female, BI*

> *'My school had computer science lessons but I didn't attend them, so that's why I have to learn more now.' -Participant code 18, Male, BI*

Others, who did have computing lessons at school, expressed their opinion towards students who did not have such lessons, knowledge in informatics, nor did they have any experience in programming, stating that the study will not be easy in this case:

> *'Some didn't have experience in programming. So they will describe the study as difficult. When someone comes here and didn't program at all before, when the student study programming for example the subject of Prof. ***** <professor of an informatics subject> one requires the understanding of abstract concept of generalization and everything related, the students will think it as very complex what they can't understand. While who had practice they will see it differently, they will relate the theory that they had with the programming practice that they implemented before and they will understand. -Participant code 34, Male, CS*

'... If he didn't never saw it <referring to programming> or talk about it or something like that, spent time with it, he won't easily understand it and I think programming and informatics is something if you like it or not, and if you understand it or not, there isn't something in the middle.' -Participant code 49, Male, BI

'... It is not easy; you have to know some information from the beginning before studying the subject.' -Participant code 40, Female, BI

'I don't think it is a good idea for the ones who didn't have computing lessons in school and wishes to study CS.' -Participant code 42, Male, BI

Some of the participants who had computing lessons at school said it was just a basic or a simple course:

'<interviewer: you didn't have it in school?> I just had it for one year but we just did turbo Pascal, and some basics. <..>' -Participant code 49, Male, BI

'<interviewer: did you had CS at school?> a little bit in math < interviewer: basic course?> yes but only for 1 year or something, so informatics yes but as IT base' -Participant code 57, Female, BI

'<interviewer: did you had CS at high school?> Yes, but only one year <interviewer: that was the basics?> yes yes <interviewer: was it too easy at that time?> yes, at that time it was easy but now I .. it is different' -Participant code 36, Female, BI

'<interviewer: you didn't have programming in High school?> I had two years of programming, "interviewer: basics?" Basics, yes ,, I had C and C++ , but I have to say that the teachers didn't learn the stuff at the university , so I couldn't take it to Abitur or something because teachers were not qualified.' -Participant code 43, Male, BI

'when I was at high school we didn't have courses such as informatics or something , we had it but it was so easy , it wasn't so difficult' -Participant code 31, Male, BI

'<interviewer: did u have basic and advance computer science subject at school?> Yes, but it was easy, it is different; it isn't related to what we had now. We had a bit Java and Delphi, C' -Participant code 14, Male, BI

'It was a basic course SQL and something else <interviewer: IT basic> yes.' -Participant code 42, Male, BI

Many participants said that they knew before they came to the university that the study will be difficult and hard, and it is mostly theory, some heard that from a friend or a family member. But many did not know for real what they are expecting. Here are some examples of what some participants said:

'It is not that really what I thought it was, it is too much theory and that's it' - Participant code 15, Male, BI

'I really didn't look that much in the study and subjects before I came, because they didn't accept me in Berlin, they have changed this year the 'acceptance procedure' and the people applying were very much, so it was hard to get accepted there. So this is the only department that accepted me <referring to the business informatics study at the University of Potsdam> so I said I must come and study in it, and also my cousin is studying it, but I didn't see exactly what are they studying, I asked my cousin many times about the study and he gave me some of his lectures notes before the study began to get an idea, but I didn't look deeply in them.' -Participant code 18, Male, BI

'... I knew how difficult it is by the university and I know the difference between the abitur <he means school> and the university. Because abitur is on a very low level and here is high level, and when I do more then it becomes simpler for me, every subject.', '... but I don't like so many theory, and here is only theory' -Participant code 31, Male, BI

'My sister, she is older than me, and she studied another subject but she said that University is just theory and no practice and something like this, I imagined that we just have the theory put I didn't imagine that it is like this!' -Participant code 38, Female, BI

Few participants also felt not so good or different because they saw other students much more advanced in their study, in programming for example, due to their background from school or because programming was already their passion and they had some experience with it. This usually happened to business informatics students as they compare themselves with computer science students:

'... I am a little bit sad if you are sitting there with others and they are just programming all the time and you are asking the teacher every 5, 6 minutes how to do this and why doesn't it work and the others are maybe on a another next task.' - Participant code 18, Male, BI

'...I think that the informatics students know more because we thought that the business informatics students wanted to study BWL <business administration> and they thought OK this could be a second way to study this and we really do not know really about the informatics and if we study just study informatics you already .. I think you have to know about this, I would not study informatics if I don't know about this before the study' -Participant code 44, Male, BI

* The federal law that regulates these student loans and grants is called "Bundesausbildungsförderungsgesetz" (Federal Training Assistance Act) or "BAföG" for short. - http://www.bafoeg.bmbf.de

5.4.3 Students Financial Situation

Most participants acknowledged that they do not have financial problems, 54% of the participants had BaföG* (A governmental financial aid to students under some conditions) and they did not have any financial problems, 24% of them also had a part time job during part of their study. About 64% of the participants who did not have BAföG had a part time job during part of their study (one of them acknowledged that he had some financial problems). 58% of all of the participants acknowledged that they have financial support from their parents, mostly by living with them.

Some participants got a part time job in their second or third semester, they stated that the first semester was difficult so they wanted to concentrate more on their study; usually those participants had BAföG or lived with their parents.

Most of the students who had a part time job said that their jobs do not affect their study and it is usually one or two days a week, usually on weekends or at evening. And it is usually a flexible job as they can choose either to work or not on some days according to their study and exam schedule:

> *'My work is especially on weekends, just one day maybe Friday or Saturday and all the other days I may have the time to learn.' -Participant code 49, Male, BI*
>
> *I work in a call centre, and I can tell them when I can't work. ... <interviewer: so it does not affect your study?> no no.' -Participant code 31, Male, BI*
>
> *'I work at the same place where my father works too and he asked his company whether I could work for them ... and, they liked what I did and how fast I worked so they asked me if I just could work for them.','... in this company I do not have to work every day, just Tuesday for 3 hours and Friday for 6 hours, ... and then if I do not have time and this time I have to learn then they say OK.' -Participant code 35, Male, BI*
>
> *'I do work part time but when I have exams that I should prepare for, I don't go to work. I can manage my time.' -Participant code 20, Male, BI*
>
> *'I also work, I can choose when I can work, if they have job they will ask me whether I can make it <interviewer: whenever you have time> yeah, it is good.' -Participant code 57, Female, BI*
>
> *'I am a trainer for a football team. <..> Because of this I don't have time any more. So I study then I go home, I am at home maybe 5 to 10 minutes and then I go to the*

field, and then on the evening I am on the way home. <interviewer: but you find time to study?> yeah. <interviewer: you manage> yeah.' -Participant code 44, Male, BI, note: He started to work on his third semester

Some participants acknowledged that they just work to make some extra money for themselves:

'I work but only for 400 euros a month, that's it. And I am only doing it for myself so that I have some money for me. <Laughing>', '<interviewer: How often do you work?> only when I have time. It is in a shop.' -Participant code 23, Female, BI

Few other participants had more than one job, for example this student had one job on her first semester and then two jobs on her second semester, beside that her parent were supporting her financially:

'I try to work a little bit like serving beer, whatever <laughing> yeah, so, actually I am fine, its low money but it is OK', '... my parents pay for my flat apartment' (participant was in 1st semester)

'Beside my subjects I have two jobs. They take a lot of time. There is almost no free period in my time table ...' (participant was in 2nd semester) -Participant code 29, Female, BI

5.4.4 Adaptation Problems and Apprehensions

Some participants had adaptation problems as they started their study at the university. Being alone is one of the feelings that faced some participants at the beginning, but this usually eases up or disappears after a couple of weeks especially when students start to make friends:

'At school it wasn't difficult and there was the teacher, here you are alone and you must do it', 'If you find the right friends, then you will not be alone, in the first months at the university I was so alone and I didn't even want to come to university <short laughable tone> after that I found friends and I had high motivation to come to university. They helped me and supported me and I supported them, it helped me.' -Participant code 31, Male, BI

Others had problems in getting used to the university system. This big difference between the school and university systems made some participants think in leaving their study:

'The university system is very different from the school system. The first week I was so confused here, I was thinking about leaving and going to work or something else <short laugh>, but now it is OK, it is interesting.' -Participant code 38, Female, BI

'The problem is that nobody cares about you in the university; if a student stops attending nobody ask what happened and why he is not coming. Nobody will ask

whether you did your homework or not. If I have a problem and I feel that nobody cares for me then I will gradually stop coming to the university.' -Participant code 20, Male, BI

Participants, especially at their first semester, had problems in arranging their time between subjects, many of them complained that they have too much material with not enough time to study:

'I must do more, and there is a lot of material …, but maybe because I am still didn't wake up yet from school, 100% I need more time to get used to university.' -Participant code 18, Male, BI

'I read about it that you have to spend about 10 hours per week for a subject, and I don't have that much time <said it with a loud laughable tone>' -Participant code 57, Female, BI

'… it is very difficult to reach 10 hours per week per subject , if you want to do all these lessons points you have to do 15 hours per week and that is not... If you have a weekend, a free weekend, then maybe, but if not and you have parents and such things to do <short laughing> you don't, you can't do it. You have to sleep you have to eat you have to travel with S-Bahn <urban railroad line><short laugh>, such things. And you would do some other things.' -Participant code 34, Male, CS

'they give us a lot of subjects, for example this subject <talking about one of the informatics subjects> alone taking time but I have other 5 subjects, and now left from study at university only one week and two weeks free to study before exams' -Participant code 3, Female, BI

*'It is a lot of subjects and I don't know how to learn all this in the short time', 'I have problem with time, because I come here and then I go home then I do for example ***** <an economic subject> and then I can't do any more' -Participant code 41, Female, BI*

'I think it is a little bit difficult, but it is too much, you must do everything on time and you don't have only one subject and so many things are given in a lecture of 2 hours! And you must look again in everything' -Participant code 31, Male, BI

'… I have to write 5 exams and each subject has one book, so I am asking myself, how can I study 5 books in 2 months?!! First we were focused on our test in math and we left all the other subjects so that we can passed it and that is the reason we did not learn for the other subjects and it is very hard to combine it because there is too much … it is not very hard because there is no reason to say if you can't study, you can leave, students are also humans and have their own preferences. If you study all the time, just like professors say, and you don't have a hobby and just focus on study then you are just like a robot, programmed.' -Participant code 15, Male, BI

A total of 59 tags (codes) were associated with the adaptation problem, see table 5.1.

This made many participants usually focus on some subjects which they consider easy or possible to pass in the exams, leaving behind the difficult subjects (difficult from their point of view). Participants usually ignored such "difficult" subjects from the early beginning of their study. They probably unconsciously chose to put it aside by repeating that they will start studying it later, next week, or for example they will assume that they can cover it one month before the exams (Procrastination in study will be discussed in the following section).

Some participants believed that whatever they do and how much they study, it will not be enough to pass one of the subjects (The name of subjects and name of professors students are mentioning will be kept anonymous to give a wider perspective to the problems that students are facing). Students usually hear things from other students, especially the students from higher semesters or the students who have failed before, that makes them have fear towards one subject or another as being difficult or hard to be passed:

> *'... I think that professor ***** must do something else with his exams, I hear that we can use the script while doing the exam and only seven students passes! And they have the script!!! So I think there is something that needs to be change or an alternative for the students. ' -Participant code 3, Female, BI*

> *'Perhaps you heard that last year only 11 people passed the exams, of the subject of professor *****' -Participant code 31, Male, BI*

But some participants said clearly that a tutorial teacher or the professor had told them that only few students had passed the exam of their subject through the previous years. This had a major effect on the students, it made them have continuous anxiety that they will probably fail too. And this anxiety usually continues to other semesters, as those students either fail in the exam of such subject, or avoid taking the exam postponing it to the following semesters. The following participants are expressing their fear and anxiety towards one of the informatics subjects at the first semester of their study:

> *'... last year on the last exam 90% of the students failed in the exam, <interviewer: who said that?> the professor and the tutorial teacher said that. From 113 I guess, only 11 students had passed! That's really bad. It makes pressure on the students, and more than that, you have a burden on the shoulder because you carry it with yourself over years, it is not just one or two semesters, if you cannot pass it this semester you can do it next semester, you have to learn for it but there are other subjects and you also have to work on them and it is .., I don't know, it is not helpful' -Participant code 15, Male, BI*

> *'Prof. ***** every year he tells us that most of us will do not get his exam, that is the first part that you begin, mmmm, that is nice to know <laughing tone and short laugh> you think: 90% will not get it, and you say Oh I have to be in the other 10%!!*

<Laughing tone> oh oh. <interviewer: that is a big pressure on you?> ya, ya.' - Participant code 10, Male, BI

'I want to study this field, but I am a little bit afraid , most of the students say it is very difficult to pass …', 'last year as I have heard from the tutorial that only 7 students passed the test from 118 or 119 and the year before 11 people passed the test from 130 <interviewer: so that makes you feel down?> of course and most of my friends say that they will not go to the exam because they say that they don't understand and they are afraid a little bit. They want to go in to see the exam and maybe they try to solve some questions but they don't have hope.', 'I have some students in the group they did it too and not passed it and they must do it now …, and if they don't pass it this time then their study will be finish.' -Participant code 7, Male, BI

Some participants at their third semester began to have apprehensions towards their future in completing their study successfully, especially business informatics students. These apprehensions developed basically because of some informatics subjects which they consider difficult to pass. One of the first semester mandatory "difficult" informatics subjects, played a major role in students fear about their future. As some participants failed or postponed this subject, they began to think in changing the university and seeking an easier one as they have heard that studying business informatics at TU Berlin is easier than studying it at the University of Potsdam (further details about participants attempts to change the university will be given later).

The following participant is at his third semester, he was afraid about an informatics subject. He failed before in passing this subject at his first semester:

*'***** <a 1st semester informatics subject> now is more difficult than the 1st semester, the groups are bigger and we become a new programming language and now the exams change, we learn last semester the old questions for the exam and maybe a little bit the same came, but now the exam are complete changing and I don't have <previous years exams questions!>' -Participant code 7, Male, BI*

One business informatics participant began to question whether he could study business administration or not if he fails in the three attempts to pass this "difficult" informatics subject (As according to the university system in Germany, if a student fails in passing a specific subject after three attempts then he/she will not be accepted at any university in the same field of study, and he/she must study some other field of study to gain a university degree*):

* Ref. (in German): https://www.blogs.uni-mainz.de/fb02-lob-sowiso/studienorganisation/fragen-rund-um-meine-pruefungen/

'People from 200 did this and I can be one of the 7 so …. But it is a little bit what I heard in informatics last semester, 7 did pass the exam and much of people didn't, and before <as in older exams, of other years> 11 or 7! it is a small and then you think should I better do more for BWL <economics> than Informatics, when you think OK, Informatics so much failed, I think I will be fail too, so you think it is better to do more for BWL <economics> so that I do not fail there ..', 'For me it is something new, I never had. To the exam, I don't know if I will get this. You can do the exam three times but when you know you do not make it the first time you think second time but then you already know the third time and then I have to stop the study and I don't really know if I can study BWL <business administration>, because we already had BWL so I do not know if we could study BWL, maybe you have to study law or something different maybe because of this or some studies, Informatics, I do not know, I thought it was different than this but it is too hard ..' -Participant code 44, Male, BI

5.4.5 Procrastination

Some participants may try to study, attend the lecture or mostly the tutorial section of some subjects especially the ones they consider "hard" or "difficult", but more likely they are also not doing enough. Students may convince themselves that they could do it and study next week, or the week after, till exams come and then they say we will specify two or three weeks to study before exams. With this continuous procrastination, the material of the subject will be piled. Students then find it difficult to start so they usually choose to postpone taking the exam of such "difficult" subjects. Here is what some participants said at their first semester:

'now I want to concentrate, but because of the exams, I want to concentrate on it because I think it isn't so hard, if I really take notes and looking all the videos and doing all the tutorials, I think I could do it! So I will try it, but then it is really hard because it is so but and all people said you have to learn too months before the final exams, but now it is only one month and for the exams will be too short but now they are saying in only two weeks or so, ok this will not be in the final exam <he means he will not take the exam of this informatics subject!> this will be too short, I don't want to learn now so much and then it will be only this <he means he will waste his time before exams on only this subject!>' -Participant code 44, Male, BI

'<interviewer: Do you study every day or do you postpone to the last minute?> That's what I do <short laugh> <interviewer: you postpone?> yeah, I am not quite really happy about this but I am just passing the test even if I just learned one hour before the test.' -Participant code 49, Male, BI

'Really the most students they don't study so much, and keep everything till last moment <laughable tone>' -Participant code 31, Male, BI

'I think the most students learn at the end of the semester when the exams come <short laugh> and most of the time they <short loud laugh> they chill and say OK it will work, we have our books and something' -Participant code 23, Female, BI

'The short of information, I guess that develops feeling that one say: yeah I can do it tomorrow. So it leads to procrastinating, that is my view on it. I think that is why my group died; it is so much of information so just drop out' -Participant code 46, Male, CS

Here are other signs of procrastination or acts that are leading to procrastination:

'The tutorial teacher says what the solution is? Then he brings us the code in Java and just says ok we finished! I didn't understand, so I stopped going to the tutorial because I didn't find <benefit!> from it' -Participant code 3, Female, BI

'Now I have a subject 'multimedia technology!' Mmm I understand in the lecture, I feel that I have understood, then I go to the tutorial and the tutorial teacher cannot make me understand one word, and this is not good, I feel I don't understand the subject.' -Participant code 3, Female, BI

'Only one or two discuss the exercises, most of the students just sit and watch <short laugh> yeah, we just listen, I am just listening, yeah , because it is too difficult and when I was at the first lecture .. I was like: oooooh <very short laugh> it feels that the time doesn't move on and he just sit and you don't know why' -Participant code 23, Female, BI

'<interviewer: do you get help from the tutorial section? > Mmmm in informatics? <interviewer: yes> I don't go there. <interviewer: you don't go there?> NO <interviewer: economic subjects you go?> yes I go.' -Participant code 36, Female, BI

'The teacher ask the students if they made the exercises, one student say I have it , he goes to the blackboard and write write write , the lecturer then say do anyone has a question,, nobody says yeah I have one!! Then everybody just make faces to each other, they don't try. Then I ask myself, why I am sitting here??!! So I really don't understand anything. <interviewer: do you go to the teacher and tell him that you don't understand?> No, <with a smile> I don't dare to do that!' -Participant code 38, Female, BI

'The exercises are not an obligation to attend and do and the teacher say if the students don't come then it is OK! But in the school, in High school you must come. I think it is better to tell you that you must come, because a lot of students don't come and don't do exercises and don't learn so much and then come to the final exams so they don't succeed in the exam, I think this is one of the biggest problem.' -Participant code 31, Male, BI

'We don't have motivation and this is very important, yes. <interviewer: why you don't have motivation?>because when I look on what we write, it is a mess, I go to the lesson and he <a tutorial teacher> make it all fast and then he say : yes we see you in the next year! ... Most people have bad notes and it is difficult to offer it to you. <interviewer: he says to you, you will not make it and he will see you next year at the same class?!!> Indirectly. Not directly in your face, but indirectly.' -Participant code 41, Female, BI

'It is all theory, no practical implementation, it is difficult, even the tutorial I am not going to it any more, I am not understanding anything in it' -Participant code 20, Male, BI

*'<interviewer: you didn't do the exam of *****?> No <laughing> <interviewer: neither *****?> mmm No, but all the people I know didn't pass it so <laughing> I think it wasn't our fault <laughing> not doing it. But I don't why it must be that hard?! Are we that stupid?!! <laughing> I don't know. It is really hard. <short laugh> <interviewer: but you will do it this semester?> no I didn't do it, I was like: no I won't do it again. My friend did it and I am going to wait if she's going to pass it then I will have more energy to do it. <laughing> I want to keep it away <light laugh>' -Participant code 57, Female, BI*

A total of 50 tags (codes) where recorded where students directly mentioned that they fall into the problem of procrastination, other 24 tags (codes) where students do actions or show signs that are leading to procrastination, see table 5.1. Some participants try to change their habits in studying and avoid procrastination, but they usually keep studying the same way although they acknowledge it is not a good thing to do! Here is what some participants said on their third or fifth* semester of their study:

'<short laugh> I try every year to study from the beginning of the semester <laughing tone> and I tried this year again <short laugh> but yeah, at the beginning is fine but then there is like a little hole and it gets up again so, I think at the beginning of January I started to learn for the exams in February, so it will be better if you start from the beginning and try to understand things. It was in school also so <laughing tone> it is always the same' -Participant code 57, Female, BI

'It is always the same, you begin with the learning too late and then it is too much and you can't structure and order' -Participant code 40, Female, BI

'It depends on the subject, but I always give the same advice but me myself don't take it <she was answering a question about what kind of advice she could give to new freshmen students> it is to keep following the subject, don't leave it for a week, read the script, go to the tutorial, do everything related to the subject every week. If he

* Students with codes 34, 03, 10 were registered as 3rd semester students when this study started.

keeps following with them then he will not find it difficult. He must not say I will do it later' -Participant code 3, Female, BI

'I need the time before the exam where I will learn for it, now I don't have so much time. I wait for march and in complete March I can run for it, I have time then. <Talking about an informatics subject from his first semester that he is willing to do his exam on his third semester>' -Participant code 44, Male, BI

Some other participants had changed their way in studying and tried to start early at the beginning of the semester:

'This semester I start from the beginning, and I do every week a little bit, but last year in my first semester I didn't make that and I begin learning before the exam and then I realize it was too late so I decided this semester to start from the beginning.' -Participant code 41, Female, BI

'We started earlier, in the 1st semester we started two weeks before the exams to learn. Now it is not perfect but it is better.' -Participant code 18, Male, BI

'It's not so good but I believe it was an experience I did in the first two semesters, I do it <as now> better with the time management.' -Participant code 31, Male, BI

One of the participants points out that some subjects at his third semester require passing a pre-test successfully before taking the final exam. He prefers to have this "pressure", as he described, to avoid procrastination. This is what he said on the second and later on his third semester as he compared between semesters:

'Given the fact, that there is almost no pressure, it can be difficult to learn, instead of idling around sometimes.' (2nd semester)

'there are now subjects which require to pass a test to do a final exam but last semester there was almost only subjects where you go to the lesson and then read their stuff what they have to say and you just go home until the exams so you don't need to learn what they said, yeah. And sometimes you just say: great I will do it later and then you say oh there are friends I have to meet and then it got piled up' (3rd semester) -Participant code 43, Male, BI

Some other subjects may have pre-tests, as test in the middle of the semester, but their score is not counted in the final score of the subjects. So a student usually doesn't take it because it is not an obligation for him/her to do. Other subjects may need exercise requirements to be fulfilled by the students before they are allowed to take the final exam, but usually students just have to present few exercises to get such points, so they are not usually an indication that the students are avoiding procrastination.

On the third semester of the study, participants were asked to give an advice to a new student who just started his/her study at the computer science department at the University of Potsdam on how to study, 60% of the participants advised the new student to study early enough (avoid procrastination), this shows how much of a problem for student procrastination is, especially when students start their study and usually everything is new for them:

> *'Start to learn much earlier <interviewer: that is the main thing?> that is the only thing <laughing> if you study only one week before the exams then you will not make it.' -Participant code 49, Male, BI*

> *'It depends on the subject, but I always give the same advice but I myself don't take it. It is to keep following the subject, don't leave it for a week, read the script, go to the tutorial, and do everything related to the subject every week. If he keeps following with them then he will not find it difficult. He </she> must not say I will do it later, some subjects requires from us every week to give back HW, these subjects I couldn't lift my eyes away from them, I was always with it, and I passed such subjects without any problem.' -Participant code 3, Female, BI*

> *'Aaah I would say that he </she> always has to go to the tutorial because they are really important and if he </she> has enough time always to do the exercises, and go to the tutorials because I think it is really helpful when you are always active during the study and not doing something else, just start learning do not say I will do it at the end of the semester because then it will be really hard.' -Participant code 23, Female, BI*

> *'I would say do it like at school, you have to do at the beginning <she means start> at some point and during the whole semester you have to learn, don't put it till the end <do not start late> and don't be lazy.' -Participant code 40, Female, BI*

> *'I will say they must go to the tutorials at first and they must learn from the first day till the exams, they must learn every day for the informatics subjects, and yes. They must learn. <interviewer: and you didn't do that at the beginning?> No, this is my failure.' -Participant code 36, Female, BI*

> *'Since I said it is a different situation from school and as my all friends said the difficulty of the exams surprised them so they were not expecting it. So I warn him </her> <the new student> to study at first and then I would say that he </she> shouldn't do the same mistakes as me, and he should make sure that he understands always, maybe he says that there is 1 or 2 days a week that he dedicates to understand all the material on board and read about, so do not run that at the end first weeks before the exams.' -Participant code 43, Male, BI*

'It is not easy, it is hard but if someone wants to do something then you have to do something <light laughing tone> so learn more, study more.' -Participant code 38, Female, BI

'They have to learn very often and very hard to get the exams … I think I have studied hard, but yeah, too late.' -Participant code 30, Male, BI

'<specify> time to learn … yeah, I am doing every time the same mistakes so I want to learn before <early> , so maybe a month before but I don't get it <do it.> <both laughing> but yeah, time is the most <important>' -Participant code 44, Male, BI

'… Invest every time you have. Don't spend it on useless stuff. Go to every practice with the tutors, mentors, I don't know. To the tutorial, to everything which is given go to there if you want to and you see if you have some potential to improve if you go there. You can do this at home too, it is not so hard.' -Participant code 46, Male, CS

'My first advice is that the make all from start, every week a little bit. And this is very important.' -Participant code 41, Female, BI

'He </She> has to learn every day, not thinking that he </she> could do it at the last minute, yeah.' -Participant code 10, Male, BI

Some participants may have the intention to study a subject but they start blaming the professor or the tutor, or both, for not explaining it enough to them. Especially blaming the tutorial teacher, this could be understandable since most of the tutorial teachers are students themselves, from postgraduate studies or higher semesters, so they may not have the required experience and knowledge to teach and communicate with students (this will be discussed more on the following section).

5.4.6 Problems, Issues, and Difficulties in Study

Some of the participants specified some problems, issues or difficulties during their study; they range from problems and issues at the tutorial section and with the tutorial teacher of some subjects to some problems and issues at the lecture halls and with some professors' teaching methods along with communication issues between the students and the professors. The business informatics participants had mainly problems and issues with informatics subjects.

5.4.6.1 Problems and Issues at Tutorial Sections

The majority of participants pointed out some problems and issues during the tutorial section. These issues are usually affecting their motivation and progress in studying the subjects that have these tutorial sections. The main issue of the participants was the behaviour of some tutorial teachers inside the tutorial section, questioning their ability to teach, whether he/she is qualified to teach or not, since many of the tutorial teachers are students from higher semesters or postgraduate studies. Some participants said that one or more of the tutorial teachers just sit during the tutorial section while few students write down their solutions of the exercises on the white board. Other participants pointed out clearly that a specific tutorial teacher is not doing enough to help them:

> *'If he <the tutorial teacher> is now at the 3rd semester, it means that he started his study a year ago and he had a mark that was 3 or something like that! He is not as good as it could be <light laughable tone> ...and mmmm I guess that is not the basic for teaching, that is nice for him that he get it <this job> but he should not teach and there are a lot of tutorial teachers very much like him.', '... they aren't really able to teach, because they aren't teachers' -Participant code 10, Male, BI*

> *'Some tutorial teachers are very good but some teachers, I don't know perhaps it is because of the lack of experience, they don't tell us the problems in the right way, I believe, and most of the students don't understand.. It is only in some subjects, it is not every tutorial teacher. I believe they tell us the problem not so good and they are not always motivated in the tutorials. ... They must do it with fun, because they come there and they are bored and if he is so bored then the students are bored, and you must do it interesting for everyone.' -Participant code 31, Male, BI*

> *'Only one or two discuss the exercises, most of the students just sit and watch <short laugh> yeah, we just listen, I am just listening. Yeah, because it is too difficult and when I was at the first lecture I was like: oooooh <very short laugh> it feels that the time doesn't move on and he just sit and you don't know why!', '...he just picks people and they go to the white board and just write the solution of homework and there is no explanation and no interaction, yeah and I sit there and think: ahaa what!! <short laugh> ... yeah it is difficult.' -Participant code 23, Female, BI*

> *'The teacher ask the students if they made the exercise, one student say I have it, he goes to the blackboard and write write write, the lecturer then say do anyone has a question, nobody says yeah I have one!! Then everybody just make faces to each other, they don't try. Then I ask myself, why I am sitting here?! So I really don't understand anything.' -Participant code 38, Female, BI*

'In tutorial section, they don't tell us how they did it, so they come in and they say that who have the answers come on the board and make it, then nobody can do it so he show us his answers, the teacher, but nobody understand. It is difficult sometimes. <interviewer: and the students do not tell the teacher that they did not understand?> Sometimes they try to ask him and when he tries to explain it, it is the same <interviewee laughing>. -Participant code 18, Male, BI

*'The tutorial teacher in *****, this is a guy who doesn't really helps, ... he only sits there and didn't give us, or show us maybe some solutions after a bit ...', 'if someone says a question he comes to him and answer the question but not really good, I think that the most time upset me.' -Participant code 42, Male, BI*

'The teacher should help when a student stops in something during programming, and for me I think that the teachers are not doing enough to help us.' -Participant code 31, Male, BI

*'In *****, they tell us that we have to do the exercises and then we put it on the board and then we tell you if it is right or wrong! That is ok but one needs to learn this stuff! I don't even have any idea on how to do these things!! So they have to work with us, every exercise, and explain it to us. They just tell us to go to the board and do this, remove this, pull down this <referring to programming statements> and one doesn't understand a thing! Secondly the people who teach, I don't know, they know the subject but they don't know how to make us understand it!' -Participant code 3, Female, BI*

*'Other subjects are easy , but what I don't like now is ***** subject , the teacher doesn't really help, he says do this and this but if we have a problem and ask him, he doesn't answer and says you have to solve it yourself. I say why don't he help us a little bit, wouldn't be that better? It will be faster and we will learn' -Participant code 18, Male, BI*

'Lectures with our tutorial, the lecturer is talking to you, you see him talking, great! I like it! But I don't get anything from him <talking a bit fast with a laughable tone as if nervous!> I am getting more from the tutorial on the day before it in theoretical informatics!' -Participant code 46, Male, CS

As one can see, many of those participants were complaining about the tutorial teacher sitting inside the tutorial section while some students solve the exercises on the white board. Some tutorial teachers just gave the solution to the students without further discussion. "We/I do not understand" is a common phrase used by the participants to describe the situation inside some tutorial sections.

While some participants questioned the purpose of attending the tutorial section as they do not understand the teacher, some participants stopped attending a specific tutorial section, as those two:

> *'the tutorial I am not going to it any more, I am not understanding anything in it, the teacher just sits on his chair and just say do this and do that, just sit down and give orders! I made once a presentation and he gave me a point that allows me to enter the exam, so after that I stopped going to the tutorial section.' -Participant code 20, Male, BI*

> *'... The teacher says what is the solution? Then he brings us the code in Java and he just say ok we finished! I didn't understand, so I stopped going to the tutorial because I didn't find benefit from it.' -Participant code 3, Female, BI*

You can see that some participants are attending the tutorial section with no prior knowledge about the subject that is going to be given by the tutorial teacher. Some students, especially students at their first semester, may have the opinion that the tutorial teacher must explain everything for them even if they did not read about the subject nor tried to solve the exercises before attending. This may have left them sitting inside the tutorial section with no understanding and with not enough knowledge to discuss and ask questions. But some participants referred that they could not even know how to start solving an exercise since everything was new for them, probably because of their weak background in informatics, and they needed a real attention by the tutorial teacher.

Taking things step by step in an attempt to understand the subject and start solving the exercises is a common request by a lot of participants, especially at their first semester. Some participants acknowledged that there are problems regarding the size of the tutorial group as having a lot of students, and this affects the tutorial teacher's ability to follow the progress of each student and answer their questions. Also some participants pointed out that the tutorial section time is not enough to solve and discuss exercises, especially if there are a lot of students attending tutorial section group:

> *'I think there is a lot of exercises that is given that the tutorial section is not enough to cover it all' -Participant code 34, Male, CS*

> *'The teachers are helpful, it is good but we have only one time tutorial in the week and the teachers cannot help every student in the class, the time of the tutorial is too short.' -Participant code 36, Female, BI*

'The tutorial I think is good but I think mmm when it was two days it was better, because one lesson in a week is not enough, yes' -Participant code 41, Female, BI

'The homework is too much the tutorial teacher doesn't cover it all, so we may start some exercises but not finish them and the next week we have new homework and we already did not finish the old one, so we always have questions which are kept open. .. It is too much. The tutorial teacher cannot get everything arranged into time. .. There is no enough time. And that is not good' -Participant code 10, Male, BI

'We should have much time <speaking about the tutorial section>, four hour <as a suggestion!> so that we can write the questions we have.' -Participant code 42, Male, BI

'my group is 50 people or something and so you cannot ask because everyone has to go to the whiteboard one time to be "zulassung" <allowed to enter exam, get permission> and if the group would be smaller, it wouldn't be such a big problem, but I think yah more exercises <she means tutorial groups> more money yah' -Participant code 23, Female, BI

When participants were asked whether they ask the professor, tutorial teacher, or a friend for help in case they need any in their study, most of them said that they prefer to ask a friend or their study group, or students from higher semesters for help over asking the tutorial teacher or the professor. The tutorial teacher came in the second place when a student wanted to ask for help. But some participants began to avoid asking the tutorial teacher for any help since they say that he/she will not clarify enough the solution of a problem, in a way that makes them understand, as we have discussed some reasons behind that early in this section. Other said that they avoid asking the tutorial teacher because of his attitude:

'It was hard sometimes and our teacher in the tutorial wasn't good so if you have questions he said yeah and he is every time angry and we don't want to ask him because he is so .. Yeah ok. And he said: yeah I am just here to sit and you have to do it alone, only when you are having big problems and really really don't know how to do this then I can help you. But you ask him and he answered a little bit, so students think OK I don't want to ask any more.' -Participant code 44, Male, BI

'I went for the exercises (Übung) and for example you had a question, and you ask the tutorial teacher, who is a student by the way, he answers you but by then you will have ten more questions because of his answer!! He doesn't explain in a way that makes you understand!' , 'There are exercises that I try to solve them but if I get stuck I just give up and leave them. Even if I ask the tutorial teacher about the problem that have stopped me, he looks at it as a small problem, and one must know it! But unfortunately I don't know it!! I see him not interesting in explaining things, so I just withdraw myself and stopped asking.' -Participant code 20, Male, BI

'The teachers are very fast and sometimes a little irritable after you ask them few questions, because of that you don't even try to ask them again.' -Participant code 38, Female, BI

*'in *****, the teacher isn't too friendly , if you have a question and want to ask him something , he thinks you should know this because he told it in the lecture, he just say aaahhhhhh mmm look there! He could be a little bit friendlier, but if you, I don't think if you could really write something, a program or something like that and have something, just one thing you don't know, he just could help you and won't be so angry about it. But in general he is not too friendly.' -Participant code 35, Male, BI*

'I do not ask the teacher for help, but some students …', 'I don't like the teacher of these tutorials <laughable tone> because he doesn't have a bachelor's degree, and I don't like it when they are not opened to help somebody … they don't have lust <to teach>' -Participant code 57, Female, BI

'… What I didn't like at the beginning of my study was that we get some homework to do and they told us here that there will be no lessons to get for this! So OK, I went to the tutorials and asked for help and the teachers of the tutorial told me he isn't allowed to help in anything! He sits there, and he was quiet and everyone talks and so you have to do the simplest things alone but the problem was that I did not know anything at the beginning so simple problems were so big problems …' -Participant code 10, Male, BI

As some participants said above, simple question iterated a tutorial teacher and he assumed that the students should know basic information or answers to simple questions. Such questions or problems might be simple from the tutorial teacher's point of view, but it could be difficult or unknown for some students, especially freshmen students at their first semester.

Some participants also pointed out that because there were different groups for the same subject with different tutorial teachers, and those teachers had different teaching and communicating abilities, students tried to change tutorial groups and seek the good tutorial teachers:

'<interviewer: what about the tutors?> they are students too. It depends on their character. And if you have a tutor which is horrible you can change it. You have the chance according to the time schedule, you have some dates and you can choose. <interviewer: did you change so many?> I changed some because I wasn't really happy with some tutors. But this is I think it just happens. Those are students; they are not personal to teach, just students.' -Participant code 46, Male, CS

'... I wasn't only in one tutorial, I just switched a little bit, only a little bit about two times, and sometimes you think one could be better and then you think that one could be better <referring to the tutorial teacher>' -Participant code 35, Male, BI

Sometimes changing groups is not possible or difficult because the starting time of the tutorial section intersects with other non-mandatory theoretical subjects or tutorials chosen by some students who seek to change.

Some tutorial groups were faster than others in covering the subject and solving exercises depending on the tutorial teacher commitment and ability. Some tutorial teachers came late at some days and some were sometimes absent. This left some students in such groups frustrated since they were slower than the other groups in doing exercises, especially if the exams are on the doors:

'... there are 4 groups or more than 4 mmm and it is very different in the group, my friends went to another group that week and we have 40 exercise, they are now at the 39 while we were at the 19 maybe, we are very at the basis now and this is because of the teacher, what they teach us, five times they did not come <she means the tutorial teacher>, I had two times with the teacher <she means the number of times the tutorial section has been hold>. I don't want to say the name of my teacher, but the teacher is very important.' -Participant code 38, Female, BI

'... My teacher for example comes sometimes late, too late, last time it was ½ hour from finishing time of the lecture and he do, for example, the first exercise and then goes to the fourth! The second and the third he don't do it, and says that we must do it, but nobody understand it!' -Participant code 31, Male, BI

'There are very different, big different between the teachers.' -Participant code 30, Male, BI

'The teacher is good but he is too slow, the other tutorials are faster, for me that is not good.', 'We solve all the questions but it is very slow, we reach question 20 while other groups is in 36 or 37 question, and if you want to change the group then you don't have the answer of 21, 22 and so on to 36. And he says it is OK, but if we go to the test we say it isn't OK! We are too slow.' -Participant code 7, Male, BI

'... a tutorial teacher comes to late every time and one time he didn't come and he didn't tell us why or send us an email, we were there at 8 O'clock in the morning and waiting for him, and, so that aaaah, that makes me really angry, if you stand out at this time <laughing tone>', 'tutorial teachers are not good as they present themselves by the prof. .. For example this one guy didn't come <stopped firmly> and the next lecture he tells you.. yeah we have a problem, you have to learn the stuff from the last

week <previous week> and this week it was two hours long! That is crazy! That is our problem!?' -Participant code 10, Male, BI

*'The tutorial teacher of ***** comes really late sometimes, sometimes he never comes. And I have the exercises early in the morning 8 to 10 <referring to the tutorial section time> If he comes, he has information to give but doesn't have time to help all students and he says that they are like that and we have to look into the script and see' -Participant code 18, Male, BI*

'There are 50 exercises and we have only made 23 and the exam is after one month, and it is too much' -Participant code 36, Female, BI

A total of 56 tags (codes) were associated with problems related to the tutorial teacher and his/her qualification. Other 24 tags (codes) were associated with the tutorial section environment and time period, see table 5.1.

5.4.6.2 Problems and Issues with Theoretical Lectures

Participants' problems inside the lecture hall were not as much as inside the tutorial section. Concerning the nature of the lectures, many complained about having more theory than practical implementation, some find it difficult to connect the theory they had at the lecture with the practice they are doing at the tutorial section:

'I really I don't understand, I look it and write then I look in the exercise and it is not the same, I cannot put them together' -Participant code 38, Female, BI

'I don't like so many theory, and here is only theory', 'For me the problem is too much theory, too many information, the exercises are not so useful, some of them.' -Participant code 31, Male, BI

'... We just sit in our class and just listen and take notes and I think that it is sad, it is not a waste of time but we could do it better' -Participant code 15, Male, BI

'We must practice more; the tutorial section must be practice on what we had in the theoretical lecture! One in this way can understand the subject. If it is only theory then one cannot understand. The theory is not simple itself, it is hard theory.' -Participant code 20, Male, BI

'the issue is, the problem is that we are able to write it down , to note it but we, well especially I, can't categorize them,... you can learn it, you can study it, but when someone asks you to do it, you cannot!' -Participant code 15, Male, BI

Some participants stated that it is much more useful to do practice over theory, they will lose the track in the theoretical lecture while they are more focused when implementing on the computer:

> *'When we work on laptops it is easy because we have lists, and we can look see we do that and that and we do programming, last time we made hard time web program and it was very easy, because we had the pages for .. but if we are in the lectures we hear hear hear and in the middle of the lecture we say OK that is enough' -Participant code 7, Male, BI*

> *'I think for informatics is really theoretic, ... only writing writing, hearing, we don't do something! ...', 'Sometimes in the tutorial it is better than the lecture so, the tutorial is not so theory so we can discuss it' -Participant code 44, Male, BI*

Many participants complained about the starting time of some lectures, one lecture was at 6 pm and it was considered very late for many students, and many did not attend it because it was too late for them:

> *'I see the lecture on videos because I don't go to the lectures because they are too late', 'the lecture is very late 6 pm to 8 pm and my way to home is 1 hour, and this is very late , after the lecture I am at 9 o'clock at home, so I eat something and do something else then it is 10 so I must go to bed, and this is the reason why I look at his lectures in the internet, but I really I don't understand.' -Participant code 38, Female, BI*

> *'I think also that the lecture time is too late, it is at 18 o'clock, 18 to 20, it is too late, and most of the students for that they don't come to the lecture.' -Participant code 31, Male, BI*

> *'I stopped after 3 times of attending, I don't like the lecture time at the afternoon, it doesn't suit me, I have to go to the sport centre to play football, it's just I don't have enough time. ' -Participant code 18, Male, BI*

> *'I went at the evening and I cannot concentrate in this time. So it is difficult, not going to these speeches', 'He <the professor> should move his lesson to morning' -Participant code 57, Female, BI*

> *' *****, it is very hard to understand, I think the lectures are very late and sometimes it is difficult to attend them and I cannot concentrate because my head is full with other things ...' -Participant code 23, Female, BI*

> *'... and the lecture also is too late, 6 o'clock!! Till 8 o'clock <pm>.. Who goes to the lecture! No body!!' -Participant code 40, Female, BI*

> *'The time 18 to 20 it is too late, you can't concentrate. I tried to but then I am sitting there and I am just playing with my laptop or talk to others and I can't concentrate*

anymore so I think OK then I went at home eat something, shower and then learn a little bit.' -Participant code 44, Male, BI

'Mmm I don't go to the lecture, because it is too late at 6 in the evening, and I think I will make it at home but I don't make it <short laugh> yes' -Participant code 36, Female, BI

A total of 53 tags (codes) are associated with theoretical lecture problems, see table 5.1.

This informatics lecture that the participants complain about being late at the evening is also available for students as a video, but many participants complained as well on not understanding it, being too complicated, or recorded several years ago (old lectures):

'The professor now put another theme in his subject, he is now also talking about Python, it wasn't before, but the videos which are on the internet to watch are still the same, maybe about some 10 years <the age of the videos> , if he takes another theme or another subject then he must add it to the videos.' -Participant code 49, Male, BI

'...<interviewer: and do you see the videos of the lectures sometimes?> Yeah, also, but it is such hard to listen <short laugh> I don't know. Yeah. <interviewer: what do you think like it is too much information? Or what?> Mmm he is quite slow, I think, maybe he should probably more compare with some actual topics from real life, yeah <very short laugh>' -Participant code 57, Female, BI

'<interviewer: you have the lectures on videos so if you repeat them can't you understand the subject?> No, I see those videos because I don't go to the lectures because they are too late and , mmm nothing < with a laughable tone indicating that she doesn't understand anything>' -Participant code 38, Female, BI

'the lectures m are very late and sometimes it is difficult to attend them and I cannot concentrate because my head is full with other things m and when you see the videos after you go back home from university it is difficult also to concentrate on them' -Participant code 23, Female, BI

'I have the videos of the lectures and I see them but also do not understand! Sometimes I go to the lecture but leave after half an hour, it is as the video. '-Participant code 20, Male, BI

Some participants go through the video very fast as this one:

'...<interviewer: What about videos? Is it the same thing?!> Yes it is, and when I watch the videos I always walk on them tic tic tic tic tic tic tic tic tic tic <referring that she passes on the video quickly> because he is too slow and then he switches to the subject before and then forth and then back <laughing> yeah, I just get confused sometimes.' -Participant code 23, Female, BI

Another participant says that he cannot learn from the lecture if it is recorded, he wants the atmosphere of a real lecture:

> *'No, I cannot sit there in front of my computer and watch videos!! And make notes! I am not able … <interviewer: so you want a face to face contact with the professor and not a screen?> yeah and I want the surrounding that give me the experience to learn, and when I am here and when I am home in front of my computer I am not working <referring to studying> "interviewer: playing?" yeah!' -Participant code 39, Male, CS*

And this participant says that students usually do not often see recorded lectures, they want real lectures:

> *'… if you hear it two times in a week the same, it could be better. But it is hard too because often people <students> will not see the videos at home, only the lecture, and.. I don't know. But it is too late <the lecture time>' -Participant code 44, Male, BI*

As well as this participant but he refers that even if the lecture is better than the recorded one he cannot understand:

> *'We look into the videos and look in to the script, but I think it is better to go to the lectures. I go to the lectures but I think it is nothing <he means he does not understand>' -Participant code 7, Male, BI*

Those two participants say that the video is a good way to understand the subject but they cannot relate it to the exercises, having problems in connecting the theory to practice:

> *'With the videos one can read the script and listen, but I still find the Exercises so difficult to solve.' -Participant code 42, Male, BI*

> *'I look in to the videos, I understand it but when I want to make the task I have problems' -Participant code 41, Female, BI*

As we have described previously, many participants stated that if they have some questions on a subject and need some help to find answers, they usually ask their friends or their learning group for help, the tutorial teacher comes in the second place when seeking help. But they usually avoid asking the professor if they have any questions. Participants gave several reasons for not asking the professor, especially inside the lecture hall, among them is that they assumed that the professor usually does not have time, or their question may be simple and then they will get embarrassed in front of the other students in the class:

> *'In the lecture, no it doesn't happen, because I know my questions are really trivial, but that's all. Something you forgot so you just have to not think about it and leave it, so I don't ask, never.' , 'No No , in the tutorial section "Übung" I go and ask and I*

don't leave a question that I don't ask , but in the lecture No' -Participant code 3, Female, BI

*'I think when I will ask Prof ***** then he will try to explain them but I think he has not so much time to explain for everyone what he wants to, and somehow I do not ask, and I try to understand by myself at home or something' -Participant code 23, Female, BI*

'The professors have a very short time after the lecture. Usually they don't have very much time for us.' -Participant code 31, Male, BI

'I don't ask the professor, no, there is too a lot people' -Participant code 41, Female, BI

' ... the problems of the professors is that they disappear, very fast, ... they will run away and you won't ask them anything, because if you ask them they maybe say they don't have time or something like that. And they just have to go to the other lecture time, but it doesn't disappoint me because I don't ask them.' -Participant code 49, Male, BI

Some participants avoided asking the professor for help outside the lecture hall as well. They assumed that the professor also has no time for them:

'<Interviewer: if you have a problem in your study do you go to the professor to ask him?> No I don't go. <interviewer: why?> he has not much time for the students', 'I always talk with my friends, and if I don't understand it then I think I look into the videos again or I ask my tutorial teacher' -Participant code 42, Male, BI

'... First I would ask students for help, and if they can't help I will try it again, if no, I will go to a teacher and ask him. I know that the Professor has too much work to do that he don't need any.. <laughing> don't teach <He means the prof. doesn't have time to answer questions!>' -Participant code 10, Male, BI

'I just like to try at home by myself and if I still don't know it then I will ask probably any student for any kind of help <short laugh> and if he doesn't know in any way then I will ask the professor, probably it will be my last choice <short laugh>' -Participant code 57, Female, BI

*'I never asked Prof. ***** ..., because I know he doesn't have time for me.' -Participant code 20, Male, BI*

Participants have mainly issues and problems in studying informatics subjects, some few also have problems with mathematics. A total of 27 tags (codes) were associated with problems and difficulties in mathematics, and a total of 167 tags (codes) were associated with problems and difficulties in informatics subjects, see table 5.1.

Reasons mainly are due to the weak background of students, as mentioned previously in section 5.4.2. Workshops before university could make a difference in this case, as some of the participants said, they attended mathematics workshop for two weeks before the first semester started, and it helped a lot later when they started their study. Some participants recommended the same thing for informatics subjects:

> *Maybe they could make some workshops in programming for the 1st year students before the semester begins similar to what they are doing for mathematics, so the students can understand the concepts. In software engineering and other related concepts, especially abstract thinking. ' -Participant code 34, Male, CS*

> *'Probably students should be told more about informatics, probably offering them workshops for example', 'and we only had this math tutorial before the university starts, but if they also offer mmm something programming to make it more easier to start with it so probably not just math but also programming, business informatics, everything just a little bit. May be 3 or 4 days for everything and not just math for 2 weeks.' -Participant code 57, Female, BI*

> *'One of the things they could do is the workshop before the university starts, for example they gave us 2 weeks mathematics, three hours a day, so they could do something similar to informatics subject about 3 weeks and programming, that will really help the students. By that the student will enter the lectures when university starts and he will start to understand what the professor is talking about. I began to love mathematics because of this workshop before university started.' -Participant code 3, Female, BI*

> *'Maybe they should do something like we had in math, we had a course before University began and it was good, because I know Ok the math is on this level and I have to work more for math that I understand it, this was a good idea. This was 2 weeks before university' -Participant code 38, Female, BI*

> *'It was only math <speaking about the workshop before University> but it was important for the first weeks I guess. This was mathematics for beginners to study computer science, ... and it was the best course I had ever had to get a hang on everything.' -Participant code 46, Male, CS*

Some problems	Number of tags (codes)	Details
Adaptation	59	Having Too much material and not enough time is related to 14 participants with 28 tags (some have multiple tags, max 5, min 1) + having problems with other students is related to 7 students with 10 tags (some have multiple tags, max 2, min 1), problems related to field speciality for example. + other different adaptation problems related to 13 participants with 19 tags (some have multiple tags, max 4, min 1) and it is related mainly to university system being different from school, and some for being alone and not having friends. And 2 tags for 2 participants for the problem of the long distance of the university to their house although they live in Berlin.
Procrastination	74	A total of 50 tags are related to 22 students where students directly mentioned that they fall into the problem of procrastination (some have multiple tags, max 7, min 1), other 24 tags (codes) where 13 students do actions or show signs that are leading to procrastination (some have multiple tags, max 3, min 1).
Tutorial teacher and section	80	A total of 56 tags are related to 22 students where students highlighted problems related to tutorial teaches qualifications (some have multiple tags, max 10, min 1) another 24 tags are related to 14 students (some have multiple tags, max 4, min 1) , 12 tags of them are concerned with problems related to the tutorial section environment, the other 12 tags related to the problem of not enough time inside the tutorial section
Theoretical lectures	53	A total of 53 tags are related to 21 students (some have multiple tags, max 6, min 1) having problems in inside the lecture hall (14 tags, 9 students), having mainly problems in connecting the theory with practice (24 tags, 13 students), other students (15 tags, 11 students) having problems with the starting time of the lecture.
Mathematics	27	A total of 27 tags are related to 12 students (some have multiple tags, max 5, min 1) having problems in Mathematics
Informatics subjects	167	A total of 90 tags are related to 25 students (some have multiple tags, max 10, min 1) having problems in 'Foundations of Programming I+II', A total of 57 tags are related to 19 students (some have multiple tags, max 8, min 1) having problems in Programming. Other 20 tags related to informatics subject in general being heavy, difficult, very stressful and not fun.

Table 5.1: Some tags (codes) with details.

5.4.7 Changing the University and Changing the Study Field

Participants usually have a tough start at their first semester when they are introduced to informatics subject, as we have seen from previous sections. Anxiety and fear of informatics subjects usually continues on the following semesters as some students fail in some of those informatics subjects or postpone taking their exams. As participants reached their third semester, they began to think about their future and whether they could make it or not in their study. So changing the university is one of the first options that those participants started to think about. They wanted to continue in the same field of study but in a different university, TU Berlin was the choice of the participants, they believed that the study will be easier there. And since most of the participants who wanted to change lives in Berlin, TU Berlin was their optimal choice, study is easier (from some of the participants' perspectives) and near their home. Only few other participants thought about studying something else, which is mainly business administration. Here is what some participants said at their third semester:

'... after the summer semester I think I will now try to change, and then if I got a yes then I will think about it ... <interviewer: is it because you don't like the informatics subjects?> yeah, because I am not sure if it <stopped> it is not that fun for me, I know that some other subjects are not fun too but they are more interesting for me. So I don't know if I want to do like program things later in my life in my job, administration is more my thing. I have to think about it.' -Participant code 57, Female, BI

'Maybe I will switch the university, I just asked for the acceptance for the TU in Berlin because they have also Wirtschaftsinformatik <business informatics> and because a friend of mine ... said it is much easier in TU. Because we have a lot of programming languages they just focused on Java, just Java, and I think it is much easier for me to do there my study than here because I am not an informatics student, I can't be a friend of that.' -Participant code 49, Male, BI

'... <interviewer: so what about this semester?> This semester is a little bit complicated because I want to change the university, yes I want to change and some subjects the other university don't accept and it is a problem now I will write three tests at the beginning of the semester I wanted to write six, but then I decided three because these subjects, the other three, the other university will not accept it. I don't know whether it is the right move, right decision, but I hope I can change.', '...I have fun with the subjects, but informatics <ah> I think oh GOD <laughing> <interviewer: In Berlin you must also take informatics subject?!> Yes there are I think three subjects statistics and something like that <interviewer: so there are less informatics subjects?> yes, because I talked very often with friends about this. <interviewer: and they encouraged you to go?> yes <laughing> I hope it will be the Right decision, I don't know if it is.' -Participant code 40, Female, BI

'It is difficult and I have problems and I think I will change the university to TU, <interviewer: when will you change?> after this semester, I give my degrees and I wait for the .., because I study economics and informatics, so business informatics, and it is the informatics part is too difficult because my study is not informatics alone, it's with the economics and her I study with the informatics students and it's two studies in one! That is difficult.' -Participant code 41, Female, BI

*'Now we are six or seven friends who will change. I searched a little bit about TU and then he <his friend> said I come and then we said to our group, the girls and the other boys, and every one said we want to change. ... And the reason is really ***** <an informatics subject from the 1st semester>. And if you don't pass during your three chances you will not study business informatics.' -Participant code 7, Male, BI*

'I want to change my university to TU, I have friends there and I attended with them in TU, it was good, they don't have a lot of theory as here ..., they focus on programming languages and the important things.' -Participant code 18, Male, BI

All the participants who wanted to change to TU Berlin did not get accepted, their request application to change was refused (one participant said that they did not have enough points required to start at the third semester in TU Berlin) so they continued their study at the University of Potsdam except one female student, she has changed her study field to business administration at the University of Potsdam after her failed attempt to change the University. See Table 5.2 (her code is 41).

The passion of this female business informatics student was business administration from the beginning but she said at her first interview that she wants to continue in business informatics as long as she is doing well in the exams, on her third semester she said that she wants to change to TU Berlin in the same study field and she is attempting to apply after she finish the third semester. But she could not get accepted. Her friends (who are also participants in this research) also requested to join TU, and their application was also rejected. So she changed later, after her fourth semester, to Business Administration at the University of Potsdam, while her friends continued their study in business informatics at the University of Potsdam. This pattern can be seen with other participants, as they were willing to continue their study at the University of Potsdam but then at their third semester they begin to think in changing the University. And as discussed earlier in previous sections and according to some participants, one of the first semester informatics subjects has played a main role in many students decision to think in changing or staying at the University of Potsdam, or for some to think in changing their study field later.

During this study, two male business informatics students stopped responding after their first interview to any further questions or interview meetings, see Table 5.2 (participants with code 15, and 20). One of them said in his first interview that he will change to business administration.

Two other male business informatics students stopped responding to the invitation to the second interview (held on the 3rd semester of freshmen), see table 5.2 (participants with code 42, and 35). One said on his second semester, in the questionnaire, that he will not stay further more in his current study without giving a reason. The other responded later after three semesters, to an email that was intended to ask students about their current situation in study and whether they are still continuing or not, and he said that he did not respond earlier because he was away for a semester to try to study in TU Berlin and he returned back to the University of Potsdam to continue his study in business informatics.

Another female participant changed to business administration, after her fifth semester (according to her response on an email asking her about her continuity in study). At her third semester she said that she would like to continue studying business informatics, but her study depends on how she will do on her third semester:

> *'I would like to stay here. But yes study depends on how this semester will be. I might change to BWL... I like informatics but some subjects are really hard and I don't know if I will handle them' -Participant code 23, Female, BI*

Code	Real passion of study	Semester *	**Winter semester 2012/2013**	**Summer semester 2013**	**Winter semester 2013/2014**	Study status on the following semesters (If any!)
			Are you planning to continue in your study?	Will you continue to stay in the study program?	Till now you want to continue?	
Computer science participants (all male):						
46	Computer science	1st	Yes, I am planning to continue.	Yes, I will continue to stay in the study program in the normal informatics. Maybe planning to change into the new bachelor "Computational Science"	I am not sure about it. I just want to restart this with another bachelor, this is I don't know anything.	
39	Politics/History	1st	Yes	Yes	Yes, definitely	
34	Computer science	3rd	Yes, at any case.	Yes	It's one more and I think probably two more semesters and I will finish.	
Female business informatics participants:						
41	Business administration	1st	I don't know, but I have good marks in the exam then I will continue but when I have nothing then I will change	Yes I want to continue with business informatics	I want to continue business informatics in Berlin; here we study with informatics students while there it is separated. It is easier.	*She did not get accepted in TU Berlin so she changed to Business administration at the University of Potsdam.*
38	Business administration	1st	Yes, I will try <laughable tone> I can do it, but it is hard.	Yes, I am still staying in this study program and want to continue	I want to change to TU Berlin in the same study field. But I don't know if they will take me. It's mostly because the informatics part.	*She did not get accepted in TU Berlin and continued her study at the University of Potsdam.*
36	Business administration	1st	I think I will continue	Yes	I want to change to TU Berlin, and continue in Business informatics. Here it is too.. I don't know, it is too complex.	*She did not get accepted in TU Berlin and continued her study at the University of Potsdam.*
03	Business administration	3rd	I have registered to all universities, and only this accepted me. So if this is my road then I must walk in it! And I will continue walking in it.	Yes	Yes, not so much has remained <short laugh>	
29	Business informatics	1st	Yes	Yes	Yes	
23	I was interested in computers so I chose business informatics	1st	Yes	Yes	I would like to stay here. But yes study depends on how this semester will be. I might change to BWL ... I like informatics but some subjects are really hard and I don't know if I will handle them	*She changed later to Business administration at the University of Potsdam!*

Code	Real passion of study	Semester *	**Winter semester 2012/2013**	**Summer semester 2013**	**Winter semester 2013/2014**	Study status on the following semesters (If any!)
			Are you planning to continue in your study?	Will you continue to stay in the study program?	Till now you want to continue?	
Female business informatics participants: (cont.)						
40	Business administration	1st	At the beginning I wanted to change but then I thought mmm you have to do this, one must try it	Yes	I want to change the university. In TU business and informatics are separated, not together, different subjects. I hope it will be the right decision, I don't know if it is.	
57	Business administration	1st	Ahhhh I am still not sure yet! So I have to make some improvement more and see if I want to make it or if I can make it! I am not sure	Yes	I will now try to change <to business administration at the University of Potsdam> and then if I got a yes then I will think about it … I am not sure of it … Informatics it is not that fun for me	
Male business informatics participants:						
44	Business administration	1st	Yes, I will do it because after that you get a job , find easier a job with business informatics than only BWL	Yes	Maybe it would be better for me to go to the TU Berlin; I need 20 minutes, to come here one hour. But they all say that it is easier there but I can't imagine that it is so much easier there! They say that there the subjects are for only business informatics. So maybe.	
10	Business administration	3rd	Actually I studied IT business, it is both financial and IT, and first I thought I could change to economic studies but then I did so much so I decided to study here	Yes	I am really thinking about changing the subject but within the University of Potsdam, I am thinking about studying something else.	
07	Business administration	1st	I want to continue	Yes	I want to change to TU Berlin.	*He did not get accepted in TU Berlin and continued his study at the University of Potsdam.*
15	Psychology	1st	I study because I mind about my future, about my family, to get a secure job, but it is not like I can say I love it!	*He did not respond on the following semesters, but he is continuing studying at the University of Potsdam since his university email was still active till the end of this research but I am not sure whether he continued as a business informatics student or changed his study field!*		
20	Business administration	1st	To be honest, I like the study, and the first year I am going to complete it any way. I will take the exams and everything. But the reason that I want to take the exams is that the subjects that I will pass in I can take them with me when I change my study. I want to continue only in Business.	*He did not respond in the following semesters, but he is continuing studying at the University of Potsdam since his university email was still active till the end of this research but I am not sure whether he continued as a business informatics student or changed his study field to business administration as he stated at the first interview!*		
42	Geo-technology	1st	I want to see myself in the exams in Feb, and if I see I can't do it and it is too difficult for me then I will change the study. Informatics was not my first wish of study.	I won't stay, I will change my studies	*He did not respond on the following semesters. He did not give his University email so I am not sure whether he continued his other study at the University of Potsdam or not!*	

Code	Real passion of study	Semester *	**Winter semester 2012/2013**	**Summer semester 2013**	**Winter semester 2013/2014**	Study status on the following semesters (If any!)
			Are you planning to continue in your study?	Will you continue to stay in the study program?	Till now you want to continue?	
Male business informatics participants: (cont.)						
35	Industrial Engineering	1st	Yes, but not because it is the best, but just to have something, maybe later it will become more fun than the 1st semester	Yes	*He did not respond to the invitation to make another interview but then he said he was away for a semester to try to study in TU Berlin and he returned back to the University of Potsdam to continue his study in BI!*	
30	Business Informatics	1st	Yes, I do not want to change	Yes	Yes, I think so.	
43		1st	Until now I want to continue.	Yes	I am going to continue	
49	Business Informatics	1st	I really want to finish this study	Yes	I want to continue as a business informatics. But maybe I will switch the university, I just asked for the acceptance for the TU in Berlin	*He did not get accepted in TU Berlin and continued his study at the University of Potsdam.*
18	Politics	1st	Yes	Yes, I will continue with business informatics	Yes, but I want to change my university to TU Berlin,… they don't have a lot of theory as here	*He did not get accepted in TU Berlin and continued his study at the University of Potsdam.*
14	Business informatics	1st	Yeah, regardless of what will happen later, I have decided to study here and I want to do everything required to continue. That is the current situation.	Yes	Yes	
31	Business informatics	1st	Yes I want to continue, on the current moment I want to continue because I like it.	Yes	Yes I want to continue it but I don't know if I want to do it at this university or in Berlin. Because a lot of my friends wants to go to the TU in Berlin, … many of them said it is easier than here because there is not so many theory	*He continued his study at the University of Potsdam.*

Table 5.2: Study status of participants through continuous semesters of their study at the University of Potsdam

5.4.8 Students' Preferred Leaning Styles

The ILS questionnaire (a multiple choice questionnaire created by Felder and Soloman, see chapter 4 for more details) was taken by 19 participants during the second interview. The goal was to identify their learning styles preferences on the four distinct dimensions: active/reflective (ACT/REF), sensing/intuitive (SEN/INT), visual/verbal (VIS/VER), and sequential/global (SEQ/GLO), see table 5.3.

From the table 5.3 one can see that more female participants have a tendency towards being sensing learners than male participants, and more male participants have a tendency of being visual learners than female participants (same findings as in chapter 4).

Participants code	ACT/REF	SEN/INT	VIS/VER	SEQ/GLO	Tendency of being
Computer science participants (all male):					
39	**-5**	-3	-1	3	Active learner
34	**5**	-1	**-11**	1	Reflective and Strong Visual
Female business informatics participants:					
41	-3	**-7**	1	-1	Sensing learner
38	1	**-7**	-3	3	Sensing learner
36	**-5**	**-5**	**-5**	**-5**	Active Sensing Visual Sequential
3	1	**-11**	1	**-5**	Strong Sensing learner
29	-1	-1	-1	**7**	Global learner
23	-1	**-7**	-1	-1	Sensing learner
40	**-9**	1	**-5**	1	Visual and Strong Active
57	**-5**	**5**	**-7**	**-7**	Active Intuitive Visual Sequential
Male business informatics participants:					
44	-3	-3	**-7**	-1	Visual learner
10	**11**	1	**7**	**7**	Verbal Global and Strong Reflective
7	**-7**	-1	**-11**	-1	Active and Strong Visual
30	1	-3	**-7**	-1	Visual learner
43	-1	**-7**	-1	-1	Sensing learner
49	**-7**	-3	**-5**	1	Active Visiual
18	**-5**	**-7**	-3	**-9**	Active Sensing and Strong Sequential
14	-1	**-11**	**5**	-3	Verbal and Strong Sensing
31	-3	-3	**-5**	1	Visual learner

Table 5.3: Participants' learning styles preferences according to FSLSM. To understand the table let us take for example the ACT/REF dimension: the odd numbers between -1 and -11 indicate the strength of preference towards being an active learner, while the odd numbers between 1 and 11 indicate the strength of preference towards being a reflective learner.

According to [47, 48, 49], the students that need the teacher's attention are those whose preference is moderate or strong (meaning that the score is between -5 and -11 or between 5 and 11). The more students in that category, the more a teacher should adapt the teaching to meet their needs. When a dimension is in balance, meaning that the score is between -3 and 3, a student can switch between the preferences depending on the teaching style; this means that no matter which preference is used in teaching, such students will manage.

The questionnaire was only taken once by the participants. No particular relation was found between the participants learning style preferences recorded in table 5.3 and their performances results in subjects of their first semester (some information regarding their performance in exams was only collected through the questionnaire that was sent to the participants on the semester following their first interview), but as mentioned in chapter 4 and according to a study done by Allert, J., see [53]. And a study by Chamillard and Karolick, see [54], and Thomas et al. study, see [55]. They found that reflective and verbal learning style students achieved top grades more frequently and lower grades less frequently than their scale opposites (active and visual learners respectively), this applied on one computer science student (participant code 34, see table 5.3) as he was a moderate reflective learner and he was doing great in his study but on the other side he was a strong visual learner. Another participant who is a business informatics student which has an IT background (participant code 10, see table 5.3) he is a strong reflective and moderate verbal learner, and he says he is OK and satisfied except for one of the informatics subjects. Another participant who was a moderate verbal learner and a balanced Active/Reflective learner was doing well in his exams. But there are other students who are also doing well (despite having complains about some subjects and tutorials) but there were not reflective and verbal learners.

5.4.9 Teaching Methods and Personal Qualities of Lecturers Preferred by Students

After three semesters from the beginning of this study participants were asked on the kind of teaching methods or the way they will teach if they were chosen to be tutorial teachers, here are the answers of some of the participants:

> *'I think most of the time I can go along with start of exercises lessons and do exams at the end but I was like if we do a project in groups in all of the semester and give a paper at the end and do a competition and such things, that is more for learning communication and aaa programming styles and such things.' -Participant code 34, Male, CS*

'Best way is to have small groups mmm ok it is not always possible <short laugh> I know. But if you have small groups you can interact more closely with the students and this is always a good practice because students ask more and are on track and yes, and this feeling of personal interaction is very important I think … it is more a friendly giving and taking <short laugh> that should be.' -Participant code 34, Male, CS

'I would do this a little bit individual, just ask everyone where are the problems, what didn't you understand, and especially where is the difficulty. Because there are some people who won't say anything, who will not say: ok here is my problem. But maybe there are 3 or 4 people have the same problem. And there is only one who is saying this is a problem and you are solving this problem for more than just one, but for all the others who are not having the mood to even say: I got a problem. Also, I would give them homework, because in school we don't like homework, because you say: OK this is easy and I don't like to do this. But in your study it is much better to get homework, you have, you must to, you must sit down at home and you have to learn. And just to give them maybe 'Bonuspunkte' <bonus points> for the 'klausur' <exam>, when you are doing the homework you just give them +0.1, if they are passing the test, so maybe if you are doing all the homework then score will change from 2.6 into 2.3 then every student will do this, really do all homework. Because you cannot tell someone who is grownup you must do homework. I cannot tell you if I am your professor or tutorial leader to do your homework. You may say: NO, I don't like to do homework, if I will understand it, I understand it here and not too at home. But if I say I will give you something, I will encourage you, if you say if you are doing all the homework and you pass your exam you get a plus 0.3' -Participant code 49, Male, BI

'I would rather try to let them do it by their own also but I think I would know if they really need help or if they can't do it the way I would like them to do it so I would help them as much as I can and mmm I would often ask them if their like knowing grade is getting higher or not, or are you feeling with me and if they are happy with me and if they are learning anything <light short laugh> yeah.' -Participant code 57, Female, BI

'I want from the tutorial to teach us, I want him to show us all together how to solve a problem <interviewer: step by step carefully?> yes that is better, and not just to talk about the solution this and this and say you continue! <Interviewer: so you didn't understand>? We didn't understand.' -Participant code 3, Female, BI

'I would like the students to do their homework so we could do it all together <later>. so first they have to do it at home and then we would mmm do it like step by step, … then I would give them the final solution, and mm yes the I would do like the discussion I would ask them questions what the problems were, what was easy to understand, what now .. Yes, but the most important thing is that the students do their

homework and that is not always the case <now> but I will always give them the right solution of the homework.' -Participant code 23, Female, BI

'I would try to teach by doing, be active and also try to explain and also sharing computer or I don't know at tube , many videos, I would show them videos sometimes to get better , to understand it better. Clearing not always the same but using different ways <interviewer: make it interesting?> yes of course. And yes, be creative.' -Participant code 40, Female, BI

'Mmmm I think I will be funny and would like it with many materials to show it is better to.. <interviewer: to remember?> yes yes.' -Participant code 36, Female, BI

'Well, I guess I try to not make it all boring, it is important. And I will try to explain it, the best I could. And answer the questions. I probably not be like what you had in your survey try to relate it to some other subjects, I just concentrate on what I was supposed to explain them and try to make them understand. This is the best as I could. <interviewer: and you will give more HW and exercises?> it can be annoying but it is on the larger scale helpful.' -Participant code 43, Male, BI

'Oooh mmmm I would mm pooof <making a sound>. I would teach them on the … yeah … cool way, but they understand something, really understand! They can do it after the tutorial … mmm along themselves. Not so like a teacher, not stress, and not like the professor. And there are tutorial teachers they have their PowerPoints and their laptops and tic tic yeah example 14 example 15, who done it, who can do it! It is so boring. <interviewer: you like explaining everything for the students? All the information you have?> yeah. Information that they have to know to work, yes.' -Participant code 38, Female, BI

'I will combine between theory and practice, so mm last semester I had like half tutorial for exam, there was just twice, but it turned out to be fun and also they learn something .. I first describe what we are going to do then how the ways we are going to do it. … So when I describe this is our problem and how we are going to solve this and we are going to do this and we like describe it and talk about it, and then do express it, something like this. That is what I will try to do in my tutorial. <interviewer: will you teach in a fun way?> yeah.' -Participant code 29, Female, BI

'Mmm just let them know what to look at and then do it step by step.' -Participant code 39, Male, CS

'They must do it with fun, because they come there and they are bored and if he is so bored then the students are bored, and you must do it interesting for everyone.' -Participant code 31, Male, BI

'I think I will describe more and do text easier with not so much abstract words, I would communicate and built abstract things so that everyone can understand what I am doing.' -Participant code 30, Male, BI

'Examples, yes, examples are for me the best because if I get examples I think: oh ok this is in life so so I can.. <interviewer: so you will give them the solution and discuss it with them?> yeah. Examples in economics ..., how they are on the projects go on, how the company works and when they need to look at, ... so maybe I will do a lecturing in marketing.. I would like that. I would give many examples.' -Participant code 44, Male, BI

'I ask at the first if someone has a question from the lecture, if some have questions I try to tell <answer> them. And now I show my results and tell them step by step and when someone doesn't understand it I can, or I give him my email address and say write to me.' -Participant code 7, Male, BI

'I think if I have the position to teach others in a tutorial I will not react to all questions, I would describe the way and results and then if there is a question then I will react, when they get the understanding.' -Participant code 14, Male, BI

'If I teach someone it is always the same procedure, structure first, organize and always thinking about my structure and going through every step, yes every step of the structure until I know everything and then I go to the lessons teach step by step, if someone has a question, he is not allowed to ask <short laugh> because I have to say what I want to say then after he can ask everything. ... I try to explain everything so that everyone is able to understand, ok sometimes I use for example words which are not phrases which stand only for one subject, which are complicated or something like that. Like CPU for someone who has no idea about computers, you say CPU, and he looks at you: who? Ok that is not as complicated as one knows. <interviewer: you mean describing the terms to them?> yes, I don't use difficult terms. A few times I use them but I explain afterwards. So if you listen to me it is like hearing a story, I start from the beginning, go to the next step to the middle, and then to the end. And for example I had a great teacher in 10th grade in school which was for mathematics lesson, and that was the same procedure.. If you listen to her it was like she is talking about a.., I don't know, about a ... , so everything was clear. Every rule was based on the rule before, so it was great. Ok if you miss one lesson you have to read after that. ... That would what I would do by teaching. ' -Participant code 10, Male, BI

'First I begin from the bottom, so I explain the task, what you have, what you want to do, then begin step by step, and yes, and at the end I ask the students when they have questions.' -Participant code 18, Male, BI

Participants were also asked about their favourite professor and why, in an attempt to recognize the personal qualities and/or teaching methods they like to exist in a professor or lecturer (names of professors and their subjects that they teach will not be mentioned):

*'Ok mmm I like mm Prof. ***** because the lessons are very interesting and I very like this bonus system for the exams and *****. I don't like Ms.***** because it's very difficult to hear her speaking for the lessons and it is difficult to concentrate on*

that and she works always with pressure and such things …' -Participant code 34, Male, CS

*'Dr. *****, … he makes the lectures and the tutorial and mmm if you are doing both of them you can also apply the tutorial with ''I told you in the Lecture yesterday '' <he will connect the tutorial to the lecture> he just focuses on the but, he also said side by side, I like that way because if he is explaining something in the tutorial he says I told you in the lecture .. We just will get into the details when he tells something. <interviewer: and that is the only professor that you like?> no no .. the professor for ***** he is called ***** because he makes it fun to hear him and to follow him because he also sometimes makes jokes and making you pay attention for this subject he is talking in.' -Participant code 49, Male, BI*

*'I like the **** lessons cause he also make jokes and he made it fun and I think that that is a good idea to get the students interested' -Participant code 57, Female, BI*

*'The best one from professors is Mr. *****, he teaches *****. His subject is so difficult but he knows how to make the student understand what is required from him and why. Most of the time we get out tired from his lecture <with a laughing tone> but we understood. He knows how to make us understand. And he tell us that this subject is so difficult but you will go through it, and master it, and this was really a good thing to hear, this is why I like this subject. Mr. ***** teaches us sometimes in the lecture but the most in tutorial, and he is the one that made me understood the subject, I didn't understood from the <maybe she said the previous lady professor> any word, one goes in and out without understanding. But he really makes us understand the subject. The tutorial is much more important than the lecture.*

*And from the informatics, the professor giving ***** is a good one, I forgot his name. <interviewer: how is it his method in teaching?> his method is he shows us, he says this is the thing, why? Because 1.2.3.4., the subject is like math needs concentration but he works on it and asks us, I even went to him once and he was so kind, he explains the subject and says if you don't understand something or you can't go to the tutorial then come to me and ask. And for true I went and asked. He was patient with me and explained everything. And at the beginning of his lectures he gave the basics of the subject and stayed on a on a level as if students don't understand the subject. So I feel that he knows my level of knowledge and he builds on it and I go with him. But if starts in a higher level then I will just look at him <short laugh>.. So he is a clever professor.' -Participant code 3, Female, BI*

*'Aaaa yeah Prof. *****, he come in ***** and *****, his lectures, yes, he knows how to do it and he is funny and it is really interesting and not so stiff' - Participant code 23, Female, BI*

*'Prof. *****, for subject ***** and *****, he is very fun but he knows exactly what his dream, he likes to very special address us, and you are not bored from him, I like to listen to him, he is not boring and he is very funny <short laugh> and laugh a lot*

*<laughing> in his lessons. … He is very cool. And another one, in the 1st semester in ***** he is a silent character but he is also not boring and sometimes funny, he makes some jokes and he also know what he is saying or teaching us. Yes.' - Participant code 40, Female, BI*

*'Prof. ****** is a very good professor. He teaches *****, he makes jokes in the exams; it is interesting to hear him. <interviewer: so he is the only favourite?> yes' - Participant code 36, Female, BI*

*'The most I like prof. ***** …, <interviewer: and how is his style?> he explains good, that what I like, you understand what he says, it is easy to keep track with him.' - Participant code 43, Male, BI*

*'Prof. ****** … he is good. <interviewer: why is that?> because he is so.. He knows what to say and he transport it in the way so cool with jokes and he is kidding a lot. So I like it. And the ***** professor … Prof. *****. Only those both. <interviewer: prof. ***** is also friendly with students?!> He is. I don't know if I am able to say this! He is strange <short laugh> so this is so funny <interviewer: so you will pay attention to his lecture?> yes.' - Participant code 38, Female, BI*

*'I think mmm Prof. *****, he is an informatics professor, mm well he gives many examples, he makes his lectures alive most of the time … I think his lectures are remembered.' - Participant code 29, Female, BI*

*'Mmm it is a hard question, I think Ms. ***** <interviewer: what is her subject?> I think *****. And yeah <interviewer: why do you think that?> first thing she is the first woman I get to know, so she has another view on subjects and if she tells something and more active I get everything she says, writing every note she says. <interviewer: is it because she is a woman?!!> Mmm no! It is because she explains it in a different way. And that is because she is a woman <short laugh> and not because she is a female. <interviewer: anybody else?> I don't think someone is bad!' - Participant code 39, Male, CS*

*'It is a difficult question, my ***** professor was very good, Mr. **** if you know him, and Mr. **** that is a ***** professor. <interviewer: can you tell why they are good?> they are open, you can ask them everything after the lecture and they can help you.. Mr. **** <a professor> is good too because he helped me very more because of the exams and something, he said always to me you can learn the old exams from me, that is the best learning method in my exams. <interviewer: and did you take his advice?> I have, I have now his old exams. I will do it.' - Participant code 31, Male, BI*

*'***** and *****,… <interviewer: what is special about their way of teaching?> because they teach with examples and so from real life and sometimes say jokes and so on, it is easier to concentrate on their talk' - Participant code 30, Male, BI*

*'It is difficult. Yeah, now aaa in ***** Mrs. ***** , yeah ... , maybe it is because I find the subject interesting, but she is doing a lot, she wants to give some examples and we are talking about it, so we don't only have the lecture , so one week we have the lecture then second week nothing, so we have to do something for this, and so there is a discussion role, so we have an example and we talk about it so the way she is doing this its good as I said because we learn the lecture and after two weeks we do a discussion about this lecture on an example from life' - Participant code 44, Male, BI*

*'I have 3 in my mind ... Prof. ***** ... Dr. ***** ... ***** ..., <interviewer: why do you consider them as good professors!?> Dr. prof. ***** ... was very Javier; very friendly, very very friendly. And also we could ask everything. ... if he don't scare me away. I could ask him everything if I didn't understood it. It was just a friendly atmosphere with him. <interviewer: and the second ...? > He is just a figure; I can't say anything about him. He is just unique. He is very strict, he doesn't tell anything, he doesn't tell many things, he is just like sarcastic most of the time, he is just lecturing and every time he is making jokes about how we are not listing to him, because many are talking while he is lecturing and he is just making jokes about them who are not listening, every time he is making jokes about them and constantly talking and lecturing. ... And he gives tips on the topics for the exams, while he was doing it! Who won't listen to it? He is just really.. I like him very much. ... He is strange, very strange ... I just like him. <interviewer: And the third one?>I guess he is very introverted somehow. He doesn't really look at us, just at around and staff ... I liked him very much. ' - Participant code 46, Male, CS*

*'Prof. *****, because he explains the facts, he gives good examples, and the script of his is understandable. And Prof. *****, his script is understandable too, so if I read that and think about that and try that, then I learn.' - Participant code 41, Female, BI*

*'Oooh mmm that's hard. <thinking>.. I think it is.. in this semester Mr. ***** , 'subject: **** ', <interviewer: what is special about him?> special in teaching way, he reacts.. He reacts with questions ... in one way that is flexible and that is very good. - Participant code 14, Male, BI*

We can see that the qualities and teaching methods of the favourite professor(s) for many of the students participating in the study go along or matches the preferred individual way of teaching for those who were asked on the way or method they will use if they become a tutorial teacher (especially participants with the code: 3, 40, 36, 43, 38, 29, 31, 30, 44, 14). And when we compare the ways/methods that participants will adopt to teach with their learning style preferences we find that most participants teach the same way they like to learn, or at least one of their learning style preferences is standing in their preferred teaching

method. This indicates that the learning style preferences of participants have an impact on the selection of the participant to his favourite professor.

5.5 Professors' Opinions

Below is a documentation of some the opinions collected through interviewing some of the professors and lecturers at the University of Potsdam regarding some of these problems and issues presented by the participants, as well as the problem of students dropping-out of study or course:

Professor of the subject (Introduction to operating system and communication):

> *CS students continue with their study, dropout usually happens to CS teacher students and economic students <the interviewee means business informatics students>, those two don't usually have skills in programming and they complain about programming in C language, they are 3rd semester students so it is not my job to teach them programming.*
>
> *I don't think that programming is a school issue; you need to learn it by your own. And usually students who face problems in programming leave the course at the beginning.*

Professor of the subject (Computer engineering and multimedia technology):

> *Interviewer: Do you see some dropout rates from your lectures?*
>
> *Professor: Yes, there is each semester and the dropout rates varies for the same courses, so in computer engineering about 20% and the high semester courses is lower and …*
>
> *Interviewer: Can you give in general why these dropouts occur?!*
>
> *Professor: Mmm I think it depends on the topic, for instance multimedia technology there are many students from other facilities departments and they believe 'oh Multimedia, this is easy I will take this one, easy credit points' and they see it is hard core computer science you have to develop algorithms or calculate any coding and then they are overwhelmed by the complexity and difficulties of the subject, they just skip it … They don't come to the exam and try another easy (subject). And another mmm subject was in computer engineering, this is a little bit like math or theoretical computer science, if we are in the first semester, it is hard to study, just the methods of studying at the university is something new for most of them, and mmm more over it is so theoretical .. so with computer engineering we have the benefit of you can grasp,*

you can touch the subject, you could if you want you could develop hardware and you see if it works, so of course you can do it online with a simulator also, but it is a lot of theoretical algorithms how to develop a circuit and they just drop out because they don't like math, they are not good in math … they believe they are not good in math! And afraid of it 'I do not get it' so they don't try, but you take them by the hand and you show them one on one, yes do this one 'yeah it works.. you see?' Then it works but you cannot do this with hundreds of students so you are lucky to have only few <smile>.

Professor of the subject (Undergraduate math):

I think that some of the students who come to the computer science department. In Potsdam maybe are not so well motivated, you know, and that could contribute in the dropping out …

I guess in general you know you choose something you want to study and you maybe had a little bit of school computer science and you had a sort of an idea what it is about and then you go to university and you find out that it is something completely different. So that could be one reason.

… So again it is a bit of matter of motivating the students and the students being motivated, not just motivating them but they have to motivate themselves. We often talk about motivating students but I think students need to be motivated in the first place from their own as well, I mean not motivating them out of zero.

Professor of the subject (theory of CS):

I have seen this happen ever since I started studying computer science. mm you start studying then you find out things become more and more difficult and then it is getting grey outside and then you have Christmas break, it's time to reconsider and then they don't just drop out of my course, they drop out of computer science. So they stop showing up and then they realize I may not be the right subject and they are just totally frustrated and say it is worthless, I tell them at the first lecture that everyone has this feeling around that time. So they should show up and talk to me before they leave but many of them don't dare to come.

Interviewer: and in your opinion what do you think the solution is to this problem?

One, my favourite solution doesn't work is to shift the semester to start in September. And be done by Christmas. <interviewer: ah OK> that was because the break in between is a really bad thing.

The other solution would be a test, mandatory test before they start, so when they sign up for computer science, … take the test, you don't have to pass it, just take it. To know what you are getting into, because quite a lot of students have no clue what

computer science is. They are shocked by the amount of mathematics that we have. So it would have been better if they haven't started at all. And they realize that they shift to something else or they just drop out of studies. I think we have some evidence but we have no proof because we can't ask the ones who left, we don't know how to talk to them afterword's.

Professor of the subject (Foundations of Programming I+II):

Interviewer: Do you see any dropouts from your lecture?

Professor: I do not have a definite drop-out rate for my lecture. I only have the numbers of people who fail in the exams but I do not know how many people quit the lecture before the exams. In every exam around 50% of the participating students fail. Since students have – depending on their study regulations – 3 or 4 trials there are very few students (estimation <5%) who fail after using all their trials. But I estimate that around 50% of the students give up and drop out before using all the trials.

Interviewer: In your opinion, why these dropouts occur?

Professor: Several reasons: Students might have misconceptions on what computer science is and they may be shocked that it is so "mathematical". Studying is so different from "schooling" and students must learn that they have to motivate themselves, organize their day themselves, make plans what to achieve and when, be persevering to work hours and hours to understand and solve a problem and many students seem not to be able to do this.

But it seems that computer science is also a really difficult subject, more difficult than others. A little anecdote to substantiate this: There are master students from different study programs in my first semester course who need to acquire a little computer science. These students are from all over Germany and carefully selected from a large number of applicants according to their final Bachelor marks, i.e. these are top-level students who, I guess, have A's since school. Nevertheless these students, although having passed a full Bachelor study program, being able to study and being aware of how a university works, have to struggle to successfully finish my course.

Professor of the subject (Undergraduate math, a different professor from the first one):

… Somebody needs to tell them how they have to study. This is the problem, the problem is not the subject itself, and the students are clever enough and most of them young. But most of them don't know how to learn at the university. They learned only how to learn at school. But in the university it is different. I think somebody should tell them one day or in some lecture: how, what it means to study at the university.

5.6 Conclusions

Most of the participants did not accomplish their dreams to study what they like, because of their examination score at their final exam in secondary school (in Germany called: Abitur) was not enough to gain what they wanted. Only 33% of the participants were studying according to their passion, this is because most of the participants in this study were business informatics students, who some of them wanted to study business administration but they couldn't get accepted there, so they chose to study business informatics. Few other business informatics students wanted to study different other fields but they could not as well due to their limited score in Abitur. Some of the students were just happy to have a university study.

Relating to the participants background, 58% of the participants did not have computing lessons at school, this made them struggle with their study, especially at the beginning although even the ones who had computing lessons said they were very simple compared to what they have started with at the computer science department at the University of Potsdam. So it was difficult at the beginning of the semester for most of the participants. Many participants expressed their positive opinions towards the mathematics workshop that started before the University, expressing that it will be good for the students to have a similar workshop in informatics. Such workshops will give them some basics, even if it gave redundant information to what they had in school, it will have a positive energetic effect to the students at their beginning of their study as they will gain some basics, especially for the ones who did not have (for example: informatics) and to have an idea about what is coming ahead in the study.

Most of the participants did not have financial problems, 54% of the participants had BaföG (A financial aid to students under some conditions) and they did not have any financial problems, 24% of them also had a part time job during part of their study. 58% of all of the participants acknowledged that they have financial support from their parents, mostly by living with them. Most of the participants with part time job said that their jobs do not affect their study, so there were no real financial problems that forced the participant to think in dropping-out of his/her study.

Some participants had adaptation problems as they started their study at the university. Being alone is one of the feelings that faced some participants at the beginning, but this usually eases up or disappears after a couple of weeks, but the adaptation problems that relate to

university system being different from school could take a while to adapt (multiple semesters maybe) as students are more used to the fact that the teacher follows their progress in study, giving them weekly charts to do, asking about how they are doing and so on… having too much material and not enough time was a major concern or problem for the participants, somehow most of the participants did not know how to arrange their time to study, specifying early lectures of each professor to speak and open a discussion with the students on how to arrange and study their subjects at the university is recommended. As students begin to face some subjects, especially informatics subjects, they begin to categorize them as very difficult, especially if they have weak background on them, this made some participants ignore such subjects or postpone studying them as they think it will take all their time to learn such subjects, while they have other subjects that they should learn. This leads to procrastination in these subjects in which the students ignored attending and/or studying such difficult subject (from their point of view) and focussing more on the easier ones. Some participants convinced themselves that they could study them later, maybe concentrating on them one month before the exams of the semester. Some decided, maybe unconsciously, from the early beginning, when they heard that these subjects are difficult to pass, to shut down their intention on learning them, and decided to shift them to higher semesters as the system provides flexibility in taking the exams of subjects later in higher semesters (usually a student have 3 attempts during his university study to pass each subject). The psychological effect of being frightened by some subjects as students heard from other higher level semester students or even from tutorial teachers that only few could pass these subjects could also have a negative impact on the students' intension to study hard and on his will to prepare and take the exam of such subjects.

As students procrastinate studying some subjects or fail in some exam attempts they begin to have apprehensions towards their future in completing their study successfully, especially when they reach their third semester, and especially business informatics students. So with this continuous fear of not passing a subject or two students begin first to think in changing the university and seeking an easier one, as for example the participants have heard that studying business informatics at TU Berlin is easier than studying it at the University of Potsdam, so they began to work on changing the university after completing the third semester. All of the participants who wanted to change the university did not succeed in doing that as they did not have the enough points to transfer in the same semester of the other university as some participants said. So the majority of the participants decided to continue

their study at the computer science department at the University of Potsdam, while few others decided to change their field of study within the university and change to business administration. Within the process of perusing to change the university, which took time and energy from the students, students did not take some subjects at their third semester saying that the other university does not need them, so as students couldn't change the university more subjects were accumulated on their shoulder, leading to more pressure and anxiety towards studying them and passing their exams in the future.

In my opinion having some pressure from the beginning is good, from the first semester, pressure that does not depend on the difficulty of subjects but rather on following the progress of the students through their first semester by multiple pre-tests or at least one mandatory pre-test in the mid of the study semester. Such earlier test arrangement pressure made by the professor or the tutorial teacher, could help the student to study and focus from the early beginning putting him on the right track of learning and studying. These tests do exist but they are not a must for the student to take. Probably when the student finds himself studying and passing some exams of subjects that he considers difficult then he will be more energetic to continue on the same style on the following semester without any required pressure, so easing the gap between university system and the school could help the students to put his/her feet on the ground. And since most of the students did not know how to study and arrange their time at the university level, lectures on advising them are required from the beginning by the professors of the subjects as mentioned before.

As students reach higher semesters many realize that they are much near to graduate so they focused more on their study and exams, and don't think any more in changing the university or study field. So less energy and time is spent in this direction and more focus on the study is started.

Many participants, especially at their first semester, had complaints on some tutorial teachers' attitudes and qualifications, some tutorial teachers coming late to the tutorial section, some tutorial teachers being unable to cover all the required exercises allowing for gaps in progress between the different groups of tutorials (with different tutorial teachers). Most of the tutorial teachers are students themselves and usually do not have experience in teaching and dealing with students. Selecting good tutorial teachers, with good communication abilities beside their good scientific background and ability is highly recommended. Some students asked for the professor to visit the tutorial section from time to time to see their progress and connect

the theory they had at the lecture with the practice they are doing at the tutorial section, which I think is a good idea. And another action that will have a positive influence on the tutorial section atmosphere, if implemented, is increasing the number of tutorial sections along with minimizing the number of students in each tutorial, as some participants and professors recommended, this will allow more time for questions, feedback, and discussion inside the tutorial section, or as another solution increasing the tutorial time as some students complained of not having enough time for the tutorial section that allows the teacher to react to each question and need from a student. Taking things step by step in an attempt to understand the subject and start solving the exercises is a common request by a lot of participants, especially at their first semester.

Many participants also had complaints towards the lectures being late at the evening, as many did not attend it because it was too late for them. Some said they had other things to do while others said they could not concentrate on the lecture being in the evening. Although recorded lectures as videos are available for some subjects. But some students complained about not understanding them, being complicated, inability to connect the lecture to practice to do the exercises, and/or being incapable on concentrating on them. Some professors may avoid recording their lectures or avoid even putting too much material online to force their students to attend their lectures, other professors may try to make the lecture more interesting than the recorded one to make students attend and interact, this second approach could go along with the students desire to hear something different when he/she attends the professor's lecture, not a replicate of what the professor has on a video. Qualities that existed in students' favourite professor were many and differed more or less from student to student, we found out that the learning style preferences of participants had an impact on selecting their favourite professor. Participants liked the professor that connects the tutorial to the lecture, makes jokes, being funny and interesting, not boring, likable to listen, easy to keep track with, makes the students understand what is required from them and why, knows the level of knowledge of his students and builds on it, explains good and gives many examples especially examples from real life, makes his lectures alive and unforgettable, being open and friendly where students can ask anything (making a friendly atmosphere during the lecture), as well as some students mentioned other different qualities such as being unique in his style, strict, sarcastic, giving tips for the exams, the script is understandable, having a bonus system, and/or being strange (getting the students' attention).

No particular relation was found between the participants' learning style preferences and their performance, probably because of the low number of participants. The qualities and teaching methods of the favourite professor(s) for many of the students participating in the study go along or match the preferred individual way of teaching for those who were asked on the way or method they will use if they become a tutorial teacher. And we found that most of the participants prefer to teach the same way they like to learn, or at least one of their learning style preferences is standing in their preferred teaching method and/or their favourite professor.

Chapter 6: Conclusions and Recommendations

6.1 Introduction

The main objective of this PhD project was to analyse prerequisites, expectations, apprehensions, and attitudes of students studying computer science to look into the reasons that make students think in dropping-out of study or changing the study field or university.
The study worked on three aspects: cultural, personal and study aspects, these aspects could have an influence on students' decision in dropping-out/changing their study and/or changing the university. Cultural aspects were investigated through study 1 (chapter 3), personal aspects were investigated through study 2 and part of study 3 (chapter 4 and 5 respectively), and study aspects were investigated through study 3 (chapter 5). This chapter will contain a summary and an open discussion of the findings, recommendation, and suggestions for further research.

6.2 Findings and Discussion

One of the main findings of the first study presented in chapter 3 is that students at the computer science department at the University of Baghdad managed to continue in their study and graduated successfully although it is not really their passion of the majority of students (due to the central acceptance procedure controlled by the ministry of higher education, please see chapter 3 for more details). And due to the nature of the admission procedure to Iraqi universities, women are the majority in almost all branches of study at the University of Baghdad, especially computer science (about 60% and more, differing from one year to another). And they also graduate at the top of their classes for most study years. The high percentage of female faculty members (Asst. Professors, lecturers and Asst. lecturers) at the computer science department, 65%, along with about 91% assistant technician members who are female, could have also a positive influence on female students to study and succeed in their field.

Students who got accepted at the computer science department at the University of Baghdad have usually high scores in the "Baccalaureate" examination; the examination that the students take as their final exam in secondary school that allows them to apply to Iraqi

Universities/Institutes. This probably helped them to graduate successfully although they majority did not have passion to study computer science. And also because of the limited flexibility that exists in the Iraqi higher education system in allowing the students to change universities and study fields, except under some conditions, which gives no choice for the student other than studying hard and graduating successfully. According to Hovdhaugen et al., see [18]: "The degree of selectivity of an institution on the other hand has a negative impact on the probability of students to drop out, i.e. the more selective a higher education institution is, the more likely is study success. Study success is associated with students' prior academic attainment, so institutions with the highest entry requirements have lower rates of drop out in comparison to those at institutions with lower entry requirements". Also, flexibility of the system plays a tremendous role in changing the study and the university/institution. As long as credit transfers are accepted, students can start one degree and then switch to another. One of the drawbacks of this flexibility is study delays and the increase of time spent in higher education to complete the degree but it could prevent the students from dropping out of the higher education system, see [18].

Since there is very limited or no flexibility at the Iraqi university, changing study field and university is not usually possible or very difficult, unless changing is done from a higher department to a lower one (hierarchy of the departments depends on the scope of scores of the students accepted), also "dropout" usually does not occur, this is because of the influence of other factors: first the Iraqi family has a tremendous role in encouraging their sons and daughters to graduate successfully through continuous support, and families will not allow their sons and daughters to just dropout of study without having a second education plan, the community and friends will also have an effect in which usually dropping out without a reason is considered a failure and the student will be judged for this step. Another factor is that the student will think in his/her education and future career, the student usually has no other choice but to continue, otherwise he/she has to apply to a private college or study abroad and this will be a financial burden on the student's family, and a lot of families could not handle such expenses. Studying at the Iraqi public universities also has its benefits, it is for free, even recently students are getting a monthly simple allowance from the government without any future payback to support some of the students' expenses during his/her study at the university (papers, books, cloths, internet, etc..), and this allowance will not be paid if the student failed in his study year, postpone his study for a year, or did not attend his lectures for several times. Also public Iraqi universities have good academic reputation over private

universities, and this will have its effects on the students' career in the future or in case he wants to complete his/her higher education outside the country, so students will not usually think in dropping-out or changing to private colleges, especially if they are intelligent and/or have high scores from school, as in the case of students getting accepted at the computer science department at the University of Baghdad, they have usually excellent school grades when they get accepted, so students often manage to study the hard subjects that they take at the computer science department without much problems, even if they don't like them. Also if we look at the study system and exams schedules adopted by Iraqi universities we see that it uses an annual system were the student needs usually 4 years to graduate from the university, as in the case of college of science, during the year students have two exams, one in the middle of the year (exam of the first term, or also called mid exam) and the other one at the end (exam of the second term) ((50% of the score counts on them) and then a final last exam at the end (represent the other 50% of the score), this distribution of percentage between exams could change from time to time according to the regulations of the examining committee. So students have a whole year to prepare themselves, even if they did not do well at the begning or at the first half of the year due to adaptation problems or weak background, especially in programming, then they have the chance to remedy their score later (second term exam) and prepare well for the final exam. And if they fail to pass these exams then they have a second chance in late summer (before the following new study year begins) so they usually can start the new study year without the burden of taking old subjects with them from the first year, so they will have the opportunity to start the second study year with all new subjects, unlike the case at the University of Potsdam were a student usually lives in anxiety because he has old subjects from previous semesters that he needs to pass and he cannot usually take many new subjects because it will be too much on him/her. The burden of accumulating subjects from previous semesters will be a big burden on the students shoulder and it will usually keep him/her in continuous anxiety and fear of not passing them, as this study explained (for more information see chapter 5). Permanent technicians who have a BSc or a higher degree in computer science, and usually have graduated on top of their class, roll the labs at the computer science departments at the University of Baghdad, they are equal in their type of jobs to the tutorial teachers at the computer science department at the University of Potsdam in supervising and guiding the students when solving their exercises. They are also responsible in doing continuous quizzes for the students over the year to follow their progress, and in doing major lab exams were its score is counted within the annual score of the student. 91% of those technicians are females. And those technicians are available during

the working hours at their labs, and usually there are two technicians in each lab (depending on the size of the lab), so students usually can ask them question whenever free time is available. Having such permanent technicians with teaching abilities at the computer science department at the University of Potsdam instead of the tutorial teachers which are usually students, were many students have pointed out many negative notes on their attitude and on their performance (see chapter 5), could be a good idea, but it will be costly for the university to cover their salaries.

Within the previuos description, we can see that many organizational actions by the university, for example exams, quizes, well trained technicians at labs could be ideas to be thought about by the computer science department at the University of Potsdam that could have a possitive effect on reducing the drop-out rate. Of course forcing students to study a field that they do not like is out of the equation of discussion, and I believe that if students want to change their study from the begining then they should have the oportunity to do so, especially if they have misunderstood the study field they have accepted in. But accepting students with a weak background in a new system such as the university, which is different from the school, should require some special care actions, especially at the first semester, these actions could have its effect on the students life and study progress for the following semesters if he/she has the will to continue and succeed, putting too much pressure with no guidance and/or organizational actions along with no steps to upgrade his essential and nessary knowledge for the field, could make the student study time really hard and streeful and with unessary big presure leding him eventually to seek another university, and if that was not possible, then he/she searches for a different field of study, at the same university or different university or to a university of applied sciences (in german called: fachhochschule), in which in this case probably many semesters have already been passed from the students study life, and changing will probably be the only solution for the student to obtain a university degree, as what happened to some participants in this study (chapter 5). Such changes could be counted as dropouts for the department although the student could still be at the same university, and then the question pops out again: why such dropouts occure? well probably a little bit care, advice, and organizational actions from the begining could have made a difference, especially for the students who want to continue and learn.

The main findings in study 2 (chapter 4), that looks into the personal aspects of the students from the side of their learning style preferences, shows that there are differences in the

learning styles of the students of the three main study fields at the computer science department at the University of Potsdam (computer science, business informatics, and teaching computer science).

This study (chapter 4) has its limitations in which it was only conducted once for the same sample of students, so it is unknown whether there are any changings in the learning style preferences over the time and whether they are affected by the study field of the students, the study also did not take the performance of the students into consideration, this would require access to their scores, other studies such as the one done by Allert, J., see [53], who concluded that two learning style dimensions were highly correlated with performance (Active/Reflective and Visual/Verbal), Reflective and verbal learning style students achieved top grades more frequently and lower grades less frequently than their scale opposites (active and visual learners respectively). His findings agreed with the results of Chamillard and Karolick study, see [54], and Thomas et al. study, see [55]. A study (in chapter 5) on a smaller sample of students showed no particular relation with general performance, except for few cases which have some similarities along with some differences with the other studies mentioned above, especially there was a computer science student who was doing great in his study, and he is a moderate reflective learner but on the other hand he is a strong visual learner. Feedback about the results was collected from some of participants, who gave a valid email, which showed that most students agreed with the results. The choosing of Index of Learning Styles (ILS), created by Felder and Soloman, which is a questionnaire for identifying the learning styles according to Felder-Silverman learning style model (FSLSM), among other different learning style models was based on the fact that is easily administered over the web, easily filled by participants (selection of only one choice out of two for each question), and because of classifying students into two learning style tendencies for each dimension (more detailed than other models) [45, 50, 53]. After doing study 2 (chapter 4) I thought that going further in research in this direction, investigating in the effects of learning styles preferences and differences on the dropout phenomenon, will not serve deeply the case of our dissertation (the problem of dropout), beside the time constraints from the side of my government. So I decided to put it aside and investigate in more important factors from my point of view that could affect the dropout phenomenon between students studying computer science. But as I did study 3 (chapter 5) and looked more into the realations between students learning style preferences and his/her prefered teaching methods and favorite professor, I began to realize how important it is to meet the students prefered learning style, especially

when it comes to motivate the students to attend and listen to lectures, this will lead the student to understand the lecture as he/she will be probably more focused on the professor inside the lecture hall. The student will loves the way and method of teaching of the professor and this will lead him to like the subject as well. It will not be the same as if the student studies alone or in groups just to remedy the deficiency of lecturing (teaching) when it did not met his/her learning style preferences, or at least one of his preferences. Further research should be conducted in this area to look into the differences that have been recorded in study 2 (chapter 4) in a way that reflects positively on the teaching methods of the subjects that embrace all those students who might differ in the way they learn.

More personal aspects was investigated in study 3 (chapter 5), background of the participants and their financial situation was under investigation. 58% of the participants did not have computing lessons at school, this made them struggle with their study, especially at the beginning although even the ones who had computing lessons said they were very simple compared to what they have started with at the computer science department at the University of Potsdam. So it was difficult at the beginning of the semester for most of the participants, who were mostly business informatics students. Many participants expressed their positive opinions towards the mathematics workshop that started before the University, expressing that it will be good for the students to have a similar workshop in informatics. Such workshops will give them some basics, even if it gave redundant information to what they had in school, it will have a positive energetic effect to the students at their beginning of their study as they will gain some basics, especially for the ones who did not have (for example: informatics) and to have an idea about what is coming ahead in the study.

Most of the participants did not have financial problems, 54% of the participants had BaföG (A governmental financial aid to students under some conditions) and they did not have any financial problems, 24% of them also had a part time job during part of their study. 58% of all of the participants acknowledged that they have financial support from their parents, mostly by living with them. Most of the participants with part time job said that their jobs do not affect their study, so there were no real financial problems that forced the participant to think in dropping-out of his/her study.

Concerning the investigation in the study aspects that could have an influence on the droput problem, we found that most of the participants did not accomplish their dreams to study what they like, because of their examination score at their final exam in secondary school (in

Germany called: Abitur), it was not enough to gain what they wanted. Only 33% of the participants were studying according to their passion, this is because most of the participants in this study were business informatics students, of whom some wanted to study business administration but could not get accepted there, so they chose to study business informatics. Unfortunately some of them had misconceptions about the informatics part and they did not realize how hard it could be. This made them have many problems in informatics subjects, saying that it is hard and difficult to understand. Few other business informatics students wanted to study different other fields but they could not as well due to their limited score in Abitur. Some of the students were just happy to have a university study.

Some participants had adaptation problems as they started their study at the university. Being alone is one of the feelings that faced some participants at the beginning, but this usually eases up or disappears after a couple of weeks, but the adaptation problems that relate to university system being different from school could take a longer time. As students are more used to the fact that the teacher follows their progress in study, giving them weekly charts to do, asking about how they are doing and so on, having too much material and not enough time was a major concern or problem for the participants, somehow most of the participants did not know how to arrange their time to study. Specifying early lectures of each professor to speak and open a discussion with the students on how to arrange and study their subjects at the university could be a good idea, even if their is an adviser who probably advices students on these matters, an advice coming from the professor and relating it to his/her subject could have a greater effect on students.

Students at the begining of their study usually begin to categorize subjects as easy, difficult and probably very difficult, especially if they have weak background on some of them (informatics for example), this made some participants ignore such subjects or postpone studying them as they think it will take all their time to learn such subjects, while they have other subjects that they should learn. This lead to procrastination in these subjects in which the students ignored attending and/or studying such difficult subject (from their point of view) and focussing more on the easier ones. Some participants convinced themselves that they could study them later, maybe concentrating on them one month before the exams of the semester, of course this could have happened over several steps of trying to study, trying to attend lectures, and then eventually leaving the subject aside. Or probably some participants decided, maybe unconsciously, from the early beginning, when they heard that these subjects

are difficult to pass, they shut down their intention on learning them. Usually procrostination leads the students to fail in the exams of those difficult subjects, or the student decides to untake the exam, leading this subject to be passed during his study in higher semesters (usually the students have 3 attempts during his university study to pass each subject). The psychological effect of being frightened by some subjects as students heard from other higher level semester students or even from tutorial teachers that only few could pass these subjects could also have a negative impact on the students' intension to study hard and on their will to prepare and take the exam of such subjects, leading to procrastination.

As students procrastinate studying some subjects or fails in some exam attempts they begin to have apprehensions towards their future in completing their study successfully, especially when they reach their third semester, and especially when old subjects begin to be piled one over the other. So students begin first to think in changing the university and seeking an easier one, as for example the participants have heard that studying business informatics at TU Berlin is easier than studying it at the University of Potsdam, so they began to work on changing the university after completing the third semester. All of the participants who wanted to change the university did not succeed in doing that as they did not have enough points to transfer in the same semester of the other university as some participants said. So the majority of the participants decided to continue their study at the computer science department at the University of Potsdam, while very few others decided to change their field of study and did that later. Within the process of perusing to change the university, which took time and energy from the students, students did not take some subjects at their third semester saying that the other university does not need them, so as students could not change the university more subjects were piled, leading to more pressure and anxiety towards studying them and passing their exams in the future.

The qualification and attitude of tutorial teachers was also an important issue to most of the participants, also some tutorial teachers were coming late to the tutorial section, others were unable to cover all the required exercises. Since most of the tutorial teachers are students themselves they usually do not have experience in teaching and the right way to communicate with students. Selecting good tutorial teachers, with good communication abilities beside their good scientific background and ability is highly recommended, as discussed early in this section.

Some participants requested the visit of the professor to the tutorial section, a visit that could be arranged from time to time, to see the progress of students and to connect the theory they had at the lecture with the practice they are doing at the tutorial section. They also did not like having informatics lectures late at the evening, many participants could not attend, they gave many excuses, one of them was the inability to concentrate at this time.

Qualities of students' favourite professor were many and sometimes differed from student to student according to some of his learning style preferences. In general, participants liked the professor that connects the tutorial to the lecture, makes jokes, being funny and interesting, not boring, likable to listen, easy to keep track with, makes the students understand what is required from them and why, knows the level of knowledge of his students and builds on it, explains good and gives many examples especially examples from real life, makes his lectures alive and unforgettable, being open and friendly were students can ask anything (making a friendly atmosphere during the lecture), being unique in his style, strict, sarcastic, giving tips for the exams, the script is understandable, having a bonus system, and/or being strange (getting the students' attention).

It was interesting to investigate in the cultural aspect presented in chapter 3, personal and study aspects had the most related link to the problem of ''dropout'' from the computer science department at the University of Potsdam, the investigation was presented in chapter 4 and 5, many findings in the study aspects had direct influence on the student to think in changing the university and/or the study field. No real dropout occurred between the participants of this study, only few students changed the study field or were thinking in changing it, after some of them had failed in changing the university (see table 5.2).

6.3 Recommendations

First point to highlight is that students are accepted at the computer science department without a selection procedure. If such selection procedure existed probably there were fewer problems as students with good education background and high school scores will be accepted and most of them will probably manage their study. But as I expect that this will not happen, as the department wants students, and as long as there is no high demand on the subject field and their is an empty study seat available then students are accepted without constraints, probably some of them with weak background as is hapenning now.

So to solve the problem of weak background, a possible first solution that could help, and it already exists on a smaller scale, is workshops before university. It is also positively recognized by the students who took the mathematics workshop, they say it helped them a lot. A similar workshop in computer science to give the basis and more could help.

Another possible solution is to separate between computer science students and business informatics students in the informatics subjects at the first semester to allow for more care and attention to the business informatics students who are usually much weaker in informatics subjects, especially in theoretical computer science, first semester will be enough to put their feet on the ground and later on in the second semester they could join the computer science students in joint courses. Such separation has happened in the mathematics subject recently.

Also special care for students through tutorial sections could help, taking the first semester students by hand, performing step by step implementation of exercises, opening discussions and allowing for more time. This requires hiring tutorial teachers with good education and capabilities in dealing with students. More time for tutorial sections is recommended, or allowing for more tutorial sections with a less number of students to have more time discussions and questions.

Possible spontaneous quizzes that would surprise the students during the tutorial sections, will make students prepare themselves for future quizzes. This could help solve the problem of students attending the tutorial section without any previous preparation or understanding of the topic. Such quizzes could be counted as points to encourage the students to study and prepare. This could also help to eleminate the effect of procrastination.

The problem of students being unable to connect the theory to practice could be eliminated by the professor him- or herself through attending some of the tutorial sections with the teacher to allow for open discussions with the students on this matter. Students want to see how the theory lessons they take reflect on the excersises they solve.

Another possible way that could help eliminate the effect of procrastination is a mid-semester test (pre-test) that is an obligation to take and if possible its score should be counted. A little pressure could help the student to follow the subject from the early beginning.

To have students with less anxiety and fear, and make them more positive about pursuing their study and continuing at the department, and to give a chance for the students to choose more new subjects in higher semesters and eliminate the effect of procrastination, it could be possible to think of putting a limit on the number of subjects that students could take with them to higher semesters, probably a maximum of two will be the best. But I think such action will require some legislation, that is worth discussing with the the concerned authorities.

Specifying one or two lectures by each professor at the begining of first semester to open a discussion about how to study at the university in general and how to study their subjects, and give them advise, attention, and open time to ask questions could help to encourage the studnts to start studying from the early beginning. Hearing advice and recommendations from the professor him- or herself concerning the students study and future after the university will have a great effect on the students from my own perspective.

And as students reach higher semesters many will realize that they are near to graduate so they will focus more on their study and exams, and do not think of changing the university or study field anymore. So possible solutions to the problem of dropout or changing the study and/or university could be a little care, advice, and organizational actions, especially for the students of the first semester.

6.4 Suggestions for Further Research

1. More research on the learning style preferences of students with different specialities, when taking joint course, relating it to students performance, and prefered teaching approaches .
2. Improving tutorial sections in a way that positively influence creativity and motivation of the students in approaching informatics subjects.
3. Possible research on the kind of workshops before university that could compensate the students' weak computer science background within a specific short period of time.

4. Performing a long period research within multiple universities with similar pedagogical goals through a joint research program to follow a sample of computer science students from each university through all the semesters of study to analyse possible similar problems and issues that could have an effect on students' decisions in thinking of dropping out of the study associating it with students' semester performance and learning style preferences.

References

[1] Niitsoo, M., Paales, M., Pedaste, M., Siiman, L., Tõnisson, E.: Predictors of informatics students' progress and graduation in university studies. Proceedings of INTED2014 Conference 10th-12th March 2014, Valencia, Spain.

[2] Rodríguez-Gómez, D., Feixas, M., Gairín, J., Muñoz, J. L.: Understanding Catalan University dropout from a comparative Approach. WCES 2012, Procedia - Social and Behavioural Sciences 46 (2012), 1424 – 1429.

[3] Rodríguez-Gómez, D., Feixas, M., Gairín, J., Muñoz, J. L.: Understanding Catalan university dropout from a cross-national approach, Studies in Higher Education. 40:4, 690-703, 2015.

[4] Fozdar, I., Kumar, L. S., Gandhi, S. K. I.: A Survey of a Study on the Reasons Responsible for Student Dropout from the Bachelor of Science Programme at Indira Gandhi National Open University. International Review of Research in Open and Distance Learning Volume 7, Number 3. ISSN: 1492-3831, December – 2006.

[5] Heublein, U.: Student Drop-out from German Higher Education Institutions. European Journal of Education Volume 49, No. 4, 2014.

[6] Larsen, M. S., Kornbeck, K. P., Kristensen, R. M., Larsen, M. R., Sommersel, H. B: Dropout Phenomena at Universities: What is Dropout? Why does Dropout Occur? What Can be Done by the Universities to Prevent or Reduce it? A systematic review, Danish Clearinghouse for Educational Research, 2013.

[7] Larsen, M. R., Sommersel, H. B., Larsen, M. S.: Evidence on Dropout Phenomena at Universities. Danish Clearinghouse for Educational Research, 2013.

[8] Bound J., Turner, S.: Chapter 8 - Dropouts and Diplomas: The Divergence in Collegiate Outcomes. Handbook of the Economics of Education, Elsevier, 573-613, 2011.

[9] Ulriksen, L., Madsen, L. M., Holmegaard, H. T.: What do we know about explanations for drop out/opt out among young people from STM higher education programmes?. Studies in science education, 46(2), 209-244, 2010.

[10] Woszczynski, A. B., Haddad, H. M., Zgambo, A. F.: An IS Student's Worst Nightmare: Programming Course. SAIS 2005 Proceedings.

[11] Edwards, M., Cangemi, J. P., Kowalski, C. J.: The college dropout and institutional responsibility. Education. 111(1), 107-117, 1990.

[12] Bourdieu, P.: Homo Academicus. Cambridge: Polity Press, 1990.

[13] Tinto, V.: Dropout from Higher Education: A theoretical synthesis of recent research. Review of Educational Research, 45(1), 89-125, 1975.

[14] Tinto, V.: Leaving College: Rethinking the causes and cures of student attrition. Chicago University Press, 1987.

[15] Tinto, V.: Leaving College: Rethinking the causes and cures of student attrition. 2nd ed. Chicago University Press, 1993.

[16] Tinto, V.: Colleges as Communities: Taking Research on Student Persistence Seriously. The Review of Higher Education, 21(2), 167-177, 1998.

[17] Heublein, U., Hutzsch, C., Schreiber, J., Sommer, D., Besuch, G.: Ursachen des Studienabrruchs in Bachelor- und in herkömmlichen Studiengängen: Ergebnisse einer Bundesweiten Befragung von Exmatrikulierten des Studienjahres 2007/2008. HIS: Forum Hochschule, 2. Berlin: HIS GmbH, 2010.

[18] Hovdhaugen, E., Kottmann, A., Thomas, L.: Dropout and Completion in Higher Education in Europe. Literature Review, European Union, 2015

[19] Heublein, U., Spangenberg, H., Sommer, D.: Ursachen des Studienabbruchs. Analyse 2002, Hannover: HIS, Hochschul-Informations-System, 2003.

[20] Ramm, M., Multrus, F., Bargel, T.: Studiensituation und studentische Orientierungen. BMBF, 2011.

[21] Romeike, R., Schwill, A.: Das Studium könnte zu schwierig für mich sein – Zwischenergebnisse einer Langzeitbefragung zur Studienwahl Informatik. HDI2006-2. GI-

Fachtagung "Hochschuldidaktik der Informatik", in: Hochschuldidaktik der Informatik (P. Forbrig, G. Siegel, M. Schneider, eds.), 2006; S. 37-49.

[22] Schulte, C., Knobelsdorf, M.: Attitudes towards Computer Science-Computing Experiences as a Starting Point and Barrier to Computer Science. ICER'07, ACM, 2007.

[23] Beaubouef, T., Mason, J.: Why the High Attrition Rate for Computer Science Students: Some Thoughts and Observations inroads. The SIGCSE Bulletin, Volume 37, Number 2, 2005.

[24] Wiedenbeck, S., LaBelle, D., Kain, V. N.R.: Factors Affecting Course Outcomes in Introductory Programming. 16th Workshop of the Psychology of Programming Interest Group. Carlow, Ireland, April 2004.

[25] Erdogan,Y., Aydin, E., Kabaca, T.: Identifying Predictors of Programming Achievement. 6th WSEAS International Conference on Education and Education Technology, Italy, November 21-23, 2007.

[26] Carter, L.: Why Students with an Apparent Aptitude for Computer Science Don't Choose to Major in Computer Science. SIGCSE '06 Proceedings of the 37th SIGCSE technical symposium on Computer science education ACM New York, NY, USA 2006.

[27] Caspersen, M. E., Larsen, K. D., Bennedsen, J.: Mental Models and Programming Aptitude. The 12th annual SIGCSE conference on Innovation and technology in computer science education, New York, NY, USA 2007.

[28] Chinn, D., Sheard, J., Carbone, A., Laakso, M.: Study Habits of CS 1 Students: What do they do outside the Classroom. Proc. 12th Australasian Computing Education Conference (ACE 2010), Brisbane, Australia.

[29] Holden, E., Weeden, E.: What Makes Valuable Pre-experience for Students Entering Programming Courses?. Issues in Informing Science and Information Technology Volume 3, 2006.

[30] Jones, S., Burnett, G.: Spatial Ability and Learning to Program. Human Technology, Volume 4 (1), 47-61, May 2008.

[31] Peart, A., Bennett, A.: Can’t Program, Won’t Program, Will Program!. http://eprints.port.ac.uk/7743/1/can'tprogramme_won't_programme.pdf, 2005.

[32] Huggard, M., Goldrick, C. M.: Self-affirmation and Success in Undergraduate Computer Science, Frontiers in Education. Oklahoma, USA, 23 - 26 October 2013, IEEE, pp1806-1811.

[33] Huggard, M.: Programming Trauma: Can it be avoided? In Proceedings Grand Challenges in Computing, British Computer Society, March 2004.

[34] Miliszewska, I., Tan, G.: Befriending Computer Programming: A Proposed Approach to Teaching Introductory Programming. Issues in Informing Science and Information Technology Volume 4, 2007.

[35] Stamouli, I., Doyle,E., Huggard, M.: Establishing Structured Support for Programming Students. IEEE 2004.

[36] Kinnunen, P., Malmi, L.: Why Students Drop Out CS1 Course?. Computer Science Education, Volume: 67, Issue: 7, Publisher: ACM, Pages: 97-108, 2006.

[37] Kruger, J., Dunning D.: Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments. Psychology, 1, 30-46, 2009.

[38] University of Baghdad, Iraq; <http://www.uobaghdad.edu.iq/>

[39] Ministry of Higher Education and Scientific Research. Iraq, <http://www.mohesr.gov.iq/>

[40] College of Science, University of Baghdad, Iraq; <http://www.scbaghdad.edu.iq>

[41] Questionnaire; <https://www.dropbox.com/s/gwr3bj1vo0mmqy8/Quetionnaire.pdf>

[42] Henwood, F.: From the woman question in technology to the technology question in feminism: Rethinking gender equality in IT education. The European Journal of Women’s Studies Volume 7, 2000; pp. 209–227.

[43] Gurer, D., Camp, T. : An ACM-W Literature Review on Women in Computing. Inroads, ACM SIGCSE Bulletin Volume 34, No. 2, 2002; pp.121-128.

[44] Cassidy, S.: Learning Styles: An overview of theories, models, and measures, Educational Psychology, 24(4), (2004)

[45] Graf, S., Viola, S. R., Leo, T., Kinshuk: In-Depth Analysis of the Felder-Silverman Learning Style Dimensions, Journal of Research on Technology in Education (2007).

[46] Alaoutinen, S., Smolander, K.: Are Computer Science Students Different Learners?, Proceedings of the 10th Koli Calling International Conference on Computing Education Research, Finland (2010)

[47] Derntl, M., Graf, S.: Impact of Learning Styles on Student Blogging Behavior, Ninth IEEE International Conference on Advanced Learning Technologies (2009)

[48] Felder, R. M., Spurlin, J.: Applications, reliability and validity of the Index of Learning Styles, International Journal on Engineering Education, 21, (2005)

[49] Soloman, B. A., Felder, R. M.: Learning Styles and Strategies, http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/ILS.pdf, (1993). Based on material in Felder, R.M., Silverman L.K.: Learning and Teaching Styles in Engineering Education, Engr. Education, 78(7), 674-681, (1988)

[50] Soloman, B. A., Felder, R. M.: Index of Learning Styles Questionnaire, http://www.engr.ncsu.edu/learningstyles/ilsweb.html

[51] Al-Saffar, L. T.: Where the Girls Take the Role of Boys in CS - Attitudes of CS Students in a Women Dominant Environment, HDI 2012, conference proceedings: http://opus.kobv.de/ubp/volltexte/2013/6289/, University of Hamburg, Germany, November 2012.

[52] Al-Saffar, L. T.: Learning Styles of Computer Science Students, KEYCIT 2014 - Key Competencies in Informatics and ICT (KCICTP – WG 3.4 parallel conference), Potsdam, Germany, July 2014.

[53] Allert, J.: Learning Style and Factors Contributing to Success in an Introductory Computer Science Course, IEEE, 2014.

[54] Zywno, M. S.: A Contribution of Validation of Score Meaning for Felder-Soloman's Index of Learning Styles, Proceedings of ASEE Conference and Exposition, Washington, D.C., American Society for Engineering Education, 2003.

[55] Felder, R. M., Spurlin, J.: Applications, Reliability and Validity of the Index of Learning Styles, Int. J. Engng Ed. Vol. 21, No. 1, pp. 103-112, 2005.

[56] Zwanenberg N. V., Wilkinson L. J., Anderson A.: Felder and Silverman's Index of Learning Styles and Honey and Mumford's Learning Styles Questionnaire: How do they compare and do they predict academic performance?, Educational Psychology, 365-380, DOI: 10.1080/713663743, 2000.

[57] Maric, M., Penger, S., Todorovic, I., Djurica, N., Pintar, R., Differences in Learning Styles: A comparison of Slovenian Universities, Procedia - Social and Behavioural Sciences 197, 175 – 183, 2015.

[58] Melis, E., Monthienvichienchai, R.: They call it learning style but it's so much more. In G.Richards (Ed.), Proceedings of World Conference on e-learning in Corporate, Government, Healthcare, and Higher Education, pp. 1383-1390, 2004.

Appendix A: Education Policy in Iraq

Schools are administered by the Ministry of Education (MOE). Universities, colleges and most institutes are administrated by the Ministry of Higher Education and Scientific Research (MOHESR). School education consists of 12 grades (years), these are elementary stage (6 years) and secondary school, which usually consist of two phases, intermediate and preparatory education phase (3 years each). Each of the elementary, intermediate and preparatory stages ends up with a national central exam (called: Baccalaureate Examination), the maximum obtainable score is 100 and the minimum passing score is 50. See table below for a detailed description of the education system in Iraq [1, 2, 3].

<table>
<tr><th></th><th>Learning level</th><th>Period</th><th>Acceptance age</th><th>notes</th></tr>
<tr><td>1</td><td>Pre-School Education (Nurseries)</td><td>2 years</td><td>4-5 years old</td><td>Kindergarten and Preliminary</td></tr>
<tr><td>2</td><td>Elementary Learning Stage</td><td>6 years</td><td>6 – 11 years old</td><td>Compulsory</td></tr>
<tr><td rowspan="4">3</td><td>Secondary Education Stage
Consists of 2 phases:</td><td>6 years</td><td>12-17 years old</td><td>Two phases</td></tr>
<tr><td>1st phase: Intermediate education</td><td colspan="3">Years (12-14). It is complementary to what pupils learn in the elementary stage and supplies them with broader information of what he or she learned in language and general culture.</td></tr>
<tr><td rowspan="2">2nd phase: Preparatory education</td><td colspan="3">3 years (15-17). Its role is to prepare for university and professional life. The two general preparatory education branches are science and literature.</td></tr>
<tr><td colspan="3">There is another type of preparatory branch which covers the years of age (15-17). It includes vocational and applied studies in industrial, agricultural and commercial education, where the student is prepared for the vocation and the university education in the industrial, agricultural and commercial domains.</td></tr>
<tr><td rowspan="3">4</td><td colspan="3">Tertiary Study Stage, covers one or both of these 2 stages:</td><td rowspan="3">Studies in colleges prepare its students to attain a Bachelor degree and maybe later postgraduate degrees.
Studies in technical institutes prepare its students to attain a Technical Diploma degree.</td></tr>
<tr><td>University Stage</td><td>4 to 6 years</td><td rowspan="2">Usually 18 years and older</td></tr>
<tr><td>Technical Education Stage</td><td>2 years for institutes, and 4 years for colleges</td></tr>
<tr><td colspan="5">There are other educational stages that come right after the intermediate phase of the secondary education with a period of 5 years study and acceptance age between 15 -20 years old, such as:
- Institute of Fine Arts.
- Institute for the preparation of primary school teachers.</td></tr>
</table>

Schools in Iraq are not mixed; there are schools for boys and others for girls. Study is free of charge for all stages at the governmental sector except for evening studies.

Higher education is open to all students who have successfully completed the preparatory

[1] Issa, J. and Jamil, H.: Overview of the Education System in Contemporary Iraq. European Journal of Social Sciences – Volume 14, Number 3, 2010.

[2] UNESCO: World Data on Education (Iraq). 7the Ed, 2010/2011 (updated ver. Aug 2011).

[3] Foundation of Technical Education, Iraq; viewed 4 June 2012; <http://www.fte.edu.iq>

stage of secondary education. The application process is centralized at the MOHESR. The Ministry defines the level of attainment needed for acceptance in special fields of study, based on the number of students and the popularity of the university. The highest grades are required for medical studies and engineering [4].

The acceptance to a specified college or institute will be determined by the student's final score in the central examination (Baccalaureate Examination), taken at the 6th class in secondary school. The central distribution procedure done by MOHESR starts by submitting an electronic application form to MOHESR, where the student can specify 50 choices of subjects, no more than 35 colleges and no less than 15 institutes (if their Baccalaureate average score is 60 and above), or only 50 institutes (if their Baccalaureate average score is less than 60) that he/she prefers to be accepted in. The placement system also considers other facts, like knowledge of additional languages and the permanent residence of the student [4, 5, 6]. Most of the years, females are discriminated in order to achieve an almost equal share between males and females that overrules the females' better scores in the final exam.

Afterwards a second controlled procedure is performed by colleges to distribute students to fields of study (departments) which is also based on the same principle that is used by MOHESR. Most colleges do not have freedom to choose their students, nor can the students "freely" choose their study field (unless they have a high Baccalaureate score), except for few study fields that are based on talent or ability.

Although students in both stages are listing in admission papers their preferred college/institute/subject combination, in reality only those who have got a high score in Baccalaureate Examination could accomplish their dreams.

[4] UNESCO; Iraq, Education in Transition Needs and Challenges. 2004; <http://unesdoc.unesco.org/images/0013/001386/138665e.pdf>

[5] Ministry of Higher Education and Scientific Research. Iraq, <http://www.mohesr.gov.iq/>

[6] Office of the General Inspector in MOHESR, Iraq, <http://www.igmohe.gov.iq/>

Appendix B: An Example of a Learning Style Result Sent to Participants who had provided us with a Valid Email Address

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Results for: *********@***.**

ACT **X** **REF**

11 9 7 5 3 1 1 3 5 7 9 11

<-- -->

SEN **X** **INT**

11 9 7 5 3 1 1 3 5 7 9 11

<-- -->

VIS **X** **VRB**

11 9 7 5 3 1 1 3 5 7 9 11

<-- -->

SEQ **X** **GLO**

11 9 7 5 3 1 1 3 5 7 9 11

<-- -->

Abbreviations	Meaning
ACT/REF	Active/Reflective
SEN/INT	Sensing/Intuitive
VIS/VRB	Visual/Verbal
SEQ/GLO	Sequential/Global

- If your score on a scale is 1-3, you are fairly well balanced on the two dimensions of that scale.
- If your score on a scale is 5-7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favours that dimension.
- If your score on a scale is 9-11, you have a very strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

Recommendations:

- You are a strong active learner. If you found yourself in a class that allows little or no class time for discussion or problem-solving activities, you should try to compensate for these lacks when you study. Study in a group in which the members take turns explaining different topics to each other. Work with others to guess what you will be asked on the next test and figure out how you will answer. You will always retain information better if you find ways to do something with it.
- Since you are also a strong visual learner, try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly verbal. Ask your instructor, consult reference books, and see if any videotapes or CD-ROM displays of the course material are available. Prepare a concept map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections. Color-code your notes with a highlighter so that everything relating to one topic is the same color.

For more information: http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/styles.htm

Appendix C: The Invitation Sent to the Students at the University of Potsdam to Participate in the Study

Liebe Studentinnen und Studenten
der Informatik und Wirtschaftsinformatik,

Sie alle strengen sich im Moment sehr an, um die anspruchsvollen Lehrveranstaltungen zu bewältigen. Nicht alle von Ihnen werden das Informatik- oder Wirtschaftsinformatikstudium erfolgreich beenden. Einige von Ihnen werden das Fach wechseln, einige sogar das Studium abbrechen.

Wir möchten erforschen, welche Gründe genau Studierende bewegen, das Informatik- oder Wirtschaftsinformatikstudium abzubrechen. Es handelt sich um eine Langzeitstudie, bei der wir in jedem Semester mit Ihnen in Kontakt treten möchten, um Sie nach Ihrem Studienfortschritt und möglichen Gründen für den Abbruch zu befragen.

Dabei ist es für uns wichtig, nicht nur Studierende zu gewinnen, deren Studium weniger den Erwartungen entspricht, sondern auch Studierende, deren Studium erfolgreich verläuft.

Wenn Sie an dem Forschungsvorhaben teilnehmen möchten, füllen Sie bitte zunächst folgenden Fragebogen aus:
<https://docs.google.com/spreadsheet/viewform?fromEmail=true&formkey=dFJydTFuX091NlBIdE5EcFZ3ZkVLR0E6MQ>

Die privaten Angaben werden nicht an andere Personen weitergeleitet; sie dienen ausschließlich zur Kontaktaufnahme.

Weitere Informationen zum Ablauf des Projekts erhalten Sie per Email nach der Registrierung.

Als Entschädigung für Ihren Aufwand erhalten Sie nach Abschluß der Studie 3 Leistungspunkte im Bereich der Schlüsselqualifikationen.

Herzlichen Dank für Ihre Mitwirkung.
Didaktik der Informatik
Andreas Schwill

Appendix D: An Acknowledge to the Students Registration in the Study and an Invitation for the First Interview

Dear Ms./Mr. …….. ,

Thank you for registering to participate in our research.

Please register for a date and time for an interview about the subject. In order to be anonymous please use the following number (….) instead of your name to register using the link below. Specify 2 meeting times suitable for you on different days, and I will choose one of them and inform you about it. Please try to choose different times than other participants had already done. The duration of the meeting will depend on how much we talk about the subject, but initially 2 hours, maybe it will take less!

Once again:

- Do not use your name but this number (….) to select the date (every student will have an own unique number)
- Choose two different days.
- Choose times that have not been chosen by other people.

Hint: Do not Sign In when using doodle!

http://doodle.com/s3tdycbdzew4hcqb

If you have any questions, please don't hesitate to ask me.

Kind regards,

Loay Al-Saffar

Appendix E: The Open-Ended Questions at the First Interview

Main questions:

Q: Do you like studying in Potsdam? From which city are you? Do you live here? Do you have travel problems? Distance, take time, missing family?

Q: Do you have financial problems? Do you work?

Q: When did you first think about studying CS? Why?

Q: What is your opinion about the procedure to get enrolled in the study? Should there be an entrance exam? Should they take your grades at school into consideration?

Q: In general, can you list the main reasons for dropping out CS study in your opinion?

Q: Do you think about dropping out from study?!

Study Related Questions:

Q: How are you doing in your study so far?

Q: Did the study meet your expectations? Is studying CS is like what you imagined?

Q: Do you regret now studying CS?

Q: Did you really wanted to study CS from the beginning? What was your real passion?

Q: Do you have motivation to complete your study? What is it? Does your Family support you to continue?

Q: Do you study alone or with your friends? How much often do you study in a group? Do you understand more when you study with your friends?

Q: Do you have enough time for study and for doing your Homework?

Q: What are the subjects that cause you problems in your study? Why in your opinion? Do you think it is because of the subject itself or the professor is teaching it in a way that doesn't suits you or make you dislike the subject!! (Please give details on the problems of each subject individually)

Q: Do you get support from professors or technicians? Do you ask for help from them or are you afraid to ask? Why?

Q: Do you think that the Department of CS is not supporting you enough? How could they support you in your opinion to complete your study with success?

Appendix F: The Questionnaire Sent to the Same Volunteer Sample of Students on the Following Semester

Dear Ms./Mr. …….,

Our second meeting will be next winter semester 2013/2014, for now we just want you to fill this form if possible. We want to see how you are doing in this semester, your problems in study, and how you did in the final exams of the last semester.
Your number is ….. "You should give it when you fill the questionnaire"
This is the questionnaire link:
https://docs.google.com/forms/d/1a_iElDhtraDu341f5gJ_9OQbcea6nLjui-orl_tAT7U/viewform
If you have any questions, please don't hesitate to contact me.
Thank you.

Kind regards,
Loay Al-Saffar

The questionnaire:

1 - Do you stay and will you continue to stay in the study program you were when the interview was taken?
2- What problems are you facing in this semester if any? What subjects are difficult to you?
3- Which targets did you set yourself this semester? Which of them do you think you will achieve?
4- How did you do in the final exams of last semester (WS2012/2013)? Did your achievements meet your expectations?
5- If you took exams, what marks did you achieve?

Appendix G: Invitation for the Second Interview

Dear Ms./Mr. ……,

Happy New Year!

Please register for a date and time for the second interview about our research concerning study difficulties and reasons for dropping out of study! In order to be anonymous please use the following number (….) instead of your name to register using the link below.

Specify 1 meeting time suitable for you; the meeting will take place at the same room we met before "room 2.03".

Once again: Do not use your name but this number (……) to select the date (every student will have a unique number)

Hint: Do not Sign In when using doodle!

http://doodle.com/qxmic5g9eiyfw6ye

If you have any questions, please don't hesitate to ask me.

Kind regards,

Loay Al-Saffar

Appendix H: The Open-Ended Questions at the Second Interview

Q1: In which semester are you now?

Q2: How did you do in the exams?

Q3: will you continue in your study?

Q4: What changes happened over the past two semesters related to the attitudes towards your study?

Q5: Did you adopt new habits to your study?

Q6: Which professor is your favourite? Why?

Q7: How are you in programming?

Q8: Do you have any problems in your study now?

Q9: If you were a tutorial teacher, how will you teach, what is your method?! Or what kind of teaching do you want in the tutorial section?

Q10: What makes you dislike a specific subject?

Q11: What is affecting your progress in study? (If any)

Q12: what are your future plans?

Q13: Do you have any friends dropped out of the study or changed it?

Q14: In your opinion, why did you fail in some subjects? (If any)

Q15: What is your advice for new students (on how to study)?

Q16: Did you have a moment when you realized you now understand everything as when you are exposed to a new subject!

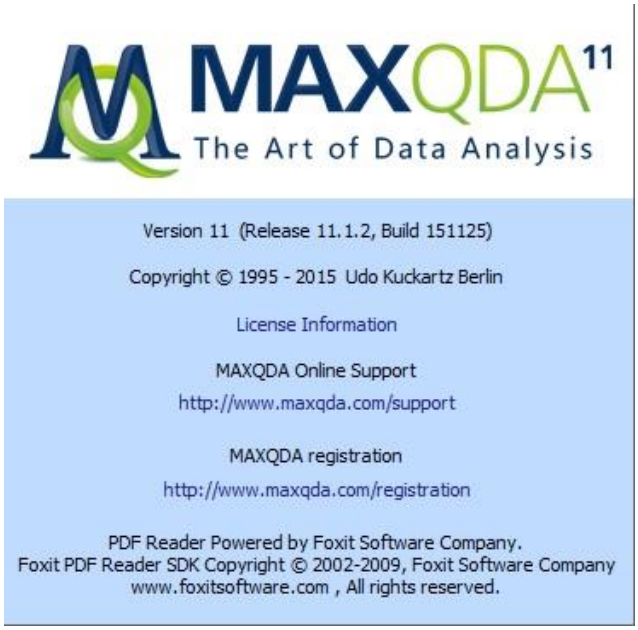
Q17: Regarding learning groups, how did it change over your study?

Q18: talking about learning styles and making them do the questionnaire!

Appendix I: MAXQDA11 and our coding

MAXQDA is a software program designed for computer-assisted qualitative and mixed methods data, text and multimedia analysis in academic, scientific, and business institutions. It is being developed and distributed by VERBI Software based in Berlin, Germany.

MAXQDA is designed for the use in qualitative, quantitative and mixed methods research. Comprehensive qualitative data analysis for researchers working with diverse data sets. MAXQDA Standard works with a wide range of data types and offers powerful tools for advanced coding, retrieval, transcription and visualization, while still being easy to learn and use. For more information visit: http://www.maxqda.com/



Our coding (the four following pages):

Code System [1943]

- Problems and Difficulities [0]
  - Tutorial section problems [0]
    - We don't have a real tutorial in BWL [2]
    - I don't attend the tutorial section, or won't! [5]
    - Tutorial time is short [12]
    - Tutorial section environment [12]
    - Tutorial teacher problems and qualification [56]
    - HW problems [2]
      - HW is not corrected [5]
      - HW has easier questions than exam [3]
      - Obligation to do HW [18]
        - I don't do HW [3]
      - A lot of HW [6]
      - HW is difficult [6]
  - Exams [0]
    - Pre-exam problems [8]
      - Pre-exams are easier than the final Exam! [6]
    - Exam problems [13]
      - Passing mostly economic subject exams! [4]
  - Subject problems [0]
    - Problems in SW Eng. [1]
    - Problems in BWL [4]
    - Problems in Math [27]
    - Problems in informatics subjects [20]
      - Problems and issues in Programming [57]
      - Problems in GDP [90]
      - Opinion of a CS student! [1]
    - Understanding a subject [19]
      - The subject is difficult [14]
  - Lecture problems [0]
    - Practical vs Theoritic lectures [20]
      - Problems in the introduction to the theoretic of CS [4]
    - Student problems inside the lecture hall [12]
      - Not enough time for the lecture [2]
    - Lecture starting time [15]
  - Students problems [0]
    - Adaptation issues [0]
      - Problems between students [0]
        - Wirtschaftinformatiks vs CS students [7]
        - German students and others! [3]
      - Adaptation problems [19]
      - Home distance from University [2]
      - Too much material and not enough time! [28]
    - Apprehensions [16]
    - Selecting subjects [6]
    - Procrastination [50]
      - Leading to Procrastination [24]
    - Study Group problems [12]
    - Personal problems, ex. family problems [5]
  - Blaming! [0]
    - Blaming himself/herself [21]
      - My fault! [9]
    - Blaming the Prof. [17]
    - Blamming the tutorial teacher [18]
    - Blaming the University system [2]
- Students opinion [0]
  - About Professors/Teachers [0]
    - Positive opinion about a Prof. [5]
    - Favorite Professor [20]

- Professors Role [7]
- Attitude towards a Prof.! [4]
- Positive opinion about the tutorial section [25]
  - I understand in tutorial section more than the lecture [6]

About subjects [0]
- Attending lectures? [11]
- Recorded videos of Lectures [25]
- Dislike a subject [16]
- Informatics is related to Mathematics [9]
- Good in Math [13]
- Good in Programming [7]
- Attitude towards economic and informatic subjects [11]
- Opinion about workshops before Uni. [8]

About University [0]
- Why Potsdam Uni? [9]
- TU Berlin vs Potsdam Uni! [23]
- Opinion about how study at Uni should be [8]
- University Role [2]
- Uni like school! [6]

Recomendations by students [0]
- Recomendation to Dept./Uni. [0]
  - A test for tutorial teachers [1]
  - Enrolment test [1]
  - Motivate the students in some way! [3]
  - To have a real tutorial in BWL! [2]
  - Ask the students! [2]
  - Exam dates! [1]
  - More technical subjects! [4]
  - Less subjects at the 1st semester [1]
  - Provide classes to help students in some subjects! [1]
  - Divide the difficult subjects into two! [1]
  - Show more online about the study [1]
  - Make a workshop before Uni starts [7]
- Recomendation to a Prof. [0]
  - Be patient with us, explain more! [1]
  - Make two small theoritical lectures a week [1]
  - More female tutorial teachers! [1]
  - More practice [4]
  - Should visit us in tutorial! [6]
  - Make small tests! [1]
  - More tutorial! [1]
  - Be more friendly! [2]
  - Slow down! [3]
  - More HW! [3]
  - Less HW! [1]
  - Dividing the final exam into multi small exams [3]
  - To have more tutorial groups with smaller number of students [3]
  - Having a book for the subject [1]
  - Bring good teachers in the tutorial section [3]
  - Making the lesson more fun [1]
  - Changing the lecture time [2]
  - More real life examples [9]
  - Change the HW questions every year [1]
  - Arranging more group projects [2]
  - Pre-exams [15]
  - Getting points for HW [8]
  - Other! "maybe helps to motivate students!" [3]
- Recomendation to a teacher [0]
  - We should use the computer! [1]
  - Use slides and Blackboard together! [1]

- Explain more! work with us! [4]
- Be more friendly! [1]
- Advice to a new student [44]
- Entrance exam opinon [16]
- Allowing restrictions at acceptance? [2]
- Work and study?! [12]
- I have time to study! [4]
- About other things! [0]
- The study is difficult here [4]
- The study and its relation to future work [3]
- Underestimating himself/herself! [4]
- Girls and boys! [4]
- Opinion about the this research study [2]

Passion [0]
- Hobby [2]
- When did you decide to study this field? [1]
- I did not know what to study [3]
- beleving that he wanted to study it! [3]
- It was my first choice [8]
- Not my first choice [21]
- Regret [14]

Professor/Dr. [0]
- Prof. Dr. Trosten Schub [1]
- Prof. Dr. Ingo Balderjahn, BWL Prof.! [11]
- Prof. Dr. Norbert Gronau [11]
- Ms.Petra bird [1]
- Dr. Henning Bordihn [7]
- Prof. Dr. Bettina Schnor [1]
- Prof. Dr. Ulrike Lucke [3]
- Prof. Dr. Andreas Schwill [35]
- PD Dr Joerg Koppitz [21]
- Prof. Dr. Christoph Kreitz [18]

Dropout?! [0]
- influance by friends! [4]
- I changed my study! [1]
- I will change the University [10]
- I thought before about dropingout of study [1]
- I don't know if I will continue! [4]
- Students opinion about why students dropout or change [31]
- Friends change study [17]
- Friends change study / 2nd interview [11]
- Thinking about changing my study [10]
- Continue in my study [45]

Study [0]
- Background [0]
- Background not from school [9]
- School [0]
- School grades doesn't matter! [1]
- School teachers! [2]
- I did not had informatics at school [19]
- When not having informatics at school [12]
- I had infrmatics at school [16]
- Math at school [3]
- School problems [4]
- Misunderstanding the study field?! [0]
- I had an idea! [15]
- knowing it is going to be hard?! [2]
- Having less knowledge about the study field [16]
- Help/Support [0]
- Study advisor [4]

- Support [0]
  - Friends support [4]
  - College support [2]
  - Family support [17]
- Asking for help [0]
  - Finding help on Internet [2]
  - Asking a group or friend for help [18]
  - Asking the professor for help [21]
  - Asking the tutor for help [15]
- Attitude towards groups [7]
- Study alone [23]
- Study with a group [32]
  - Different study group [2]
  - Same study group [5]
- Motivation to complete study [23]
- Motivation to study a subject [9]
- Goal and future plans [26]
- Meeting Expectations (after one semester!) [21]
- Some notes from students after more than two semesters! [0]
- Passing exams [9]
- Study status! [35]
- what is different from the 1st semester? [0]
  - Its easier to understand now [2]
  - Time management! [1]
  - I began to know how to study! [4]
  - Same way of studying! [2]
  - Study more! [5]
  - I study in a different way [3]
    - Start from the begining [10]
- Financial situation [1]
- Financial support from a spause or the family [4]
- I live with my parents [11]
- Financial Problems? [2]
- I don't have BAFOUG [2]
  - No financial problems, I don't have BAFOUG [8]
  - I have some financial problems! [3]
- No financial problems, I have BAFOUG [21]
- I do not work [9]
- I work [16]
- Styles! [0]
- Prefered teaching methods or styles of students! [21]
- Groupping the prefered teaching methods of students [0]
- I will motivate and encourage them and follow their progress! [2]
- Students should do their HW, then I can explain [2]
- I will teach by doing! [2]
- I will explain everything so they know how to do HW later [2]
- Explain step by steps allowing questions through the process [1]
- Teach in a fun way! [3]
- Explain in an easier way with not so much abstract words [2]
- Teach by examples [1]
- Students can ask first then I will explain step by step [0]
- I explain step by step, then students can ask! [5]
- Notes [0]
  - Using black board and slides [1]
  - encourage students to contact me and ask! [1]
  - Teach and explain like a story! [1]
  - Questions after the students understand! [1]
- Learning styles [22]

Sets [0]