EXPLORING STUDENTS INTENTIONS TO STUDY COMPUTER SCIENCE AND IDENTIFYING THE DIFFERENCES AMONG ICT AND PROGRAMMING BASED COURSES

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ABSTRACT
Computer Science (CS) courses comprise both Programming and Information and Communication Technology (ICT) issues; however these two areas have substantial differences, inter alia the attitudes and beliefs of the students regarding the intended learning content. In this research, factors from the Social Cognitive Theory and Unified Theory of Acceptance and Use of Technology were selected as important motivating factors in students' behavior and attitude towards CS courses. This hybrid framework aims to a) investigate the influence of these factors on students' intention to study CS and b) identify potential differences on these effects among ICT and Programming based courses. Responses from the total of 126 Greek students, (71 attending ICT courses and 55 attending Programming Courses) were used to measure the variables and to identify the differences between ICT and Programming students. Results revealed the influence of most of the motivating factors, on students' intention to study CS and indicated the moderating effect in the enrolment with ICT or Programming course on the relationship among students' Perceived Behavioral Control and their intention to study CS. The outcomes of this study are expected to open new avenues to understanding students' intentions to pursue computing and IT related careers.

Keywords: Secondary education, Computing education, Student experiments, ICT, Programming.

INTRODUCTION
The comparison of Computer Science Education (CSE) in different countries uncovers substantial disparities regarding the conception as well as the practice (Hubwieser et al., 2011). Some of these disparities are forced by the big differences in the Educational Systems, while others are caused by differences of traditions, national heritage or public opinion. In several countries computer science education (CSE) has been introduced in the curricula as a distinct course, while it was taught across curriculum in others. Generally CSE focuses on basic concepts about the constructional principles of computers and networks (hardware) and the principles of programming, (formal languages and programming), whereas Information and Communication Technology (ICT) is focused on computer uses and how to apply software (The Royal Society, 2012). In many countries (Hubwieser et al., 2011), CSE includes both ICT and programming courses, however, students' sometimes face these courses differently.

Many theories have been employed to understand students' perceptions and attitude towards learning media (Giannakos et al., 2013) and curricula (Chen et al., 2011). The Unified Theory of Acceptance and Use of Technology (UTAUT) and his initial forms are the most widely and successfully used models (Chen et al., 2011). Other researchers have empirically explained (using UTAUT or its initial form of TAM) several issues regarding students' attitude (Hsu and Lin, 2008; Shih, 2008). As successful CS teaching largely depends on students' perception and beliefs, we aim to identify students' differences among programming and ICT courses. In this light, variables related to students' attitude were chosen and applied to programming and ICT courses respectively. Then a between group experiment was conducted among students participating ICT course and students participating programming course. Our empirical research aims to investigate any distinct differences among ICT and programming courses in order to shed a light in the differentiation of educators' attitude in these courses which are mostly (in many countries) treated as a common course.

The focus of this empirical study is to measure students' beliefs and to identify potential differences among ICT and Programming courses. As (1) students' beliefs and attitude are highly correlated with their performance and (2) students' perceptions have an impact on what they have already learned and what they choose to do next (Metcalfe and Finn, 2008). This article describes an attempt to investigate students' motivational factors into a secondary education ICT and Programming courses by quantitatively measuring students' perceptions. Since several differences have been identified among ICT and Programming based courses (Giannakos et al., 2013), with that paper we are going one step ahead by investigating which factors influence students to participate in CS courses and how the nature of these courses (ICT or Programming based) moderates this influence.

In particular, this attempt is undertaken by using a quantitative survey of student perceptions in an ICT and Programming courses on the Greek educational context. The purpose of the survey was to assess students' perceptions toward a wide variety of behavioral issues in CS, including a number of issues that are related to their beliefs and their intentions. The study itself had the three following goals.

- Measure and understand students' perceptions regarding: usefulness, social impact, satisfaction, self-efficacy and control on the CS courses.
- Investigation of the potential effect of the prior perceptions on students' intention to study CS courses.
- Investigation of the potential differences among programming and ICT courses in the effect of the students perceptions on their intention to study the respective course.

The clarification of these three goals is expected to contribute to the understanding of students' performance and intentions to pursue programming and ICT courses in their future studies.

The paper is organized into six sections. In the next section, the related work and the hypotheses are outlined. In the third section the ICT and Programming courses are presented as they are taught in Greek educational system. The fourth section describes the methodology employed to investigate the effect of some important students' perceptions in their intention to study CS courses and if there is any differentiation on that effect among ICT and Programming courses. The fifth section outlines the empirical results and at the final section, the article concludes with implications, limitations and future work.

RELATED WORK AND RESEARCH HYPOTHESES

Students' perceptions and intentions are important determinants of the learning success (Metcalfe and Finn, 2008). Disinclination towards studying CS disciplines implies that more research is needed to investigate how students could be motivated. Previous studies (Barker et al., 2009; Biggers et al., 2008; Papastergiou, 2008; Akbulut, 2010) have empirically investigated numerous issues related to perceptions and beliefs regards CSE, it is mostly focused on higher education and more specifically on CS departments. As a result, to date, there is lack of empirical studies on students CSE perceptions and the effect of these perceptions into students' intentions to study CS courses.

To date, many theories have been applied to address students' attitude, perceptions and to identify the influence of different factors on the adoption of science education. UTAUT and Social Cognitive Theory (SCT) are some of the most successfully used theories in students' behavior [e.g., (Hsu and Lin, 2008; Lee et al., 2009)]. In addition, Performance Expectancy (PE), Perceive Behavioral Control (PBC), Satisfaction (STF), Social Influence (SI) and Self-Efficacy (SEF) have been verified as important determinants on affecting students' intention to attend a respective course [e.g., [Chen et al., 2011)]. In view of the above we aim to measure these factors and examine the effect of them on students' Intention to Study with CS courses (ISCS); in addition we will identify potential difference of these effects among ICT and Programming courses.

The Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT is the successor of Technology Acceptance Model (TAM) and combines a great number of TAM variables (Venkatesh et al., 2003). Perceived Expectancy is based on the traditional construct of "perceived usefulness" from the original (TAM) study. Prior research on systems' adoption has agreed that UTAUT is valid in predicting the individuals' enrolment on various contexts (Hsu and Lin, 2008). In our case high performance expectancy (PE) means that students believe attending CS course is useful for him/her and we assume that positive PE lead them to attend the course. Thus, we hypothesize that:

H1. Students' PE has a significant positive effect on their ISCS.

Student satisfaction (STF) is a measure of subjective evaluation of any outcome or experience associated with the attendance of CS courses. Studies have suggested that individual perceptions of satisfaction influence in a positive way their intentions (Lee and Lin, 2005). In addition, in CSE, satisfaction has been recognized as an important factor for student attitude (Drury, Kay and Losberg, 2003). In that study, we assume an important role of satisfaction, that effect students' Intention to Study CS. Specifically, we argue that, if previous experience is positively evaluated, and hence incurs students' satisfaction, then it has a higher impact on their willingness to study the respective course. Hence, we hypothesize that:

H2. Students' STF has a significant positive effect on their ISCS.

UTAUT (Lee et al., 2009) introduces Social Influence (SI) and explained usage intentions in terms of social influence. SI refers to the degree to which an individual's opinion affected by others (i.e.., friends, relatives). As the learning/teaching process is negotiated through numerous interactions (e.g., instructor-learner, learner-learner), and its characteristics, in turn, have the socializing factor very intense (Rorty, 1999).In addition, prior studies have showed that Social Influence is a significant predictor of individual's decision (Giannakos and Vlamos, 2013). In view of the above, we assume that SI influence students' Intention to Study CS. Thus, the following hypothesis was proposed.

H3. Students' SI has a significant positive effect on their ISCS.

Social Cognitive Theory (SCT)

SCT (Bandura, 1986) indicates that cognition employs strong influence on the creation of one's beliefs and reality, as it selectively structure and convert information on actions (Jones, 1989). In his attempt to explain how people acquire and maintain certain behavioral patterns, Bandura (1986) defines Self-Efficacy (SEF) as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance (p. 391)". SEF is important in learning processes because "competent functioning requires both skills and self-beliefs of efficacy to use them effectively" (Bandura, 1986; p. 391). In prior studies (Chang and Tung, 2008), a significant influence of SEF on learners' intention has revealed. SEF is specific to a certain activity and context. Hence, an individual may have high SEF in one course (Algebra), and low SEF in another (CS). However, it is likely that SEF will positively affect students' ISCS. Hence, we assume that:

*H4.*Students' SEF has a significant positive effect on their ISCS.

Theory of Planned Behavior (TPB)

Another widely used theory is the TPB (Ajzen, 1985); TPB is based on individual's perception of the ease with which the behavior can be performed, or in other words Perceived Behavioral Control (PBC). In particular, PBC refers to a individual's potential to perform the behavior in question, how easy/hard the behavior is perceived to be (Ajzen, 1985). PBC has been widely used to investigate several issues concerning students' use of technological tools (Shih, 2008). In addition, prior research (White et al., 2008) has indicated that attitude and PBC predicted intentions, with intention as the sole predictor of attendance at peer-assisted study sessions. This means that students were more likely to participate on peer-assisted study sessions if they had positive attitudes and believed that they had control over attending them. Hence, in the context of CS it should be investigated if students' PBC affects their ISCS. Therefore, we hypothesize that:

*H5.*Students' PBC has a significant positive effect on their ISCS.

Differences among ICT and Programming Courses

Students' perceptions regarding CS many times lead their actual behavior (Ruslanov and Yolevich, 2010). In most of the prior research CS has been mostly investigated as a unified (both ICT and Programming) course. However, there are certain differences among these two disciplines and the investigation of these differences is highly important as many countries used a unified curriculum for ICT and Programming (Hubwieser et al., 2011; Ismail et al., 2010). Hence, in the context of CSE, it seems likely that ICT and Programming courses may have important differences in students' perceptions and their attitude. Therefore, the moderating effect of the courses ICT and Programming on the relationships among the motivating factors and ISCS is emerged to be examined. This leads us to the following five hypotheses (see in Figure 1 the visual diagram of the hypotheses):

H6a. ICT or Programming orientation moderates the influence of PE on ISCS.
H6b. ICT or Programming orientation moderates the influence of STF on ISCS.
H6c. ICT or Programming orientation moderates the influence of SI on ISCS.
H6d. ICT or Programming orientation moderates the influence of SEF on ISCS.
H6e. ICT or Programming orientation moderates the influence of PBC on ISCS.

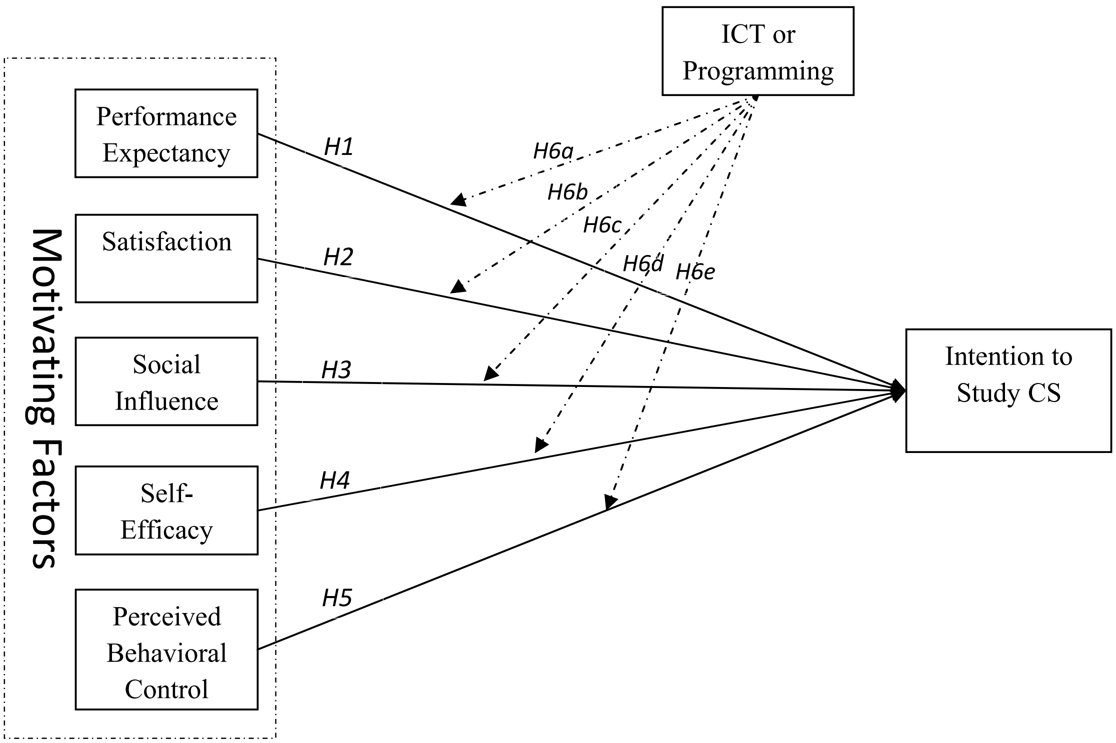

Figure 1: The Visual Diagram of the Hypotheses

ICT AND PROGRAMMING COURSES IN GREECE

The curricula of Secondary Education in Greece, since the school year 1998-1999, included a single philosophy which was based on the Single Curriculum Framework. In 2003, the Interdisciplinary Unified Education Course Framework (IUECF) and the new detailed curricula (NDC), prepared for compulsory education, from which the inter-disciplinary approach of knowledge was adopted. Afterward in the school year 2006-2007 the new books have been introduced to the schools (based on IUECF and NDC).

In these compulsory education Curricula the importance of Information and Communication Technologies and the role these should play is widely recognized. ICT is not seen only as a separate subject of study, absolutely necessary today for students' technological literacy, but also as a multi-tool: cognitive teaching, information seeking, communicating knowledge etc. The theoretical model adopted, for introducing ICT in lower secondary education, is characterized by the teaching of an "informatics" course and the gradual use of computational and networking technologies as a means to support the cognitive process for all subjects of the programme of study.

The Cross-curricular Single Framework for Curricula for the lower secondary education, through the teaching of Informatics, foresees that the student is to (I-Curriculum, 2003):

- Be able to explain and analyze basic notions and terminology of Informatics (i.e. data, information, coding, data handling, file, save, programme, software, etc).
- Be aware of the operations of the main computer units and use with ease a computer system.
- Use generic software tools to record (write down) their ideas, to treat and present them in a variety of ways and means, to resolve simple problems, to use simple projection and control models in order to simulate and test simple problems or results from other cognitive domains.
- Be able to select, choose, analyze and evaluate information through different sources (electronic encyclopedias, electronic dictionaries, www etc) and utilize these for complex projects individual work or teamwork.
- Utilize possibilities offered by ICT to communicate, exchange views, wonder, entertain, present their ideas and opinions (the way they choose) and apply simple knowledge of ICT in everyday life.
- Develop critical skills to be able to address problems using computer and to resolve simple problems in a programming environment.
- Cooperate to perform a given project, develop initiatives, design, set objectives, recognize the importance

of teamwork in advancing the project, discuss and assess their work and the work of the others.

- Develop an ethics code in regards to their work in the lab, the respect of the work and differentiation of others.

In addition, Informatics has been introduced as a separate curriculum subject which is taught once a week by specialist IT teachers. In the course of Informatics ICT content dominates the curriculum throughout lower secondary education. By the end of the third Gymnasium (middle school) year the students are introduced into fundamental algorithms and programming using Logo.

In the case of upper secondary education (Lyceum, equal to high school); the 1st grade operates as an orientation year with a general knowledge program. The second grade offers three directions (Scientific, Theoretical and Technological). In the third grade of Lyceum students are following again the same three directions. Students who follow the technological direction are taking a programming course. This course focuses on the development of problem-solving and algorithmic skills through programming.

The overall aim of the programming course is to help students to develop algorithmic thinking and methodological and problem solving skills within a programming environment. This Programming course includes basic algorithmic and programming concepts (conditions, logical expressions). This course is being taught (partially) in school labs. The Ministry of Education has certified specific programming environment to support the lab work, especially for the Lyceum programming course. In addition to the certified programming environment, there are other educational software that have been developed by scholars and educators, and are already in use in many schools, in order to motivate students, and increase the retention (Papastergiou, 2009).

METHODOLOGY

Context

The empirical study was conducted in the context of secondary education in Greece. As we previously mentioned, the relevant curriculum ICT courses (named Informatics) are mandatory during Gymnasium (lower secondary) years and aim to teach students' ICT (e.g., word processing). The first group in our experiment (ICT Group) consisted of students attending the 3rd class of Gymnasium. They have experience on ICT courses and they are asked for their perceptions regarding the ICT curriculum in the under investigation factors.

For the case of Lyceum (high school), ICT is taught as an elective or direction course since 1999. Thus, besides mandatory education (primary, lower secondary), students in all the classes of Lyceum can select certain ICT from a wide range of various subjects. In the last two classes of Lyceum, students select one of three directions, technological, scientific or theoretical). If students in the last grade select the technological direction, they attend the programming course for which they are assessed through national exams. The second group in our experiment (Programming Group) consisted of students attending the 3rd class of Lyceum. They have experience on the programming course and they are asked for their perceptions regarding the programming curriculum in the under investigation factors.

In view of the above, our between group experiment was conducted among students' of 3rd of Gymnasium regarding ICT courses and students of 3rd of Lyceum regarding programming courses.

Sampling

The data collection included a questionnaire composed by questions on the six principal factors. The questionnaire was open during the last ten days of November 2011 at four public Gymnasiums (middle schools) and four public Lyceums (high schools) in the northwestern Greece. The final sample included 126 participants (students). From the total of participants, 71 (56.35%) were 14 years and attended 3rd of Gymnasium (taught ICT course) and 55 (43.65%) were 17 years and attended the 3rd of Lyceum, in addition, 89 were males (70.6%) and 37 (29.4%) females.

Measures

The questionnaire included measures of the principal factors identified in the literature. Appendix lists the survey factors with their items, their operational definition, and the source from the literature review. In all cases, 7-point Likert scales was used (from 1 strongly disagree to 7 strongly agree).

DATA ANALYSIS AND RESEARCH FINDINGS

We followed the three step procedure to assess the convergent validity of any measure in a study (Fornell and Larcker, 1981):

(1) Composite reliability of each construct,
(2) Item reliability of the measure,
(3) The Average Variance Extracted (AVE).

First, we carried out an analysis of composite reliability and dimensionality to check the validity of the scale used in the questionnaire. Regarding the reliability of the scales, Cronbach`s indicator was applied and inter-item correlations statistics for the items of the variable. As Table 1 demonstrates, the result of the test revealed acceptable levels of internal consistency in all the factors.

In the next stage, we proceeded to evaluate the reliability of the measure. The reliability was assessed by calculating the factor loading onto the underlying factor. A factor loading of 0.5 and higher is recommended to be good indicator of validity at the item level (Segars, 1997). Based on the factor analysis we identified 6 distinct factors; a) Performance Expectancy (PE), b) Satisfaction (STF), c) Social Influence (SI), d) Self-Efficacy (SEF), e) Perceived Behavioral Control (PBC) and f) Intention to Study CS (ISCS) (Table 1).

The third step for assessing the convergent validity is the AVE; AVE measures the total variance that is applied to the factor in relation to the amount of variance derivable to measurement error. Convergent validity is found to exceed the recommended thresholds of 0.50 (Segars, 1997).

Table 1: The measurement values

Factors	Items	Mean	S.D.	CR	Loadings	AVE
Performance Expectancy	PE1	4.61	1.81	0.89	0.75	0.65
	PE2	4.48	1.74		0.80	
	PE3	4.76	1.63		0.85	
	PE4	4.83	1.51		0.81	
Satisfaction	STF1	5.21	1.40	0.88	0.63	0.56
	STF2	5.20	1.39		0.66	
	STF3	5.63	1.35		0.85	
	STF4	5.41	1.36		0.83	
Social Influence	SN1	4.32	1.93	0.86	0.79	0.65
	SN2	4.09	1.92		0.82	
Self-Efficacy	SEF1	3.56	1.90	0.71	0.86	0.71
	SEF2	4.04	1.77		0.82	
Perceived Behavioral Control	PBC1	5.01	1.44	0.86	0.85	0.69
	PBC2	4.78	1.49		0.81	
Intention to Study CS	ISCS1	4.63	1.91	0.93	0.83	0.78
	ISCS2	4.56	1.93		0.90	
	ISCS3	4.00	1.91		0.91	

Respondents expressed high STF (5.36/7) with CS courses. In addition, PE (4.67/7), PBC (4.40/7), ISCS (4.40/7) and SI (4.21/7) were slightly lower. These high levels indicate positive insights of students concerning their experience, control, usability, usefulness and intentions to study CS. However, their SEF (3.80/7) with computing is not indicating the same positive view.

Pearson's correlation coefficient between the factors was used, which is about quantifying the strength of the relationship between the variables. By performing Pearson's test we found that some of the factors are correlated relatively strong. In particular, ISCS is related with all factors, except for SEF; in addition SEF has no correlation with SI and STF. Table 2 exhibits the correlations between the factors in detailed.

Table 2: The measurement values

Factors	PE	STF	SI	SEF	PBC	ISCS
PE	1					
STF	**0.55****	1				
SI	**0.52****	**0.59****	1			
SEF	**0.18***	0.05	0.09	1		
PBC	**0.42****	**0.52****	**0.51****	**0.22***	1	
ISCS	**0.42****	**0.49****	**0.42****	0.10	**0.45****	1

Correlation is significant at the* 0.05 level, ** at the 0.01 level.

To examine the research questions regarding the effect of the selected factors on students' ISCS we used Analysis of Variances (ANOVA) including students' ISCS as dependent variables and the five factors (PE, STF, SI, SEF, PBC) as independent variable. As we can see from the outcome data in Table 3, all the selected variables except SEF have indicated an impact on students' ISCS.

Table 3: Hypothesis Testing using Analysis of Variances (ANOVA)

Dependent Variable	**Mean (S.D)**			**F**	**Results**
	Low	**Medium**	**High**		
Intention to Study CS (ISCS)	Performance Expectancy (PE)				
	3.46 (1.93)	4.39 (1.54)	5.21 (1.46)	**11.92***	H1 (Accepted)
	Satisfaction (STF)				
	3.41 (1.68)	3.91 (1.69)	5.48 (1.31)	**21.71***	H2 (Accepted)
	Social Influence (SI)				
	3.64 (1.96)	3.98 (1.61)	5.45 (1.21)	**15.32***	H3 (Accepted)
	Self-Efficacy (SEF)				
	4.13 (1.99)	4.67 (1.45)	4.36 (1.88)	0.93	H4 (Rejected)
	Perceived Behavioral Control (PBC)				
	3.37 (1.84)	4.46 (1.46)	5.28 (1.59)	**13.82***	H5 (Accepted)

*$p < 0.05$

Observing figure 2, the insignificance of SEF on students ISCS is very obvious. In addition, it can be clearly noticed that students' PE and PBC have the similar influence on students' ISCS in the both shifts from Low to Medium and Medium to High. On the other hand, STF's and SI's shifts are from Medium to High rather than from Low to Medium. Hence, it seems that students' STF and SI in high levels is very helpful for students' ISCS. Overall, in Figure 2 the positive and significant influence of PE, STF, SI and PBC on students' ISCS is exhibited.

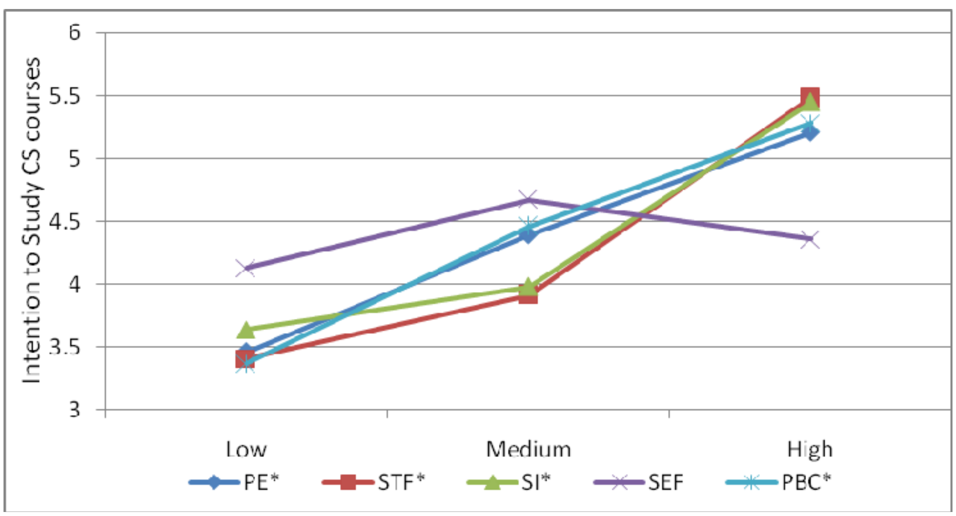

Figure2: The Influence of the motivating factors in students' ISCS

On that stage we aim to examine if the differentiation of ICT and Programming influence the relationship between motivating factors and ISCS. To examine that effect (H6a–H6e), the correlation coefficient between motivating factors (PE, STF, SI, PBC) and ISCS of the ICT and Programming students was used. Simple regression of ICT and Programming students was conducted among (PE, STF, SI, PBC) and the students ISCS. Firstly, we calculate the R for the ICT students and for the Programming Students at each one of the motivating factors. Afterwards, the coefficient R from the regression analyses and the sampling N was used to conduct a Fisher's Z-transformation analyses (Baron and Kenny, 1986). The results (table 4) mean that the difference among ICT and Programming has a significant moderating effect on the relationship between PBC and ISCS (supporting H6e). For the case of PE STF and SI the results (table 4) revealed that the difference among ICT and Programming does not moderate the relationships between PE and ISCS (rejecting H6a), between STF and ISCS (rejecting H6b) and between SI and ISCS (rejecting H6c). For the case of SEF, it is difficult to have reliable result due to the insignificance of the correlation coefficient of students on ICT course.

Table 4: Testing if the differentiation among ICT or Programming orientation moderates the influence of motivating factors on ISCS using fisher z-transformation analysis

	ICT	Programming	Significance test (<1.96)	Results
PE→ISCS				
Correlation coefficient R (N)	0.323 (71)*	0.417 (55)*	0.59	H6a (Rejected)
Z-transformation coefficient	0.335	0.444		
STF→ISCS				
Correlation coefficient R (N)	0.544 (71)*	0.403 (55)*		H6b (Rejected)
Z-transformation coefficient	0.610	0.427	0.99	
SI→ ISCS				
Correlation coefficient R (N)	0.464 (71)*	0.294 (55)*		H6c (Rejected)
Z-transformation coefficient	0.502	0.303	1.08	
SEF→ ISCS				
Correlation coefficient R (N)	0.027 (71)	0.252 (55)*		H6d (N.S.)
Z-transformation coefficient	0.027	0.258		
PBC→ ISCS				
Correlation coefficient R (N)	0.254 (71)*	0.570 (55)*	2.11[a]	H6e (Accepted)
Z-transformation coefficient	0.260	0.648		

* Coefficients are significant at 0.01; [a] Z is 1.96 for $p < 0.05$.

According to Figure 3, students with low PBC who attending ICT have similar ISCS with students with medium PBC who attending Programming. This means that the influence of PBC on ISCS can be eliminated by the influence of the different content on CS course (ICT or Programming).

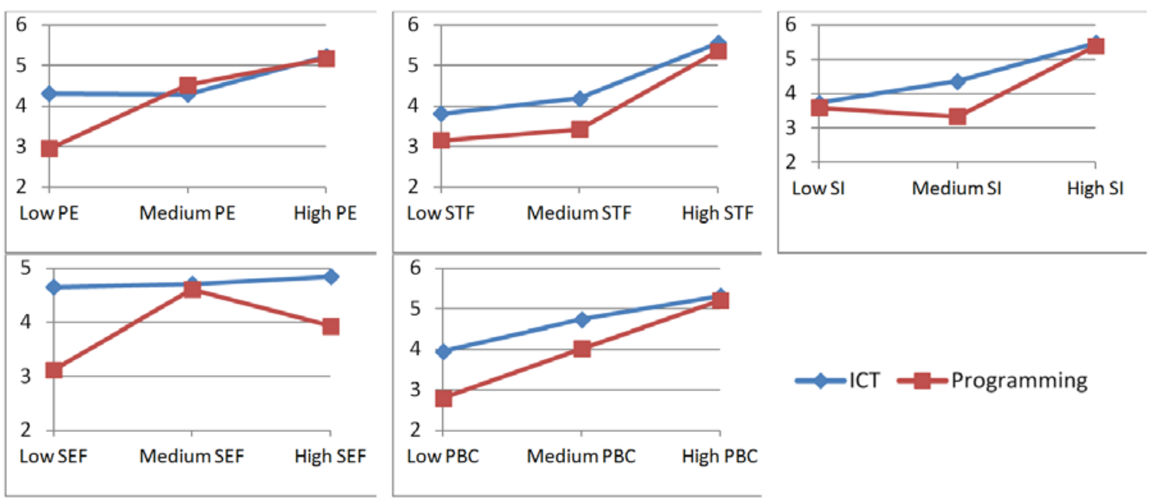

Figure3: The moderating effect of ICT or Programming orientation

CONCLUSION AND DISCUSSION

In the empirical study, students' intention to study CS was analyzed. In particular, this study measured five motivational factors regarding CS attendance and students' intention to study CS; based on the experience of two groups of students. The first group took a programming course and the second an ICT course during the 2011-2012 school year. Both respondents' groups expressed high satisfaction on ICT and Programming course respectively. Additionally, they expressed slightly lower perceived behavioral control and performance expectancy. High levels of motivating factors exhibit positive insights of students concerning their experience, control, usability and usefulness regarding CS.

Previous studies mainly focused on non-behavioral factors regarding students' likelihood to pursue CSE course, like: Gender, Ethnicity (Barker et al., 2009), Career Opportunities (Masnick et al., 2010), Teaching Methods and the Curriculum Selection (Morrison and Preston, 2009). Hence, our study opens new avenues towards the analysis of students' intention to attend CS courses, which verifies the key role of four of the five motivational factors in the context of CSE.

Especially, the 5 hypotheses (H1-H5) were formulated and the 4 of them were accepted (except H4), which help in understanding the motivating factors contributing to CS attendance. The results revealed that PE, STF, PBC and SI have a significant positive effect on students' ISCS. In addition, the results indicated that SEF is not influence students' to attend CS courses.

Another aspect of this paper is the moderating effect of Programming or ICT on the effect of PBC on ISCS. An interesting observation was that students with low PBC who attending ICT have the same ISCS with students with medium PBC who attending Programming (H6e). This means that the effect of PBC on ISCS can be eliminated by the effect of the different content on CS course (ICT or Programming).

Overall, this study contributes to the literature with many ways. First, we empirically measure students' perceptions and intentions for CSE, second we identify the effect of the motivational factors on students' intention to study CS and (3) identifies the moderating effect in the enrolment with ICT or Programming course on the relationship among PBC and ISCS. The current study is one of the few so far, where a CSE empirical assessment is employed among students who attend ICT and Programming courses.

Previous studies have shown that students' perceptions of what they learned affect their performance and what they choose to do next (Metcalfe and Finn, 2008); in addition, this study revealed that student intentions to pursue CS courses are highly affected by their beliefs. As such, the conclusions of this study are important as they indicate perceptions which lead students' on their future study and career decisions. Therefore, our findings have important implications for understanding how students perceive their learning and achievement in CSE and by taking care of that, the number of pupils making an educated decision to pursue CS can increase.

As with any empirical study, our study has certain limitations. First, the respondents are Greek students, who had attended the Greek educational system; this may limit the extend of the generalization of the findings. However, another study has been conducted among the secondary education students of Greece and Germany indicates that there is no significant difference on their perceptions regarding CS courses (Giannakos et al., 2012). Secondly, the data are based on self-reported method, other methods such as depth interviews and observations could provide a complimentary picture of the findings through data triangulation. Thirdly, there are numerous factors affecting students' behavior and perceptions (Aypay, 2010), but in our study we used motivating factors raised from prior studies as the most important ones. Last there is an age difference among the two groups (3years), this was made because we want each group to have the same exposure on the respective course, this age difference may have casual effect. However, we know from the literature that age does not impact on students' computers perceptions and anxiety (Gilroy and Desai, 1986). In addition, the results from seventeen studies (Rosen and Maguire, 1990) support the contention that age was not a significant correlate of computer anxiety (p. 181).

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APPENDIX

Factor	Operational Definition	Items*	Source Adopted
Performance Expectancy (PE)	The degree to which an individual believes that attending the respective course is useful for him/her.	Using programming improves my performance in a task. (PE1)	Giannakos et al., 2013
		Programming enhances my effectiveness in tasks progressing. (PE2)	
		Programming would make it easier to complete a task. (PE3)	
		Programming increases productivity in completing tasks. (PE4)	
Satisfaction (STF)	The degree to which a person positively feels with the respective course.	I am satisfied with the programming experience. (STF1)	Giannakos et al., 2013
		I am pleased with the programming experience. (STF2)	
		My decision to use programming was a wise one. (STF3)	
		My feeling to use programming was good. (STF4)	
Self-Efficacy (SEF)	The degree of conviction that one can successfully execute the operation required to produce the outcomes.	**I could complete a programming task …**	Shih, 2008
		if there was no one around to tell me what to do. (SEF1)	
		if I had never used it before. (SEF2)	
Social Influence (SI)	The degree to which an individual perceives that most people who are important to him think he should or should not attend the respective course.	People who are important to me think that I should learn programming. (SI1)	Hsu and Lin, 2008
		People who influence my behavior encourage me to learn programming. (SI2)	
Perceived Behavioral Control (PBC)	The degree to which a person perceives how easy or difficult it would be to perform an operation in the respective course.	I would be able to complete programming tasks (PBC1)	Shih, 2008
		I have the knowledge and the ability to complete programming tasks. (PBC2)	
Intention to Study CS (ISCS)	The degree of students' willingness to attend the respective course	I intend to continue learning programming in the future. (ISCS1)	Hsu and Lin, 2008
		I will continue learning programming in the future. (ISCS2)	
		I will regularly learn programming in the future. (ISCS3)	