Skills in computer use, self-efficacy and self-concept

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Abstract

In today's information society knowing information technology is a critical factor for academic and professional education. The judgments of the individual about his/her competence in computer use can influence their goals and future plans concerning professional career and success. The continuously increasing rates of change in all aspects of contemporary life (technological, economic and social), as well as the production, distribution, exchange and diffusion of an enormous volume of information, facilitate collaborations while, at the same time, they increase competition and the standards set by the individual for him/herself making it hard to maintain a positive perception for his/her competence or adequacy in various domains. The purpose of the present study is to investigate the relations between computer self-efficacy and self-concept. The results of the study reveal a positive relationship between the aforementioned variables.
Keywords: self-concept, self-efficacy, computer self-efficacy, academic and professional education, career.

1 Introduction

Academic self-concept and academic self-efficacy have been estimated as unique factors that contribute to academic achievement or performance [3,20]. Academic self-concept and academic self-efficacy refer to the individuals' self-

concept and self-efficacy beliefs that are formed specifically toward academic domains. More specifically, academic self-concept refers to the individuals' knowledge and perceptions about themselves in achievement situations [2]. Academic self-concept incorporates attitudes, feelings and perceptions relative to one's intellectual or academic skills, and represents a mixture of self-beliefs and self-feelings regarding general academic performance [11]. Academic self-concept has been found to be predictive of overall grade performance suggesting that a student's belief about his/her general academic capabilities is related to his/her overall academic performance [11].

Academic self-efficacy is more related to one's ability to succeed in a given specific subject [3]. Bandura defined self-efficacy as a person's "judgments of [his or her] capabilities to organize and execute courses of action required to attain designated types of performances". Research has generally shown self-efficacy to be a stronger predictor of subject-specific academic performance and goals than more global measures such as self-esteem or self-concept [1,11]. Further, other studies have found that self-efficacy is not necessarily fixed, but can be attenuated or increased by performance on a previous task. Past performance can affect current feelings about self-efficacy about a given subject.

Both constructs received much attention from educational researchers because of their purported influence on students' academic functioning. Numerous studies have reported how positive self-concept or self-efficacy facilitated students' academic engagement, goal-setting, task choice, persistence and effort, motivation, strategy use, performance and achievement, and even career selection etc.

In today's information society becoming proficient with information technology is a critical factor in academic, personal and career development. A seminal study found that undergraduate students who possessed a low sense of self-efficacy in computer use, thus displaying little interest in acquiring information technologies competencies. Individuals increasing their interest in information technology, can acquire skills, expand the range of career choices and use the computer as a problem-solving tool [17].

People's beliefs about their self-efficacy influence academic motivation, ambitions, interest in intellectual skills, and their effort for academic performance and achievement [1,17]. A strong sense of efficacy creates interests in self-regulated learning environments and it could develop conditions for lifelong leaning programs. A strong sense of efficacy in basic education learners may lead students to develop competence and skills for further social and economic stability [17].

Similar studies point out that lack of self-efficacy with regard to knowledge of information technology could prevent academic and professional development, pointing out that the self- efficacy in computer use and competence constitutes a prognostic indicator of future activities and occupational interests in information technologies [17]. Further development (professional, economic, personal) depends on the interaction with the information technology.
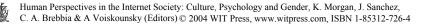
2   Computer self-efficacy

Computer self-efficacy refers to a judgment of one's capability to use a computer [5]. It has been described that individuals base self-efficacy judgments on four main sources of information and the same is considered in Information technologies courses. Individuals evaluate the contributions of these sources of information, regarding their capabilities, and perform their behavior of interest. Individuals who perceive themselves capable of performing certain tasks or activities are defined as high in self-efficacy and are more likely to attempt and execute these tasks and activities. People who perceive themselves as less capable are less likely to attempt and execute these tasks and activities, and are defined as lower in self-efficacy [1].

These four sources of information are described below at declining order of influence [1]:

- The students develop the more important source of computer self-efficacy, from their *enactive mastery experience*, realising computer exercises and laboratorial activities that are related to the computers that require comprehension of material (hardware) and software (software) in the computer.
- Students *observe the successes and failures of others (vicarious experience)*. They constitute models in which they compare their own performance from related standards (successes or failures). In a similar way, the professors shape/demonstrate behaviors that are related to computer activities, and consequently the students constitute models of comparison of their self-efficacy.
- Self-efficacy information is delivered through *verbal persuasion*. Students receive reinforcements or exhortations from instructors and/or fellow students that encourage and support their computer skill and/or competent development.
- Students may acquire self-efficacy information from *physiological reactions.* For example the anxiety of fear prior to an in-class computer exercise might be a sign that they would not do well. On the other hand, a lack of these reactions could be perceived as a sign of computer competence [17].

3   Information technology and relevant computer self-efficacy research

The Computer Self-Efficacy (CSE) construct has been used in order to examine the decision of individual to use the information technology, the software training and performance and the relationship between experience and academic performance [10,17]. Researchers have examined the connection between CSE and several other behaviors of interest to educators. For example, research has found evidence of a positive relationship between CSE and registration in

college-level computer courses, decisions to use computers and performance in software training etc [4,7].

Several research studies have investigated the relationship of CSE to computer training and other individual and situational variables of interest to educators. Some of these studies are briefly summarized below:

In a study of the effects of a training method on CSE and performance with computer software, individuals performed higher CSE when skills were delivered via a behavioral model, than what they provided with an interactive tutorial [7]. Significant increases in student CSE were found following completion of an undergraduate course in computers and information processing where they received both lecture and laboratory instruction [18]. Comparing two training models: (a) behavior and (b) traditional lecture, Compeau and Higgins tried to examine computer self-efficacy, outcome expectations, and performance. Word processing and spreadsheet applications were used. The behaviour model was more effective than the traditional lecture for training the spreadsheet application. For the word processing application no significant difference was found in the training models. Results concluded CSE had a strong influence on performance in both models [4].

Significant increases in CSE were found for students receiving standard classroom instruction in an introductory computer science course, but no significant increase in CSE was found for students who received additional verbal persuasion [15]. In another research, Smith-Weber (2000) investigated the relationship of CSE and the impact of computer technology education. Pre and post tests of the four sources revealed CSE was significantly related to mastery experiences and affective states. In addition, overall perceptions of CSE increased after computer technology education [17].

Zhang and Espinoza examined the relationship between self-efficacy, attitudes toward computers, and desire to learn computer skills. Attitudes toward computers were correlated with CSE, and attitudes about the usefulness of computers predicted desire to learn computer skills. CSE was a strong predictor of willingness to learn advanced computer skills [19].

The relationship of computer experience to CSE has also been investigated by Karsten and Roth [10]. Individuals with prior computer experience are more likely to evidence higher levels of CSE than individuals without such experience. This research also showed that the perceptions of students of their competence of computer use were progressively increased as result of their training. The measurement of the CSE influences the factors that are related to the training providing practical interest in the instructors. Results showed that the measurement of self-efficacy in computer use constitutes a practical vehicle for the evaluation of educational process [10].

The influence of CSE, outcome expectations, affect, and anxiety on computer usage was developed by Compeau and Higgins [5]. Using data collected over a one-year (business subscribers), a significant relationship was found between CSE and outcome expectations. CSE also had a positive influence on affect, anxiety, and computer use [17].

From another study of Joo et al. (2000) founded that the student's self-efficacy in regarding self-learning, has positive correlation with their self-concept, so much in the conventional teaching and also in the teaching that is based on the Internet. Self-efficacy in Internet use was a prognostic indicator of achievement of students when the evaluation based on the Internet tests, but not on the written tests [9].

4   The method

The sample of the study consisted of 175 students from the University of Piraeus [Department of Technology Education and Digital Systems]. Of these 175 students, 91 were first-year students and 84 were fourth year students.

For the purposes of this study, the following measures were used:
- Self-Perception Profile for College Students by Neemann and Harter [13]. From his scale only three subscales were used taping academic self-perception, job competence and self-esteem.
- Computer Self-Efficacy Scale by Murphy et al. [12]. This scale was developed to measure individuals' perceptions of their capabilities regarding specific computer knowledge and skills. Items represent beginning moderate and advanced skills.

Table 1:   Pearson r correlation coefficients between self-concept and computer self-efficacy.

Construct	Beginning skills	Advanced skills	File & software skills
Self-perception of academic competence	.266**(175)	.353**(175)	.217**(175)
Self-perception of job competence	.168 (110)	.246**(110)	.103 (110)
Self-esteem	.261** (175)	.279**(175)	.185* (175)

Note: * Correlation is significant 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Numbers in parentheses are the sample size.

5   Results

The Pearson r correlations between self-perception, self-esteem and CSE are presented in Table 1. The data in Table 1 indicate that higher levels of self-perception of academic competence and self-esteem are associated with higher

levels of CSE across all skills. In contrast, only the advanced skills in computer use are associated with higher levels of job competence.

In order to investigate whether perceived self-efficacy in computer use changes from first to fourth year of study we performed a t-test. The results in Table 2 indicate that CSE increases with increasing year of study.

Table 2:   Relationship between CSE and year of study.

		Levene's Test		t-test					95%	
		F	*Sig.*	*t*	*df*	*p*	Mean diff.	Std. error diff.	Confidence interval of the difference	
									Lower	Upper
Beginning skills	Eva	1.358	.245	-2.612	173	.010	-.2380	.09112	-.41785	-.05817
	Evna			-2.621	173.000	.010	-.2380	.09082	-.41727	-.05876
Advanced skills	Eva	.067	.797	-2.246	173	.026	-.2451	.10910	-.46040	-.02974
	Evna			-2.243	170.811	.026	-.2451	.10924	-.46070	-.02944
File & software skills	Eva	4.957	.027	-3.158	173	.002	-.3450	.10923	-.56058	-.12938
	Evna			-3.186	169.825	.002	-.3450	.10829	-.55874	-.13121

Note: Eva = equal variances assumed. Evna: equal variances not assumed.

6   Conclusion

The purpose of this study was to investigate the relations between self-concept and computer self-efficacy. This study was designed to find the correlation between self-perception (of academic competence and job competence), self-esteem and computer self-efficacy.

The findings of the study show that the higher the self-perception of academic competence the higher the computer self-efficacy in all its dimensions of the CSE scale (beginning skills, advanced skills, file and software) that were cross-examined. These findings appear to support other studies, according to which the higher self-concept one has the better one's computer self-efficacy is, which means that those students who regard their performance as high also expect that they will succeed in the development of computer skills.

However, as far as self perception of job competence is concerned, the findings revealed statistically significant differences only with regard to advanced skills, which seems to mean that the students who have high self-

perception of job competence believe that they need to possess special skills in computer use. This could be based on the current data of competition in the workplace. Therefore, the students appear to use the manual, to describe the function of peripheral systems, to comprehend the levels of data processing, so that they can eventually solve problems – a necessary property for furthering the development of the their career. While this is not the case with beginning skills, and file and software, the former of which they only consider basic and the latter obviously non-existent, maybe because they are lacking in professional experience. On the other hand, the findings regarding self-esteem and CSE show statistically significant differences and this can be combined with the previous findings referring to self-concept. In particular, since they esteem their self-perception of academic competence to be high, this makes them feel emotionally well so that they consider their CSE high as well.

Considering the variable of year of studies, when comparing the means it was found that there is a clear and statistically significant difference between beginning skills and advanced skills. The difference between the means seems to increase considerably at the final level of skills to file and software. This may account for the fact that the more knowledge and experience one gains the better CSE one possesses for further personal and career development.

The present study aimed at drawing college teachers' attention and interest to the existence of differences between first- and fourth-year students. While the age of the respondents was examined as part of data collection, these findings could be related to the questions of the study, which would be an important parameter for consideration. If, for example, it was found that certain ages within a population (high school level, freshmen) demonstrated low self-efficacy, then ways could be suggested to restore this phenomenon [6,8].

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