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## Predictors for Student Success in an Online Course

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### ABSTRACT

This study analyzed the factors that affect student success in an online computer programming course. The study had two with two main objectives. The first was to examine relationships among selected variables (gender, age, educational level, locus of control, and learning style), motivational beliefs (intrinsic goal orientation, extrinsic goal orientation, control beliefs, task value, self-efficacy, and test anxiety), self-regulated learning components (cognitive strategy use, self-regulation), and student success in the online course. The second objective was to examine course instructors' views about the factors that contribute to the students' success in the online course. The study sample consisted of two course instructors and 80 voluntary participants who partook in this online course in 2005–2006. Both quantitative and qualitative methods were used to collect relevant data in this study. Four online questionnaires (Demographic Survey, Internal-External Locus of Control Scale, Learning Style Inventory, and Motivated Strategies for Learning Questionnaire) were used to gather data on quantitative variables, and semi-structured interviews were conducted to gather data on instructors' views. The statistical results indicated that the effect of the self-regulation variables on students' success was statistically significant, and the interview results indicated that successful students generally used self-regulated learning strategies in the online course.

### Keywords

Online student characteristics, Motivational beliefs, Self-regulated learning components, Online student success

### Introduction

Throughout the past decade, advances in information technology have affected various areas, such as communication, the nature of work, structure of organizations, daily life, and education. In particular, emerging technologies such as the World Wide Web and online communication tools have changed the face of education. These technologies create an anywhere-and-anytime learning environment that allows educators to deliver a course asynchronously, synchronously, or through a combination of the two. Also, these benefits provide easier and more convenient access for many students who are unable to attend traditional classes. With the help of these technologies, higher education institutions can begin to offer a number of distance-education opportunities to meet the needs of increasingly high numbers of these nontraditional students (Khan, 1997; Kearsley, 2000).

As distance education, especially online education, continues to expand, the need for determining and maintaining quality in the process of designing, developing, and delivering online education is becoming an important issue. It was reported that several online distance-education courses failed to meet quality standards set by researchers and institutions (Garrett, 2004; Oliver, 2005). A broad range of factors (i.e., institution, technology, instructor, student, support system, course structure, and instructional design) that can influence the quality of the educational experience in online education have been mentioned in the literature (CHEA, 2002; Fresen, 2005; IHEP, 2000; Meyer, 2002). In other words, some of previous literature identified student characteristics as one of the important considerations for the quality of online education. In addition, a general consensus among distance-education researchers in the literature is that factors that affect students' success in distance-education courses need to be identified (Biner et al., 1996; Dille & Mezak, 1991; Stone, 1992). Although numerous studies on the qualities of distance learners have been conducted, the factors that contribute to success in online learning have not been adequately described (Phipps & Merisotis, 1999). Some of the essential characteristics that affect student success as a distance learner (i.e., gender, age, educational level, locus of control, learning style, motivational beliefs, and self-regulated learning components) have been investigated in the literature. Consequently, in order to obtain evidence to increase the quality of online education, the combination of all these learner characteristics was examined to see their effects on student success in an online environment.

One of the learner characteristics that has often been the focus of research in distance education is gender. When reviewing gender-related studies, researchers have found that the effects of this variable are inconclusive with

regard to student success in distance education. On the other hand, there are some differences in using online learning between male and female students in the literature. Arbaugh (2000) mentions that males see online learning as a medium to provide education to many people more quickly and at a smaller cost. Males communicate via this medium in a competitive manner and also try to improve their own status in relation to their peers. However, females view Internet-based communication as a medium to develop higher collaboration in online learning. They are more supportive of networks to increase learning and communication for the group. As a summary, some studies reported differences between genders (i.e., Barrett & Lally, 1999; Taplin & Jegede, 2001), while others did not (i.e., Dille & Mezack, 1991; Lim, 2001).

Age is seen as another student characteristic in research studies, since distance education is viewed as very suitable to adults. The convenience, flexibility, and self-pacing of distance-education courses or programs are especially beneficial to them. Distance education allows adults to continue their education without having to disrupt their employment or family obligations (Moore & Kearsley, 1996). Dille and Mezack (1991) found that the average age of successful students in their study was 28 as opposed to an average age of 25 for non-successful students. On the other hand, Biner et al. (1996) indicated that the age of the learners was unrelated to satisfaction in their live, interactive telecourses. According to these studies, there are conflicting findings in regard to relations between age and dependent variables, such as success and satisfaction, in the literature.

Moreover, students enrolled in distance-education courses usually have a higher education level (i.e., senior, graduate student, etc.). Yukselturk (2005) reports that over 60% of students who attended an online program in his study had a bachelor's degree. Although Moore and Kearsley (1996) emphasize the importance of educational background in predicting the success factor in distance education, education level or academic standing has not been shown much in the literature to predict student success in a distance-education environment. For example, Lim (2001) report that academic standing does not affect student perceptions of web-based instruction. Also, Miller and Pilcher (2000) state that there is no significant difference in student achievement with regard to academic standing between on-campus and off-campus courses.

Researchers also agree that there is a relationship between the locus of control and student success. According to Rotter (1966), there are two types of locus of control: internal and external. Individuals who have an internal locus of control will take responsibility for their failures and congratulate themselves on their successes. Individuals who have an external locus of control tend to see their failures and successes as a result of chance, luck, or intervention by others. Research generally shows that, in the distance education environment, students with an internal locus of control are more likely to be successful than students with an external locus of control (Dille & Mezack, 1991; Parker, 1999; Stone, 1992). However, Sterbin and Rakow (1996) cite a few studies that found no relationship between the locus of control and success.

Many researchers have also included learning style as a part of the design of their studies. Kolb (1984) simply defines learning style as a preferred individual orientation toward learning. Learning style consists of a distinctive and observable behavior that provides clues about each individual. Knowing their learning style helps learners to improve their power of learning (Askar & Akkoyunlu, 1993). In the literature, there are more than 30 commercially published instruments used by researchers and educators to assess the different dimensions of learning style. One of the most common (which is also similar to what was used in this study) is Kolb's Learning Style Inventory (LSI), which categorizes learner types as Converger, Accommodator, Diverger, and Assimilator (Kolb, 1985). Although considerable research has been conducted regarding the relationship between students' learning style and success, the conclusions drawn from these studies conflict again. For example, Loomis (2000) and Dunn (2000) state that learning styles do affect student success; however, some researchers found that there is no statistically significant relationship between learning style and success (i.e., Shih & Gamon, 2001; Wang et al., 2001).

One of the most important components of learning in any educational environment is motivation. It is considered to be one of the best determining factors of student success. In the literature, the discussion of motivational beliefs includes several different constructs that have been generated by different theoretical models (e.g., attribution theory, goal theory, and intrinsic motivation theory). In this research, the theoretical framework for conceptualizing student motivation is an adaptation of the general expectancy-value model of motivation (Pintrich, 1990). The model proposes that there are three motivational components. These three components concern students' motivational beliefs about their reasons for choosing to do a task (value components that include goal orientations and task value), their beliefs about their capability to perform a task (expectancy components that include self-efficacy and control beliefs) and the affective construct of test anxiety. There are many studies related to each motivation variable and students' perception, attitude, and dropout as well as success rate. For example, some predictor components of motivational beliefs are higher levels of intrinsic and

extrinsic goal value (Pintrich & Garcia, 1991; Pintrich et al., 1991), self-efficacy (Bandura, 1997; Pintrich & DeGroot, 1990, Zimmerman & Martinez-Pons, 1990), control beliefs (Pintrich et al., 1991; Pintrich & Schunk, 1996), and task value (Pintrich et al., 1991). As with traditional education, students' motivation to learn is a critical factor for them to be successful in online education (Keller, 1999; Sankaran & Bui, 2001; Song, 2000).

Research on self-regulated learning has increased exponentially in recent years. It is important for all students, as well as educators, since the primary goal of education, especially distance education, is to develop independent and self-regulated thinkers and learners. Schunk and Zimmerman (1998) state that self-regulated learning refers to the process whereby learners systematically direct their thoughts, feelings, and actions toward the attainment of their goals. In this study, following the work of Pintrich and DeGroot (1990), self-regulated learning conjoins three major constructs: (a) students' metacognitive strategies for planning, monitoring, and regulating their cognition, (b) students' management and control of their effort on classroom academic tasks, (c) cognitive strategies that students use to learn, remember, and understand the material. Research conducted on self-regulated learning shows a strong relationship between students' academic success and the use of self-regulated learning strategies (Pintrich & Garcia, 1991; Schunk & Zimmerman, 1998; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1990). Similarly, the relationship between self-regulated learning strategies and success is also stated widely in the distance education literature (i.e., Azevedo et al., 2004; King, Harner, & Brown, 2000; Whipp & Chiarelli, 2004).

To summarize, the concern for student success in distance education continues to be a focus of research, even though the study results relating to student success are sometimes conflicting. This study analyzed the factors that affect online student success with regard to the two main goals. The first purpose was to investigate how online student success can be explained in terms of selected variables (i.e., gender, age, educational level, locus of control, learning style), motivational beliefs (intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, and test-anxiety), and self-regulated learning components (cognitive strategy use and self-regulation). The second goal was to thoroughly examine the instructors' views about online student success in the online course. By examining issues such as the qualities of online students, not only will this study fill a void that currently exists in the research, but it will also be useful in identifying characteristics of successful and high-risk students in online education. This information might allow institutions of higher education to implement procedures in order to design high-quality online learning environments through early intervention.

## Research Questions

The following two major research questions guided this study:

- What is the extent to which selected variables (gender, age, educational level, locus of control, learning style), motivational beliefs (intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, and test anxiety), and self-regulated learning components (cognitive strategy use and self-regulation) account for student success in the online course (Data Structure and Algorithms with C)?
- What are the instructors' views about the factors that affect student success in the online course (Data Structure and Algorithms with C)?

In order to examine the first research question, the following hypothesis was stated:

- The thirteen variables together (gender, age, educational level, locus of control, learning style, intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, test anxiety, cognitive strategy use, and self-regulation) do not explain a significant amount of variance in students' success in the online course (Data Structure and Algorithms with C).

## Method

This study was a combination of quantitative and qualitative research methods. The careful and purposeful combinations of different methods in social and behavioral research strengthen and deepen the analysis, and decrease the weaknesses of the study (Johnson & Turner, 2003). The quantitative part of this study was based on correlational research design. Fraenkel & Wallen (2000) stated that correlational research designs are used for two major purposes: to help explain important human behaviors or to explore relationships between variables, and to predict likely outcomes or the score on one variable if the score on the other variable is known. Considering the second purpose of the study, the qualitative paradigm was the appropriate choice. Qualitative research is descriptive and inductive, focusing on uncovering meaning from the perspective of participants (Bogdan & Biklen, 1998; Merriam 1998).

## Description of the Online Certificate Program and the Online Programming Course

The Online Information Technologies Certificate Program (ITCP) is one of the first Internet-based education projects at the Middle East Technical University in Ankara, Turkey. Offered through the cooperation of the Computer Engineering Department and Continuing Education Center at Middle East Technical University, the program is based on synchronous and asynchronous communication methods over the Internet. The online certificate program was started in May 1998 and is still active.

This online certificate program provides online lecture notes, learning activities, and visual aids to course participants. One instructor and one assistant deal with each course. Also, each course has an email address, discussion list, and chat sessions to provide interaction between both instructors and students, and students and students. At the end of each semester, there are face-to-face sessions for each course. Data Structure and Algorithms with C is one of the programming courses in this online program. Students take this course in the second semester of the program. The main aim of this course is to teach basic data-structure and algorithm concepts to use in preparing different programs. The aim of providing these basic concepts is not only to enable students to use them in solving problems during the course, but also to be able to teach students how to use the concepts to find solutions to any programming problems they encounter. The course content consists of basic C programming strategies (e.g., pointers, data structures, lists, trees, searching, sorting, and algorithms). This second-semester programming course was selected to decrease some effects on the results of this study, such as students' lack of familiarity with online learning, environment, communication tools, and computer-programming concepts.

## Subjects of the study

The study included 80 volunteer students (October 2004–June 2005) who attended the online computer-programming course at Middle East Technical University in Ankara, Turkey. All students were computer literate and had an intermediate level of English. Table 1 presents the demographic characteristics of the students. The number of male students ( $N = 56$ ) was greater than the number of female students ( $N = 24$ ), and the majority of the students' were between 19 and 29 years of age. In addition, the majority of the students had an assimilator learning style and a university degree.

Table 1: The characteristics of the students

	<i>N</i>	<i>P</i>
<b>Gender</b>		
Female	24	30
Male	56	70
<b>Age</b>		
19–24	25	31
25–29	35	44
30–34	12	15
35–39	5	6
40 and above	3	4
<b>Education Levels</b>		
University graduates	45	56
Undergraduate students	35	44
<b>Learning Style</b>		
Assimilator	52	65
Converger	13	17
Diverger	13	17
Accommodator	1	1

*N*: Number of students who attend the study, *P*: Percentage of students who attend the study

## Instrumentation

To collect relevant data in this study, both quantitative and qualitative methods were used. The following instruments helped us collect quantitative data: Demographic Survey, Internal-External Locus of Control Scale, Learning Style Inventory, and Motivated Strategies for Learning Questionnaire.

The Demographic Survey was used to gather students' demographic information (i.e., age, gender, education level). The Internal-External Locus of Control Scale (IELOC) was used to measure students' locus of control orientation. This scale, originally developed by Rotter (1966), is a 29-item, forced-choice, self-report scale with a scoring range from 0 (internality) to 29 (externality), excluding six buffer items. The scale was translated into Turkish and standardized on a Turkish sample by Dag (1991) ( $N = 532$ ). He found the Cronbach alpha coefficient as 0.71 and test-retest reliability as 0.83.

The Learning Style Inventory (LSI) was used to classify students' learning styles. This inventory was originally developed by Kolb (1985) and translated into Turkish by Askar and Akkoyunlu (1993). According to them, the reliability coefficients for the adapted inventory were calculated separately for four basic learning-style types and various combinations of them, and found to be between 0.73 and 0.88 ( $N = 268$ ).

The Motivated Strategies for Learning Questionnaire (MSLQ) was used to collect data related to motivational beliefs and self-regulated learning components. It is an adapted version of the relevant sections from the MSLQ developed by Pintrich, Smith, Garcia, & McKeachies (1991). It was translated into Turkish, and the pilot study was administrated to students enrolled in the Department of Foreign Languages Education at METU, Turkey (Hendricks, Ekici, & Bulut, 2000). Also, it was used in the study of investigating mathematics achievement and self-regulated learning in the city of Denizli, Turkey, with 752 ninth-grade students. In this study, some items of the scale were lightly adjusted to ensure applicability to all students (Ozturk, 2003). The reliability coefficients for the last version of the adapted questionnaire were calculated separately for eight sub-scales and various combinations, and found to be between 0.53 and 0.89.

In addition to these questionnaires, semi-structured interviews were conducted to elicit additional information regarding student success in this online course. Interview questions were developed around the central themes of the questionnaires used in this study, and consisted of ten questions. The interview questions were examined by two experts in the field of instructional technology at the university. Some of the major interview questions were as follows:

- What are the online students' characteristics?
- What are the successful and unsuccessful students' characteristics in the online course?
- What are the major points that students like in the online course?
- What are the major points that give students difficulty in the online course?
- How could an effective online course be designed?

## Data Collection and Analysis

Students who registered in the online Information Technologies Certificate Program were selected to participate in this study. During the face-to-face meetings at the beginning of program, students were informed that their participation was voluntary and that they had the right not to participate and the right not to answer all questions. Then, three instruments (Demographic Survey, Internal-External Locus of Control Scale, and Learning Style Inventory) were distributed by the researchers to the students to collect relevant data for this study. Also, the last instrument (Motivated Strategies for Learning Questionnaire) was distributed by the researchers to the students at the end of the course on the university campus. The structure of the online certificate program and the course given in this program was not changed, and researchers did not influence the students or the course instructors during the study.

With the help of these instruments, thirteen independent variables, three categorical (gender, educational level, and learning style) and ten continuous (age, locus of control, intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, test-anxiety, cognitive strategy use, and self-regulation) were gathered. The dependent variable, students' success scores, was gathered from scores on three assignments given in the course and a traditional paper-based final examination at the end of the course. Correlation and regression tests were used to analyze these quantitative data. Descriptive statistics, such as, mean and standard deviations of subjects, were calculated for the scale scores. Dummy coding was applied for the learning-style variable, and the accommodator learning style was not included in the analysis since only one student had it.

In addition to quantitative data, semi-structured interviews were conducted with course instructors (one instructor and one assistant) of the selected course. Bogdan and Biklen (1998) stated that researchers are confident that they can obtain comparable data across subjects through semi-structured interviews. The interviews were conducted by the researchers and took about 20–30 minutes. Before each interview, the instructors were informed of the purpose of the interview. Instructors have over five years of experience in

teaching the online programming course in this program. The data analysis was continuous and iterative throughout data collection and report writing. This analysis process went through in iterative cycles of examining the data, exploring similarities and differences among the participants, and searching for confirming and disconfirming evidence that would be incorporated into the conclusions (Merriam, 1998).

## Results

### Descriptive Statistics

Table 2 shows the descriptive statistics (range, minimum, maximum, mean, and standard deviation) of variables such as locus of control (Lcontrol), intrinsic goal orientation (Intr), extrinsic goal orientation (Extr), task value (Tskv), control beliefs (Cont), self-efficacy (Slef), test anxiety (Tanx), self-regulation (Slrg), cognitive strategy use (Cstra), and student success (Success). Slrg was constructed from metacognitive self-regulation and effort regulation, while Cstra provides a measure of the use of rehearsal, elaboration, organization, and critical-thinking strategies. This table shows the descriptive statistics of MSLQ subscale scores, converted into a 7-point Likert-type scale, similar to the original scale), the locus of control (ranging from 0 to 23), and student success (ranging from 0 to 100).

Table 2: Descriptive statistics of MSLQ subscale scores, locus of control, and success

Predictors	N	Range	Min	Max	Mean	SD
Lcontrol	80	15.00	2.00	17.00	8.76	3.71
Intr	80	6.00	1.00	7.00	5.12	1.21
Extr	80	5.00	2.00	7.00	4.34	1.09
Tskv	80	5.50	1.50	7.00	5.44	1.03
Cont	80	4.00	3.00	7.00	5.46	0.99
Slef	80	4.38	2.63	7.00	4.74	1.10
Tanx	80	5.60	1.00	6.60	3.44	1.25
Slrg	80	4.13	2.25	6.38	4.50	0.95
Cstra	80	4.47	2.05	6.53	4.16	0.94
Success	80	95.64	4.36	100	39.82	28.20

Table 2 demonstrates that students mainly have an internal locus of control (mean = 8.76). Furthermore, motivational subscales range from 3.44 to 5.46, which means that students tend to reflect an “agree” perspective toward their motivational beliefs about programming especially with regard to intrinsic goal orientation, task value, and control beliefs. They have an “undecided” perspective about extrinsic goal orientation, and a “disagree” perspective about test anxiety. In addition, they tend to reflect an “undecided” perspective on self-regulated learning components in programming, with mean scores ranging from 4.16 to 4.50.

### Results of Testing the Hypothesis

The problem of this study was examined by means of its associated hypothesis. The hypothesis was in the null form and tested at a significance level of 0.05. The interrelationships among variables before testing hypotheses were examined due to the concern about the issue multicollinearity. Therefore, Pearson Product-Moment correlations were conducted to examine the interrelationships among measures. The correlation matrices were presented in Table 3. Table 3 shows that predictor variables did not have high correlations among themselves; therefore, we deduced that multicollinearity was not a problem in this study.

Table 3: Pearson Product-Moment correlations among measures for all subjects of the study

Variables	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Gender	-0.11	0.03	0.11	-0.63	-0.63	-0.16	0.16	0.17	0.17	0.05	0.05	0.01	0.16	0.20	<b>0.02</b>
2. Age		-0.5*	0.10	0.04	-0.18	-0.05	0.20	-0.3	0.17	0.09	0.22*	-0.04	0.19	0.06	<b>0.13</b>
3. Edulevel			-0.01	-0.04	0.09	0.13	-0.29*	0.06	-0.20	0.01	-0.23*	0.11	-0.26*	-0.13	<b>-0.28*</b>
4. Assimilator				-0.61*	-0.61*	-0.08	0.02	-0.11	0.09	0.08	-0.04	-0.15	0.07	-0.03	<b>-0.05</b>
5. Converger					-0.20	-0.09	0.03	-0.04	-0.05	0.02	0.12	0.11	0.14	0.13	<b>0.15</b>
6. Diverger						-0.09	0.21	-0.07	-0.12	-0.06	0.02	-0.24*	-0.08	-0.08	<b>-0.08</b>
7. Lcontrol							-0.32*	-0.16	-0.31*	-0.27*	-0.37*	-0.09	-0.40*	-0.38*	<b>-0.24*</b>
8. Intr								0.2	0.79*	0.38*	0.69*	-0.06	0.07*	0.65*	<b>0.36*</b>
9. Extr									0.25*	0.26*	0.25*	0.26*	0.21	0.46*	<b>0.06</b>
10. Tskv										0.50*	0.64*	-0.02	0.60*	0.65*	<b>0.28*</b>
11. Cont											0.55*	0.07	0.26*	0.27*	<b>0.18</b>
12. Slef												-0.17	0.64*	0.59*	<b>0.39*</b>
13. Tanx													-0.06	0.20	<b>0.0</b>

14.Slrg	0.76*	0.39*
15.Cstra		0.24*
16.Success		1

As Table 4 indicates, only one variable (self-regulation) explained a significant amount of variance in students' success,  $R^2 = 0.164$ , adjusted  $R^2 = 0.153$ ,  $F(1,74) = 14.53$ ,  $p = 0.000$ . 16.4 percent of the variances are explained by this variable. The value of Standardized Coefficients is 0.4 and Standard Error is 26 for this variable.

Table 4: Linear Stepwise Regression Analysis results for one significant predictor variable on success

Regression Statistics					
Multiple R	0.405				
$R^2$	0.164				
Adjusted $R^2$	0.153				
Standard Error	26.18				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sig F</i>
Regression	1	9954.74	9954.74	14.53	0.000*
Residual	74	50719.55	685.40		
Total	75	60674.31			

\* $p < .05$

Gender, age, educational level, online readiness, locus of control, learning styles, intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, test-anxiety, and cognitive-strategy use were excluded from the equation of predicting success because they did not have a significant contribution to variance in success ( $p > .05$ ).

### The instructors' views about online student success

Interviews with two course instructors showed similar results about student characteristics in this online course. The instructors stated that online students were different from traditional students in various ways. Traditional students had similar characteristics (i.e., similar age level, similar background knowledge), and their primary aim was to study and learn the topics covered in the courses. However, online students were older than traditional students, and they had various responsibilities (i.e., jobs and families). Also, online students were different from each other. Their age range could be from 20 to 50, based on information provided by the instructors during the interviews. Students' background or education could be from either a social or science field. Moreover, there were some differences in their motivations and aims in attending the program. For example, some online students attended this certificate program to find a job, others attended for improving their knowledge about the IT field. According to the instructors, even though online students had different characteristics, general personal characteristics, especially, gender, age, educational level, and learning style, did not directly affect their success in the online course.

The instructors described successful students based on their experiences in the online course. First, successful students were already mature enough, initially. They were aware of their responsibilities and were self-disciplined while doing their tasks. Second, successful students were active in their learning process. One of the instructors said, "students are generally successful if they follow the course notes regularly, review and study them carefully, do their assignments timely and evaluate them by themselves, ask questions when faced with problems, and attend the discussions in computer-mediated communication tools during the course." Third, successful students were eager to interact with their peers and instructors, with the help of communication tools. They learned lots of information by interacting with peers and instructors regularly during the course. In addition, instructors mentioned that students' previous experiences, their interests related to topics, and their confidence about their capabilities might have affected the students' success in the online course.

On the other hand, instructors pointed out that some students could not meet their course requirements. They did not follow the classes regularly, and they did not prepare assignments and pass the exams in the online course. According to the instructors, there might have been various reasons for being unsuccessful in the online course. They emphasized that these reasons generally resulted from the online students' "underestimating time and effort necessary for courses, lack of time management, and unexpected emergency situations in their life." Further, instructors mentioned that some students were faced with motivation problems as well. Although most of the students started this online certificate program with a high level motivation, some students could not maintain the high level throughout the entire course. In particular, the motivation level of unsuccessful students decreased during the course. Moreover, the instructors stated that some students could not adapt to these online courses.

According to one instructor, students were not familiar with this new method of taking courses. He mentioned that the teacher-centered method is a widely used method in our education system, from primary school to university. On the other hand, instructors in this online program tried to facilitate and use student-centered methods in their courses; therefore, this new learning model might have been strange for some students during the course.

Instructors expressed the major areas of the course that students liked, as well as those students found difficult. According to the instructors, students were generally highly satisfied with the course when they were able to immediately put into practice what they had learned. In other words, students generally preferred practical information, and they wanted to integrate their knowledge into their life immediately. Therefore, instructors tried to provide students with more practical information in the course notes, such as examples, exercises, and assignments. On the other hand, the major difficulty that students faced within their course was studying the course material regularly. Due to the flexibility of online learning, students could study whenever and wherever they desired. However, instructors expressed concern that some students did not study the material and perform their requirements regularly and therefore risked falling behind the other students once work accumulated. This behavior could lead to students' dropping the course before completion.

Although the popularity of online learning has been increasing dramatically in recent years, the instructors said that designing and teaching online courses properly was not an easy job for them when compared to teaching traditional classes. They stated that online education placed all major responsibilities on the students; therefore, educators tried to create a more effective learning environment by using contemporary techniques and tools. They emphasized some of the critical issues in preparing online courses. For example, online course notes consisting of rich materials (i.e., interactive examples, multimedia applications, and reference books) should be designed carefully and updated regularly. Both synchronous and asynchronous Internet-based communication tools (i.e., email, discussion groups, and chat sessions) should be integrated into the course structure to increase interaction among students and between students and instructors. Moreover, student-centered methods, which are active-learning methods, have been designed for students to create knowledge and meaning by themselves. Individual and timely feedback could be provided regularly to the students by the educators, and educators should try to guide and help students in the learning process through the incorporation of small instructional activities.

## Discussion

In order to design online courses or programs to fit the needs of online students, it is necessary to investigate the characteristics of successful online learners. In other words, research is needed to discover what will help students succeed, and the results of this research should be incorporated into the preparation of high-quality online courses. Therefore, this study focused on two main goals for online student success. The first goal was the relationship between student characteristics and online student success. The second goal was to examine the results of the online course by considering feedback from the course instructors. To meet these goals we conducted analyses with data gathered from students and instructors in an online programming course in an online certificate program.

The demographic information of students and instructors' views in this study showed that the students of the online course were of different educational backgrounds and ages, and possessed different learning styles and employment characteristics. Also, many of these students had other responsibilities outside of school (e.g., family, job) in this online certificate program. Demographic data available from several large national studies of adult students showed similar personal characteristics among online students (Thompson, 1998). In the literature, the effects of these general personal characteristics (i.e., gender, age, and learning style) on student success are inconclusive. Many study results, like the results of this study, showed that these general personal characteristics did not significantly affect student success in online courses (i.e., Lim, 2001; Wang & Newlin, 2002).

Table 3 displays the correlation among the selected characteristics of students and their success in the online course. Intrinsic goal orientation, task value, self-efficacy, cognitive-strategy use, and self-regulation were significantly positively correlated with online success. Educational level and external locus of control were the only variables that were negatively correlated with success. In addition, according to the regression analyses of this study, self-regulation related to success was the only variable to enter a regression equation in the online course regression analyses. That accounted for 16.4% of the variance in students' programming success.

Zimmerman (2000) defined self-regulation as “self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (p. 14). Research states that one of the best predictors of academic success appears to be self-regulation and its strategies in educational environments (Pintrich & DeGroot, 1990; Schunk & Zimmerman, 1998; Zimmerman & Martinez-Pons, 1990; Zimmerman, 2002). Also, research shows that successful students use self-regulated learning strategies in online courses (King, Harner, & Brown, 2000; Whipp & Chiarelli, 2004; Azevedo et al., 2004). These students are described as having three main characteristics (Pintrich, 1995). First, self-regulated students try to control their behavior, motivation, and thought. Second, they aim to accomplish a goal. Last, they must be in control of their learning. Zimmerman and Martinez-Pons (1990) also stated that self-regulated learners select, organize, and plan and control the form and amount of their own instruction for their academic achievement. In doing so, they create advantageous learning environments for themselves.

Instructors also described students with self-regulated learners’ characteristics as successful. Successful students were mature enough to know what they wanted in an online course. Also, they were aware of their responsibilities and could control their learning through self-discipline. Interview results also showed that successful students were active in their learning process. They followed the course notes and reviewed them regularly, and did their work carefully. At the same time, interaction with peers and instructors played an important role in ensuring students’ success. Similarly, Pintrich and DeGroot (1990) state that, in addition to being able to self-regulate cognitive and metacognitive strategies (i.e., planning, organizing, self-instructing, and self-evaluating), self-regulated students are able to learn from peers, and seek help and support from peers and instructors.

Even though the other variables (i.e., intrinsic goal orientation, task value, self-efficacy, and internal locus of control) were correlated with online programming success, these variables did not enter the regression equation in the online course regression analyses. This finding contradicts previous research results (Pintrich & DeGroot, 1990; Zimmerman & Martinez-Pons, 1990; Wang & Newlin, 2002). For example, research on the self-efficacy variable (belief in one’s capabilities) and the intrinsic motivation variable (one’s own desire to do well) has shown that these variables also significantly affect student achievement (Pintrich & DeGroot, 1990). In line with these statements, instructors in the interview mentioned those variables that might affect student success, such as students’ interest in certain topics, their previous experiences, and their confidence.

Unfortunately, not all students could be successful in the online educational environment. They were unable to meet the course requirements and therefore failed the course. Interview results showed that there were several reasons that might have negatively affected success. One of them was that students perhaps underestimated the time and effort necessary to succeed in an online course. They may have thought that they could easily pass without studying hard. On the other hand, Moore and Kreasley (1996) state that distance education places the responsibility of learning on the students much more than traditional education does; therefore, students have to study more. Further, in our study, some students were unable to manage their time properly in the online course. Research shows that time planning and management training helps students to better self-regulate their use of study time, which improves students’ level of achievement (Zimmerman, Greenberg, & Weinstein, 1994). Unexpected emergency situations can also negatively affect students’ success. Online students have various responsibilities apart from class. They sometimes might be faced with problems related to their job, family, or health.

Interview results also showed that some students, especially unsuccessful ones, were faced with motivation and adaptation problems within the online course. Although the statistical results showed that students generally felt they were motivated about the prospect of online learning, and the interview results showed that students started the online certificate program with a high level of motivation, instructors mentioned a decrease in the students’ motivational levels as the students’ progressed through the course. In other words, students could not maintain their motivation during the entire course; therefore, they risked failing the course. Similarly, according to the studies conducted on motivation in distance education, motivation has a great importance in student success and continuity (Keller, 1999; Sankaran & Bui, 2001; Song, 2000). Also, Pintrich and DeGroot (1990) stated that students should not only use self-regulated learning strategies to achieve, but also they should be motivated to use these strategies to fulfill course requirements. Furthermore, some students could not easily adapt to the online program since in traditional classes they were used to passively receiving information from teachers. In contrast, the online learning environment requires students to be active and use self-study methods in order to succeed. Hill and Hannafin (1997) emphasize this problem and state that traditional education does not prepare students for the exploration and learner-centered thinking that is necessary in online learning environment, because students are largely externally managed and teacher-directed in traditional classes.

In summary, the statistical results in this study revealed that self regulation had a significant effect on student success in the online course. Similarly, interview results in this study emphasized the successful students used self-regulated learning strategies in the online course. According to these results, we can conclude that student success is highly dependent on being a self-regulated learner and using self-regulated strategies in online courses. The self-regulated learning strategies in the literature, similar to those detailed in this study, were summarized as follows: self-evaluation, organization, and transformation; goal setting and planning; seeking information, keeping records, and monitoring; environment structuring; self-consequences; rehearsing and memorizing; seeking social assistance; and reviewing records (Pintrich & DeGroot, 1990; Schunk & Zimmerman, 1998; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1990).

## Conclusion and Recommendations

Many institutions of higher education have made the decision to offer both courses and full degree programs online. However, it is not easy to determine and maintain quality in the process of designing, developing, and delivering these online learning opportunities for educational institutions. There are several critical success factors for quality online education (CHEA, 2002; Fresen, 2005; IHEP, 2000; Meyer, 2002). One of these factors is the student. According to Fresen (2005), Students can influence the quality of online education through the following: communication with fellow students, time management, expectations of efficiency and effectiveness, critical thinking strategies, motivation, commitment, self esteem, and improved problem-solving abilities. Moreover, Meyer (2002) mentions quality factors in distance education, and states that student learning might also depend on a number of individual qualities, such as attitude, motivation, and sufficient computer skills. In sum, the previous literature suggests that student qualities are reported to be a critical factor in the quality of online education.

There is a need in higher education to ensure that the standards set by national and international accrediting organizations are being met. One standard used by accrediting organizations to monitor quality and credibility is student learning outcome and student success (CHEA, 2002). Here, in this paper, we aimed at exploring characteristics of online students and the factors that contribute to their success. By understanding the factors that affect student success and implementing procedures to increase learning outcomes, higher education institutions can ensure the course or program quality meets credibility standards. In particular, we found self-regulation to be a significant factor affecting online student success. Based on the results of this study, the following major recommendations can be offered for online courses to design high-quality learning environments:

- Learners should be directed to be self-regulated learners (metacognitively, motivationally, behaviorally active participants), and self-regulated learning strategies could be provided to enhance students' achievement of intended learning outcomes (Zimmerman, 2002; Zimmerman & Martinez-Pons, 1990; Pintrich & DeGroot, 1990; King, Harner & Brown, 2000; Whipp & Chiarelli, 2004);
- Orientation to give information about the nature of online learning and its requirements should be provided to students to enable them to better understand and determine whether they can handle the requirements of an independent environment. Also, they should be guided to adapt to different environments and learning methods (i.e., the student-centered methods);
- Learners should be encouraged to keep their motivation at a high level through the help of instructional activities during the online course;
- Learners' performance should be monitored, and individual and timely feedback should be provided during the online course;
- Interaction, especially among students, through both synchronous and asynchronous communication tools should be encouraged, so that students can work together, share information and opinions, analyze data, and solve problems;
- Course contents should be of immediate real-life value for the students. Also, course content should consist of rich materials (i.e., interactive examples, multimedia applications, reference books) that are updated regularly to reflect the students' needs and new technologies.

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