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Clayton Arlen Looney
University of Montana, clayton.looney@business.umt.edu

Asli Yagmur Akbulut
Grand Valley State University

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COMBATING THE IS ENROLLMENT CRISIS: THE ROLE OF EFFECTIVE TEACHERS IN INTRODUCTORY IS COURSES

Clayton Arlen Looney
School of Business Administration
University of Montana
clayton.looney@business.umt.edu

Asli Yagmur Akbulut
Seidman College of Business
Grand Valley State University

ABSTRACT

Assigning effective teachers to introductory IS courses represents one intervention strategy that has been broadly advocated to help reverse the sharp decline in students majoring in Information Systems (IS). Using a survey of 305 students enrolled in a multiple-section introductory IS course, this study empirically confirms that students who are taught by effective teachers are more likely to be attracted to the IS discipline. Moreover, based on a robust theoretical foundation grounded in Social Cognitive Theory, the findings reveal the underlying mechanisms through which teaching effectiveness influences students' aspirations to pursue an IS degree. Specifically, teaching effectiveness bolsters students' confidence in their ability to successfully perform as IS majors (i.e., self-efficacy), raises students' expectations that valued rewards will be received by majoring in IS (i.e., outcome expectations), and helps students develop enduring interest in the IS field. In addition to teaching effectiveness, students with high self-efficacy and robust outcome expectations become more interested in IS. In turn, interest serves as the primary channel through which goals to choose the IS major develop. Implications for theory and practice are discussed.

Keywords: choice goals, enrollment, interest, major, outcome expectations, self-efficacy, social cognitive theory, teaching effectiveness

I. INTRODUCTION

The Information Systems (IS) field is currently experiencing an enrollment crisis. Despite the allure of high-paying jobs in the information technology (IT) sector [Hamm 2006; Kalwarski et al. 2006] and an estimated 30 percent increase in IT jobs by 2012 [Hecker 2004], forces such as offshoring, completion of Y2K overhauls, and the dot com bust have taken their toll on the number of students seeking IS degrees [George et al. 2005; Ives et al. 2002; Vegso 2005]. In fact, reports indicate that enrollments have declined by roughly 50 percent since 2002 [George et al. 2005]. The paradoxical combination of a burgeoning job market and plummeting enrollments presents a significant challenge, not only for organizations seeking qualified graduates, but also for IS programs trying to meet accelerating industry demand.

Clearly, remedying this situation will require a concerted effort toward attracting additional students to the IS discipline. Given the urgency of the situation, academicians have recently begun recommending intervention strategies targeted at enhancing student recruitment [see George et al. 2005; Akbulut and Looney, forthcoming]. While there are many potentially profitable approaches to consider, this study focuses on one particular method that has been broadly advocated – assigning effective teachers to introductory IS courses. According to this rationale, introductory IS courses provide a unique opportunity to steer students toward the IS major, as most students enrolled in these courses have yet to finalize their decisions about which major to pursue [George et al. 2005; Akbulut and Looney, forthcoming]. In terms of teaching effectiveness, when the pedagogical process fosters a productive learning environment, students might become more confident in their abilities to pursue an IS major, expect to receive valued rewards from majoring in IS, develop greater interest in the IS discipline, and acquire aspirations to choose IS as their primary field of study [Akbulut and Looney, forthcoming].

Despite its intuitive appeal, no evidence to date has empirically linked teaching effectiveness to student uptake. Moreover, a theoretical model has yet to be put forth to explain the means by which teaching effectiveness sways students to select IS as a major. Understanding these underlying mechanisms has significant implications for explaining, predicting, and ultimately modifying student choice behaviors. To proceed toward the development of intervention strategies aimed at attracting larger pools of students to the IS field, it is vital to understand the interplay among the various factors affecting major choice. Therefore, the purpose of this study is twofold: 1) to empirically validate whether assigning effective teachers to introductory IS courses improves student recruitment; and 2) to derive and test a theoretical model that can be used explain how and why teaching effectiveness influences major selection.

To this end, the next section describes the concept of teaching effectiveness, as well as the theory that serves as a cornerstone for developing an integrated research model aimed at understanding the manner by which teaching effectiveness might improve student recruitment. Using a survey of 305 students enrolled in introductory IS courses, the model is empirically tested and the results presented. The article concludes with a discussion of the findings, limitations, and implications for theory and practice.

II. BACKGROUND AND THEORY

TEACHING EFFECTIVENESS

Prior to presenting our theoretical model, it is essential to understand how the education literature views the concept of teaching effectiveness. Due to the prevalence and importance of teaching in society, defining teaching effectiveness and identifying the factors that constitute it have garnered extensive research interest over the past century (see d'Apollonia and Abrami [1997] for a brief review). Teaching is a complex task, characterized by many different processes (e.g., course organization, feedback provision) and products (e.g., learning) [d'Apollonia and Abrami 1997; Feldman 1997; Marsh 1984; Marsh and Roche 1997; McKeachie 1997].

Given the multi-dimensional nature of teaching, considerable debate has ensued regarding the most appropriate method of assessing teaching effectiveness. One approach involves measuring the various dimensions of teaching and subsequently evaluating their independent effects on student learning [Feldman 1997]. Other studies suggest that capturing teaching effectiveness as an overall evaluation produces results similar to measuring and summating scores across the sub-dimensions of teaching [d'Apollonia and Abrami 1997; Greenwald and Gilmore 1997]. While each approach has its supporters and detractors (see Greenwald [1997]), scholars generally agree that effective teaching cultivates student learning. As d'Apollonia and Abrami [1997] point out, "students whose instructors are judged the most effective also should learn more" [p. 1201]. Therefore, student learning can be used as a gauge for measuring teaching effectiveness.

In terms of student learning, the construct has typically been measured either objectively through a skill assessment (e.g., Johnson and Marakas [2000]) or via subjective student evaluations of learning (e.g., Marsh [1984]). Although obtaining an objective measure would seem optimal in the context of an introductory IS course, it can introduce methodological challenges and perhaps result in erroneous conclusions. Unless all teachers use the same syllabus, cover the same material, and utilize a standardized skill assessment, comparing student learning across multiple sections can be problematic [d'Apollonia and Abrami 1997; McKeachie 1997]. Even when standardized tests are utilized, prior studies suggest that it is difficult to compare student learning across sections [Marsh and Roche 1997]. As McKeachie [1997] indicates, standardized tests reflect "how well the teacher has prepared students for the test; it does not assess learning that goes beyond the test" [p. 1220]. Due to the issues surrounding objective measures, student evaluations of learning represent "the single most valid source of data on teaching effectiveness" [McKeachie 1997, p. 1219].

Based on the understanding that effective teachers promote student learning, in the next section we suggest that, in the context of an introductory IS course, teaching effectiveness triggers an interrelated set of beliefs, expectations, emotions, and goals, which can independently and jointly result in a student's aspirations to select IS as a major.

SOCIAL COGNITIVE THEORY

The majority of career choice and development models recognize that career-related behaviors are shaped by personal and environmental factors [Osipow 1990]. Therefore, we surmise that teaching effectiveness (a factor operating within a student's environment) combine with student-intrinsic factors to motivate and govern a particular type of behavior – a student's decision to pursue the IS major. Consequently, we sought theory that not only included personal and environmental components to account for individual behavior, but also has been used to explain IS phenomena.

Social Cognitive Theory (SCT) [Bandura 1986; 1997] represents one such theory that has received extensive research attention. SCT views psychosocial phenomena as mutually and reciprocally determined by personal, environmental, and behavioral factors. According to SCT, behavior depends on the interplay between personal and environmental factors operating in a given situation. People enter contextual situations with a set of abilities, expectations, traits, histories, emotions, and cognitive resources to deploy during their interactions with the environment. Environmental forces can preclude, enable, inhibit, or promote certain types of behavior. When considering prospective behaviors, individuals assess their ability to engage in these behaviors by integrating perceptions of themselves, the environment, and the particular behavior in question. Behavior in a given situation is, therefore, mutually determined by environmental and personal components.

According to SCT, actual behavior provides feedback to the individual, resulting in a reassessment of his or her capabilities as well as the nature of the environment. Moreover, environmental forces can vary based on prevailing circumstances. As a result, SCT's triadic system of reciprocality does not imply that the linkages exert equal influence or operate concurrently. In contrast, their relative importance will fluctuate depending on experience and situational circumstances [Bandura 1997]. Repeated interactions within a given context facilitate the crystallization of individual beliefs, which become increasingly stable as experience is acquired [Gist and Mitchell 1992].

SCT has proven to be a powerful mechanism for explaining, predicting, and governing behavior. The theory has been found to consistently predict a wide range of behaviors across a broad array of domains including education, health, clinical psychology, athletics, and organizational functioning (see Bandura [1997]). Specific to the IS literature, SCT has been successfully applied in studies related to training [Agarwal et al. 2000; Compeau and Higgins 1995a; Johnson and Marakas 2000], technology use [Compeau and Higgins 1995b; Compeau et al. 1999], virtual organizations [Staples et al. 1999] and user psychology [Looney et al. 2006] to name a few.

IS MAJOR CHOICE GOALS MODEL

Lent et al. [1994] were the first to apply SCT to academic- and career-related choices. Specifically, Social Cognitive Career Theory (SCCT), developed by Lent et al. [1994], represents a specific instantiation of the broader SCT. SCCT was derived as a conceptual framework aimed at understanding the mechanisms through which individuals develop goals to pursue particular educational or occupational paths, make choices among available alternatives, and perform in their selected fields of pursuit. While SCCT covers a broad spectrum of academic- and career-related issues [see Lent et al. 1994], Akbulut and Looney [forthcoming] leveraged SCCT to develop a model describing the core factors affecting student decisions to major in IS. The researchers introduced a theoretical model aimed at understanding a particular subset of SCCT factors that influence student selection of IS as a primary field of study. Referring to Figure 1, the IS Major Choice Goals Model represents a theoretical framework consisting of four interrelated personal factors: self-efficacy, outcome expectations, interest, and choice goals. The factors, as well as their theorized relationships, are described in the following subsections.

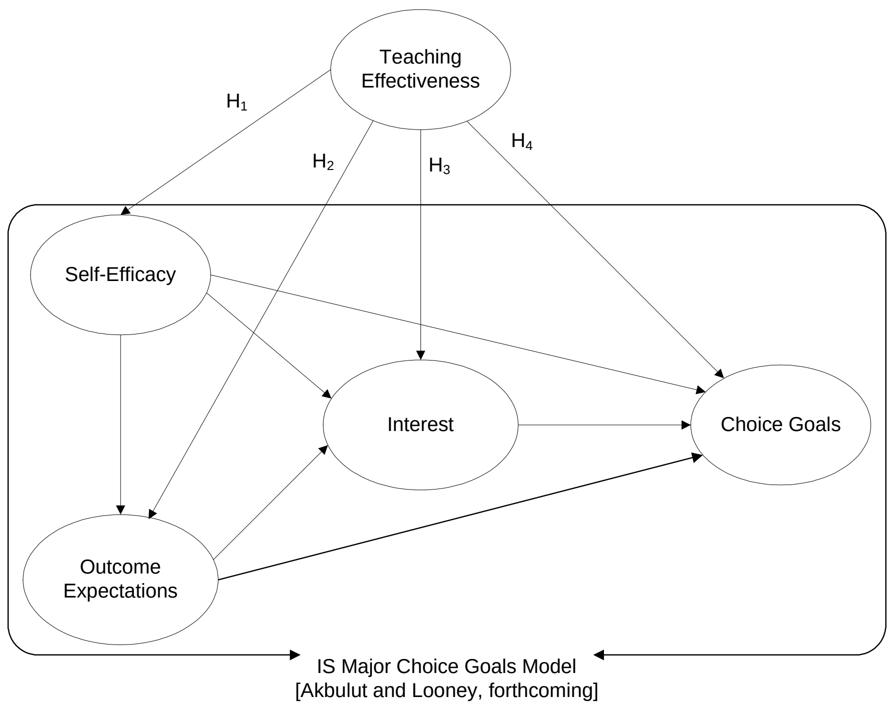


Figure 1. Research Model

Self-Efficacy

In general, self-efficacy refers to “a belief in one’s capability to organize and execute the courses of action required to produce given attainments” [Bandura 1997, p 3]. According to SCT, self-efficacy depends on the interplay between behavioral and environmental factors operating in a given situation. As such, self-efficacy functions by providing individuals with a set of beliefs regarding their capabilities to exercise control over their actions and the environment. Across a broad range of settings, self-efficacy beliefs predict behaviors such as academic achievement [Pajares 1996], job performance [Stajkovic and Luthans 1998], goal attainment [Wood and Bandura 1989], computer skill acquisition [Compeau and Higgins 1995a; Johnson and Marakas 2000], and, most pertinent to the present effort, the actions individuals pursue [Lent et al. 2002].

To be an accurate predictor, self-efficacy judgments should capture the capabilities necessary to perform the behavior in question [Bandura 1986, 1997]. Marakas et al. [1998] propose that generality, which refers to the level of abstraction to which a self-efficacy belief pertains, can be viewed as ranging from general to task-specific. General efficacy beliefs focus on a broad range of abilities within a particular realm of achievement, whereas task-specific beliefs focus on a particular activity within a specific achievement domain. In order to be predictive of a student's decision to pursue an IS major, self-efficacy beliefs must be tailored to the domain of interest at the appropriate level of generality [Bandura 1986, 1997]. In other words, "the optimal level of generality at which self-efficacy is assessed varies depending on what one seeks to predict" [Bandura 1997, p. 49]. Consequently, *self-efficacy* is defined as a student's judgment of his or her capability to perform effectively as an IS major [Akbulut and Looney, forthcoming].

Outcome Expectations

Self-efficacy is conceptually distinct from outcome expectations. Self-efficacy perceptions are concerned with a judgment concerning the capabilities one currently possesses, whereas outcome expectancies capture the perceived likelihood that favorable consequences will occur after one has acted [Bandura 1997]. In the context of the present study, *outcome expectations* refer to a student's judgment regarding the likelihood that valued rewards will occur as a result of pursuing an IS major [Akbulut and Looney, forthcoming].

Although behaviors must be carried out for rewards to materialize, individuals do consider their future prospects in the form of outcome expectancies before undertaking a particular task [Bandura 1986, 1997]. As such, self-efficacy alone may be insufficient to motivate individuals to engage in a specific behavior. It is unlikely that the individual will possess the impetus to undertake the endeavor unless one expects it to produce favorable results [Bandura 1986, 1997].

Outcome expectations can be categorized into three major forms: social, self-evaluative, and physical [Bandura 1986]. The social dimension includes rewards received from one's social environment such as being perceived as more competent, status enhancement, recognition, and monetary compensation. Self-evaluative outcomes reflect appraisals of the self. Pride, satisfaction, and a sense of accomplishment serve as examples of self-evaluative rewards. The physical dimension involves bodily sensations and affective responses, such as worry, pleasure, pain, sense of security, angst, and discomfort.

The model explicitly includes a direct, positive relationship between self-efficacy and outcome expectations (see Figure 1). Outcome expectations are largely derived from self-efficacy beliefs [Bandura 1986]. Highly efficacious individuals are more likely to develop optimistic outcome expectations. In a broad range of IS settings, self-efficacy has been found to influence the outcomes people expect [Compeau and Higgins 1995a, 1995b; Compeau et al. 1999; Johnson and Marakas 2000; Looney et al. 2006].

Interest

Interest refers to an emotion that arouses attention to, curiosity about, and concern with the IS major [Akbulut and Looney, forthcoming]. The direct path between self-efficacy and interest (see Figure 1) proposes that self-efficacy beliefs figure prominently in the formation of interests [Lent et al. 1994]. People tend to form enduring interests in activities in which they view themselves as capable [Bandura and Schunk 1981]. When self-efficacy is weak, self-doubt produces negative emotions and curtails curiosity. In contrast, individuals who view themselves as able are more likely to develop an interest in the activity. Therefore, the model proposes that students with higher self-efficacy will develop deeper interests in the IS discipline.

Similarly, a direct link from outcome expectations to interest is explicitly included in the model. Even when individuals deem themselves as capable, interest may wane unless individuals expect the undertaking to result in favorable consequences [Lent et al. 1994]. Therefore, interest in a particular activity is partially determined by the perceived likelihood that desirable outcomes will occur. Individuals who expect to be rewarded for their efforts find the activity more compelling [Lent et al. 1994]. In fact, rewards based on individual performance not only signify competence, but also sustain interest [Bandura and Schunk 1981]. Based on these notions, Akbulut and Looney [forthcoming] surmised that students who anticipate that sufficient rewards will be acquired as a result of pursuing the IS major are more likely to develop an interest in the discipline.

Choice Goals

Goal systems play a fundamental role in the regulation of behavior. Goals help guide one's actions, better equip people to organize activities, and help individuals sustain behavior over extended periods of time [Bandura 1986; Wood and Bandura 1989]. Goals operate by providing a set of standards by which individual performance can be evaluated. Setting goals serves two beneficial functions. First, linking performance to explicit standards focuses individuals on the goal to be attained [Bandura 1986; Lent et al. 1994]. Second, when behavior falls short of personal standards, individuals regulate their behavior to achieve a more acceptable level of performance. As a result, setting goals to achieve a future state can serve in a self-motivating capacity.

Specific to academic choices, the majority of theories acknowledge the importance of goals in determining academic- and career-related choices [Lent et al. 1994]. In these contexts, goals are typically operationalized as choice goals, which refer to aspirations to choose a particular occupational or educational path. Choice goals constitute an influential precursor to actual choices [Lent et al. 1994]. Intuitively, people who set goals to engage in a particular activity are more likely to eventually pursue it. Accordingly, the IS Major Choice Goals Model ultimately targets *choice goals*, which is defined as a student's aspirations to choose IS as a major [Akbulut and Looney, forthcoming].

The model posits that self-efficacy and outcome expectations will have direct, positive influences on choice goals. Bandura [1986] points out that "people act on their judgments of what they can do, as well as their beliefs about the likely effects of various actions" [p. 231]. Consequently, choice goals develop, in part, based on self-efficacy beliefs and outcome expectations. An individual's efficacy beliefs have been shown to influence the actions they strive to pursue [Bandura 1997; Lent et al. 2002]. Self-efficacy beliefs drive students toward particular educational activities [Lent et al. 1994]. In essence, when students believe they can successfully accomplish a behavior, the desire to undertake it increases. However, outcome expectations can influence choice goals independently of self-efficacy. If the individual believes that no favorable outcomes can be obtained, it is likely that the activity will be avoided. In contrast, the rewards may be so enticing that people may aspire to engage in a behavior regardless of their perceived capabilities.

In terms of interest, the model proposes a direct, positive relationship between interest and choice goals. Individuals who are intrigued by a particular subject are more likely to seek additional exposure to satisfy their curiosity [Lent et al. 1994]. Furthermore, interest is considered an emotion [Akbulut and Looney forthcoming]. Emotions, such as anxiety, have been found to affect subsequent behavior [Johnson and Marakas 2000]. Positive emotions invoke a stronger desire to engage in a behavior, whereas negative ones reduce ambition [Bandura 1986]. Thus, students who develop robust interests in the IS major should be more likely to set goals to choose it [Akbulut and Looney, forthcoming].

III. HYPOTHESES DEVELOPMENT

Referring to Figure 1, this study extends the IS Major Choice Goals Model by incorporating a fifth factor, teaching effectiveness, which we considered to be an environmental variable. Although the model has focused exclusively on personal factors (self-efficacy, outcome expectations, interest, and choice goals) that affect student choice behaviors, the broader SCCT and SCT frameworks provide guidance as to the potential influences of environmental variables on the personal factors specified in the model.

The extended model proposes that teaching effectiveness directly shapes self-efficacy, outcome expectations, interest, and choice goals. These notions are consistent with SCCT, which postulates that learning experiences interact with personal factors to guide career development

[Lent et al. 1994]. The following subsections develop the hypotheses about the relationships between teaching effectiveness and the factors specified in the original model.

TEACHING EFFECTIVENESS AND SELF-EFFICACY

According to SCT, self-efficacy beliefs are shaped through the forces of enactive mastery, social persuasion, vicarious learning, and psychobiological states [Bandura 1986; 1997]. Enactive mastery, the strongest source of efficacy information refers to previous experience performing a particular task. Successes strengthen one's sense of efficacy, whereas failures lower it [Gist and Mitchell 1992; Silver et al. 1995]. Observing others successfully performing a behavior can result in vicarious learning, which has been shown to elevate one's perceptions about accomplishing the same behavior. By learning from their observations, individuals tend to believe they can perform likewise [Gist 1989; Gist et al. 1989; Johnson and Marakas 2000]. When individuals are convinced of their abilities through social persuasion, self-efficacy can be amplified. The encouragement of others, praise, and coaching serve as examples [Bandura 1977; Compeau and Higgins 1995a]. Psychobiological states, such as fatigue, stress, and anxiety, can trigger individuals to question their capabilities, whereas positive affect and arousal can magnify them [Bandura, 1977].

Lent et al. [2000] suggest that learning experiences, which can include all four sources of efficacy information, have a direct influence on student learning and, in turn, the formation of subsequent self-efficacy beliefs. In terms of enactive mastery, Compeau and Higgins [1995a] suggest that learning increases considerably when students experience immediate and repeated successes. Vicarious learning can be facilitated through observational learning [Yi and Davis 2003] or behavioral modeling [Johnson and Marakas 2000], where students learn by observing the instructor perform the activity. Doing so positively affects post-training self-efficacy. When trainers encourage students to learn (i.e., social persuasion), students develop a feeling that they are capable of acquiring new skills [Compeau and Higgings 1995a; Torkzedah and Van Dyke 2002]. Finally, teachers can promote student learning by generating positive affective states, such as creating classroom environments that are fun and entertaining [Akbulut and Looney, forthcoming].

Given that teaching effectiveness is characterized by student learning, it can be logically deduced that students who learn from effective teachers will exhibit higher levels of self-efficacy. We put forth the following hypothesis to test this assertion:

> H_1 *Teaching effectiveness will have a significant positive influence on self-efficacy.*

Teaching Effectiveness and Outcome Expectations

Environmental variables can affect outcome expectations indirectly through the self-efficacy mechanism, as well as directly [Bandura 1997]. In a manner similar to sources of efficacy building information, Lent et al. [1994] suggest that direct experiences and vicarious learning of academic relevant activities can facilitate changes in outcome expectations. Individuals who directly experience rewards, such as a sense of accomplishment, as a result of performing particular behaviors are more likely to develop more robust outcome expectations. Moreover, individuals who learn vicariously about the favorable consequences that can be derived from the behavior tend to expect that valued rewards are more likely to occur.

Teachers in introductory IS courses can serve as role models to students [George et al. 2005]. Modeled behavior, a form of vicarious learning, that individuals see rewarded tends to be adopted by the observers [Bandura 1997]. Therefore, it is reasonable to conclude that student outcome expectations can be adjusted when teachers model the favorable consequences that can arise from pursuing an IS major. Furthermore, setting student expectations appropriately has been linked to teaching effectiveness [Feldman 1997]. Today's students have many misconceptions about prevailing trends, such as offshoring, and their effects on the IT job market [George et al. 2005]. Teachers can play a pivotal role in breaking down myths and, in turn, elevating student expectations. For instance, students are likely to revise their outcome expectations upward when their teacher assuages fear about the lack of IT jobs. Based on the logic above, we offer the following hypothesis:

> *H_2 Teaching effectiveness will have a significant positive influence on outcome expectations.*

Teaching Effectiveness and Interest

Empirical evidence indicates that a teacher's ability to generate student interest in the subject matter constitutes one of the most important reasons that students learn [Feldman 1997]. As such, it can be logically deduced that effective teachers promote student interest. Berlyne [1978] demonstrates that interest can be influenced via novelty, complexity, conflict, and uncertainty. While Akbulut and Looney [forthcoming] caution about the potential side-effects of introducing conflict and uncertainty in an educational setting, novelty and complexity represent constructive ways to build student interest.

Individuals tend to become more interested when topics are new, as repeated exposure to the same stimuli tends to get weary. Therefore, it is important to keep course content current to impart novelty, sustaining student interest. In the IS discipline, this is especially important due to the rapidly evolving nature of technologies. Moreover, today's students are generally conversant with computing technologies [George et al. 2005]. Intuitively, little learning can take place when students have already mastered the content. Thus, rather than discussing topics that are familiar to students, teachers need to expose students to current and emerging topics, such phishing, blogs, and the like to promote student learning.

Regarding complexity, activities that are too easily mastered or overly difficult can frustrate students and stifle motivation. Unchallenging activities indicate that student learning has already taken place, providing minimal opportunities to advance learning. In contrast, learning can be suppressed when students are exposed to tasks that are beyond their current reach. In essence, an optimal level of learning occurs when teachers challenge, but do not overwhelm students. Based on the logic above, the following hypothesis is put forth:

> *H_3 Teaching effectiveness will have a significant positive influence on interest.*

Teaching Effectiveness and Choice Goals

Environmental variables are believed to affect choice goals directly [Bandura 1986; 1997; Lent et al. 1994; Wood and Bandura 1989]. Factors that support the development of individuals, such as teaching effectiveness, play an important role in promoting certain behaviors. Individuals tend to be more determined to engage in particular courses of action when they are provided with assistive tools and aids to help them execute the behavior [Bandura 1986]. Such is the case with effective teachers, who facilitate student learning. In essence, favorable learning environments increase the opportunities for students to be successful in a specific field of pursuit, which ultimately fosters the development of aspirations to pursue a particular academic path.

Moreover, the process of goal setting can serve in a self-motivating capacity. The motivating capability of goals requires individuals to perform a cognitive comparison. Specifically, individuals compare their performances to the desired future state and regulate their behavior accordingly. As such, goals can create incentives that motivate individuals to match their performances to goals. As Wood and Bandura [1989] point out, "activation of self-processes through internal comparison requires both comparative factors – a personal standard and knowledge of the level of one's own performance" [p. 368]. Teachers who set high performance standards augment student learning. In fact, establishing high standards of performance has been cited as one of the most important factors fostering teaching effectiveness [Feldman 1997]. Students tend to be more motivated to learn when striving to reach a designated goal [Bandura and Schunk 1981]. These motivational effects not only require students to adjust their internal standards upward, but also help students achieve higher levels of performance.

Goals systems also require feedback. Feedback enables individuals to judge how well they are doing in relation to their personal standards. Teaching effectiveness has been empirically linked to the quality and frequency of instructional feedback [Feldman 1997]. In essence, students learn more effectively from teachers who provide timely, detailed, and constructive feedback about student performance. Without high-quality feedback, it is unlikely that students (especially those in introductory courses) will be able to gauge how well they are grasping the subject matter or whether they have achieved a sufficient level of skill to pursue more advanced courses within the discipline. Therefore, the provision of high-quality feedback and the establishment of personal standards are likely to heighten a student's aspirations to pursue the IS major. Thus, the following hypothesis is offered:

> H_4 *Teaching effectiveness will have a significant positive influence on choice goals.*

IV. RESEARCH METHOD

Since the purpose of the study was to empirically test a research model investigating the factors that influence students' choice of IS as their major from a socio-cognitive perspective, the survey method presented an effective approach. The construct operationalization, sample and procedure, and analysis are presented in the following subsections.

CONSTRUCT OPERATIONALIZATION

Special emphasis was placed on the operationalization of the constructs in the research model. A total of five scales were required to measure the constructs. A comprehensive review of the literature was undertaken to identify existing measures. When available, existing scales were utilized directly to take advantage of their proven psychometric qualities [Boudreau et al. 2001]. Four scales (self-efficacy, outcome expectations, interest, and choice goals) were available and applicable in their current forms. The remaining scale (teaching effectiveness) was adapted to reflect the context accordingly.

Each construct was measured using multiple indicators to capture the underlying theoretical dimensions comprehensively. As suggested by Boudreau et al. [2001], all scales were subjected to rigorous pretesting in separate studies. Appendix I describes the instrument development process associated with the core constructs in the IS Major Choice Goals Model, while Appendix II provides a list of all constructs used in this study, as well as the final set of items used to measure each.

Self-Efficacy

A 6-item scale developed by Akbulut and Looney [forthcoming] was utilized to measure self-efficacy. The response format consisted of an 11-place Likert-type scale encapsulating capability beliefs ranging from 0% (*Cannot Do*) to 100% (*Certain Can Do*) certainty. Item responses yielded scores ranging from 0 (0%) to 10 (100%).

Outcome Expectations

An existing 10-item scale [Akbulut and Looney, forthcoming] was used to measure the three forms of outcome expectations: self-evaluative, social, and physical. The response format consisted of an 11-place Likert-type scale capturing the likelihood that a particular outcome would occur. Specifically, likelihoods were captured in percentage terms ranging from 0% (*Will Never Occur*) to 100% (*Will Always Occur*). Responses were coded from 0 (0%) to 10 (100%).

Interest

Interest was measured using a five-item scale developed by Akbulut and Looney [forthcoming]. The response format consisted of a 7-place Likert-type scale ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

Choice Goals

The choice goals measure consisted of four items, taken from Akbulut and Looney [forthcoming]. A 7-place Likert-type scale ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) were utilized.

Teaching Effectiveness

Given the issues surrounding objective measures of student learning [d'Apollonia and Abrami 1997; Marsh and Roche 1997; McKeachie 1997], teaching effectiveness was measured in terms of a student's overall, subjective appraisal of learning. Specifically, using three items adapted from Marsh [1984], respondents were asked to rate the extent to which they learned the material covered in an introductory IS course. The response format consisted of a 7-place Likert-type scale ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

SAMPLE AND PROCEDURE

The sample consisted of students enrolled in an introductory IS course at a large North American university. The course was offered across multiple sections, with each section being taught by one of several faculty members.[1] Although teachers varied across sections, each section covered the same material and used a common textbook (specifically, [Jessup and Valacich 2003]). All teachers delivered the majority of content via traditional lectures. However, the course also included a skills component in which students were provided hands-on experience working with contemporary business applications. Despite these similarities across sections, teachers were free to develop their own assignments, exams, and lecture materials, such as presentation slides and handouts. The content provided students with a general survey of the IS discipline, including an introduction to careers in the field. Specifically, the first chapter in the textbook provided a high-level overview about IS careers. In addition, information about specific types of careers was sprinkled throughout the semester. For example, the chapter discussing database management introduced students to the responsibilities of a database administrator. Thus, students were exposed to IS career issues over the course of several lectures.

The specific university provided fertile grounds for understanding the role of teaching effectiveness in promoting or inhibiting student choice behaviors. First, surveying students who learned from different teachers increased sample variation. Restricting the survey to a single section taught by one person could have biased the results and prevented us from making broader inferences. Second, the opportunity to persuade a prospective student typically disappears after a different major has been chosen. All students were required to take the course in order to pursue business degrees, but the vast majority of students were still in the process of formalizing their major decisions. Students who indicated that they had already chosen a major were removed from the sample. Chi-squared and t-tests revealed no significant differences between discarded and retained respondents in terms of gender, age, class standing, or business school classification.

The study was conducted during a single semester in 2006. At the time, IS graduates were encountering a favorable, expanding IT job market, which had rebounded from four years of stagnant or declining growth [Chabrow 2006]. Respondents participated in a Web-based survey, which included a consent form, background questionnaire, and separate instruments for each of the five measures. The survey software counterbalanced the instruments so that the measures were presented in a random order. Within instruments, the items were also randomized. The survey was conducted during the last week of the course, as the course provided most students with a preliminary introduction to the IS discipline. By the completion of the course, students gained a general understanding of the topics that they would encounter if they decided to major in IS. Respondents volunteered to complete the survey and were provided course credit in return for

[1] Per the request of the university, department, and faculty, the exact numbers of sections and teachers, as well as enrollment data and survey response rates are not disclosed to preserve anonymity.

their participation. In total, 305 usable responses were obtained. Table 1 provides the demographic profile of respondents.

Table 1. Demographic Profile of Respondents

	Number	*Percent*
Usable Responses	305	100.0 %
Class Standing		
Freshman	5	1.6 %
Sophomore	164	53.8 %
Junior	115	37.7 %
Senior	21	6.9 %
Business School Classification		
Business	287	94.1 %
Non-Business	18	5.9 %
Gender		
Male	177	58.0 %
Female	128	42.0 %
	Mean	*Std. Dev.*
Age	21.1	3.8

ANALYSIS

Partial least squares (PLS) was chosen to analyze the research model [Barclay et al. 1995; Wold 1985] since PLS is more suitable than covariance-based techniques when the objective involves theory building [Gefen et al. 2000]. Such is the case in the present study, where the research model had yet to be empirically tested. More specifically, PLS Version 3 was utilized [Chin 1998]. The psychometric properties of the measurement model were confirmed prior to estimating structural model parameters, as discussed in the following subsections.

Measurement Model Analysis

Indicators and constructs were examined in three stages following Barclay et al. [1995]. First, the reliability of each construct was examined to ensure the items collectively measured their intended construct consistently [Gefen et al. 2000]. Internal consistency reliability was examined in two ways: Cronbach's α [Nunnally 1978] and composite reliability [Fornell and Larker 1981]. Table 2 depicts the internal consistency reliability estimates. In all cases, the generally agreed upon lower limit of 0.70 for each type of reliability [Nunnally 1978; Fornell and Larker 1981] was achieved, confirming reliability of the scales.

Table 2. Descriptive Statistics, Reliability, Correlations, and Discriminant Validity

	No.	Avg. Item Scores					Construct[a]				
Construct	Items	*M*	*SD*	∝	CR	AVE	1	2	3	4	5
1. SE[b]	6	6.18	2.23	0.967	0.974	0.862	**0.928**				
2. OE[c]	10	6.29	1.97	0.951	0.958	0.697	0.334	**0.835**			
3. INT[d]	5	3.57	1.52	0.954	0.965	0.847	0.468	0.496	**0.920**		
4. CG[d]	4	2.19	1.48	0.987	0.990	0.962	0.344	0.353	0.644	**0.995**	
5. TE[d]	3	4.81	1.53	0.933	0.958	0.884	0.253	0.368	0.406	0.197	**0.979**

[a]Diagonal elements (in bold) represent the square root of the average variance extracted (AVE). Off-diagonal elements represent the correlations among constructs.
[b]Item scores ranged from 0 (*Cannot Do*) to 10 (*Certain Can Do*).
[c]Item scores ranged from 0 (*Will Never Occur*) to 10 (*Will Always Occur*).
[d]Item scores ranged from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

Note: *M* = mean average item score (unweighted). *SD* = average item score standard deviation. ∝ = Cronbach's alpha. CR = composite reliability. AVE = average variance extracted. SE = self-efficacy. OE = outcome expectations. INT = interest, CG = choice goals, TE = teaching effectiveness.

Convergent validity can be assessed at the individual item and construct levels by examining individual item loadings and the average variance extracted (AVE), respectively [Fornell and Larker 1981]. Individual item loadings, which represent squared multiple correlations, of 0.707 or greater [Gefen et al. 2000] imply that the indicator shares more variance with its construct than error variance, whereas AVE of 0.50 or greater [Fornell and Larker 1981] demonstrates the construct as a whole shares more variance with its indicators compared to error variance. As shown in Appendix II, all individual items converged adequately on their intended constructs. Moreover, collectively, the items demonstrated acceptable convergent validity, as AVE surpassed the recommended threshold for each construct (see Table 2).

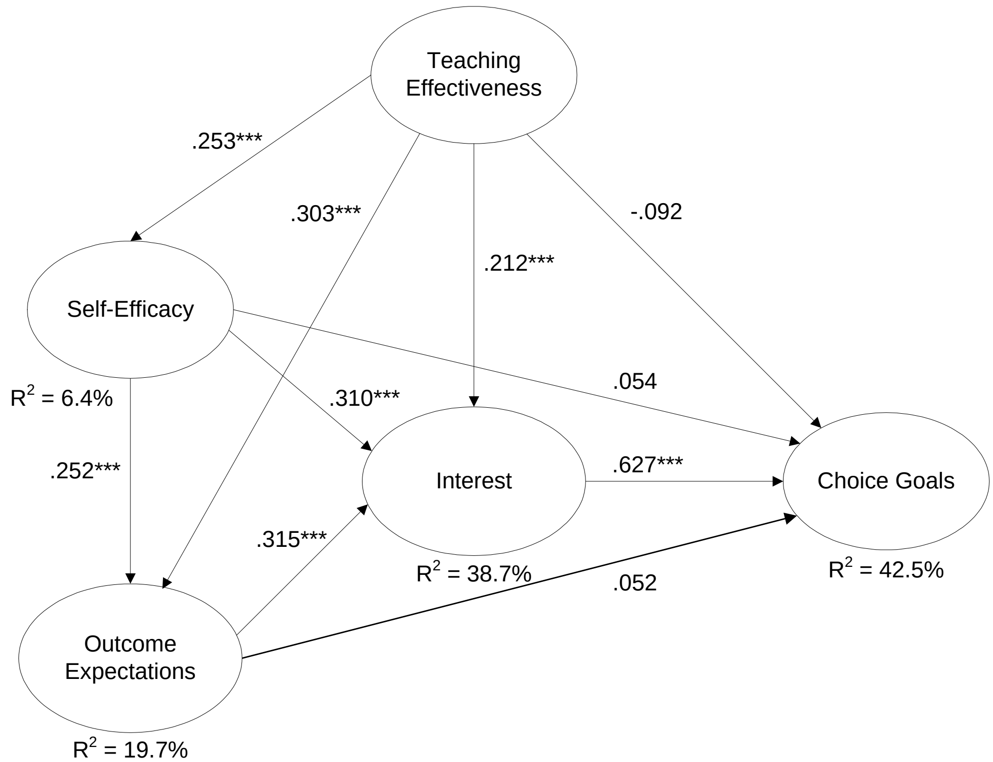
Finally, discriminant validity was assessed by comparing the AVE associated with each construct to the correlations among constructs [Barclay et al. 1995]. The calculations emerging from the discriminant validity analysis are provided in Table 2. Diagonal elements represent the square root of the AVE, whereas the off-diagonal elements represent the correlations among constructs. In order to claim discriminant validity, diagonal elements should be larger than any other corresponding row or column entry. For each construct, the estimates show that the AVE exceeded the correlations between constructs; therefore, the discriminant validity of each construct was established.

Given the strong reliability and validity estimates, the psychometric properties of measures were deemed acceptable.

Structural Model Analysis

Statistical significance at the 0.05 level was determined using two-tailed tests based on the bootstrap resampling method with 500 samples. The results of the structural model analysis are depicted in Figure 2.

Hypotheses H_1 proposed that teaching effectiveness would have a significant positive influence on self-efficacy. As expected, teaching effectiveness was a significant predictor of self-efficacy (0.253, $p < .001$), supporting hypotheses H_1. Hypothesis H_2 suggested a significant positive relationship between teaching effectiveness and outcome expectations. This hypothesis was supported (0.303, $p < .001$). Similarly, support for H_3 was received. The influence of teaching effectiveness on interest was significant and positive (0.212, $p < .001$). Hypothesis H_4 anticipated that teaching effectiveness would have a significant positive influence on choice goals. Despite our expectations, teaching effectiveness was not a significant predictor of choice goals (-0.092, *ns*). Thus, H_4 was not supported. A summary of the hypotheses, results, and conclusions are presented in Table 3.



Note. * *p* < .05; ** *p* < .01; *** *p* < .001

Figure 2. Structural Model Results

Table 3. Summary of Hypotheses Testing

Hypothesis		Coefficient	t-statistic		Conclusion
H_1	Teaching effectiveness will have a significant positive influence on self-efficacy.	0.253	3.720	***	Supported
H_2	Teaching effectiveness will have a significant positive influence on outcome expectations.	0.303	4.355	***	Supported
H_3	Teaching effectiveness will have a significant positive influence on interest.	0.212	3.509	***	Supported
H_4	Teaching effectiveness will have a significant positive influence on choice goals.	-0.092	1.786		Not Supported

Note. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (2-tailed).

Examining the relationships proposed in the IS Major Choice Goals Model, a positive effect of self-efficacy on outcome expectations was predicted. As anticipated, self-efficacy was a significant predictor of outcome expectations (.252, *p* < .001). In addition, the model proposed that both self-efficacy and outcome expectations would have a direct influence on interest. Self-efficacy (0.310, $p < 0.001$) and outcome expectations (0.315, $p < 0.001$) were significant predictors of interest, as expected. Finally, the model proposed that choice goals would be directly impacted by self-efficacy, outcome expectations, and interest. Contrary to expectations, neither self-efficacy (0.054, *ns*) nor outcome expectations (0.052, *ns*) served as significant predictors. However, interest was a significant positive predictor of choice goals (0.627, $p < 0.001$).

In terms of the model's explanatory power, teaching effectiveness accounted for 6.4 percent of the variance in self-efficacy. Self-efficacy and teaching effectiveness together explained 19.7 percent of the variance in outcome expectations. Combined, self-efficacy, outcome expectations, and teaching effectiveness accounted for 38.7 percent of the variance in interest. Finally, self-efficacy, outcome expectations, interest, and teaching effectiveness accounted for a sizable portion of the variance in choice goals (42.5 percent).

V. DISCUSSION

The two purposes of this research were: 1) to determine whether assigning effective teachers to introductory IS courses improves student recruitment; and 2) to build and test a model to explain how and why teaching effectiveness influences a student's choice to select IS as a major. Based on the results, we can confidently conclude that placing effective teachers in introductory IS courses affects students' desires to pursue the IS major. Thus, this study provides empirical evidence that supports a broadly advocated intervention strategy [George et al. 2005; Akbulut and Looney, forthcoming].

Not only do the findings endorse the merits of the approach, but also illuminate the underlying mechanisms through which teaching effectiveness persuades students to major in IS. Specifically, teaching effectiveness exhibits a direct, positive influence on self-efficacy, outcome expectations, and interest. Students who learn from effective teachers have a greater tendency to believe they are capable of succeeding as an IS major (i.e., self-efficacy). In addition, these students hold more robust expectations that valued rewards will occur as a result of pursuing an IS major (i.e., outcome expectations). Similarly, their curiosity about, concern with, and attention to the IS major (i.e., interest) increases significantly. Despite our expectations, however, the findings indicate that teaching effectiveness does not directly influence choice goals. Rather, students' aspirations to choose IS as a major are shaped indirectly through the core variables constituting the IS Major Choice Goals Model.

Specific to the IS Major Choice Goals Model, Akbulut and Looney [forthcoming] were the first to develop and empirically test the model. To date, however, research had been restricted to the relationships among the personal factors constituting the model (i.e., self-efficacy, outcome expectations, interest, and choice goals). This study extended previous work by including an environmental variable (i.e., teaching effectiveness) and empirically linking it to the existing model. Examining the relationships among the personal variables, the data replicate Akbulut and Looney [forthcoming], as an identical pattern of results emerged. Consistent with previous findings, choice goals develop as a byproduct of strong interests. Contrary to the model's predictions, choice goals do not appear to be directly influenced by either self-efficacy or outcome expectations. Apparently, aspirations to major in IS do not develop simply because students deem themselves as qualified or solely based on beliefs that prized outcomes are likely to occur. Rather, self-efficacy and outcome expectations bolster interest, which, in turn, helps aspirations surface.

Beyond interest and choice goals, stronger outcome expectations develop based on a combination of self-efficacy beliefs and teaching effectiveness. Students who deem themselves capable of succeeding as an IS major are more likely to develop expectations that valued rewards will occur. Outcome expectations are further amplified by teaching effectiveness, which strengths outcome expectations directly and indirectly through self-efficacy.

Despite the replication of prior results, some cautions are warranted. Although the current and forthcoming [Akbulut and Looney, forthcoming] studies were conducted one year apart and surveyed different students, the data were collected in the same course at the same university. As such, the identical pattern of results could be attributed to the specific context in which the surveys were administered. To more fully understand how the findings might generalize, additional data need to be collected in other academic settings.

In total, the model accounts for more than 40 percent of the variance in choice goals, establishing the power of the model to explain how and why students develop aspirations to pursue a degree in the IS field. Nonetheless, the study stopped short of capturing actual decisions to major in IS. The choice goals construct reflects a student's aspiration to choose IS as a major. While there is ample evidence to believe that choice goals will be highly correlated with actual choices [Lent et al. 1994; Lent et al. 2000; Lent et al. 2002], we cannot conclusively test the relationship given the data available at this juncture. As a reminder, the survey took place in an introductory IS course where most students had yet to formally declare a major. To appropriately address the research question, we needed to sample students who were in the formative stages of decision making. The actual decisions that these students will eventually make would need to be captured beyond the scope of the introductory IS course. Although we are in the process of collecting these data, at this stage we cannot be completely certain how the variables will affect student behavior. Nonetheless, the research model and existing data provide compelling evidence that teaching effectiveness will influence actual decisions to major in IS.

In terms of teaching effectiveness, the data confirm the fundamental role it can play in attracting additional students to the IS discipline. Nonetheless, teaching effectiveness was measured as students' overall evaluation of the extent to which they learned. Teaching involves a complex, multi-faceted set of processes and outcomes [d'Apollonia and Abrami 1997; Feldman 1997; Marsh and Roche 1997; McKeachie 1997]. Our operationalization of teaching effectiveness did not account for the richness inherent to the multidimensional nature of teaching. Although our operationalization is entirely consistent with the literature, Feldman [1997] points out that "the exact psychological and social psychological mechanisms by which these instructional characteristics influence student learning need to be more fully and systematically detailed than they have been" [p. 375]. Specific instructional characteristics (e.g., grading leniency, subject-matter expertise, etc.) might emerge as having a larger influence, especially given the unique nature of the IS curriculum [George et al. 2005; Gorgone et al. 2003]. Additional research is necessary to document whether certain dimensions of teaching affect IS students in unique ways. Understanding these subtleties might enable teachers to target their efforts on a subset of dimensions that possess the greatest impact on student learning.

IMPLICATIONS FOR THEORY

This study leveraged and extended the IS Major Choice Goals Model to understand the manner in which teaching effectiveness influences student aspirations to choose IS as their primary field of study. As a result, we gained a theoretical understanding of the role teaching effectiveness can play in the student recruitment process. By testing the hypothesized relationships among variables, we not only confirmed the efficacy of assigning effective teachers to introductory IS courses, but also explained how and why teaching effectiveness influences student aspirations to major in IS. To our knowledge, this study is the first to provide a theoretically-driven model that explains the underlying mechanisms through which a particular intervention strategy persuades students to major in IS. Nonetheless, the constructs in the research model represent a relatively limited subset of the factors that could plausibly affect student choices. In order to develop a more comprehensive set of intervention strategies targeted at student recruitment, a wider range of factors needs to be considered and validated. For instance, it is likely that certain barriers, such as a lack of role models and concerns about the impact of offshoring [George et al. 2005], prevent more students from majoring in IS. The research model can be readily adapted to study these and other barriers that might be impairing student enrollments.

In addition, according to SCT, personal factors (e.g., self-efficacy, outcome expectations) can fluctuate based on prevailing environmental circumstances [Bandura 1986; 1997]. For instance, the outcomes that today's students expect are likely to differ radically from the students of late 1990s. It is certainly plausible that the dot com era attracted students to IS because of a highly favorable environment that offered a myriad of potential rewards [Ives et al. 2002]. In contrast, current student populations may be more attuned to negative forces, such as offshoring [George et al. 2005]. Thus, students may believe that rewards (e.g., job opportunities) are more limited compared to the past. Therefore, we do not recommend discarding the non-supported relationships solely on the results herein. Rather, we anticipate that specific conditions under which self-efficacy and outcome expectations affect choice goals directly will emerge.

In terms of pedagogical techniques, students in many introductory IS courses learn using a combination of human- and computerized-based methods of instruction. Supplementing human-led instruction, the use of computer-based learning (CBL) technologies (e.g., Prentice-Hall's TAIT, McGraw-Hill's SIMNET) is rapidly growing [Kegely 2006]. CBL systems deliver application software training (e.g., Microsoft Office) via an interactive, computer-mediated teaching environment. Although reports indicate that CBL systems produce many desirable learning outcomes [Kegely 2006; Limkilde and Irvine 2006], the underlying mechanisms producing these effects are not well understood. Moreover, we currently do not know whether differences between CBL- and human-led modes of instruction affect students in unique ways. Evidence indicates that, like humans, technologies can influence self-efficacy beliefs [Looney et al. 2006]. For example, vicarious experiences (a source of efficacy information) can be delivered by either a human teacher or computerized agent that demonstrates concepts. Therefore, we expect that CBL systems can mold self-efficacy beliefs. This suggests that CBL systems might have an impact on student recruitment efforts. On one hand, students who view CBL systems as a positive learning experience might develop aspirations to choose IS as a major. On the other hand, when CBL systems fail to help students learn, they might avoid the IS major. At this stage, however, we can only speculate. Despite the widespread use of CBL systems in the classroom, research in the area of technology-mediated learning continues to be scarce. Thus, we reiterate Alavi and Leidner [2001] call to carry out research in this important area.

Over the past several years, many studies have leveraged SCT to understand IS phenomena, such as computer skill acquisition [Agarwal et al. 2000; Compeau and Higgins 1995a; Johnson and Marakas 2000] and technology use [Compeau and Higgins 1995b; Taylor and Todd 1995; Venkatesh and Davis 1996]. Until now, no IS research based on the SCT framework has included the interest construct [Marakas et al. 1998], much less theorized about the direct effects of personal and environmental factors on interest formation. Interest appears to constitute an important, yet overlooked explanatory variable. The findings indicate that interest mediates the effects of self-efficacy, outcome expectations, and teaching effectiveness on downstream variables. Thus, it is highly plausible that interest will play a pivotal role in broader IS settings, such as computer skill acquisition and technology use. Research shows that interest can be influenced by various factors, such as novelty and complexity [Berlyne 1978]. Deploying innovative technologies and/or technologies that provide an optimal level of challenge could potentially cultivate and sustain user interest, leading to enhanced learning and increased use of such systems. Additional research is clearly needed to identify and study the role that interest plays in broader IS phenomena.

IMPLICATIONS FOR PRACTICE

Clearly, the results indicate that assigning effective teachers to introductory IS courses can and does influence a student's desire to pursue the IS major. Effective teachers not only build student confidence in their abilities to perform effectively as an IS major, but also raise student expectations that valued rewards will be received by majoring in IS. Effective teachers also pique student curiosity. Although teaching effectiveness does not affect choice goals directly, its indirect influence fosters a student's aspirations to major in IS. Despite evidence indicating that choice goals determine actual choices [Lent et al. 1994; Lent et al. 2000; Lent et al. 2002], the current data do not conclusively prove that assigning effective teachers will improve enrollments.

Nonetheless, the results are encouraging. There is no reason to expect the relationship between choice goals and actual choices will fail to emerge in the context of IS major choices. At a minimum, by assigning effective teachers to introductory IS courses, IS program administrators can bolster students' confidence in their ability to successfully perform as IS majors, raise students' expectations that valued rewards will be received by majoring in IS, and help students develop an interest in the IS field. In turn, IS programs are likely to attract additional students by instilling a desire to major in IS.

Even though the findings show that teaching effectiveness influences student aspirations to major in IS, there are ethical issues to consider. It should be noted that self-efficacy judgments reflect a subjective appraisal of one's ability rather than an objective measure of actual competence. Self-efficacy beliefs can be manipulated without corresponding proficiency increases, resulting in overestimations of one's ability to perform [Looney et al. 2006]. In particular to the classroom setting, when sources of efficacy information (e.g., enactive mastery) do not reflect the material that students will eventually encounter while pursuing an IS major, they might form inaccurate efficacy beliefs. Coursework that can be easily mastered is likely to bolster self-efficacy beliefs, kicking off a chain of psychological events that could ultimately culminate in pursuing the IS major. While this situation might benefit IS program enrollments, students could be lulled into a false sense of confidence; their level of competence may be insufficient to handle the rigors of the IS major. Therefore, it is important that educational efforts are designed to develop student competence *and* confidence. Coursework should be realistic, reflecting material that students will actually encounter in their academic and professional careers.

LIMITATIONS

Like any research undertaking, this study is limited in certain respects. The cross-sectional nature of our survey limits our ability to draw causal inferences. While such a design is useful for identifying the relationships among constructs, it does not provide conclusive evidence for temporal precedence. According to SCT, the person-behavior-environment relationships are reciprocally determined as time progresses. Although the findings support the predicted directionality, these relationships are likely to evolve cyclically over time [Bandura 1997]. Similarly, common response bias cannot be ruled out entirely given the exclusive use of self-reported data. Although all the measures exhibited sufficient levels of reliability and validity, the possibility that bias inflated the relationships among the constructs exists. Therefore, complimentary methods, such as experimental designs and longitudinal studies, are necessary to expand our current understanding of the interplay among the constructs affecting student choice behaviors.

Due to the confidential nature of teaching evaluation data, we were unable to collect data that tied particular respondents to specific teachers. Because the data precluded comparisons across teachers, we were unable to determine how specific teachers affect student perceptions. For instance, we could not assess the relative proportion of students who develop aspirations to major in IS when they are taught by effective versus ineffective teachers. Nonetheless, the results show positive relationships among teaching effectiveness, self-efficacy, outcome expectations, and interest. Since these factors directly or indirectly shape choice goals, it is reasonable to conclude that more students will develop aspirations to major in IS when they are taught by effective teachers.

Finally, the survey was designed to test the relationships among the variables in the research model. Although the majority of the expected linkages were supported by the data, it must be acknowledged that the sample could limit the generalizability of our findings. Despite the use of actual students in a real academic setting, these individuals represent a limited set of the entire student populace. Moreover, the data were collected at a single university located in a single country, meaning that we were unable to control for pedagogical differences across academic institutions. It is highly probable that introductory IS courses at other universities are not structured in the same fashion [George et al. 2005; Gorgone et al. 2003]. For instance, some institutions emphasize enterprise resource planning systems in the introductory course whereas others expose students to broader IS concepts, such as the philosophy of Thomas Friedman [see Friedman 2005]. These instructional differences might affect student learning in unique ways. In turn, perceptions of teaching effectiveness may vary markedly across institutions. Given the diversity of student populations, curricula, and cultures, caution should be taken when generalizing the results to other academic settings. Consequently, it must be left to future research to test the model in different contexts to identify the boundary conditions of the findings.

VI. CONCLUSION

The IS discipline has been witnessing a sharp decline in student enrollments. There are many intervention strategies that can potentially be used to attract students to IS. Among them, assigning effective teachers to introductory IS courses has been broadly advocated. In this study, we empirically investigated whether teaching effectiveness has any impact on student uptake. The results suggest that teaching effectiveness influences students' aspirations to pursue IS degrees. Students who learn from effective teachers acquire greater confidence in their abilities to pursue an IS major, expect that favorable consequences are more likely to occur, and develop enduring interests in the IS field. Stronger interest, in turn, inspires students to pursue an IS degree. Although the findings are encouraging, many interesting opportunities to improve student recruitment efforts remain.

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APPENDIX I. INSTRUMENT DEVELOPMENT PROCESS

Measuring the constructs in the IS Major Choice Goals Model required four scales: self-efficacy, outcome expectations, interest, and choice goals. Scales must pass several checks to be considered reliable and valid measures of the constructs they intend to capture [Boudreau et al. 2001; Chin et al. 1997; Fornell and Larker 1981; Nunnally 1978]. Therefore, a multiphase approach was adopted to develop the instruments, with assorted validity and reliability checks conducted during each phase.

To create an initial set of items that captured the underlying constructs, the first phase involved generating preliminary item pools for each construct. Next, an exploratory analysis phase was commenced, where data were collected and analyzed to establish which items faithfully represented their intended constructs. As a result, the preliminary set of items was filtered by retaining only those items that loaded adequately and did not cross-load on more than one factor. The remaining items were culled via a subsequent round of data collection and analysis, which provided evidence of convergent and discriminant validity, as well as reliability. The following subsections describe each phase of the instrument development process.

ITEM GENERATION PHASE

The item generation phase served to facility the face and content validity of the items. Although increasing the number of items tends to enhance content validity (more items capture the content domain more comprehensively), responding to a large set of items can fatigue respondents [Netemeyer et al. 2003]. Therefore, a reasonable compromise between content validity and practicality must be reached. Consequently, we sought to create a set of three to ten items to measure each construct. Nonetheless, it is likely that some newly generated items will fail to capture their intended construct, meaning that it is desirable to generate as many preliminary items as possible and subsequently eliminate unrepresentative items through empirical testing.

Based on existing scales [Compeau and Higgins 1995a, 1995b; Compeau et al. 1999; Johnson and Marakas 2000; Lent et al. 2000; Lent et al. 2002; Looney et al. 2006], preliminary items reflecting each of the four constructs were created. The literature [Bandura 1997; Marakas et al. 1998] suggests that the response format for self-efficacy scales needs to incorporate both magnitude and strength judgments. Magnitude represents a belief whether a specific task is attainable, whereas strength pertains to one's level of confidence to complete the task successfully. Consistent with Looney et al. [2006], magnitude was captured via a 0% (*Cannot Do*) response. Strength ratings were acquired through a scale ranging from 10% (*Very Uncertain*) and 100% (*Certain Can Do*). Consequently, an 11-place scale, coded from 0 (0%) to 10 (100%), emerged. Following Looney et al. [2006], the response format for the outcome expectations scale ranged from 0% (*Will Never Occur*) to 100% (*Will Always Occur*), resulting in an 11-place scale, coded from 0 (0%) to 10 (100%). Following Lent et al. [2000] and Lent et al. [2002], Likert-type scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) were utilized for the interest and choice goals scales.

For each scale, a questionnaire was created. To ensure the generated items comprehensively covered the domain of the intended constructs, brainstorming sessions were conducted with two academicians with expertise in the area of Social Cognitive Theory (SCT). The questionnaires and operational definitions of the constructs were provided to interviewees. Interviewees were asked to review the preliminary items and offer suggestions for modifications, additions, and deletions. As a result, an initial set of items emerged. Preliminary pools of 13, 21, 10, and 8 items were generated for the self-efficacy, outcome expectations, interest, and choice goals, respectively.

EXPLORATORY ANALYSIS PHASE

After the initial item pools were developed, the scales were subjected to empirical testing through an exploratory analysis phase. In a semester preceding the current and forthcoming [Akbulut and Looney, forthcoming] studies, students enrolled in an introductory IS course at the same university were asked to complete the preliminary instruments. Using the same procedure outlined in the main study, 149 usable responses were obtained.

Consistent with recommendations for exploratory factor analysis [Conway and Huffcutt 2003], factors were extracted using principal components analysis. To determine the most viable solution, the Kaiser-Guttman rule (eigenvalues greater than one) and scree test were used in tandem. Because the factors were assumed to be correlated rather than orthogonal, direct oblimin rotation was utilized [Conway and Huffcutt 2003]. The results yielded a six-factor solution. To be deemed acceptable, items should load at 0.60 or higher on one factor and no greater than 0.40 on any other factor [Chin et al. 1997]. Unacceptable items were not considered further. After reviewing item phraseology, the remaining items appeared to be loading logically on a particular factor. Given that we expected four rather than six factors to emerge, the items associated with the fifth and sixth factors were carefully scrutinized. It was apparent that these items were not sufficiently representative from a face validity standpoint. For instance, two of the items seemed to capture anxiety rather than one of the four anticipated constructs. As a result, we dropped the items that loaded on the fifth and sixth factors. In total, 7, 12, 5, and 4 items were retained for the self-efficacy, outcome expectations, interest, and choice goals scales, respectively.

To replicate the factor structure of the retained items, additional data were collected and subjected to exploratory analysis. Using the same procedure outlined above, 156 usable responses were collected from respondents, who had not participated in the first survey. Although the results produced a four-factor solution as anticipated, three items (one self-efficacy and two outcome expectation) failed to load at adequate levels. These items were eliminated and the analysis repeated. Consequently, each item loaded adequately at the established thresholds. These loadings exceeded the requirements to demonstrate convergent and discriminant validity in exploratory factor analysis [Chin et al. 1997]. Given the evidence supporting validity, internal consistency reliability (Cronbach's α) was calculated for each scale. The recommended 0.70 threshold [Nunnally, 1978] was surpassed in each case. Given the strong evidence of validity and reliability, the psychometric properties of the measures were considered sufficient. Consequently, the instruments were deemed worthy of deployment. Appendix II provides a final list of the constructs and their associated items.

APPENDIX II. CONSTRUCTS, ITEMS, LOADINGS, AND CROSS-LOADINGS

This appendix provides a list of all constructs used in the study, as well as the final set of items used to measure each. The items used to measure the constructs associated with the IS Major Choice Goals Model were determined through a rigorous instrument development process, which is described in Appendix I. Loadings and cross-loadings were calculated using Partial Least Squares, as described in the Analysis section of the manuscript.

		Loadings and Cross-Loadings[a]				
Construct	Item	1	2	3	4	5
Self-Efficacy	I can perform well as an IS major.	**0.934**	0.293	0.429	0.316	0.213
	I can master even the hardest material in courses associated with an IS major.	**0.920**	0.291	0.414	0.295	0.222
	I can perform effectively on the various activities involved in an IS major.	**0.951**	0.306	0.432	0.307	0.234
	Compared to other people, I can do most activities in courses associated with an IS major well.	**0.899**	0.318	0.438	0.325	0.249
	I can overcome the various obstacles facing people in an IS major.	**0.936**	0.328	0.456	0.351	0.237
	I can successfully utilize the tools and techniques needed in an IS major.	**0.929**	0.319	0.433	0.318	0.249
Outcome Expectations[b]	If I pursue a major in the field of Information Systems, …					
	…I will not have to worry about finding a job when I graduate. (PHY)	0.239	**0.740**	0.311	0.237	0.230
	…I will feel more powerful. (PHY)	0.300	**0.826**	0.431	0.363	0.286
	…I will increase my chances of having job security when I graduate. (PHY)	0.269	**0.868**	0.387	0.253	0.330
	…I will increase my sense of accomplishment. (SEV)	0.304	**0.874**	0.440	0.360	0.353
	…my major will be personally rewarding. (SEV)	0.310	**0.831**	0.534	0.435	0.284
	…I will be proud of myself. (SEV)	0.299	**0.851**	0.424	0.303	0.360
	…other people will perceive me as competent. (SOC)	0.299	**0.806**	0.359	0.211	0.275
	…I will be a stronger candidate in the job market. (SOC)	0.227	**0.877**	0.398	0.245	0.325
	…I will be able to get a good paying job when I graduate. (SOC)	0.233	**0.823**	0.373	0.218	0.338
	…I will be able to interview for good jobs. (SOC)	0.286	**0.845**	0.422	0.245	0.277
Interest	I think an IS major is interesting.	0.429	0.439	**0.929**	0.607	0.357
	I am interested in the kind of courses involved in an IS major.	0.471	0.448	**0.940**	0.645	0.369
	I am interested in the challenges that IS majors face.	0.425	0.457	**0.935**	0.625	0.388
	I am interested by the type of work that people in IS majors do.	0.443	0.459	**0.948**	0.615	0.382
	IS majors tackle interesting problems.	0.381	0.486	**0.845**	0.453	0.374
Choice Goals	My academic goal is to select IS as my major.	0.329	0.328	0.608	**0.978**	0.168
	I have aspirations to choose IS as my major.	0.339	0.362	0.645	**0.981**	0.211
	Choosing to major in IS is a goal of mine.	0.334	0.345	0.617	**0.979**	0.183
	I want to choose IS as my major.	0.348	0.351	0.656	**0.986**	0.211
Teaching Effectiveness	I learned something considered to be valuable.	0.220	0.354	0.394	0.217	**0.921**
	I learned and understood the subject matter.	0.248	0.351	0.384	0.175	**0.959**
	I learned a great deal in this course.	0.245	0.331	0.364	0.163	**0.939**

[a]Entries in bold denote the factor on which the item was intended to load. All loadings in bold are significant at the 0.01 level (2-tailed tests). In order to claim convergent validity at the item level, items should load on their intended constructs at 0.707 or greater. In addition, items should load higher on their intended construct than any other construct [Gefen et al. 2000].
[b]Physical (PHY), self-evaluative (SEV), and social (SOC) forms depicted in parentheses.

ABOUT THE AUTHORS

Clayton Arlen Looney is an assistant professor and the Ron and Judy Paige Faculty Fellow in the School of Business Administration at the University of Montana. He earned his Ph.D. in Information Systems from Washington State University. His areas of expertise involve electronic commerce, human-computer interaction, and decision support systems. Being the recipient of numerous teaching awards, much of his recent work has focused on understanding the effects of various teaching practices on student learning and decision making. His work has appeared in *Decision Sciences, Communications of the ACM, Journal of Computer Information Systems, Group Dynamics: Theory, Research, and Practice,* as well as various international conferences.

Asli Yagmur Akbulut is an assistant professor of Management Information Systems at the Seidman College of Business at Grand Valley State University. She is the recipient of the 2007 university-wide Pew Teaching Excellence award. Dr. Akbulut earned her Ph.D. and M.S. degrees in Information Systems and Decision Sciences from Louisiana State University. She also holds an M.B.A. degree. Her research interests include the application of Social Cognitive Theory in IS, human-computer interaction, IT in education, information sharing, and enterprise systems. Her work has appeared or is forthcoming in *Communications of the ACM, Journal of Computer Information Systems, International Journal of Production Economics, International Journal of Automotive Technology and Management, International Journal of Services and Operations Management, Journal of International Technology and Information Management, Journal of Information Technology Cases and Applications,* and various international conferences.