

# Is the Online Generation Ready for Online Learning? A Study of Online Technologies Self-Efficacy Perceptions as Predictors of Academic Success in Virtual Education Programs

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## ¿Está lista la generación en línea para el aprendizaje en línea? Un estudio de percepciones de auto-eficacia sobre las tecnologías on line como predictores del éxito académico en programas de formación virtual

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### Abstract

Students' perceptions regarding their online self-efficacy skills were investigated in order to determine whether self-efficacy serves as an indicator of success in virtual environments. Student self-efficacy was measured using the Online Technologies Self-efficacy Scale (OTSES). The survey was administered to students from a large urban school district, simultaneously enrolled in a magnet high school and online courses with Florida Virtual School (FVS). Findings from the study revealed that the statistical majority of students felt very confident with their online technologies skills regardless of their standing in the FVS, that is, failed or passed and, course drop versus course completion. However, half of the respondents claimed that online courses are more difficult than traditional face to face classes.

**Keywords:** Self-efficacy, virtual learning, online courses, education technologies, academic success.

### Resumen

Se han investigado las percepciones de los estudiantes en cuanto a sus habilidades con respecto a la auto-eficacia para determinar si la auto-eficacia es válida como indicador del éxito en entornos virtuales. Se midió la auto-eficacia de los estudiantes utilizando la escala de auto-eficacia de las tecnologías en línea (OTSES). La encuesta fue administrada a los estudiantes de un gran distrito escolar urbano, que simultáneamente se matricularon en una escuela de secundaria comprensiva y en cursos en línea en la Escuela Virtual de Florida (FVS). Las conclusiones del estudio revelan que la mayoría estadística de los estudiantes se sintió muy confiada con sus conocimientos sobre tecnologías en línea independientemente de sus resultados en la FVS, es decir, suspenso o aprobado, abandono del curso frente a curso

finalizado. A pesar de ello, la mitad de los encuestados afirmó que los cursos en línea son más difíciles que las clases presenciales tradicionales.

**Palabras clave:** autoeficacia, aprendizaje virtual, cursos en línea, tecnologías de la educación, resultados académicos.

Current figures from the US Census Bureau and the Office for National Statistics from the United Kingdom revealed the largest proportion of Internet users was in the 16 to 24 age group, at 98.8 percent (U.S. Census Bureau). Considering that the estimated amount of population who have access to the Internet in North America is 272,066,000 (U.S. Census Bureau), the amount of young adults using the Internet is impressive. Anderson (2008) stated that “Technological advances allow(s) learning institutions of all types, from major universities to alternative elementary and secondary schools, to reach students in areas that would once have been considered unreachable” (para. 2). Various reports, including Allen & Seaman, 2005; NCES, 2005; and *Keeping the Pace with K12 Online Learning: An Annual Review of Policy and Practice* (2010), continue to predict that millions of learners are deciding to access distance education, thereby increasing the number of online learners. However, Barbour (2007) argues that not enough instructional technologists are conducting research on virtual schools. Although he cites respected members of the field, such as Clark, Zucker and Kozma, Blomeyer, and some researchers from postsecondary institutions of higher learning, Barbour considers that instructional technologists can contribute specialized knowledge and training lacking in current research. Barbour states that virtual high school programs are being developed by academically content-rich K12 educators who do not possess experience with instructional technology. “The knowledge of the design process possessed by instructional technologists would be quite useful in the development of everything from individual learning objects to entire courses,” (p. 11), as well as the experience to identify and analyze reasons for retention. Furthermore, Barbour identifies the lack of theories integrated into current virtual school research, such as transactional distance from adult education, cognitive development from educational psychology, and social presence from the field of communication. Continued technological advancements are strong contributing factors towards the steady increase in distance education programs; however, Anderson further stated that the increases highlight the “need for support services for the online student, including advising” (para. 2). Distance education and online programs allow students to access their education via Internet and Web based resources. Are we assuming that because the 18-29 year old population are users of the Internet they would be better prepared to be an online student? In other words, is their familiarity with computer technology, self-efficacy, a predictor of online academic success? Hence, the purpose of this study was to investigate students’ perceptions of self-efficacy in instructional technology and online communication skills as related to academic success among students who enrolled in online high school courses for the purpose of course recovery and/or academic acceleration.

Researchers concur on self-efficacy beliefs as a significant indicator of students’ academic performance in traditional educational environments (Bandura, 1997;

Zimmerman & Schunk, 2003; Peterson & Arnn, 2005; Hodges, 2008). However, “the bulk of research done on academic self-efficacy was conducted between the late 1970s and early 1990s, prior to the birth of Internet based online learning” (Hodges, 2008, p. 8). The surge in student enrollment in online distance education programs merits the investigation of students’ perceptions of self-efficacy in virtual learning environments. Hence, the overarching goal of this study was to investigate perceptions of student self-efficacy as a mediating factor in the academic success of online students.

Although research studies conducted by DeTure (2004), Wang & Newlin (2002) and Lee & Witta (2001) provided conflicting results regarding the relationship between self-efficacy for course content and performance in online courses, each study yielded a common thread regarding the students’ self-selecting participation in the online course. DeTure’s sample consisted exclusively of students who had self-selected participation in online courses. Hodges (2008) hypothesizes:

*“If the students chose to enroll in an online class, perhaps their self-efficacy toward technology was at a high level. Evidence of this ceiling effect [survey items that are considered easy to respond to; therefore, many surveyed obtain the maximum score] can be observed as DeTure reports that the statistical mode for the measure of online technology self-efficacy was also the maximum score for this measure, and the standard deviation was relatively small. Hence, the self-efficacy for online technologies data collected from this sample may not have been variable enough to be useful in the regression analysis”* (p. 13).

Lee & Witta’s (2001) study does not specify whether or not the students had self-selected enrollment in the online course and the sample size was limited to only 16 students. Wang & Newlin’s (2002) study was based entirely on students who self-selected; subsequently, the concern is that students may have high self-efficacy beliefs regarding course outcome if they self-selected in the first place.

DeTure (2004) agrees that “research is needed to provide an understanding of what kinds of learners succeed more readily in particular distance education technologies, and why” (p. 22). Diaz (2000) concurs with DeTure and emphasizes the advantages of identifying students’ learning characteristics as revealing a correlation among successful experiences in distance education. By identifying a “specific self-efficacy measure that matches well the desired task performance criteria is a better predictor of performance outcomes than a more general self-efficacy measure” (DeTure, 2004, p. 24).

Hodges (2008) recommends further research in the areas of designing “online learning experiences and tools such as software and electronic performance support systems” (p. 21) and the development of self-efficacy measurements.

Instructional designers should give particular attention to technologies that are already accepted by learners and educational practitioners and can be implemented with low overhead in such courses. Where and how is self-efficacy addressed in the instructional design process? (Hodges, 2008, p. 20)

## Theoretical Framework

Bandura (1997) defines *self-efficacy* as the “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3).

An individual’s self-efficacy belief determines the responses to the questions: “Can I do this?” and “How will I maintain myself motivated to accomplish the task at hand?” According to Hodges (2008), whatever refers to “this” is dependent on the circumstance; therefore, the responses can vary within different environments. Peterson & Arnn (2005) emphasize that self-efficacy should be considered as the basis of human performance. Zimmerman & Schunk (2003) concur by stating: “the predictive power of self-efficacy beliefs on students’ academic functioning has been extensively verified” (p. 446). According to Puzziferro (2008), self-efficacy is the students’ beliefs regarding their abilities to implement a task. It becomes the “personal aspect that accounts for why a person engages in the task. Individual behavior is not directly affected by personal variables; rather those personal variables affect individuals to the extent that they influence self-efficacy beliefs” (p. 72). Puzziferro considers “perceived self-efficacy has the mediating influence on behavior, specifically whether a behavioral task is attempted at all, and the effort to persist in that task.”

Bandura (1989) refers to the social cognitive theory as adhering to a model of “emergent interactive agency” (p. 1175). Bandura (1989) explains by stating:

*Persons are neither autonomous agents nor simply mechanical conveyers of animating environmental influences. Rather, they make causal contribution to their own motivation and action within a system of triadic reciprocal causation. In this model of reciprocal causation, action, cognitive, affective, and other personal factors, and environmental events all operate as interacting determinants. Any account of the determinants of human action must, therefore, include self-generated influences as a contributing factor. (p. 1175).*

The social cognitive theory describes psychosocial processing as triadic reciprocal causation. In this term, “causation” refers to “functional dependence between events” (Bandura, 1999, p. 6). The model of triadic reciprocal causation represents “internal personal factors in the form of cognitive, affective and biological events; behavioral patterns; and environmental events that operate as interacting determinants that influence one another bi-directionally” (p. 6).

Bandura’s original self-efficacy theory incorporated the scheme of self-efficacy being derived from four primary sources: *performance accomplishments*, *vicarious experience*, *verbal persuasion*, and *physiological and affective states*. These four sources have remained a constant in the theory, although *performance accomplishments* are currently referred to as *enactive mastery experiences*.

*Enactive mastery experiences* relate to previous, positive experiences a learner has encountered while performing a task. “Success builds positive self-efficacy beliefs. Failure undermines self-efficacy, especially if failures are experienced before a firm

belief in one's self-efficacy is formed" (Hodges, 2008, p. 15). Bandura (1997) considered enactive mastery experiences as "the most influential source of efficacy information because they provide the most authentic evidence of whether one can muster whatever it takes to succeed" (p. 80). Hodges (2008) emphasizes that self-efficacy is not only a simplistic reflection of a student's previous performance; instead, self-efficacy beliefs are developed through cognitive progression factoring in task difficulty and the context in which the prior performances were accomplished.

The term *vicarious experiences* relates to a student's observation of a role model successfully accomplishing a given task. Hodges (2008) considers this a social comparison with valuable impacts towards developing self-efficacy beliefs. Subsequently, careful consideration should be placed in selecting the model for comparison; if modeling cognitive skills, the models should verbalize the thought process being applied during the modeling phase.

*Verbal persuasion* defines itself and is frequently utilized since it can be easily assigned. However, two important factors should be considered – the credibility and competence of the persuader. "The receiver must view the persuader as someone who is qualified to provide meaningful and accurate feedback. Persuasive comments are of greatest benefit when the task at hand is perceived to be just beyond the capabilities of the receiver" (Hodges, 2008, p. 16).

Physiological and affective states relate to the fact that individuals depend on physiological and emotional response when developing self-efficacy beliefs. According to Hodges (2008), "stress, emotion, mood, pain, and fatigue are interpreted in making judgments" (p. 16). This is critical information for all educators to be cognizant of before planning and developing any type of instruction.

According to Hodges (2008), there are sources of self-efficacy in online environments that can be correlated to Bandura's four primary sources. The initial design stage for any online course could address enactive mastery by presenting content sequentially and clustering related items together. Dick, Carey & Carey (2005) concur and recommend that instruction for online learning environments initiate with basic level skills, gradually advancing to more complex skills, thus allowing learners to build knowledge, confidence and experience. In addition, providing academic content in partial portions would provide students with a greater number of successful experiences, thereby increasing their self-efficacy for the given content. Although vicarious experiences are uncommon within asynchronous learning environments, *pedagogical agents for learning (PALs)* could impact the self-contained world of online learning. Kim & Baylor (2006) describe PALs as "animated life-like characters" embedded in instructional applications with the capability of motivating social interactions among students. Vicarious experiences can also be provided through models made accessible through videos and video conferencing.

Verbal persuasion does not have to be implemented in the traditional sense within an online environment; however, a practical equivalent can be offered through persuasive email communication. According to Hodges (2008), the research teams of Jackson & Visser (2002) and Plomp, Amirault & Kuiper (2002) have "*attempted to manipulate*

*learner self-efficacy through email and written persuasion*” (p. 17). The interventions implemented in these two studies focused on written communication in the form of motivational email messages – in a traditional face-to-face environment and through online courses. “*This pair of studies is the most overt example of research on self-efficacy online or at a distance*” (p. 17). A more recent study was conducted by Ice, Curtis, Phillips & Wells (2007) using audio feedback for students enrolled in an asynchronous online course. This research yielded promising input from participants; “*over one third of students cited the use of audio feedback as a key factor they would use in selecting future online courses*” (p. 14).

According to various researchers (Hodges, 2008; Puzziferro, 2008; Miltiadou & Savenye, 2003; King, 2001), research on self-efficacy in online learning environments is limited. Hodges presents a “possible explanation for the lack of research regarding motivation constructs, such as self-efficacy in the online context, is the lack of consideration the affective domain receives in the design process” (p. 11). Therefore, there is a need for research involving self-efficacy for computer based instruction, as well as Web-based instruction. Hodges (2008) states:

*“The role of self-efficacy and academic achievement in online learning environments, however, is not understood. This gap in the literature is critical given the growing prominence of online learning. Several questions need to be addressed regarding self-efficacy in online learning environments. Enactive mastery experiences, vicarious learning, verbal persuasion, and physiological arousal appear to be the four primary sources of efficacy in the traditional learning environment. Are these the primary sources in online environments? If so, how can elements of online courses be designed to increase the self-efficacy beliefs of online learners? What technologies and strategies can succeed in increasing self-efficacy in online learners? Is increased self-efficacy for online learning related to achievement in online courses? New research is needed to answer these questions. How do the main areas of academic self-efficacy research – prior performance, modeling, goal setting, and attributional feedback – affect online learners?”* (p. 20).

### **The Role of Self-efficacy and Student Achievement in Distance Education**

Multiple researchers have utilized self-efficacy instruments in an expansive range of academic and technology based environments (Schunk, 1982, 1983, 1984, 1991; Pintrich & de Groot, 1990; Hannafin & Land, 1997; Levine & Donitsa-Schmidt, 1998; House, 2000; and Obsorn, 2001). The findings from this volume of research exhibit an affirmative and solid influence of efficacy beliefs on students’ achievement and perseverance regarding the completion of important tasks. Schunk’s early series of studies revealed that as students’ perception of self-efficacy beliefs increased, so did the student’s overall academic improvement. Pintrich & de Groot’s (1990) research states the academic self-efficacy beliefs were positively linked to students’ implementation of core values, as well as cognitive and self-regulatory strategies. Pintrich & de Groot identified strong self-efficacy beliefs as having a negative correlation to students’ test anxiety. Research conducted by Hannafin & Land (1997),

Levine & Donitsa-Schmidt (1998) and Obsorn (2001) address self-efficacy and technology related issues. Hannafin & Land (1997) state that students' computer self-efficacy has a positive impact on their ability to research information from a variety of technology resources. Levine & Donitsa-Schmidt's (1998) study discovered that as students confidence in computer skills increased, so did a positive attitude towards computers. Obsorn's (2001) research demonstrated students with confidence in computer skills had lower computer anxiety and were thereby more likely to complete an online course. House's (2000) research demonstrated that self-efficacy beliefs were considerably correlated to grade performance and evidence of students' perseverance as specifically related to the academic courses of science, engineering and mathematics.

Mixed research findings are presented in the literature covering self-efficacy and online academic success. For example, DeTure (2004) investigated students' characteristics, cognitive styles and included assessment through the Online Technologies Self-Efficacy Scores (OTSES). The results of his research found these factors were poor predictors of students' success in online courses. Joo, Bong & Choi (2000) examined the impact of students' motivation through Web-based instruction (WBI) and applied the self-efficacy theory. The study took place in Seoul, Korea with a sample of 152 middle school students participating in WBI through a science course. The participants were administered the Self-Efficacy subscale of the Motivated Strategies for Learning Questionnaire (MSLQ). The study revealed computer self-efficacy (a skills-level measure) was a key variable that could determine student success in distance education.

## **Research Design**

To evaluate the role of computer self-efficacy as a mediator of academic success on online courses the following research questions guided the study:

Question 1: Are there statistical differences between the course recovery and course acceleration students' perceptions of self-efficacy beliefs with online communication skills?

Question 2: Is there a significant statistical relationship between students' perception of self-efficacy beliefs and the passing rate through an online course?

### *Participants*

The setting for the study was a magnet high school in a large, urban school district. In this manuscript, the research site is referred to as RM and the school district as MDCPS. RM offers eight academy programs geared towards career pathways, including performing arts. In addition to the academies, the school contains the traditional, academic based content departments including: Language Arts, Mathematics, Science, Social Studies, Foreign Languages, English for Language Learners (ELL) [formerly recognized as English for Speakers of Other Languages /ESOL], Advanced Academics/Gifted and Special Education.

Students at the secondary [high school] level register for distance education programs in the form of virtual classes for two primary reasons: to recover courses previously attempted but no credit earned, and/or to accelerate courses that are not offered and/or present a scheduling conflict at the school site. Secondary students are responsible for creating an online account and registering for a course independently of traditional school personnel [counselor].

For the purpose of the study, the inclusion criteria for the subjects was as follows: all students enrolled in Language Arts IV (commonly referred to as senior English) must be eighteen years of age or older, and previously or currently enrolled in a FVS course. The targeted participants represented a diverse ethnic, and gender population of the students at RM who register for an online course for the following reasons: to recover credit in a previously failed course [course recovery], and/or to accelerate [course acceleration] by enrolling in a course previously not taken, or both.

### *Instrument*

The Self-Efficacy Instrument (Lee, nd) contained 27 items in the form of 4 point Likert-scaled items. The instrument “measures two components of self-efficacy beliefs – self-efficacy for course content and self-efficacy for online technologies” (Self-Efficacy Instrument, nd, para. 1). The first three items were “generated based on Eccles and Wigfield’s (1995) 7-point Likert-scaled items” and the remaining items “were developed based on Miltiadou and Yu’s Online Technologies Self-efficacy Scale (OTSES).” Each of the 27 items were preceded by the statement, “I feel confident...” and the participants were required to select from the following choices to complete the statement: “Very Confident,” “Somewhat Confident,” “Not Very Confident,” “Not Confident at All.” The survey is currently used at the University of Central Florida, College of Education as an online course survey prior to undergraduates registering for online courses. A total self-efficacy score was calculated by obtaining the sum of the responses on the self-efficacy items (#11-41); therefore, the highest possible score of self-efficacy equaled 124. The mean self-efficacy score was 115, the medium was 119, and the mode was 124. The standard deviation was 11.1 with a minimum of 67 and maximum of 124. Analysis of the distribution of scores revealed that the distribution was negatively skewed with a *Skewness* index of -1.85 and a *Kurtosis* of 3.421. To identify students with high and low self-efficacy relative to this group a cutoff point was calculated by identifying those scores that were two standard deviations below the mean. The cut off score was 93. Further analysis of the distribution of scores indicated that eight individuals out of 105 were scored below 93.

A chi-square goodness-of-fit test was conducted to determine if a statistically significant difference existed between the observed distribution of responses and the expected distribution. This test was conducted across all items, #11-51, [except those that collected demographic information, Items #1-10] using a criteria of  $\alpha = 0.05$  to reject the null hypothesis. The hypothesis against which the test was run is as follows:

$H_0$ : The observed distribution is the same as the expected distribution.

$H_a$ : The observed distribution is different than the expected distribution.



In all cases, but one, the null hypothesis was rejected, thus, the expected and the observed distributions were statistically different. For all self-efficacy items, the outcomes from the chi square goodness of fit test revealed that the probability to obtain the reported test statistic value was less than .001; hence, the expected and observed distributions are different and thus the null hypotheses were rejected. For instance, the vast majority of students did not drop an online course prior to the 26<sup>th</sup> day of enrollment which would grant them no penalty for enrolling and not completing the course. The majority of students, 74%, did not consider a lack of familiarity with online tools as a factor in dropping a course and 87% of students disclosed that they had earned a passing grade of “C” or higher in their online course. Overall, the amount of students selecting course recovery and course acceleration was approximately equal. Students stated a counselor and self-selection were the main two decision sources for registering in an online course.

Items #48-51 measured the quality of the online course experience. Except for item 48, students responses about the quality of their online course experience was positive. Item #48 asked the question, “Do you feel that online courses are more difficult than traditional face to face classes?” In this item, the null hypothesis was retained.

A chi-square test of independence was used to examine the relationship between the distribution of scores of students’ perception on self-efficacy and a) the percent of students earning a grade of “C” or above in a recovery course and b) the percent of students earning a grade of “C” or above in an accelerated course. The chi-square test whether scores on the two variables are independent or related. The results revealed no statistical significant relationships between the variables tested ( $p > .05$ ).

The distribution of scores in the self-efficacy survey was negatively skewed. Therefore, the vast majority of students, students on recovery or accelerated courses, felt very confident with the online skills necessary for success in a virtual classroom. However, in spite of the preponderance of favorable perceptions about the online learning environment, the respondents were equally divided in their assessment about the level of difficulty of online versus traditional classes. That is, half of the participants indicated that online courses are more difficult than traditional classes. Moreover, approximately half of the students surveyed (47%) indicated that they had dropped an on-line course and that in the future they would not enroll in an online course. However, a statistically significant number of students indicated that lack of familiarity with online instructional tools was not the reason for dropping the course (70.5%).

## **Implications**

Bandura’s (1997) proposition of self-efficacy as an essential part of the learning process in an online environment can be better defined by the outcomes from this study. In this study technical efficacy was not correlated to student academic success in an online environment. Specifically, regardless of the reason for enrolling in an online course, recovery or acceleration, participants were highly confident with their technical efficacy. However, half of the participants claimed that the level of difficulty in online courses is higher than in a traditional setting and, that they would not enroll in another

online course. Thus, the issue of self-efficacy in regards to academic success goes beyond the aspect of self-efficacy in technology.

New self-efficacy measurements would need to acknowledge the regularity of Internet access and accessibility to new technologies as a factor resulting in “high levels on self-efficacy, especially in secondary school and college students, for the use of computers, e-mail, Web browsing, and so forth. Yet, self-efficacy appraisals may be different for such technologies within the context of learning specific content using them” (Hodges, 2008, p. 21). A relevant example would be developing a construct to measure levels of self-confidence in maintaining successful communication and comprehension of an academic course content within email dialogue in contrast to simply measuring self-confidence level through email usage. As demonstrated by the study, high technical self-efficacy is not associated with online academic success.

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