

# THE RELATIONSHIP OF SELF-EFFICACY, MOTIVATION, AND CRITICAL THINKING DISPOSITION TO ACHIEVEMENT AND ATTITUDES WHEN AN ILLUSTRATED WEB LECTURE IS USED IN AN ONLINE LEARNING ENVIRONMENT

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## Abstract

*The technological capabilities of an online-learning environment allow an instructor to make an online class better than a face-to-face class by providing students with learning activities that are individualized to meet their needs and characteristics. One possible learning activity is an illustrated web lecture, which consists of a text-based presentation, such as PowerPoint, with an audio recording of the instructor presenting the lecture. However, a deficiency exists in the research that identifies the student characteristics, such as motivation, self-efficacy, and critical thinking dispositions, which influence student achievement and attitudes when an illustrated web lecture is used. This study sought to fill that void. Results indicated that motivation and computer proficiency tend to influence attitudes and that motivation and prior knowledge influence achievement. It was concluded that when an illustrated web lecture is used to deliver content, students with higher levels of motivation tend to exhibit higher achievement and more favorable attitudes.*

## Introduction

Planning a quality educational activity begins with knowledge of the students for whom it is designed. This pedagogical principle has historical roots. Dewey (1938) argued that teachers must be aware of the past experiences, needs, and capacities of students. Bruner (1966) added that student predispositions, such as cultural, motivational, and personal characteristics, are also important when planning instruction. However, the separation of students and teachers in a distance-learning environment can create difficulties in amassing this information.

In a face-to-face class, the instructor gains this knowledge through personal interactions with students, which provides a starting point for planning learning activities that are conducive to maximizing students' learning. In contrast, the separation of students from the instructor in a distance-learning environment often limits this

interaction and feedback (Twigg, 2001). As such, instructors have difficulties recognizing when a learning activity is not reaching students. Compounding this issue is the fact that distance-learning activities are often planned and created in advance with limited knowledge of the students who will enroll in a class in a one-size-fits-all approach. However, this does not need to be the case. Distance education, particularly online education, can be individualized or personalized to meet the needs of individual students. However, this means moving away from teaching and learning ideas that begin with the thought that "all students need..." (Twigg, 2001). Given that university agricultural education programs and university agricultural educators are often leaders in distance education, this topic is of particular importance to the profession (Roberts & Dyer, 2003).

The Sloan Consortium, which is a group of institutions and organizations dedicated to providing quality online education, also

advocated creating an individualized or personalized learning experience in an online-learning environment (Moore, 2002). A key to success identified in *Elements of Quality: The Sloan-C Framework* was the “opportunity to personalize learning in innovative ways through approaches that emphasize the uniqueness of individual learners” (Moore, 2002, p. 10). Thus, according to the Sloan Consortium, the characteristics of each student can be used to identify appropriate learning activities.

This ability to individualize, or personalize, instruction allows online education to produce the highest quality learning outcomes for all students. Upon enrolling in an online education course, a student can take an assessment that will determine the learning activities that will best meet his or her needs. The instructor may then assemble the appropriate learning activities for each student (Twigg, 2001). So what activities are best for what students?

Delivering content in an online learning environment can take many forms and utilize many learning activities. These learning activities can be synchronous or asynchronous. One such learning activity available in an online learning environment is an illustrated web lecture (Simonson, Smaldino, Albright, & Zvacek, 2003). This asynchronous learning activity seeks to closely mimic the traditional lecture that dominates higher education. It consists of a text-based presentation, such as PowerPoint,

with an audio recording of the instructor presenting the lecture.

### Theoretical Framework

Some involved in distance education have called for the establishment of distance education as a separate, distinct discipline, distinct from the mainstream educational discipline (Moore, 1994). As such, these individuals insisted that a separate theoretical framework was necessary for distance education. Other scholars have argued that the teaching and learning processes are the same, regardless of the separation of teacher and students (Keegan, 1986; Shale, 1988). For educators, this latter philosophy seems plausible.

The theoretical framework for this study lies in Mitzel’s model of the teaching and learning process (Mitzel, 1960), as adapted by Dunkin and Biddle (1974). In this model, the authors posit that presage variables and context variables influence process variables, which in turn yield product variables (see Figure 1). Presage variables are variables that deal with teacher characteristics. Context variables include student formative experiences, student characteristics, school and community contexts, and classroom contexts. Presage variables and context variables influence process variables, which include the actual activities that take place in the classroom. Process variables affect product variables, which are the outcomes of teaching.

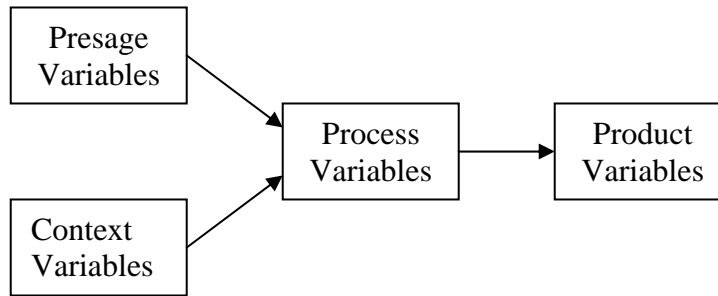


Figure 1. A Model of the Teaching and Learning Process

Many scholars have proposed theories and models for distance education that are consistent with Mitzel's model. For example, when proposing his Theory of Interaction and Communication, Holmberg (1989) made the assumption that distance education is an interaction (process variables) between learners (context variables) and teachers (presage variables). He further indicated that student learning determines effectiveness (product variables). Wedemeyer (1981) proposed a model for distance education that is compatible with Mitzel's model. In his model, Wedemeyer outlines four essential elements in a teaching and learning situation. They are a teacher, a learner, a communication system, and something to be taught (content). In relation to Mitzel's model, the teacher is represented as presage variables, the learner as context variables, and the communication system and content are represented in the process variables. Missing from Wedemeyer's model are the product variables.

This study sought to determine the influence of student characteristics (context variables) on student achievement and attitudes (product variables) while holding constant the teaching method (process variable) and instructor (presage variable). The student characteristics examined in this study were motivation, self-efficacy, critical thinking disposition, and demographic variables. As such, relevant research studies on these student characteristics (context variables) and their influence on student achievement and attitudes (product variables) in a distance-learning environment were consulted.

Motivation is the process whereby goal-

directed activities are instigated and maintained (Schunk, 2000). A student with a high degree of motivation towards success in a course will likely be more successful. Student motivation has been shown to influence student attitudes and achievement in a distance-learning environment (Berg, 2001; Shih & Gamon, 2001). However, a deficiency exists in research that examines student motivation as it relates to attitudes and achievement when an illustrated web lecture is used.

Self-efficacy is a student's beliefs about his/her capabilities to succeed or perform at an appropriate level (Schunk, 2000). Research on this variable has generally shown that self-efficacy affects student achievement and attitudes (Lim, 2001; Riddle, 1994). However, no studies have been found that examined self-efficacy as it relates to achievement and attitudes toward a specific learning activity, such as an illustrated web lecture.

Another student characteristic, critical thinking dispositions, has recently gained attention in research related to student attitudes and achievement (Jenkins, 1998). Critical thinking dispositions are approaches to life that contribute to critical thinking (Facione, 1990). No studies were found that examined the influence of critical thinking dispositions on student attitudes and achievement in a distance-learning environment.

Numerous studies have investigated how other student variables influence achievement and attitudes in a distance-learning environment. For example, Dutton, Dutton, and Perry (2002) reported that student employment had a negative impact

on performance. Age is also related to student attitudes in a distance-learning environment (Berg, 2001; Brouard, 1996). The influence of gender is inconclusive (Lim, 2001; Oxford, Park-Oh, Ito, & Sumrall, 1993). A student's previous experience with distance education is also inconclusive (Cheung & Kan, 2002; Lim, 2001). The effects of student characteristics related to computer proficiency and computer usage are also uncertain when trying to predict student achievement and attitudes in a distance-learning environment (Dutton et al., 2002; Sexton, Raven, & Newman, 2002).

### **Purpose/Objectives**

Based on a review of the literature, a lack of research exists that explains the influence of motivation, self-efficacy, critical thinking disposition, and student demographics on student attitudes and achievement when an illustrated web lecture is used in an online-learning environment. Therefore, the purpose of this study was to fill that void. Two objectives guided this research: 1) Describe the characteristics of students in an online learning environment and 2) Describe the relationship of motivation, self-efficacy, and critical thinking disposition to student achievement and attitudes in the presence of demographic variables.

### **Methods/Procedures**

This study is part of a larger study that used a causal-comparative design (Gall, Gall, & Borg, 2003). The independent variables were already present in the subjects of this study, and as such, random assignment and manipulation of variables was not achievable. The population was all students enrolled in the online sections of a University of Florida course, delivered using an illustrated web lecture. A purposive sample of 322 students was used. This sample was deemed to be representative of the population based on previous enrollments of this course.

The data collection period for this study was six weeks during the 2003 summer semester. Students from many academic

disciplines were included in the sample. All data collection and informed consent procedures occurred using web-based forms. The instructor of the course administered the achievement post-test, which also served as the second examination in the course.

The instrument used in this study to measure motivation was used in a similar study by Shih and Gamon (2001). The instrument utilized nine statements designed to assess the degree to which a student instigates and sustains goal-directed behavior. A Likert-type scale accompanied each statement. Reliability was assessed post hoc using Cronbach's alpha ( $r = .74$ ).

The self-efficacy instrument was developed by Riddle (1994). This instrument was developed specifically for use in distance education. Based on work by Bandura (1986), and a thorough review of existing literature, Riddle developed 17 Likert-type items that explained a student's self-efficacy towards success in a distance-learning environment. Post hoc reliability analysis yielded a Cronbach's alpha for this instrument of .86.

Critical thinking dispositions were assessed using the Engagement, Maturity, and Innovativeness (EMI) Critical Thinking Disposition Inventory (Ricketts, 2003). Face validity of the instrument was established by an expert panel. Construct validity was established by using the original work of Facione (1990). Post hoc reliability analysis yielded a Cronbach's alpha for this instrument of .88.

A researcher-developed instrument was used to gather demographic data. Face and content validity were determined by an expert panel of university faculty. Reliability was not an issue on this instrument. The questions did not elicit demands for considerable time, thought, nor variation and therefore posed no reliability risks (Dillman, 2000).

The class instructor developed the achievement post-test. The researcher created a parallel form to use as the achievement pre-test. Ary, Jacobs, & Razavieh (2002) defined a parallel test as one that is as similar as possible in content, difficulty, length, and format. Both tests were evaluated for face validity by an expert panel of university agricultural educators.

The instructor of the course evaluated the instruments for content validity. Post hoc reliability analysis yielded a Kuder-Richardson-20 score of .82.

The attitudinal instrument was adapted from Shih and Gamon (2001) based on the work of Miller and Honeyman (1993). The instrument used 11 Likert-type items to assess student attitudes towards web-based instruction. Shih and Gamon reported acceptable content and face validity. Slight wording changes were made in this instrument to focus on an illustrated web lecture. Post-hoc reliability analysis yielded a Cronbach's alpha of .85.

Response rates were 83% for the motivation instrument, 83% for the self-efficacy instrument, 83% for the critical thinking disposition instrument, 83% for the demographics instrument, 73% for the achievement pre-test, and 79% for the attitudinal instrument. The achievement post-test was administered face-to-face by the instructor, which allowed for a 100% response rate. Therefore, the generalizability of the findings of this study is limited.

### Findings

The first objective of this study was to describe the characteristics of students in an online learning environment. Over half of the respondents in this study were female (59%). The average age of participants was 21.13 years old ( $SD = 3.93$ ). Participants represented nine academic colleges. Self-reported grade point averages ranged from 1.95 to 4.0. The mean grade point average was 3.17 ( $SD = .52$ ).

The number of distance or online classes that participants had previously taken ranged from 0 to 15. The mean of this distribution was 1.72 ( $SD = 2.35$ ). Almost 40% of the participants in this study ( $n = 98$ ) had taken no previous online or distance education courses. Participants in this study were also asked to indicate their self-perceived computer proficiency on a scale from 0 to 100. Responses ranged from 5 to 100. The mean was 78.77 ( $SD = 14.30$ ).

The mean self-efficacy score was 68.35 ( $SD = 8.64$ ). The possible range for self-

efficacy scores was 17 to 85. Observed scores ranged from 26 to 85. The mean motivation score was 29.42 ( $SD = 3.67$ ), and ranged from 14 to 35. The possible range for motivation scores was 7 to 35. The mean score for Critical Thinking Disposition was 94.67 ( $SD = 11.39$ ). The possible range was 25 to 125. Observed scores ranged from 44 to 121.

Achievement was assessed using a pre-test and post-test. The maximum possible score for each assessment was 100. Achievement pre-test scores ranged from 15 to 75, with a mean of 34.36 ( $SD = 10.28$ ). Scores on the achievement post-test ranged from 23 to 74. The mean score was 55.24 ( $SD = 9.20$ ). Scores on the attitudinal instrument ranged from 15 to 55, with a mean score of 39.24 ( $SD = 8.44$ ). The possible range of scores was 11 to 55.

The second objective of this study was to describe the relationship of motivation, self-efficacy, and critical thinking disposition to student achievement and attitudes in the presence of student demographic characteristics. This objective was met by using the canonical correlation procedure. Attitudes and achievement post-test scores were the dependent variables. Motivation, self-efficacy, critical thinking disposition were the independent variables. Computer proficiency and achievement pre-test were also included in the analysis based on their correlation with the dependent variables (Ary et al., 2002; Stevens, 1992).

As seen in Table 1, low correlations were found between attitude and motivation ( $r = .144$ ), computer proficiency ( $r = .201$ ), and achievement pre-test scores ( $r = .146$ ) (Davis, 1971). The achievement post-test scores had low correlations with motivation ( $r = .252$ ), self-efficacy ( $r = .198$ ), critical thinking disposition ( $r = .133$ ), and achievement pre-test scores ( $r = .256$ ). Substantial correlations were also discovered between self-efficacy and critical thinking disposition ( $r = .689$ ). Moderate correlations were discovered between self-efficacy and motivation ( $r = .485$ ) and motivation and critical thinking disposition ( $r = .452$ ).

Table 1  
*Descriptive Statistics of Context and Product Variables in Canonical Correlation Analysis*

Variable	Correlations							M	SD
	Y <sub>1</sub>	Y <sub>2</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>		
<i>Dependent Variable Set</i>									
Achievement Post-Test Score (Y <sub>1</sub> )	--	.180	.252	.198	.133	.040	.256	55.24	9.20
Attitude Score (Y <sub>2</sub> )		--	.144	.120	.073	.201	.146	39.24	8.44
<i>Independent Variable Set</i>									
Motivation (X <sub>1</sub> )			--	.485	.452	.047	.157	29.42	3.67
Self-Efficacy (X <sub>2</sub> )				--	.689	.089	.087	68.35	8.64
Critical Thinking Score (X <sub>3</sub> )					--	.140	.050	94.67	11.39
Computer Proficiency (X <sub>4</sub> )						--	-.046	78.77	14.30
Achievement Pre-Test Score (X <sub>5</sub> )							--	34.36	10.28

When examining the results of the canonical correlation analysis, the independent variables of motivation, self-efficacy, and critical thinking disposition accounted for 8.8% of the variance in a linear combination of attitudes and achievement post-test (Table 2). Only the first canonical root was significant ( $R^2_{c(1)} =$

.139,  $p = .019$ ). According to Warmbrod (2003), any correlation greater than .3 is meaningful. Therefore, when examining the correlation of the independent variables to the first canonical root, achievement pre-test scores ( $r = .732$ ), motivation ( $r = .705$ ), and self-efficacy ( $r = .434$ ) were the only meaningful variables.

Table 2  
 Canonical Correlation Analysis of Context and Product Variables

Variables	Canonical Root 1		Canonical Root 2	
	<i>b</i>	<i>s</i>	<i>b</i>	<i>s</i>
<i>Independent Variable Set</i>				
Motivation	.561	.705	-.375	-.342
Self-efficacy	.233	.434	.293	-.021
Critical Thinking Disposition	-.177	.294	-.326	-.166
Computer Proficiency	.289	.296	.922	.886
Achievement Pre-test	.642	.732	-.053	-.138
<i>Dependent Variable Set</i>				
Attitude	.438	.593	.920	.805
Achievement Post-test	.820	.903	-.604	-.430
	<i>PV</i>	.584		.416
	<i>Rd</i>	.081		.007
	<i>Rd<sub>t</sub></i>			.088

$$R^2_{c(1)} = .139 (p = .019); R^2_{c(2)} = .019 (p = .354)$$

Note. *b* = standardized canonical coefficients (weights); *s* = structure coefficients; *PV* = proportion of variance in dependent variable set explained by dependent variate; *Rd* = redundancy; *Rd<sub>t</sub>* = total redundancy

Individual backward regressions were run as a follow-up to the canonical correlations to better explain the contribution of context variables to the product variables. This procedure was used because it utilizes all available variables to build a model that consists of only variables that contribute significantly to predicting the dependent variable (Agresti & Finlay, 1997).

Motivation and achievement pre-test

scores yielded the best model in predicting achievement post-test scores. Regression analysis revealed that motivation and achievement pre-test significantly predicted achievement post-test scores,  $F(2, 233) = 15.13, p < .001$ .  $R^2$  for the model was .115, adjusted  $R^2$  was .107 (Table 3). Achievement pre-test scores ( $t = 3.531, p < .01$ ) and motivation ( $t = 3.610, p < .01$ ) contributed significantly ( $\alpha = .05$ ) to predicting achievement post-test scores.

Table 3  
*Backward Regression Analysis to Predict Achievement Post-test Score*

Variable	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>p</i>
Constant	33.054	4.742		6.970	< .01
Achievement Pre-test Score	.188	.053	.220	3.531	< .01
Motivation Score	.565	.157	.225	3.610	< .01

Computer proficiency and motivation yielded the best model in predicting student attitude. Regression analysis revealed that computer proficiency and motivation significantly predicted attitude,  $F(2, 253) = 7.78, p = .001$ .  $R^2$

for the model was .058, adjusted  $R^2$  was .050 (Table 4). Computer proficiency ( $t = 3.153, p = .002$ ) and motivation ( $t = 2.157, p = .032$ ) contributed significantly ( $\alpha = .05$ ) to predicting student attitude.

Table 4  
*Backward Regression Analysis to Predict Attitude Scores*

Variable	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>p</i>
Constant	21.457	4.846		4.428	<.001
Computer Proficiency Score	.114	.036	.193	3.153	.002
Motivation Score	.299	.139	.132	2.158	.032

### Conclusions, Implications, and Recommendations

The first objective of this study was to describe the characteristics of students in an online learning environment. Given the possible ranges and the observed means, it was concluded that the average participant was highly motivated, exhibited high levels of self-efficacy, and had high critical thinking dispositions. They also expressed a degree of high self-perceived computer skills, but had little previous experience with distance or online education.

Motivation is the process of instigating and sustaining goal-directed behavior (Schunk, 2000). Although equivalent to fall and spring semester sections, the course section used in this study was conducted during the summer semester. Historically, students enroll in summer classes to accelerate their education, take courses they have missed, or retake courses in which they

have done poorly (Patterson, Sedlacek, & Tracey, 1980; Rosenthal & Gottesman, 2001). Although not assessed as part of this study, it is reasonable to assume that the participants of this study enrolled in this course for similar reasons. Given these reasons for enrollment, it is also reasonable to assume that participants enrolled with a goal of successfully completing this course. Therefore, students were motivated to instigate the behaviors necessary to successfully meet their goal for completing this course.

The course used in this study was an introductory level food science course designed for students not majoring in food science. Historically, this course has had a high degree of student success. As such, it is reasonable to expect that the participants of this study entered into the course with a strong belief that they would be successful. Therefore, it is not surprising that participants in this study had a relatively

high level of self-efficacy. Self-efficacy can be increased if the student observed a model that successfully completes the task or learns the material (Schunk, 2000). Therefore, observing or having knowledge of other students that have previously been successful in this course, learning by an illustrated web lecture, can raise the observer's self-efficacy (Schunk, 2000).

The sample used in this study exhibited relatively high critical thinking dispositions. This finding contradicts earlier work by Rudd, Baker, and Hoover (2000), who reported lower critical thinking dispositions and differences between students of differing majors.

The University of Florida has minimum computer standards that all students must meet. Students in the sample of this study had the choice of enrolling in a face-to-face section of the course or in an online section. Therefore, given the nature of the distance delivery method used in the online section of the course, students were expected to be computer proficient. Students with low computer proficiency skills likely enrolled in the face-to-face section. This course was offered as a near-distance education course. Although increasing in frequency, near-distance courses are limited at this university. Therefore, students who attend on-campus classes have likely had little need and limited opportunities to enroll in other distance or online classes.

The second objective of this study was to describe the relationship of motivation, self-efficacy, and critical thinking disposition to student achievement and attitudes in the presence of student demographic characteristics. Based on the findings of this study, it was concluded that when an illustrated web lecture is used to deliver content, students with higher levels of motivation tend to exhibit higher achievement and more favorable attitudes.

Theories of motivation postulate that higher motivation can produce greater achievement (Schunk, 2000). As such, higher achievement would be expected for students that set goals and instigate behaviors designed to meet those goals. The findings of this study are consistent with this theory and consistent with existing research. For example, in a study of web-based

learning, Shih and Gamon (2001) found that motivation accounted for nearly one-fourth of the variance in achievement, as measured by course grade and Oxford et al. (1993) reported that motivation affected performance in a foreign language course delivered by distance education.

Given the nature of the technology used to deliver an illustrated web lecture, it is reasonable to expect that students with greater computer proficiency would have more favorable attitudes toward an illustrated web lecture. Previous research has shown that computer proficiency influences achievement in a distance-learning environment. For example, Dutton et al. (2002) indicated that a student's prior experience with computers improved their performance, as measured by course grades. Another possible contributing factor to attitudes toward an illustrated web lecture was technical difficulties associated with the technology. The separation of the students from the instructor in a distance-learning environment necessitated that students take more responsibility for their learning, including handling of any technical difficulties that arose. Students with greater computer proficiency likely had fewer technical difficulties and were likely able to handle minor technical difficulties without assistance. As a result, students with higher computer proficiency had more favorable attitudes.

It is also reasonable to assume that students that enter into an educational setting with greater knowledge of the content will achieve at a higher level at the conclusion of instruction. The findings of this study support this premise, as indicated by the relationship between prior knowledge, as measured by achievement pre-test scores, and achievement, measured by achievement post-test scores.

In this study, self-efficacy was correlated to achievement post-test scores; however, it was also correlated to motivation. The relationship between self-efficacy and motivation is supported in the literature (Bandura, 1986). Given the relationship between these two variables, the model building procedure selected the variable that explained the greatest amount of the variance, motivation. With motivation in the

model, self-efficacy did not significantly explain any more of the variance. It is reasonable to assume that a student's belief about their potential for success influences their success (Bandura, 1986).

Self-efficacy was not significantly correlated to attitudes; however, it was correlated to motivation. As such, it is reasonable to expect that when building a model to predict attitudes that both variables would not remain in the model. The findings of the current study are inconsistent with the findings of Lim (2001) and Riddle (1994) who reported that self-efficacy was related to attitudes. However, neither of these studies examined motivation. Perhaps if these studies had included motivation, their findings would have been similar to the current study.

Previous studies that examined the effects of critical thinking dispositions on achievement in a distance-learning environment were not found to compare the results of the current study to. The instructor prepared achievement test employed in this study assessed mainly lower level recall information. Perhaps if participants were assessed at a higher level, critical thinking dispositions would have statistically contributed to predicting achievement. This proposition is supported by the findings of Cano and Martinez (1991).

These findings and conclusions also lead to several recommendations for further research. The sample for this study was purposively selected. This study should be replicated using procedures that allow a higher degree of randomization and ultimately more generalizability. Additionally an illustrated web lecture was used only to deliver course content in one subject. It is recommended that this study be replicated using other content areas as the focus. Perhaps in other content areas, variables that were not influential in this study would be.

An illustrated web lecture is only one learning activity used to deliver content in distance or online classes. This study should be replicated to see how motivation, self-efficacy, critical thinking dispositions, and student demographics influence achievement and attitudes when other

learning activities are used. Building the research base in this area will ultimately allow for high quality instruction that meets the needs of individual students.

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