Example Research Proposal

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## Introduction

The concept of self-efficacy was introduced nearly 40 years ago. "Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1977, p. 3). Self-efficacy has been identified as an important construct for academic achievement in traditional learning environments for at least two decades. Zimmerman and Schunk (2003) go so far as to say that "the predictive power of self-efficacy beliefs on students' academic functioning has been extensively verified" (p. 446). Its importance has been noted consistently through all levels of the educational process, with various student populations, and in varied domains of learning.

While learner self-efficacy has a well-established literature base in the context of traditional learning environments, self-efficacy research related to learners in online and other non-traditional learning environments is relatively new. Hodges (2008a) has called for researchers to explore self-efficacy in online learning environments. Additionally, in terms of students' self-efficacy beliefs toward academic achievement, "there have been few efforts to investigate the sources underlying these self-beliefs" (Usher, 2009, p. 275). The purpose of the proposed study is to investigate the relative strength of the four traditionally proposed sources of self-efficacy beliefs of students enrolled in a technology-intensive asynchronous college math college.

**Literature Review**

Self-efficacy beliefs have been found to be significant contributors to motivation and performance in academic achievement (Multon, Brown, & Lent, 1991), group functioning (Gully, Incalcaterra, Joshi, & Beaubien, 2002; Stajkovic & Luthans, 1998), health (Holden, 1991), and sports performance (Moritz, Feltz, Fahrbach, & Mack, 2000). Research revealing the connection between self-efficacy and mathematics, the context of the proposed study, includes many cultures and levels of education (Malpass, O'Neil, & Hocevar, 1999; Pietsch, Walker, & Chapman, 2003; Randhawa, Beamer, & Lundberg, 1993; Stevens, Olivarez, Lan, & Tallent-Runnels, 2004) and continues to the present (Usher, 2009).

**Sources of Self-Efficacy**

Albert Bandura's (1977) introduction of self-efficacy theory included the proposition that self-efficacy is derived from four principal sources: mastery experiences, vicarious experience, social persuasion, and physiological/affective states. These four areas are generally accepted in the literature as core elements in the development of self-efficacy beliefs, but an ordering of the importance of each of these sources is unsettled.

**Mastery Experiences.** Mastery experiences refer to previous, successful experiences a learner has had performing a task. Successes build positive self-efficacy beliefs and failures undermine self-efficacy. If failures are experienced before a firm positive belief in one's self-efficacy is formed, the creation of positive self-efficacy beliefs is more difficult.

**Vicarious Experience.** Vicarious experience refers to one's observation of a role model performing a task. Knowledge of how others have performed a similar task helps one determine whether or not a performance should be judged a success or failure. Surpassing the performances of others increases self-efficacy and falling below others' performances lowers self-efficacy.

Note the importance of the selection of individuals for comparison. Self-efficacy beliefs will vary depending on the abilities of those chosen for comparison, thus, models for comparison should be selected carefully (Wood, 1989).

**Social Persuasion.** Social persuasion is commonly used due to the ease with which it can be dispensed. The believability of the persuader(s) is important in the use of social persuasion. The receiver must view the persuader as competent to provide meaningful and accurate feedback. Bandura (1997) cautions that verbal persuasion consists of more than flippant, off-hand comments of encouragement. Unrealistic comments from the persuader may mislead the receiver, which may decrease self-efficacy and diminish the belief in the persuader as one competent to evaluate the performance. "Skilled efficacy builders encourage people to measure their successes in terms of self-improvement rather than in terms of triumphs over others" (Bandura, 1997, p. 106).

**Physiological/Affective States.** Stress, emotion, mood, pain, and fatigue are all interpreted when making judgments regarding self-efficacy. For example, someone may have prepared well for an exam, but upon learning of some unfortunate news, stress may reduce concentration, thus impacting performance on the exam. In general, success is expected when one is not in a state of aversive arousal (Bandura, 1997).

Usher and Pajares (2006) summarize the inconsistent findings regarding the relative strength of each self-efficacy source well. They follow with the proposition that "exploring the predictive value of the sources of students' academic self-efficacy beliefs and determining whether this prediction varies as a function of group membership such as gender, academic ability, and race/ethnicity is a matter of import" (p. 130).

**Methods**

**Design**

The proposed study is quantitative in nature and will use a survey research design (Newman, 2016). Survey research falls into the non-experimental category of research designs. The survey questions use mostly ordinal scales and will result in numeric scores summarizing the extent of use of each source of self-efficacy beliefs as well as a score representing the level of self-efficacy held by each student in relation to the ability to learn math in an asynchronous learning environment.

**Participants**

Approximately 300 students in an asynchronous college algebra course offered at a large, state supported university in the mid-Atlantic region of the United States will be invited to participate in a survey. This is a convenience sample, and participation is voluntary, so the final sample size may be considerably smaller than the number of students invited. The course is delivered using an emporium format (Twigg, 2003) which is technology intensive. The students enrolled in the course tend to be engaged in academic majors that are not math-intensive. They may have a high degree of math anxiety or at least some negative feelings toward their math abilities. In addition, the emporium model may be an unfamiliar concept for them.

**Procedure/Measures**

This course is offered through the Math Emporium and has no traditional class meetings. After a brief, face-to-face, orientation meeting, students complete the course asynchronously. There are weekly deadlines for quizzes, and proctored tests are administered periodically. Students prepare for the quizzes and tests by taking advantage of various technology resources available to them online. Lesson pages serve as an online textbook for the course, short

streaming video lectures are available on most topics, and an unlimited number of practice quizzes are available. For students who desire it, face-to-face interactions with assistants in the computer lab are available several hours each week. No appointment is needed for the face-to-face assistance.

At the conclusion of the course, data will be collected using a web-based survey tool. Students who provide informed consent to participate will be given an ID number and survey access information. They may access the survey either in the Math Emporium or offsite through the internet. Specific instruments to be used are the Self-Efficacy for Learning Mathematics Asynchronously (SELMA) survey (Hodges, 2008b), a demographics survey, and the Sources of Mathematics Self-Efficacy (SMSE) scale (Lent, Lopez, & Bieschke, 1991).

The SELMA survey is a 25-question survey constructed for use in college algebra and trigonometry courses offered in an emporium model. A validation study showed an internal consistency Cronbach's alpha value of 0.87 (Hodges, 2008b) which is greater than the 0.80 minimum level recommended by Gable and Wolf (1993) for instruments in the affective domain.

The SMSE scale consists of four 10-question subscales designed to measure each of the four sources of self-efficacy: mastery, vicarious experiences, social persuasion, and affective/physiological state. In a validation study of the SMSE, Lent et al. (1991) reported internal consistencies of 0.86 for mastery, 0.56 for vicarious, 0.74 for persuasion, and 0.90 for affective/physiological arousal.

**Data Analysis**

To investigate the relative strength of the four traditional sources of self-efficacy beliefs of students in an asynchronous math course, analysis of variance (ANOVA) and multiple regression will be used. Scores from each of the four subscales of the SMSE will be used as

predictors of the SELMA score. Bivariate correlations will also be examined. Significant correlations among the predictor variables may present a problem of multicollinearity. If necessary, additional statistical tests such as ridge regression (Joe & Mendoza, 1989; Kidwell & Brown, 1982) will be applied to solve this problem.

**Ethical Issues**

Participation in the survey will be strictly voluntary, and will not be tied to evaluation of the student's performance in the course in any way. As a non-experimental survey study, no deception will be used. Signed informed consent will be obtained from those who wish to participate. Those who agree to participate may withdraw from the study at any time without any type of penalty.

Confidentiality of participants will be protected by the assignment of ID numbers to be used on the survey documents instead of names or any other type of identifying information. A single copy of the list matching the ID numbers with participants' names will be kept in a secure, locked location for a period of three years after the completion of the study. After three years, the list will be destroyed in accordance with the instructions of the Institutional Review Board (IRB).

As a token of appreciation, all participants will be entered into a drawing for an Amazon gift card. The proposed amount of the gift card, subject to IRB approval, is $25. University facilities, including the computer lab known as the Math Emporium, its computers and a survey software program, will be used if this study is approved. This project will not receive any external funding from commercial or other sources, and no conflicts of interest are reported by the researchers.

**Conclusion**

Self-efficacy and its relationship to academic achievement in asynchronous online learning environments are only recently beginning to be researched (Hodges, 2008a). Given the growing prominence of asynchronous online learning, it is essential that we understand what role constructs such as self-efficacy play in these learning environments. The proposed study will address this need by using a survey research design. The surveys will provide data on the four sources of self-efficacy which will serve as predictors of students' self-efficacy for learning mathematics in an asynchronous online setting. A multiple regression model using the four predictors with the SELMA survey score as the dependent variable will indicate how much each source contributes to self-efficacy.

The results of this study are expected to be important to instructional designers and educational practitioners who either currently use or are considering using an emporium model, as they will give indications of which elements of the asynchronous course design should be emphasized to best promote students' self-efficacy relating to the subject matter. An expedited review of this proposal by the IRB is requested for approval to begin this research as soon as possible.

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