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A Brief Examination of Predictors of E-Learning Success for Novice and Expert Learners

Emily Stark
Minnesota State University - Mankato, emily.stark@mnsu.edu

Andrea L. Lassiter
Minnesota State University - Mankato, andrea.lassiter@mnsu.edu

Ashley Kuemper
Minnesota State University - Mankato

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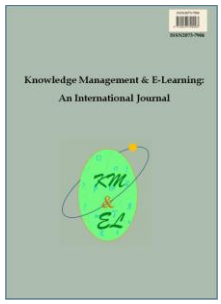

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Emily Stark
Andrea Lassiter
Ashley Kuemper
Minnesota State University, Mankato, USA

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A brief examination of predictors of e-learning success for novice and expert learners

Emily Stark*

Department of Psychology
Minnesota State University, Mankato, USA
E-mail: Emily.stark@mnsu.edu

Andrea Lassiter

Department of Psychology
Minnesota State University, Mankato, USA
E-mail: andrea.lassiter@mnsu.edu

Ashley Kuemper

Department of Psychology
Minnesota State University, Mankato, USA
E-mail: ashley.kuemper@hickorytech.net

*Corresponding author

Abstract: As the prevalence of e-learning continues to grow in higher education settings, so too does the need for empirical research examining the antecedents of success in this environment. Previous research has suggested some characteristics that may determine success in an online course; however, little empirical evidence exists relating potential predictors of e-learning success with actual performance outcomes, particularly for different levels of learners. Students new to college may need different kinds of support to succeed in an online course compared to students with more experience in taking college-level courses, whether online or in-class, and navigating institutional resources. A primary goal of the current study is to determine the kinds of support needed to help lower-level and upper-level learners succeed in an e-learning environment. We assess several predictors of e-learning success and compare the relative effectiveness of these characteristics across novice and expert learners. Findings suggest that for lower-level students, access to technology predicted learner performance, whereas for upper-level students, motivation and self-discipline predicted learner performance. We discuss the implications of these results for e-learning instructors, instructional designers, and knowledge management practitioners.

Keywords: Predictors of success; Online courses; e-Learning; Student level

Biographical notes: Dr. Emily Stark is an Associate Professor in the Department of Psychology at Minnesota State University, Mankato. Her research interests include the development of critical thinking in college students and the effectiveness of electronic and face-to-face instructional techniques on learning and engagement.

Dr. Andrea Lassiter is an Associate Professor in the Graduate Program of I/O

psychology at Minnesota State University, Mankato. Her research interests and previous publications include topics such as computer-supported collaborative learning and team training.

Ashley Kuemper is a two-time graduate of Minnesota State University, Mankato. She has worked on multiple research teams during her time as a psychology student. Her professional and personal interests include understanding behaviors, physical fitness and travel.

1. Introduction

As advances in technology create more and more options for integrating technology into teaching, colleges and universities continue to push for more e-learning options for many reasons, including the possibility of increasing enrollment and reaching more students through technology. In 2012, 69% of higher education institutions in the United States reported that online teaching in particular is a critical factor in their long-term enrollment strategies, and 32% of students in the United States had taken at least one online course (Allen & Seaman, 2012). As e-learning continues to grow, instructors, professors, and learning practitioners are responsible for making learning effective for a variety of learners in a technology-focused medium. The goal of the current research is to examine predictors of student performance in online courses for novice and expert learners attending a mid-size, four-year comprehensive university in the Midwestern United States. A better understanding of the elements that lead to success in online courses for different types of students will build a knowledge base to help those involved in designing and delivering these courses to better support learning.

Learners' geographical proximity, time commitment constraints such as work or family responsibilities, or even a student's preference for e-learning versus traditional in-class learning are some factors that contribute to the growing need for effective e-learning environments. As one type of e-learning, online learning is becoming ubiquitous with its grasp—reaching past traditional college students and into high schools and places of business (Kim & Bonk, 2006; Lewis, 2012). However, some have argued that online learning is not as effective as traditional face-to-face learning (Clark, 2002), though research comparing the effectiveness of online learning to face-to-face learning suggests that no significant difference exists (Perez Cereijo, 2006; Waschull, 2005). In addition, a 2012 survey of chief academic officers at higher education institutions in the United States found that 77% rated the learning outcomes for online courses as good, or better than, face-to-face courses, suggesting that online courses are perceived as offering at least the same level of quality as face-to-face courses (Allen & Seaman, 2012). Some studies demonstrating e-learning effectiveness have also pointed to an increase in participation, and therefore success, of students in an online class versus in a face-to-face class (Daymont & Blau, 2008). There is a growing body of research that suggests little to no differences, in general, between the effectiveness of face-to-face compared to distance or online education (Perez Cereijo, 2006). However, the fast expansion of e-learning requires continued research to examine the effectiveness of e-learning techniques for different groups of students.

With the increased need for more evidence regarding the effectiveness of e-learning, professors and course developers need to know more about how to make online learning successful for a wide range of students. Understanding learner performance and its antecedents will help instructors better tailor this type of e-learning environment to

allow for optimal student success. Previous research has focused on examining individual differences that explain variance in student performance (Yang & Cao, 2013; Flores, Ari, Inan, & Arslan-Ari, 2012). For example, Perez Cereijo (2006) examined students' success in online courses and concluded that performance was related to students' attitudes about the online class; similarly, Liaw and Huang (2013) found that both students' satisfaction with an e-learning system and their perceptions of the usefulness of e-learning positively related to their active participation in e-learning.

Moving beyond student attitudes toward e-learning, additional research finds that instructors view student characteristics such as motivation, self-discipline, study habits, and experience with technology as important in determining a student's success in an online course (Schrum & Hong, 2002). In a study by Waschull (2005), motivation and self-discipline were found to be accurate predictors of performance in online classes (see also Castillo-Merino & Serradell-Lopez, 2013), whereas neither access to technology nor experience with technology influenced student performance. It seems reasonable that learners who are more motivated and self-directed will be able to be more successful with online learning, however, it is surprising that the variables relating to technology did not influence performance in previous research, as this seems to be an essential component of successful online learning. For example, Giesbers, Rienties, Tempelaar, and Gijselaers (2013) found that students who scored higher on academic motivation voluntarily participated in more web videoconferences offered as an optional piece of an online course, but that more motivated students did not necessarily use more advanced communication tools (i.e., using video and audio options, compared to solely audio). The authors suggest that students' access to these more involved technologies may have been the primary determinant of their choice to use them, rather than their motivation, which highlights the need for research to include assessments of technology access and familiarity with technology when examining participation in e-learning.

Another individual difference that serves as an antecedent to e-learning success is knowledge or skill level. Previous research suggests novice learners and experts may succeed in different types of e-learning environments and with different learning experiences (Katuk, Kim, & Ryu, 2013). The present study operationalizes skill level in terms of lower-level students and upper-level students within a higher education setting, in order to draw comparisons between students with more or less experience with college-level courses. We also know that learning outcomes for these courses are at different levels of Bloom's taxonomy, with the upper-level courses having higher level outcomes.

The current study aimed to examine the predictors of student performance and success in online classes by having students complete measures addressing components such as motivation and self-determination, access to the Internet, comfort with electronic communication, and experience with computers. It should be noted that prior research has not addressed whether these predictors of success apply equally to all learners (i.e., novices and experts), or if learner characteristics such as knowledge or skill level may also influence success through motivation or comfort with communicating online. Instructors in higher education and knowledge management practitioners will be faced with a growing number of online students, some with extensive experience with either online and/or face-to-face courses, or others just beginning their college careers, and these different types of students may face different barriers to their success as e-learners. We predicted that predictors of success in online courses will vary based on the level of the student, with issues of accessing and properly using technology more relevant for the performance of lower-level students compared to upper-level students. In addition, we

expected that motivation and self-discipline would influence course performance for all students, regardless of level.

2. Methods

2.1. Participants

A total of 219 participants completed the assessment measures for this study and completed the courses in which they were enrolled; participants who withdrew before completion of the courses were not included in this research. Of the total participants, 53 were lower-level learners (defined as being in their first or second years of college), and 164 were upper-level learners (defined as being juniors or seniors in college; two participants did not indicate their year in school, and were subsequently dropped from analyses). This cross-sectional sample represents both novice and expert learners within the same department at a mid-sized university in the United States.

2.2. Courses

The courses used in the current study included an introductory level course (Introduction to Psychology) and an upper-level capstone course (History and Systems of Psychology) completed by students at the same university. In the Introduction to Psychology course, 53 students indicated they were in their first or second years of college, and 74 students indicated they were in their junior or senior year. In the History and Systems course, all 90 students indicated they were in their junior or senior year of college. Each course was taught completely online, using a learning management system to present content, manage discussions, and administer exams.

The Introduction to Psychology course provides an overview of areas and major theories in psychology and an introduction to the methods used by psychologists. The History and Systems course also provides an overview of areas and major theories in the field with an emphasis on the history of the field. Both courses are primarily lecture-based; students listened to recorded lectures and completed reading assignments from a course textbook. The e-learning environments were designed similarly in order to facilitate comparisons for this research.

2.3. Materials and procedure

All learners completed the measures for this study as part of a required introductory module in each course. Learners were asked to read the syllabus and complete these measures, along with a syllabus quiz, in order to begin their course.

Participants' access to the Internet was measured with one question that asked, "I am able to easily access the Internet as needed for my studies." In assessing comfort with communicating electronically, three questions were used, such as "I am comfortable with written communication" and "I am comfortable communicating with others over the internet." Six questions were used to assess motivation and self-discipline, including "When it comes to learning I am a self-directed person" and "In my studies I set goals and have a high degree of initiative." For all of these measures, responses to each question were assessed on a 4-point scale with endpoints of *1 = rarely* and *4 = all of the time*. Participants' responses were averaged within the different measures to create scores

for each measure. The resulting internal consistency reliability for the three-item scale measuring comfort with electronic communication was α = .59, and for the six-item scale measuring motivation and self-discipline was α = .67.

Learners' general experience with computers consisted of 44 yes/no questions, such as "When I have a problem with my computer I can usually fix it", "I have sent an attached document with e-mail", "I know how to access an electronic bulletin board or discussion board", and "I have used a computer for more than one year." Participants earned one point for each question they answered "yes", and their total score was summed over all the questions. Finally, course performance was assessed as a percentage of the total points earned in the course out of the possible points. This included examinations, presentations, homework, and discussions. In each course, approximately 60% of the course points were earned from examinations.

3. Results

3.1. Descriptive statistics

For access to the Internet, participants had a mean score of 3.71 (*SD* = 0.46) on a 1 to 4 scale, indicating a high level of Internet access. On the measure of comfort with communicating electronically, participants had a mean score of 3.66 (*SD* = 0.38), and on the measure of motivation, participants had a mean score of 3.33 (*SD* = 0.36), both also on a 1 to 4 scale. For the measure of general experience with computers, participants had a mean score of 30.00 (*SD* = 5.06) out of a possible score of 44. These descriptive statistics are also presented in Table 1 below.

Table 1
Means and standard deviations of all measures by year in school

	Lower-level students (*N* = 53)		Upper-level students (*N* = 164)	
	M	*SD*	*M*	*SD*
Access to the Internet	3.74	.486	3.71	.46
Comfort with communicating electronically	3.65	.35	3.66	.40
Motivation	3.26	.40	3.34	.35
General experience with computers	28.08	4.96	30.63	4.96

3.2. Overall predictors of final course grade

Learners' overall percentage grade in the course was regressed on the measures of access to the Internet, their comfort with communicating electronically, their overall experience with computers and technology, and their motivation to study and meet deadlines. Only motivation significantly predicted students' course performance, such that those who reported being more motivated earned higher course grades, $b = .06$, $p < .018$. The other predictors were not significant.

3.3. Differences between lower-level and upper-level students

Because of the similar design of the two courses used to collect data for this study, we focused on differences in the various measures between lower-level and upper-level students, rather than between courses. The learners were separated into two groups—one representing learning novices based on being early in their college careers, and the other representing learning experts, with more experience with college-level coursework. Independent samples t-tests were used to examine potential differences between these two groups. Analyses showed a significant difference in learners' general experience with computers, such that novices reported less experience (M = 28.08) than expert students (M = 30.63, $t(215) = -3.23$, $p < .001$). For none of the other measures were there any significant differences between lower-level and upper-level students (see Table 1 for means and standard deviations for all groups).

3.4. Predictors of course performance by year in school

The prediction of students' overall performance in the course (as measured by their final percentage grade) was analyzed separately for lower-level and upper-level students. For novice learners, the only significant predictor of course grade was access to the Internet ($b = .10$, $p < .04$). No other predictors were significant (all ps > .46). For expert learners, however, the only significant predictor of course performance was motivation ($b = .04$, $p < .05$), and no other predictors were significant.

4. Discussion

This study is one of the first to directly assess how predictors of success in online classes may vary based on whether learners are novices or experts. Results showed that access to the Internet was the biggest predictor of performance in an online course for novices (i.e., lower-level students), but that motivation was the biggest predictor of performance for experts (i.e., upper-level students). This is particularly interesting in light of the finding that there was not a significant difference in both Internet access and motivation between lower-level and upper-level students. It could be that lower-level students are less experienced with working online for their classes, so that they are more easily frustrated with problems related to access or correctly using course technology—if they are less likely to seek alternate solutions to accessing the Internet and solving problems with technology, their course grades could more easily be lowered due to technological problems. This explanation matches definitions of novice learners used by other researchers (e.g., Flores, Ari, Inan, & Arslan-Ari, 2012). For upper-level students who are more comfortable with using online technology and more familiar with Internet access options on campus or near their homes, their overall motivation to complete the work appears to become more relevant in influencing their final course grade.

These results suggest that online instructors and knowledge management practitioners should be particularly clear in the technological requirements for e-learning as well as how to trouble-shoot problems with technology. This is particularly important for novice e-learners. Increasing motivation to complete learning activities and incorporating new and useful technologies may be more salient to an online instructor or practitioner, who may forget that for some learners, basic access to the Internet may be an obstacle. Further, novice learners may not even realize how essential reliable and consistent Internet access is to their success. Instructors who teach more expert learners can additionally focus on the importance of being self-motivated. This emphasis can help

learners realize the importance of consistently meeting deadlines for course work, particularly as findings from the current study demonstrate that self-motivation directly contributes to success in an online class.

These findings are also important given that one of the primary reasons for the adoption and growth of online courses at the college level is the flexibility that they provide for the students (Allen & Seaman, 2011). Although online courses may certainly provide flexibility in terms of scheduling or when coursework is completed, they also therefore demand more self-discipline and motivation to actually complete course activities and required work. In 2012, 88% of academic officers at higher education institutions reported that discipline was an important or a very important barrier to online learning (Allen & Seaman, 2012). The current research supports the importance of focusing on student self-discipline and motivation, but also highlights other potentially important barriers such as technology access.

In order to successfully manage the process of knowledge acquisition for learners of different types, instructors and course designers need to understand the potential barriers faced by their students so they can structure their course resources to overcome these barriers. For example, focusing solely on the importance of motivation for success may be less important in a class targeted to newer students who may need more support in simply accessing and using the technology, whereas a focus on motivation and self-discipline is more appropriate when teaching upper-level, expert students.

A main contribution of this research is the empirical evidence regarding the influence of different individual differences for learners in different stages of knowledge and skill acquisition. In addition, the present study focused on motivation and other individual differences. It is important to note that many researchers have been emphasizing the role of learner engagement. As motivation is highly correlated with engagement, these findings are particularly relevant. It is intriguing, however, that other characteristics such as experience with computers, or comfort with electronic communication, did not significantly predict course performance. This could be an issue of lack of power in the current study to detect significant relationships with these student characteristics. Future researchers should endeavor to include a wide range of measurements of student characteristics, motivation, learner engagement, and experience with technology, for a wide range of students in different disciplines, to improve our understanding of how these aspects interact to influence student performance in different contexts.

One limitation to this study is that we do not know the specific level of learning for these two groups of participants. Previous research (Wang & Chen, 2012) has used Kolb's (1984) learning styles to infer novice and expert learning. We chose lower-level and upper-level learners in a university department to infer this distinction, to best examine how experience with college course-work may influence the relevance of other predictors of performance. Arguably, some upper-level students may still struggle with college expectations, while some lower-level students may easily adapt to the requirements of college-level coursework. We suggest that in any field, this would be a limitation, and it was more important for us to examine the relationships between antecedents and performance, than to have ultimate control or to use random assignment to learning groups. However, future research should certainly delve into this question of how level in school, or general expertise in a certain major or with certain technology, influences learning and performance in classes.

Overall, future research should continue to examine the characteristics of online learners and the predictors of success in online courses—this information can help

instructors, practitioners, instructional designers, students, and others interested in the growing area of online education to better understand how to succeed in e-learning environments. The present study did not examine optimal learner experience in an online course (e.g., Katuk, Kim, & Ryu, 2013). Considering this, future research should continue to provide empirical evidence examining learner experience, learner level and learner performance in e-learning environments.

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