

Assessing Readiness for E-Learning

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ABSTRACT

Today, e-learning is a common delivery media for education and training within many organizations. Yet, while both the supply and demand for e-learning opportunities has risen in recent years, many professionals are beginning to question whether e-learners are prepared to be successful in an online learning environment (e.g., Guglielmino & Guglielmino, 2003; Watkins & Corry, 2005). After all, a learner's demonstrated success in a conventional education and training classroom may not be an adequate predictor of success in an e-learning classroom.

One way of gauging a potential online learner's readiness is through

self-assessment. As a first step in defining an instrument that measures an e-learner's readiness, with the cooperation of volunteer participants from the U.S. Coast Guard, this study looked into the validity and internal consistency of items within a self-assessment of e-learning readiness that is under development, and provided data for the continuing development and revision of the instrument. Having demonstrated evidence of internal consistency and construct validity, the self-assessment now provides a tool for continuing research into the prediction of e-learning performance.

Introduction

Since the upsurge of Internet use in the mid-1990s, the characteristics of distance education (particularly in economically developed countries) have changed substantially. Today, earlier modes of distance education (e.g., correspondence courses, radio-based courses, video taped lectures) are being updated or replaced with Internet-based learning opportunities or other computer-based modes of delivery (NCES, 1999). During the Fall semester of 2002, for example,

more than 1.6 million college students took at least one online course, and more than half a million of those students were completing their degrees entirely online (The Sloan Consortium, 2004).

The movement toward online learning (or "e-learning") has not been limited to institutions of higher education. Today, many private sector organizations use the Internet to deliver training (American Society for Training and Development, 2003; Stephenson, 2003). According to the

American Society for Training and Development (ASTD) the delivery of training programs via e-learning platforms (for example, DVD, CD-ROM, Internet) has increased to rates as high as 29% in 2002 and 31% in 2003 across a variety of business sectors (ASTD, 2003). And while the use of the Internet for e-learning delivery ranged from 32% to 74% across organization in 2003 (depending on the business sector), questions remain regarding both the instructional soundness of e-learning as well as the readiness of learners to engage in online learning environments.

Research Problem and Purpose

The predominance of e-learning as a delivery method for instruction is well documented. Today's learners consist of those that have likely had experience in traditional classroom environments, but may not have experience in online learning situations. Despite this predominance of e-learning in both the literature and within instructional settings, measures of learner's readiness for new environment are rarely assessed for their internal consistency and external utility.

The purpose of this study was to support the development of an in-

strument to measure an individual's perceived readiness to engage in e-learning. Specifically, the research sought to obtain empirical evidence of the construct validity and internal consistency of the instrument. While the development of questions based on a literature review is a necessary, but not sufficient, step for defining the ingredients of the

effective measure; a subsequent step is to determine the internal consistency of the recommended items. This determination is then a precursor to future studies of the predictability (i.e., external validity) of the measure.

In cooperation with participants from the United States Coast Guard (USCG), this study used the statistical relationships among the questions included on the self-assessment to determine the extent to which measure yields similar results among its different sections

as it measures a single phenomenon. Based on these results an updated instrument is proposed and discussion of an initial effort to determine the predictability of the instrument is included. As a result of technical problems, however, only recommendations for future research on the ability of the instrument to predict learner success can be offered at this time.

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Background

From both pedagogical and technical perspectives, the relatively young field of distance education is swiftly changing. While technical advances lead to new teaching strategies, the growing experience of online instructors often times generates the development of new software and hardware to facilitate the demands of the online classroom. This cycle of change in an evolving field of practice, however, continually challenges researchers to validate theories and concepts across range of media, technologies, and teaching strategies. Meeting these challenges has been especially difficult for those looking to validate a measure for predicting learner success.

In 2002, Lim, Eberstein, and Wait suggested that research related to the readiness of learners to adapt to the online learning environment has not kept pace with the changes in the field of distance education. With new technologies quickly changing the capacity of Internet-based courses to support increased social support, interactivity, and simulation experiences, it is no wonder that researchers have not been able to adequately measure learner readiness. With each new advance in technology, researchers are continually challenged to expand their concepts of what knowledge, skills, and attitudes are necessary for success in e-learning.

Research on e-learner performance has most often focused on relationships between performance in the online environment and specific learner characteristics, including for example self-directed learning (Anderson, 1993; Pachnowski & Jurczyk, 2000), learning styles (Aragon, Johnson, & Shaik, 2000), and study habits

(Chan, Yum, Fan, Jegede, & Taplin, 1999). And while many of these characteristics have demonstrated ties with success using specific technologies and/or media, predicting more general success continues to be challenging.

The limitations of past research should not suggest, however, that e-learners are without an assortment of surveys and questionnaires available to offer guidance in determining their readiness for online learning. A selection of online assessments of readiness for e-learning is available in Table 1.

These, and other online assessments of readiness for e-learning, can be a valuable tool for either organizations or individuals looking to Internet-based courses as an opportunity to expand knowledge and skills. The development of an assessment instrument of e-learner readiness, with evidence supporting its validity, first internal consistency and then external utility, could influence the retention and success rates of e-learners in a variety of online learning experiences in both higher education and training institutions. Carr (2000) suggests “no national statistics exist yet about how many students complete distance programs or courses, but anecdotal evidence and studies by individual institutions suggest that course-completion and program-retention rates are generally lower in distance-education courses than in their face-to-face counterparts” (p. A39). And while research has not verified a significant problem with retention rates in online education or training programs, any decline in retention rates stands to strain many organizations already limited resources.

Table 1
Sample of Online Distance Learning Self-Test Instruments
(derived from Lim, Eberstein, and Waint, 2002)

Institutions	Main Features
The Community College of Baltimore Country http://www.bccc.state.md.us/metadot/index.pl?iid=2259&isa=Category&op=show	Quantitative score for each of three response options to ten questions. Yields an estimate of the degree to which distance learning courses fit an individual's circumstances and lifestyle.
St. Louis Community College http://www.stlcc.cc.mo.us/distance/assessment/	Twenty checkbox questions that are randomly arranged. Ten of these are positive indicators and the other ten are the opposite. Prediction of suitability is based on the number of positive responses as compared to the number of negative responses.
Suffolk County Community College http://www.sunysuffolk.edu/Web/VirtualCampus/	Twelve multiple-choice questions with three answer-options. General feedback and prediction is given to respondent without assigning a score. However, there are explanations for twelve of the dimensions or questions asked.
Tallahassee Community College http://www.tcc.cc.fl.us/courses/selfassess.asp	Introduces seven elements or facets of a successful online distance learner. Ten multiple-choice questions with three option-answers follow survey. No submission is required as respondent is given guidelines for marking his score based on the number of responses, with option "a" being the most suitable for distance learning, "b" being somewhat suitable for distance learning, and "c" being not suitable.
University of Phoenix Petersons.com Distance Learning http://iiswinprd03.petersons.com/dlwizard/code/default.asp	Six multiple-choice questions with each having four options. Three standard feedback questions advise or forewarn respondents about what distance education entails.
WEBducation.com http://webducation.com/free/learningquiz.asp	Eleven multiple-choice questions with four options to determine what kind of learner the respondent is by counting the number of R's, K's, V's and A's. Each of these letters corresponds to a different mode of learning: R= Reading/Writing K= Kinesthetic V= Visual A = Auditory
Capella University http://www.capella.edu/reborn/html/index.aspx	Six multiple-choice questions concerning time schedule, convenience, time commitment, computer, reading, discipline; six Yes/No response-type questions regarding independence and collaboration; four Yes/No response-type questions regarding class interactions.
Florida Gulf Coast University http://www.fgcu.edu/support/techskills.html	Forty-seven multiple-choice questions, most of which are Yes/No response-type covering mainly technology skills. Skills assessed include basic computer operation and concept, word processing skills, Internet/Web/Web Board, email, library skills, and computer and Internet accessibility.

One of many obstacles in predicting learner success is defining “success.” Success for distance education can be viewed from multiple perspectives, each having its own definition and criteria. For example, for supervisors of online learners the definition of success would likely include the learner’s ability to improve productivity and time off-the-job; while for the e-learner success may be defined through positive interactions with peers and the instructor, or the capacity to apply skills in future positions rather than their current job (see Watkins, 2004). These diverse perspectives on success, including those of the instructor, client, and client’s clients, are all critical to the success of an e-learning initiative. Nevertheless, as a self-assessment, the proposed instrument focused on individual (i.e., learner) achievements within a broad e-learning context.

The success of e-learning as an alternative or supplement to classroom instruction requires many changes to our currently accepted mindsets regarding education or training (see Kaufman, Watkins, & Guerra, 2002). These changes include, but are not limited to, our perceptions regarding the responsibilities of educators and trainers to ensure that learners are adequately prepared to be successful in the learning environments we create. The validation of an e-learner readiness assessment instrument is one of the first steps required for research in this area to provide practitioners with tools for improving both individual and organizational performance through useful e-learning experiences.

As a result of this context, the Online Learner Self-Assessment

was initially developed to provide potential e-learners with quick, yet comprehensive, analysis of their readiness for success in an online learning environment (Watkins, 2003). The audience for the instrument is intended to be individuals without previous e-learning experience, and as a result, the instrument requires the self-evaluation of participants on future behaviors. The preliminary assessment instrument provided an initial blend of questions that potential e-learners should ask in determining if they are ready to be successful in online education or training. The instrument was considered a useful guide for assisting individuals in determining their readiness for e-learning, as well as identifying practical study and technical skills that should be developed prior to enrolling in online courses. In 2003, funding for research into the initial validation of an e-learner readiness self-assessment was provided by the International Society for Performance Improvement.

Method

Participants

To obtain evidence regarding the internal validity of the Online Learner Readiness Self-Assessment instrument, the research team obtained three samples of volunteer participants from enlisted personnel of the U.S. Coast Guard (USCG). Participants were attending either “boot camp” or rate training and were not required to be actively enrolled in an online course.

To maintain anonymity, specific identifiers were not collected during the research. However, in 2004 the Human Resource Research Organization reported that 84% of the

male recruits and 82% of the female recruits of the USCG were self-identified as “white” in 2002, with 4% of males and 7% of females self-identified as “Black,” and 8% of males and 5% of females self-identified as “Hispanic” respectively. Of those recruits, 89% had earned a high school diploma and 11% earned a GED or other alternative high school diploma. USCG recruits were primarily between the ages of 20 and 24 (35%), with 7% being 17 to 19, 21% being 25 to 29, 14% being 30 to 34, and the remainder (23%) being over the age of 34.

The assessment of internal consistency relies on the relationships of answers within the measure and its subscales to determine if similar results among its different sections are measures of a single construct. Nine hundred thirty-six participants were included in the first two samples of the study, 436 and 500 participants in each sample, respectively. It is typically recommended that validation studies have 10 participants for each item in the scale (DeVellis, 2003). As the initial measure consisted of 40 items, the sample size was deemed sufficient.

The third sample consisted of 15 USCG personnel who recently completed basic training and were receiving their rate (i.e., job specific) training prior to assignment. Participants in this final group received the revised instrument and a measure of self-defined e-learning success.

They were required to be enrolled in training that was at least partially delivered using online technologies, but were not required to have e-learning experience. A total of 15 volunteer participants were included in the third sample and the demographics of USCG personnel in this sample were similar to those of the first two samples, with the only notable difference being the additional experience of having completed basic training.

Success for distance education can be viewed from multiple perspectives, each having its own definition and criteria.

Self-assessment Instruments

The initial self-assessment instrument (Watkins, 2003) consisted of 40 statements related to readiness for e-learning success, which were grouped into 10 scales (e.g., technology access, technology skills, online readings,

Internet chat). For each statement participants completed a 5-point Likert-type scale response ranging from “completely disagree” to “completely agree” with the statement.

Sample statements included: “I can send an email with a file attached”; “I think that I would be able to communicate effectively with others using online technologies (e.g., email, chat)”; “I think that I would be able to take notes when reading papers on the computer”; “I require more time than most others to prepare responses to a question.” The statements solicited both declarations about their abilities to perform common e-learning tasks as well as predictive statements regarding the

application of their skills in areas that may not have previous experience (e.g., online synchronous chat, use of online audio). Since many participants in the study had no previous experiences as e-learners, the readiness assessment required participants to anticipate their success in applying skills in the online environment.

Based on the initial data collection and analyses, a revised instrument was developed. The revised instrument consisted of 27 statements and the same 5-point Likert-type scale response format. Thirteen questions from the initial instrument were removed and multiple questions were re-written to improve their ability to communicate the constructs they represented. Given the number and characteristics of the changes to the initial instrument, a second sample group of participants was used to provide evidence regarding the internal consistency of the revised instrument.

In addition, a second survey was developed to assess the perceptions of performance in actual e-learning experiences. This survey permitted participants to self-define their "success" in completing e-learning experiences, and was delivered completely online. The survey consisted of seven questions; five multiple choice items and two open response items. This additional survey was provided only to the third, and smaller, sample of USCG personnel who were experienced students in the e-learning environment.

Procedure

The first sample of participants was asked to complete the initial online learner readiness instrument

using a paper copy of the assessment and a scantron form (see Watkins, 2003). The initial assessment included 40 statements related to learner readiness measured on a 5-point Likert-type agreement scale. The questions were developed based on a review of the literature. The face validity of the items was assessed through reviews by colleagues at three universities.

Data from the completed assessments with the first sample were used to perform both an item and factor analysis. These analyses examined the individual items and groups of items of the initial instrument, providing information for the determination of which subset(s) of questions would best provide a valid assessment of the desired construct.

Following the revisions to the initial instrument based on the item and factor analysis, participants from the second sample completed the revised instrument. The resultant data were used to complete a second item and factor analysis of the revised instrument.

The third, and final, sample completed the second revision to the instrument. Participants in the third sample completed both the instrument used with the second sample and the self-perceived performance survey using an online data collection site. Data from the second assessment (self-perceived performance upon completion of an online experience) were intended to be used to examine the relationship of readiness with self-perceived performance in an actual online learning experience, but had to be discarded due to a technical error that corrupted the data and created inconsistencies that could not be remedied by the researchers.

Results

Data Analysis: Sample One

Using data from the first sample, Cronbach's Alpha coefficient for each scale within the instrument was used to determine the strength of the relationship among the items within each scale. The Alpha coefficient is based on the average correlation of items within the scale and/or sub-scales of the measure. Based on the coefficients, the determination was made regarding which scales should be combined or removed as well as which scales could benefit from the addition or subtraction of items. An Alpha value of at least 0.8 was selected as a minimal value for accepting the items in a category (Kehoe, 1995). Each of the Cronbach Alpha coefficients for the instrument's scales are presented in Table 2.

Based on this data analysis, items were selected for inclusion, modification, or deletion from the next version of the instrument. As part of this

analysis, item-total statistics were calculated which provided indications of the relationship of individual items to the overall composite score of each scale within the instrument. These item-total statistics included the corrected item-total correlation, the multiple-squared-correlation, and the Alpha if a respective item were deleted. Items for which the "Alpha if item deleted" was greater than the overall Alpha of the scale were earmarked for possible modification or deletion from the instrument.

Several scales and individual items of the instrument were revised based on this analysis. Evidence supporting increases in Cronbach's Alpha within a scale when an item was removed was used to justify reducing the instrument from 40 questions to 27 questions.

Data Analysis: Sample Two

An exploratory factor analysis of the data from the second sample was

Table 2
Cronbach's Alpha Coefficients for Each Subscale Within the Initial Self-assessment (i.e., sample one)

Self-assessment category	Number of Items	Cronbach's Alpha
Technology Access	4	0.88
Technology Skills	5	0.88
Online Relationships	6	0.86
Motivation	4	0.82
Online Readings	3	0.72
Online Video/ Audio	3	0.85
Internet Chat	3	0.82
Discussion Boards	3	0.05
Online Groups	3	0.73
Importance to your success	6	0.79

then conducted to discern the underlying factors of the relationships found among the items included in the revised instrument. After analysis, the consistency (i.e., communality as represented statistically by Eigenvalues or coefficients) of the constructs was used to identify how well each variable was predicted by the remaining items in the assessment¹. Eigenvalues over 1.00 customarily suggest the number of factors to analyze (Gorsuch, 1983). Table 3 presents Eigenvalues along with a scree plot of the data. Both suggest that the revised instrument was best considered as a measure of six discrete constructs.

Based on the results of the exploratory factor analysis, the results of the “Technology Skills” and “Online Relationships” scales were considered representative of a single construct. After reviewing the items within each scale of the instrument the researchers concluded that items related to technical skills (e.g., using email) could be combined with items related the to the content of the communications using the tech-

nology (e.g., building online working relationships). As a result, in the revised instrument these questions are grouped into a single category of Online Skills and Relationship.

In addition to the exploratory factor analysis, Cronbach’s Alpha coefficients were again calculated for each item of the revised instrument completed by the second sample. This process resulted in reducing the interpretation of the 27 statement instrument to just six factors (cited in Table 4).

Data Analysis: Sample Three

The final data set to be collected and reviewed in the study was collected from the third sample of USCG participants. These participants were experienced in online training and education, and enrolled in USCG rate training. The participants in the third sample completed both the revised e-learning readiness self-assessment used with the second sample, as well as a seven-item survey of their self-perceived performance in e-learning. Data from the third instrument were not analyzed however due to techni-

**Table 3
Eigenvalues After Varimax Rotation**

No.	Individual Eigenvalue	Cumulative Percent	Percent	Scree Plot
1	3.178536	16.11	16.11	
2	2.929239	14.84	30.95	
3	3.120172	15.81	46.76	
4	5.145354	26.07	72.83	
5	1.955438	9.91	82.74	
6	1.845009	9.35	92.09	

Note: Eigenvalues under 1.0 are not reported for the sake of brevity.

Table 4
Cronbach's Alpha Coefficients for Each Subscale Within the Revised Instrument

Self-assessment category	Number of Items	Cronbach's Alpha
Technology Access	3	0.95
Online Skills and Relationships	9	0.95
Motivation	3	0.88
Online Audio/Video	3	0.90
Internet Discussions	4	0.74
Importance to your success	5	0.86

cal problems with the online version of the instruments.

Discussion

After completing analyses using data from the second sample, it was determined that a third version of the instrument could be developed that would demonstrate the desired internal consistency necessary for continuing research. The revised instrument (see Appendix) included the integration of items in scales for "Technology Skills and Online Relationships." Although items in the subscale of "Internet Discussions" were identified with a Cronbach Alpha coefficient less than the desired .8, since only marginal benefits from deleting individual items were evident from the data analysis, those items were included in the revised instrument. These items were subject to a few changes in wording.

Unfortunately, data collected to support the external validity of the instrument could not be analyzed due to technical problems. Continuing efforts to obtain a fourth sample were not within the scope of the study. As a result, the study concluded with

evidence supporting only the internal consistency of items within the E-learner Readiness Self-assessment: a necessary (but not sufficient) step in demonstrating the overall validity and utility of the measure. The revised E-learner Self-Assessment demonstrated characteristics of internal consistency that make it an appropriate candidate as an instrument for continued research regarding its external utility (i.e., predictability). The researchers plan to continue their research in the validation of the instrument by evaluating the ability of the instrument to predict performance in a wide-range of e-learning experiences.

This study of the initial and revised instrument does, however, provide evidence to support that the questions used consistently measure the desired scales that were initially derived from the e-learning literature. Consequently, future versions of the E-learning Readiness Self-assessment may provide practitioners and researchers with a valid and reliable instrument for measuring the readiness of learners for success in the online classroom.

Continued research in several areas is necessary in the continued refinement of an effective self-assessment of readiness. For example, the distinction between “Technology Skills” and “Online Relationships” is worthy of further exploration. Likewise, additional data on the relationship of scale scores with both perceived and actual success from multiple perspectives (e.g., supervisor, learner, and instructor) could be essential in supporting the broad use of the instrument as a predictive and prescriptive tool for those considering e-learning opportunities. Lastly, as research into e-learning continues, other potential constructs related to new technologies and online teaching strategies should be pursued as prospective items for the instrument.

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Notes

¹Communality is similar to the R-Squared value that would be achieved if a variable were regressed on the retained factors, though calculations are based on an adjusted correlation matrix.

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Appendix

1 = Completely Disagree
 2 = Strongly Disagree
 3 = Not Sure
 4 = Strongly Agree
 5 = Completely Agree

Technology Access	1. I have access to a computer with an Internet connection.	1 2 3 4 5
	2. I have access to a fairly new computer (e.g., enough RAM, speakers, CD-ROM).	1 2 3 4 5
	3. I have access to a computer with adequate software (e.g., Microsoft Word, Adobe Acrobat).	1 2 3 4 5

Online Skills and Relationships	4. I have the basic skills to operate a computer (e.g., saving files, creating folders).	1 2 3 4 5
	5. I have the basic skills for finding my way around the Internet (e.g., using search engines, entering passwords).	1 2 3 4 5
	6. I can send an email with a file attached.	1 2 3 4 5
	7. I think that I would be comfortable using a computer several times a week to participate in a course.	1 2 3 4 5
	8. I think that I would be able to communicate effectively with others using online technologies (e.g., email, chat).	1 2 3 4 5
	9. I think that I would be able to express myself clearly through my writing (e.g., mood, emotions, and humor).	1 2 3 4 5
	10. I think that I would be able to use online tools (e.g., email, chat) to work on assignments with students who are in different time zones.	1 2 3 4 5
	11. I think that I would be able to schedule time to provide timely responses to other students and/or the instructor.	1 2 3 4 5
12. I think that I would be able to ask questions and make comments in clear writing.	1 2 3 4 5	

Motivation	13. I think that I would be able to remain motivated even though the instructor is not online at all times.	1 2 3 4 5
	14. I think that I would be able to complete my work even when there are online distractions (e.g., friends sending emails or Websites to surf).	1 2 3 4 5
	15. I think that I would be able to complete my work even when there are distractions in my home (e.g., television, children, and such).	1 2 3 4 5

Appendix (continued)

Online Audio/Video	16. I think that I would be able to relate the content of short video clips (1-3 minutes typically) to the information I have read online or in books.	1 2 3 4 5
	17. I think that I would be able to take notes while watching a video on the computer.	1 2 3 4 5
	18. I think that I would be able to understand course-related information when it's presented in video formats.	1 2 3 4 5
Internet Discussions	19. I think that I would be able to carry on a conversation with others using the Internet (e.g., Internet chat, instant messenger).	1 2 3 4 5
	20. I think that I would be comfortable having several discussions taking place in the same online chat even though I may not be participating in all of them.	1 2 3 4 5
	21. I think that I would be able to follow along with an online conversation (e.g., Internet chat, instant messenger) while typing.	1 2 3 4 5
	22. I sometimes prefer to have more time to prepare responses to a question.	1 2 3 4 5
Importance to your success	23. Regular contact with the instructor is important to my success in online coursework.	1 2 3 4 5
	24. Quick technical and administrative support is important to my success in online coursework.	1 2 3 4 5
	25. Frequent participation throughout the learning process is important to my success in online coursework.	1 2 3 4 5
	26. I feel that prior experiences with online technologies (e.g., email, Internet chat, online readings) are important to my success with online course.	1 2 3 4 5
	27. The ability to immediately apply course materials is important to my success with online courses.	1 2 3 4 5