From Online Learner Readiness to Life-Long Learning Skills: A Validation Study

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Abstract
One student success factor in higher education is students' readiness to learn. An increasing number of students are learning in multiple modalities and the boundaries between course modalities continue to blur. In this context, there is a need to reassess readiness for online learning in ways that can serve *all* 21st century learners. The purpose of this study was to re-develop and cross-validate a measure of online learner readiness with different online student samples from two universities in the United States (combined N = 10,143). The reduced 25-item instrument retained four latent constructs: self-regulation efficacy, locus of control, communication efficacy, and technology efficacy. The emergence of these four factors replicates previous scale development studies, although individual items diverge from previous readiness instruments. Current and future applications of this redeveloped readiness instrument, the Learning Skills Journey Tool, are discussed, with a specific focus on how it can serve students throughout their learning journey.

Keywords: Online learner readiness, scale development, validation

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Online learning has grown over the last 20 years (Allen & Seaman, 2017; Seaman et al., 2018), yet interest in student readiness to learn online endures (Capranos et al., 2022; Martin et al. 2020; Arum & Stevens, 2020). Broadly defined, *readiness* is the degree to which a community or individuals may be eager and prepared to benefit from information and communication technologies (ICT) (Dada, 2006). Through the lens of student success, researchers have focused on defining and measuring student readiness to learn online, including the skills and characteristics that enable students to learn well. In early research, technological skills were a central focus, including basic computer and Internet skills (e.g., Miltiadou & Yu, 2000). Rapid technological growth and expansion of online education led to changes in how online learning readiness is measured. The onset of the COVID-19 pandemic and the sudden shift to remote learning has further reinvigorated the debate about online learning efficacy, online learning readiness, and student success.

Traditionally, existing measures of online learner readiness are viewed as tools that can be used to prepare students for the online learning environment; students are encouraged to engage with readiness instruments before starting online degree programs (Milligan & Buckenmeyer, 2008). However, the online learning landscape has fundamentally shifted; the boundaries between "traditional face-to-face" students and "online students" are blurring. While there has been significant growth in the numbers of students earning their degrees entirely online (National Center for Education Statistics, 2022), students who are enrolled in traditional, residential programs are also taking an increasing number of online courses (Bayview Analytics, 2019). Fully online programs are also increasingly serving an adult-learner population of students who are completing degrees, changing careers, or upskilling (National Center for Education Statistics, 2022).

Regardless of whether a student is campus-based, fully online, a "traditional" student, or an adult learner, a key factor shaping the effectiveness of the online learning environment is the student's degree of readiness (Artino, 2009; Galy et al., 2011; Kruger-Ross & Waters, 2013). Today all learners—including adult learners—need an essential set of skills that can equip them for the future of work in the 21st century. Therefore, there is a need to reassess readiness to learn online in ways that can serve all learners at any stage of life. In this paper, we report on the re-development and cross-validation of an online learner readiness instrument that builds on the work of Dray and colleagues' Online Learning Readiness Survey (2011). In the following literature review, we summarize the central concepts of online learner readiness that informed the development of our readiness tool.

Literature Review

Published literature on readiness for online learning began in 2000 with the psychological concept of self-efficacy (Bandura, 1989) as an overarching framework (Miltiadou & Yu, 2000). During this period, several surveys were developed to measure online learner readiness (e.g., McVay, 2000a & 2000b, Parnell & Carraher, 2003; Watkins et al., 2004; Bernard et al., 2004; and Smith, 2003 & 2005). In 2010, Hung et al. published the Online Learner Readiness Scale (OLRS) and Dray et al. (2011) published the Online Learning Readiness Survey (ORLS).

Following the development of these scales, a literature review by Demir and Yurdugul (2015) revealed that 50% or more of online learner readiness models included the following factors: a) competence of technology usage; b) self-directed learning; c) access to technology; d) self-confidence; and e) confidence in pre-requisite skills. Other frequent factors in readiness models included motivation and time management skills. More recently, Martin et al. (2020) reviewed readiness instruments and found four common constructs: online student attributes, time management skills, technical competencies, and communication competencies. In the following sections we summarize the literature on the readiness domains that have emerged across measures: self-efficacy, self-directed learning, technology capabilities, and communication.

Self-Efficacy

Self-efficacy is the ability "to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). In psychological science, research has demonstrated the impact of self-beliefs or self-efficacy on cognitive processes and performance (Bandura, 1989; de Fátima Goulão, 2014; Simmering, et al., 2009). Dray et al. (2011) described the concept of readiness as defined in part by "self-concept/self-efficacy with academics" (pg. 31). For example, one of the earliest readiness instruments by Miltiadou and Yu (2000) applied different facets of self-efficacy (e.g., self-efficacy beliefs regarding communications technology) to the online educational environment; all items in this measure loaded onto a single self-efficacy factor. In the readiness instrument developed by Dray et al. (2011), items about self-efficacy included beliefs about degree completion, beliefs about responsibilities associated with problem solving, and self-efficacy in writing/communication.

Other scales at the time did not include similar self-efficacy dimensions beyond efficacy with technology or computer self-efficacy (e.g., Kerr et al., 2006; Hung et al., 2010). One exception is the Self-efficacy Questionnaire for Online Learning (SeQoL) developed by Shen et al. (2013) that defined 5 dimensions: self-efficacy to (a) complete an online course, (b) interact socially with classmates, (c) handle tools in a Course Management System (CMS), (d) interact with instructors in an online course, and (e) interact with classmates for academic purposes. Tsai et al. (2020) confirmed the factor structure of the SeQoL and cross-validated it with a sample from a different university.

Recently, Sun & Rodgers (2020) developed and validated the Online Learning Self-efficacy scale (OLSS). This scale applied the concept of self-efficacy to technology, task completion, interaction, and self-regulation. Items in this measure focused on student's personal beliefs in their abilities in these four areas: a) technology use self-efficacy, b) online learning task self-efficacy, c) instructor and peer-interaction and communication self-efficacy, and d) self-regulation and motivation efficacy.

Self-Directed Learning

While self-efficacy is the belief in one's ability to control cognitive processes and academic performance, self-directed learning is the process by which a learner has both the motivation and the aptitude to initiate and direct their own learning (Zimmerman, 1989). Based on the widely accepted conceptual framework developed by Knowles (1975), self-directed

learning includes the ability to diagnose learning needs, develop learning goals, identify learning resources, implement appropriate learning strategies, and assess learning outcomes.

In the literature, self-directed learning is sometimes referred to as self-regulated learning (see Loyens, et al., 2008 for a review). Self-directed learning and self-regulated learning are similar in that both constructs require metacognitive skills (e.g., setting specific learning goals and creating strategies to achieve them) (Loyens et al., 2008). However, they differ in that self-regulated learning is conceptualized based purely on characteristics of the learner, whereas self-directed learning can apply to both learner characteristics and design features of the learning environment (Loyens et al., 2008). In measures of online learner readiness, both self-directed and self-regulated learning subscales focus on learner characteristics, which are measured in similar ways. For example, both the OLRS (Hung et al., 2010) and the OLSS (Sun & Rodgers, 2020) include items about goal setting and study plans, although the former refers to these items as measuring self-directed learning and the latter refers to these items as measuring self-regulated learning.

Online, one particularly important self-directed learning strategy is time management including ability to complete tasks on time. Not completing tasks on time is often attributed to academic procrastination, defined as intentionally delaying schoolwork that must be completed (Schraw et.al, 2007). Balduf (2009) found that poor time management or academic procrastination contributed to academic underachievement. Michinov et al., (2011) found that high-procrastinators' desire to drop-out spiked earlier and more frequently throughout the semester than low-procrastinators. Therefore, self-directed learning, which can increase a student's ability to complete tasks on time, is essential for online learning and is critical to overall student success.

Locus of control (LOC) is another construct associated with both self-directed and self-regulated learning. It is generally defined as a person's perceived control over life's outcomes. According to social learning theorist Julian Rotter (1966), internal locus of control (ILOC) is considered one facet of LOC—defined as the extent to which a person believes they control events that influence them as opposed to external factors. People with higher levels of ILOC believe they control the outcome, whereas lower levels of ILOC yield the control to factors outside their realm (Rotter, 1966).

Overall, the relationship between locus of control, self-directed learning, and self-regulated learning is reciprocal. Individuals with an internal locus of control are more likely to engage in self-directed and self-regulated learning, and engagement in self-directed and self-regulated learning is likely to lead to an internal locus of control. Therefore, success in self-directed and self-regulated learning depends on higher levels of ILOC (Deci et al., 1991; Jansenn & Carton, 1999; Cornoldi et al., 2003; Zhu et al., 2020).

Technology Capabilities

Although more recent readiness measures focus exclusively on self-efficacy with technology (see Sun & Rodgers, 2020; Torun, 2020), readiness instruments have historically included a broader constellation of technology skills due to the shift from face-to-face instruction to computer mediated instruction. Early readiness instruments contained questions about

computer and Internet access, as well as what are now considered basic skills such as sending and receiving email, and saving and organizing files (e.g., Watkins et al., 2004).

Most online learner readiness instruments have factors such as computer skills (Kerr et al., 2016) or technological mastery (Parnell & Carraher, 2003). Some dimensions include confidence or comfort with technology (Bernard et al., 2004; Smith 2005; Shuib et al., 2018;), computer self-efficacy (Pillay et al., 2006; Pillay et al., 2007; Hung, 2010; Torun, 2020) and technical competencies (Yu & Richardson, 2015). In their unpublished follow-up studies on the OLRS, Dray and colleagues included an *information and communication technology engagement domain,* divided into four subscales: expectancy values, achievement values, locus of control, and self-beliefs (B. Dray, personal communication, 2019).

As online learning technology has developed, recent scales have included self-efficacy to interact with the course or learning management system (LMS) (Shen et al., 2013). Overall, the measurement of students' technology capabilities aligns with the broader psychological concept of self-efficacy. For example, Lin et al. (2016) developed the Mobile Learning Readiness Scale that assesses how students embrace mobile learning systems and includes a factor called "m-learning self-efficacy," which is made up of questions evaluating students' confidence in their knowledge of mobile learning environments as well as their confidence in their skills related to mobile learning.

Communication

Many earlier readiness scales were focused solely on basic technology skills; however, several measures also assessed communication in online environments. Some measures focused on relationships and interactions, such as The Online Learner Readiness Self-Assessment (Watkins et al., 2004) or on the desire for interactions with instructors and students (see Bernard et al., 2004). Other instruments focused on students' communication self-efficacy (see Hung, 2010), including interactions with instructors, contributing to the online community, and communicating for academic and social purposes (Cho et al., 2009; Dray et al., 2011; Shen et al., 2013).

A more recently developed scale, the Student Online Learning Readiness (SOLR) (Yu 2014; see also Yu & Richardson, 2015), focused specifically on communication competencies in addition to technical skills. The SOLR scale contains four factors: social competencies with classmates; social competencies with instructors; communication competencies (based on the OLRS by Dray et al., 2011), and technical competencies. Aligned with the methodology of Dray et al. (2011), the SOLR is one of a few instruments to go through rigorous validity and reliability testing using factor analysis. In a 2018 follow-up study, Yu completed a confirmatory factor analysis of the SOLR and proposed it as a new conceptual model for online student retention.

In 2020, Martin et al. reviewed published readiness surveys and found communication competencies to be one of four common constructs. Students were also asked to report on both the importance of and their confidence in a) online student attributes (e.g., self-directed learning); b) technical domains (e.g., downloading software); c) time management (e.g., completing assignments on time); and d) communication (e.g., interacting and support-seeking). Interestingly, students were more confident in online student attributes, technical domains, and

time management than they were in the communication scale items. They also rated online student attributes, technical domains, and time management as less important. Martin and colleagues (2020) argue that students should be encouraged to reflect on all four constructs including communication, because they are critical to student preparation.

Purpose of the Study

Across online learner readiness instruments, Martin and colleagues (2020) identified the four common dimensions that make up the skills/competencies required for student success. In many of these instruments, self-efficacy and/or self-directed learning is assessed within a specific domain, such as self-efficacy within technology or communication. However, concerns about measurement of these dimensions date back to Dray and colleagues (2011), who acknowledged the limitations of existing readiness instruments and sought to measure both learner characteristics and technology capabilities with methodological rigor in their OLRS. Farid (2014) argued that research on the validity and reliability of readiness instruments was lacking, and that instruments did not consistently agree on the dimensions of readiness. These concerns have not been resolved; in 2020, Joosten and Cusatis noted that many previous readiness instrument development studies lack rigor.

The study reported here was built upon the rigorous validation work of Dray et al.'s OLRS (2011). The 32-item ORLS included two subscales: learner characteristics and technology capabilities. Post-publication, the research team continued to refine the instrument in unpublished validation studies (2014). This refinement included further dividing the two subscales into sub-domains. Dray et al. were unable to continue working on the project and transferred their work to the author's research team. Our study involved a joint re-development, validation, and cross-validation study with large samples of online learners at two different higher education institutions. The research team is aware of only one other cross-validation of a readiness instrument across two university samples in the published literature (see Tsai, et al., 2020).

The purpose of this study was to re-develop an online learner readiness instrument that can be useful for the 21st century learning landscape and can be used in different university populations. An important part of this process included working directly with student success administrators, coaches, and advisors to understand the key elements that would be useful for their work with students and to ensure these elements were well represented in the scale re-development.

Method

The authors completed a review of the current literature on online learner readiness and identified the main constructs in the published literature. They also reviewed open access readiness measures. In their 2014 unpublished work on the OLRS, Dray et al. divided the *learner characteristics domain* into the following three sub-domains: values, generalized locus of control, and self-beliefs. The values scale asked about perceptions and beliefs about college. This scale had poor reliability and was dropped by Dray et al. The generalized locus of control and self-beliefs subdomains had good reliabilities and were included in the current study. Dray et al.'s renamed *information and communication technology engagement domain* was divided into four subscales: expectancy values, achievement values, locus of control, and self-beliefs. The

expectancy values and achievement values subscales asked questions about access to computers and the importance of computers. These questions are now out-of-date, so they were not retained for this study. The locus of control and self-beliefs subdomains had adequate reliabilities and were kept and revised for the current study.

Initial Scale Redevelopment

The authors consulted with student success administrators, coaches, and advisors at two higher education institutions about the key elements they sought to measure in a readiness scale that would be useful for their work with students. In a series of meetings, we asked the following questions: What does online learning readiness mean from your point of view? What signs or red flags do you identify that indicate a lack of readiness? What elements or concepts should we be measuring for online learning readiness? The qualitative responses were recorded by the research team. These meetings helped the research team focus on constructs to consider in the re-development of the scale. The following concepts were identified:

a) Self-efficacy and locus of control
b) Time management skills within the context of course work
c) A proper study environment
d) Communication with students and instructors
e) Challenges with time, coursework, and commitments outside of work (work, family)

In addition to removing and updating items that were out-of-date, the initial revision of the scale added questions based on relevant constructs from the literature and re-ordered items. The initial revision was reviewed by a group of success coaches and individual interviews with two academic advisors at one of the collaborating universities. Both the success coaches and academic advisors suggested new items and item-wording revisions that were incorporated into the initial revision of the scale.

The initial revision of the scale included 41 items with the following seven subscales as shown in Table 1.

Table 1

Description of the Subscales in the Initial Scale Revision

	Description	Changes and Examples	Response Scale
Locus of Control (LOC) (7-items)	Included all seven of the OLRS learner characteristics: generalized locus of control subdomain.	One item was re-worded: *How well I do in my classes is often the* "luck of the draw" replaced with "determined by chance."	1=strongly disagree 2=disagree 3=agree 4=strongly agree
Self-Regulation Efficacy (SRE) (8-items)	Adapted from the OLRS learner characteristics: self-beliefs subdomain. The scale asked how well students can regulate their thoughts and behaviors to complete their course work.	Six of the OLRS items were retained with slight modifications. Two items were added that asked about creating a plan to complete given assignments and keeping up with weekly readings and assignments. The revised scale was renamed self-regulation efficacy	1=poorly 2=adequately 3=well 4=very well

Educational Skills Efficacy (ESE) (3-items)	Included three items from the OLRS learner characteristics: self-beliefs subdomain. This scale asked about specific skills that are important to online coursework: using library resources, remembering course content, and understanding independent readings.	The question about library resources was updated to reflect online and in-person use, "How well do you use the resources provided by the library (online or in-person) to get information for class assignments?"	1=poorly 2=adequately 3=well 4=very well
Communication Efficacy (CE) (10-items)	Included five original items from the OLRS learner characteristics: self-beliefs subdomain. This subscale asked about how well students communicate with group members and instructors.	Five new items added to the scale asked about communicating with and asking instructors for help. These new items were adapted from Shen et al. (2013). Example is: "How well do you clearly ask your instructor or teaching assistant (TA) questions?"	1=poorly 2=adequately 3=well 4=very well
Efficacy Challenges and Commitments (ECC) (4-items)	Created by the research team based on input from student success coaches. Items asked students about handling challenges and personal commitments that are outside of course work that might interfere with educational progress.	Example: "I put my coursework on hold when life becomes challenging."	1=strongly disagree 2=disagree 3=agree 4=strongly agree
Locus of Control Technology (LCT) (4-items)	Included four items in the OLRS information and communication technology engagement: locus of control subdomain. Questions asked students to think about how they approach situations in which there is a technology related challenge that might interfere with their course work.	One item was changed from positively worded to negatively worded, so the scale had equal positively and negatively worded items. Example: "When I am asked to download new software that I'm not familiar with, I'm unable to get assignments done."	1=strongly disagree 2=disagree 3=agree 4=strongly agree
Technology Efficacy (TE) (5 items)	Included four items from the OLRS information and communication technology engagement: self-beliefs subdomain. The scale asked students about their comfort with common technologies they need to complete tasks in an online course.	One item was added that asked about comfort with seeking help when technology was not working. Example: "How comfortable are you navigating an online learning platform (learning management system such as Canvas)?"	1=not at all 2=somewhat 3=very 4=perfectly

Six of the seven subscales were adapted from the OLRS. A new subscale, Efficacy Challenges and Commitments (ECC) included four items that were developed by the research team based on input from student success coaches. Coaches had encountered students who struggled with handling personal challenges and family or personal commitments. Previous online learner readiness scales did not measure this construct. In collaboration with the coaches, the authors developed four items that asked students about handling challenges and personal commitments that are outside of course work that might interfere with their educational progress. An example is: "I put my coursework on hold when life becomes challenging."

Explanatory Text

The authors collaborated with student success personnel to develop explanatory text that would follow each subscale. After responding to each sub-scale, participants would see the set of items again, followed by text that explained what the items were measuring and how their answers to the questions are related to skills needed to succeed as a student. An example of the explanatory text is shown below.

> Questions 19-28 ask students about how well they communicate with classmates, group members, and instructors. Communication in online course is often text-based. Therefore, effective written communication is especially important.

At the end of the survey, participants were directed to a webpage containing resources to enhance their skills for online learning at their university.

Item Analysis

The authors sought input from new students to inform the re-development and validation of the measure. The authors recruited a small group of six first-year undergraduate students to ask about their perceptions of a set of the readiness survey items with the following research questions: 1) Are the items measuring what is intended? 2) Do students understand the items as they are currently worded? 3) How can the item wording be improved?

Participants were asked:

1. What did the whole question mean to you?
2. Would you re-word the question? If so, how?
3. What did you think about when answering this question (have in mind)?

The feedback revealed that the items were measuring what was intended. For all the items, the students were understanding them as they were currently worded. Slight wording adjustments were made on a few items for clarity.

Recruitment

The initial re-developed instrument was IRB approved and tested at two higher education institutions in the United States in the AY 2020-2021. The item analysis and initial validation study was conducted at University A. Online undergraduate participants in their first term who had never taken courses at University A were recruited for the validation study. This included only students seeking their first degree. Post- baccalaureate students were excluded as well as students who had taken online courses as non-degree students in the summer of 2020. Students at

University A were primarily recruited through the online orientation Canvas module, required before beginning online courses. Recruitment involved a video message about the study and a link to the survey administered via the Qualtrics online survey platform (Qualtrics, Provo, UT). The data collected from this sample informed scoring criteria, subscale creation, reliability, and validity for the revised instrument.

The instrument was cross-validated with students at University B with all enrolled online students. At University B the instrument was embedded in the opening module of all online courses. Prior to the study, University B was using another readiness instrument in all of their courses which was replaced with the study instrument. Students were asked for their consent to take part in the research project and completed the instrument in Qualtrics before proceeding with the course.

Participants

University A. The survey data yielded 1,060 unique responses. Participants who did not consent to the study (n = 24), who indicated they were not adults (n = 11), and who provided incomplete data (n = 160) were removed from the data set, yielding 865 remaining participants. Three additional participants were removed because they indicated that they had started taking courses at University A prior to the 2020 academic year (n = 862). Of these 862 participants, 123 were part of a comparison group who primarily took face-to-face courses. These participants were excluded from the analyses, resulting in a total sample of 739 online students (median age = 28-years-old, mean age = 30.5 years, *SD* = 8.44 years, range = 18 – 64-years-old; 37.1% male, 58.2% female, 2.3% "other" or "prefer not to identify", 1.2% genderqueer/gender non-conforming, and 1.2% transgender). Of the 739 participants, 72.1% identified as White, 10.8% identified as two or more races, 7.8% identified as Hispanic/Latino, 5.7% identified as Asian, 2.7% identified as Black or African American, and 0.4% identified as either American Indian, Alaskan Native, Native Hawaiian, or other Pacific Islander. There were three participants (0.4%) who did not report their race/ethnicity.

University B. At University B, 18,160 finished responses were recorded. Participants who did not consent or qualify to participate (n = 6,042), whose responses could not be verified (n = 732), and who provided duplicate responses (n = 1,978) were excluded from the analysis. Four additional participants were excluded because they reported being less than 18 years old. The final sample consisted of 9,404 online students (median age = 21, mean age = 21.2, *SD* = 2.81 years, range = 18 – 62; n = 9,334 reporting on age). Of these participants, 85.9% identified as White, 4.9% identified as two or more races, 3.8% identified as Hispanic/Latino, 2.5% identified as Asian, 1.1% identified as either American Indian, Alaskan Native, Native Hawaiian, or other Pacific Islander, and 0.5% identified as Black or African American (1% of participants preferred not to report their race/ethnicity; n = 9,404 reporting on race). Participants were not asked to report their gender in the online Qualtrics survey at University B.

Data Analysis Procedure

To develop a parsimonious scale that captured learner readiness, we first conducted an exploratory factor analysis (EFA) on all original seven subscales (LOC, SRE, ESE, CE, ECC, LCT, TE; 41 items) with data from online students (n = 739) at University A, a large public university in the Pacific Northwest. The reduced set of items and subscales produced by the EFA

were then evaluated using confirmatory factor analysis (CFA). This reduced scale was then cross-validated using CFA with a large sample of online students at University B, a private university in the Intermountain West (n = 9,404 students).

Results

Scale Development at University A

Exploratory Factor Analysis.

Exploratory analyses yielded no missing data points on the 41 items assessing online learner readiness. We conducted an EFA with IBM SPSS Statistics (Version 27) software, using an estimation with an oblique rotation to allow for correlations among the latent constructs. Based on the extant literature, we had no reason to assume that the latent constructs that compose online learner readiness would be orthogonal. Retention criteria was set to eigenvalues greater than 1.0 and for ease of interpretation, small factor loadings (< .20) were suppressed. Initial results with all 41 items revealed a 9-factor solution, accounting for 55.14% of the total variance. However, 40% was accounted for by the first four factors alone. Using an iterative approach, items that were strongly cross-loaded across factors or weakly loaded onto multiple factors were eliminated as they were difficult to interpret. Through this process, ECC, LCT, and ESE subscales were dropped; note however that two items from the ECC subscale and one item from the LCT subscale were retained in the final model. One ECC item loaded onto the CE subscale and another ECC item loaded onto the SE subscale. The one LCT item loaded onto the TE subscale (see Appendix A for the full results of the EFA). This final model consisted of 25 items that loaded separately onto four different factors, accounting for 46.25% of the variance; the emergent factors were self-regulation efficacy (7 items), technology efficacy (5 items), communication efficacy (8 items), and locus of control (5 items).

Confirmatory factor analysis. Results of the EFA were then tested via Confirmatory Factor Analysis (CFA) using AMOS (Version 28) software with maximum likelihood estimation. The purpose of this analysis was to test the overall fit of the model and to examine correlations among the latent variables. Modification indices were used to improve model fit. Following best practices regarding the use of modification indices (see Kline, 2011), only one change was implemented in the final model (correlated error variance among two items in the CE subscale) (See Figure 1). Based on well-established fit criteria, the model was an acceptable fit for the data (see Table 2). As expected, latent variables were positively correlated; the strongest correlations were between communication efficacy and self-regulation efficacy, and self-regulation efficacy and locus of control. Examination of the standardized regression weights revealed that the individual items were strong indicators of their respective latent constructs, and each item accounted for a significant portion of the variance within each construct (R^2 *range* = .13 - .61, *ps* < .05).

Figure 1

Confirmatory Factor Analysis Model for University A

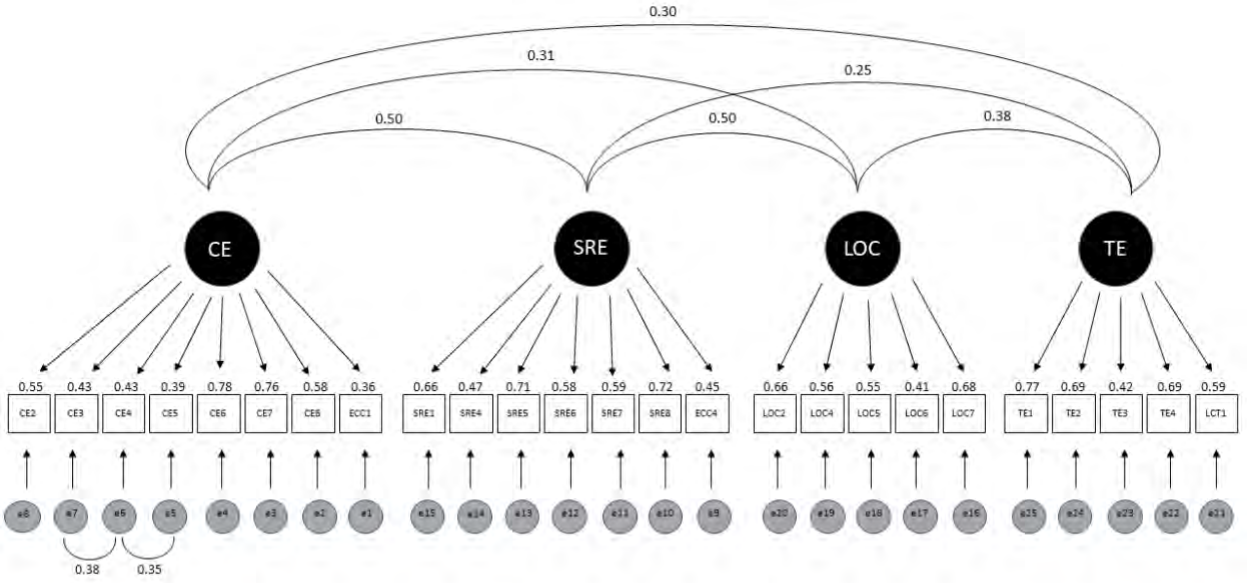

Table 2

Goodness of Fit Statistics Used to Assess CFA Models at Institutions A and B

Fit index	Acceptable fit criteria*	University A	University B
CFI	0.90 ≥ CFI ≤ 0.95	.92	.90
AGIF	0.85 ≥ AGFI ≤ 0.90	.92	.93
IFI	0.90 ≥ IFI ≤ 0.95	.92	.90
RMSEA	0.05 ≥ RMSEA ≤ 0.08	.04 *CI* [.04 - .05]	.05 *CI* [.050 - .052]

*see Hu & Bentler (1999); Kline (2011)

Cross-Validation at University B

After confirming model fit at University A, the model was cross-validated using CFA with a different sample of online students located in another region of the United States.

Confirmatory Factor Analysis

Exploratory analyses of the data from University B indicated missing data on the individual items included in the model. Missing data ranged from 10 – 58 points across these individual items (0.1% - 0.6% of the data; see Table 3 for descriptive statistics). Given the small percentage of missing data overall, no formal analysis of missing data was conducted. Missing data points were imputed using AMOS® version 28 software prior to the CFA analysis. Results of the CFA are shown in Figure 1. As was found at University A, the model was an acceptable fit for the data based on well-established margins (see Table 2). The latent constructs were again positively correlated, the strongest of which was between communication efficacy and self-regulation efficacy. Similarly, standardized regression weights revealed that the individual items were strong indicators of their respective latent constructs (see Figure 2), and each item accounted for a significant portion of the variance within each construct (R^2 *range* = .13 - .58, *ps* < .05). Table 3 reports the reliability for each subscale, as well as the standardized regression weight for the items within each subscale. Descriptive statistics for each item as well as items that were removed from the model are also included.

Figure 2

Confirmatory Factor Analysis Model for University B

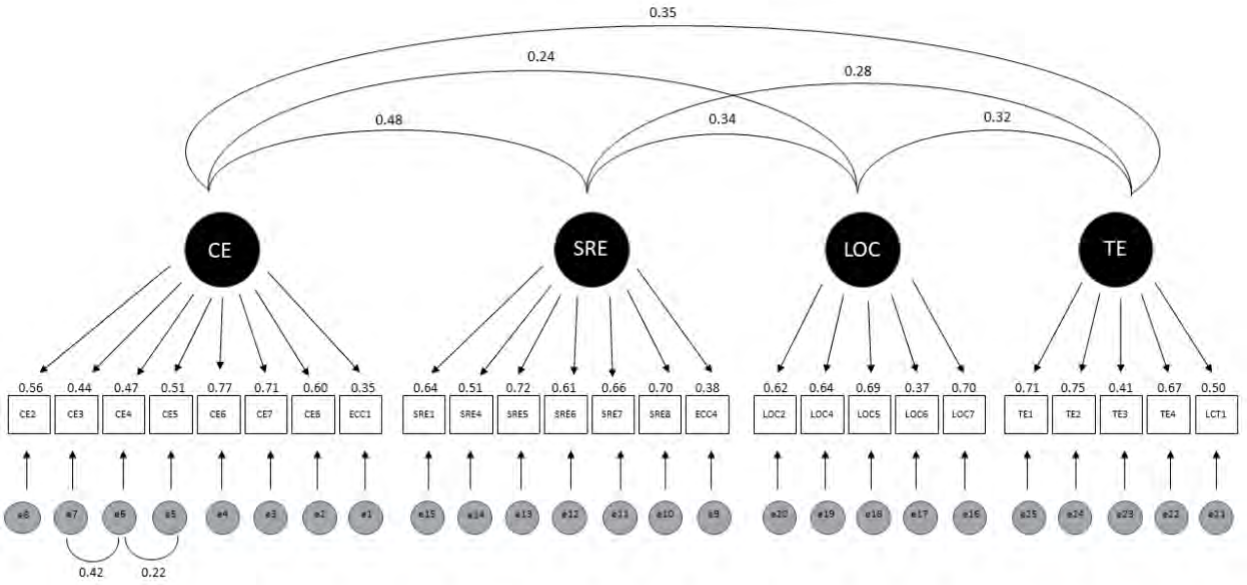

Table 3

Results of the CFA at University B Including Descriptive Statistics and Reliabilities by Subscale

	CFA Results			
Subscales	*β*	*SE*	*M*	*SD*
Locus of Control (LOC) α = .73; AVE = 0.38; CR = 0.75				
LOC 7: My grades are basically determined by things beyond my control, and there is little I can do to change that.*	.698	.022	1.62	.58
LOC 5: There is little I can do about my performance in college.*	.694	.021	1.44	.56
LOC 4: How well I do in my classes is often determined by chance.*	.642	.022	1.72	.61
LOC 2: No matter what I do, I can't seem to do well in my classes.*	.618	.019	1.75	.62
LOC 6: When I do poorly in a class, it's usually because I haven't given my best effort.	.366	.021	3.07	.66
Self-Regulation Efficacy (SRE) α = .80; AVE = 0.38; CR = 0.80				
SRE 5: How well do you motivate yourself to do coursework?	.718	.024	2.83	.80
SRE 8: How well do you keep up with the weekly readings and assignments?	.697	.024	3.03	.82
SRE 7: How well do you complete tasks independently?	.664	.021	3.36	.70
SRE 1: How well do you finish homework assignments by deadlines?	.642	.054	3.51	.68
SRE 6: How well do you create a plan to complete the given assignments?	.610	.026	2.92	.90
SRE 4: How well do you arrange a place to study without distractions?	.507	.024	2.71	.87
ECC 4: I put my coursework on hold when life becomes challenging.*	.380	.018	2.13	.67
Communication Efficacy (CE) α = .79; AVE = 0.32; CR = 0.78				
CE 6: How well do you communicate with your instructor in writing?	.765	.026	2.96	.79
CE 7: How well do you clearly ask your instructor or teaching assistant (TA) questions?	.714	.027	2.85	.84
CE 8: How well do you express your opinions to the instructor respectfully?	.598	.024	3.12	.79
CE 2: How well do you express your opinion in writing to others?	.558	.066	2.88	.84
CE 5: How well do you give appropriate feedback to others, even when you disagree?	.515	.022	2.89	.76
CE 4: How well do you actively communicate when working as part of a group?	.467	.019	3.33	.68
CE 3: How well do you contribute your fair share of work in a group?	.437	.016	3.56	.58
ECC 1: I seek help when there are challenges in my life.	.355	.018	2.95	.70
Technology Efficacy (ET) α = .73; AVE = 0.39; CR = 0.75				
TE 2: How comfortable are you finding and listening/watching assigned audio or video resources on the Internet?	.747	.033	3.47	.63
TE 1: How comfortable are you downloading and installing new software on your computer or other device?	.714	.023	2.93	.87
TE 4: How comfortable are you navigating an online learning platform (learning management system) such as Canvas?	.675	.020	3.12	.75
LCT 1: When I am asked to download new software that I'm not familiar with, I'm unable to get assignments done.*	.501	.017	3.09	.67
TE 3: How comfortable are you using social networking sites such as Facebook, Twitter, Instagram, Snapchat or others like them?	.408	.022	3.24	.86

Dropped Items (subscale in parentheses)
The more effort I put into my classes, the better I do in them. (LOC)
I see myself as largely responsible for my performance throughout my college career. (LOC)
How well do you study when there are other interesting things to do? (SRE)
How well do you concentrate on coursework? (SRE)
How well do you create a plan to complete the given assignments? (SRE)
How well do you use the resources provided by the library (online or in person) to get information for class assignment? (Education Skills Efficacy- ESE)
How well do you remember information presented in class and textbooks? (ESE)
How well do you understand the main ideas and important issues of readings without guidance from the instructor? (ESE)
How well do you seek help from your instructor or teaching assistant when needed? (CE)
How well do you promptly inform your instructor when an unexpected situation arises? (CE)
How well do you participate in class discussions? (CE)
How well do you give appropriate feedback to others, even when you disagree? (CE)
Even when my computer isn't working, I find a way to get my assignments done. (TE)
If I can't access online course content, I try several strategies to access it. (TE)
When the technology I'm using isn't working, there is nothing I can do until it starts working again. (TE)
How comfortable are you asking for help when your technology is not working?(TE)

** Item was reverse coded.*

Note: Reliability and descriptives were calculated with imputed data

Discussion

The purpose of this study was to re-develop and cross-validate a measure of online learner readiness that can be useful for 21st century learners. Two universities jointly re-developed and cross-validated a readiness scale with different student populations. The reduced 25-item instrument retained four of the seven subscales: self-regulation efficacy, locus of control, communication efficacy, and technology efficacy. The emergence of these four subscales replicates previous readiness instruments, suggesting that the latent constructs that make up readiness to learn online have remained fairly stable over time.

However, the individual items used to measure these latent constructs have evolved from the original readiness instruments and vary among more current models. For instance, the communication efficacy scale that emerged from this study focused on students' beliefs about their communication capacities, while Martin et al.'s (2020) shorter SROL communication subscale has questions about the communication technologies themselves. Similarly, our communication subscale differs from both the SOLR (Yu, 2018) and SeQoL (Shen et al., 2013), that have a greater emphasis on social and academic communication with classmates. Finally, the SOLR's technical competencies subscale (Yu, 2018) asks more global questions about basic functions in online courses while the technology efficacy subscale that emerged in this study asks about comfort with software, audio, and video resources.

The instrument we developed and validated shares greater conceptual similarities with more current models of online learner readiness. The recently published SROL (Martin et al., 2020) has some overlap with the self-regulation efficacy subscale that emerged and has specific questions about time management that also align with our self-regulation efficacy subscale. Like the OLSS (Sun & Rodgers, 2020), our instrument shares an emphasis on self-efficacy, and the OLSS includes four latent constructs that are similar to our measure. However, the items

defining the OLSS constructs differ significantly from our own. The OLSS technology use-self efficacy construct is focused primarily on confidence in searching and using websites, and the online learning task efficacy construct is focused on confidence in doing tasks in the LMS. Further, the OLSS instructor and peer interaction communication construct is focused on community, connectedness and belonging. Finally, the largest OLSS construct, self-regulation and motivation efficacy contains items asking how the student motivates themselves to do specific self-regulation tasks.

Although our findings show consistency in the latent constructs that make up online learner readiness, the instrument cross-validated here includes an often-overlooked motivational construct: locus of control. To date, few published online learner readiness scales have directly measured locus of control, which is associated with learning outcomes in online courses (one example is Kerr, et al., 2006). Locus of control refers to an individual's perception of the degree to which they have control over the outcomes in their life (Rotter, 1966). A person with an internal locus of control perceives themselves as having control over their own life and the events that occur within it, while a person with an external locus of control perceives the events in their life as being controlled by external factors such as luck or fate. Characterized by the individual's initiative, self-motivation, and responsibility for their own learning process, self-directed learning is managed by the degree of internal locus of control. Our measure contributes to literature on readiness by including some of the questions measuring generalized locus of control tested in follow-up work on the OLRS by Dray and colleagues (2011).

Our approach to this study addresses sampling bias in the readiness literature as cited by Yu (2018) by including students across two different online institutions. Further, the cross-validation of our readiness instrument improves the potential generalizability of our scale and adds to the small number of current studies that have taken similar approaches (see Martin et al., 2020; Sun & Rodgers, 2020; Tsai et al., 2020). Finally, we are not aware if other validated instruments have been designed to provide built-in benefits for student participants. We accomplished this by including explanatory text that was revealed after participants answered questions in a particular subscale; this provided students with some insight as to what their responses might indicate about their readiness for online learning.

Limitations and Future Directions

It is important to note several limitations to this study. Although both CFA models at Universities A and B accounted for a significant amount of variance, there was also a large amount of residual variance in online learner readiness unaccounted for in both models. This could be due to multiple factors that can impact readiness to learn online, such as age and employment status, which have been found to impact online learner readiness (Firat and Bozkurt, 2020). Further, online learner readiness measures—including our validated instrument—rely on self-report. It remains unclear the extent to which students' perceptions of their online learner readiness skills align with objective indicators of those skills. One possible way to examine this alignment is to determine the extent to which readiness to learn online is predictive of academic performance outcomes.

The published literature includes a limited number of studies assessing the predictive value of readiness measures. A few studies have concluded that self-directed learning is a predictor of academic success (Kirmizi (2015); Cigdem & Ozturk (2016); Torun (2020)). The next phase of our collaborative research is to test the predictive value of our instrument by tracking the enrollment status and academic outcomes of the students over a period of one year after completing the instrument.

Applications

Administrators and student success professionals have an interest in understanding the needs of their students to target specific interventions to meet those needs. An online learner readiness instrument can be used as a tool to support students as they enter an online program via student orientation or the beginning of a student success coaching relationship. The tool can be used to understand what specific resources are needed to support their academic success. Another purpose of online readiness instruments is for students to self-assess competencies, where they may struggle, particularly with the flexibility of an online environment. However, a study by Wladis and Samuels (2016) showed that a readiness survey did not predict student success. They cautioned that online readiness surveys could discourage students from enrolling in online classes even when they were not at risk of poorer outcomes by learning online. The authors suggested helping students understand how to interpret the findings of readiness surveys (Wladis & Samuels, 2016).

It is important to be intentional about how to implement online learner readiness scales. The student success professionals we partnered with argue that these types of scales should be used as tools for professional learning and growth. Furthermore, in discussion with advisors and student success coaches, they expressed interest in a readiness instrument that could be used as a *positive* tool for student exploration within the context of coaching and advising. The authors designed this instrument to be useful for assessing and developing the skills of all learners regardless of their stage of life (i.e., first-year student, adult student changing careers, etc.). As technology is more heavily infused in *all* learning environments, this instrument is relevant for online, hybrid, and face-to-face learners. Finally, dimensions of learner readiness in our measure might be more broadly applicable to all learners in higher education—particularly given the recent advancement in course modalities resulting from the COVID-19 pandemic.

Based on the intention that the instrument be used for continual, or lifelong learning and development, the authors intentionally named this newly revised instrument the **Learning Skills Journey Tool (LSJT),** thus removing the term "readiness" from the name. This chosen name reflects how this tool is being implemented at the two universities. At University A, student success coaches are embedding the LSJT into the online orientation for incoming online students and including resources associated with each of the subscales. Coaches will be following up with students, using the instrument to discuss developing skills to be more successful online students. At University B the instrument is embedded in all online classes and includes recommended resources associated with each subscale.

Future Applications

The learning skills in our readiness instrument are essential for a learner's educational journey. However, little is known about students' cognitive and emotional readiness for learning online, particularly for K-12 students. Theoretically, some of the first-year students in our current study were recent college and career-ready high school graduates. Since learning skills are teachable and develop over time, administering this instrument to high school students in their first year and using individual data to provide targeted skill-building support, theoretically would give them a college and career readiness advantage. The LSJT will be administered to incoming high school students in the Fall 2023 cohort enrolled at University B's high school. The students' progress will be tracked across their four years to help to identify gaps earlier in a learner's journey.

Concluding Comments

In promoting best practices for a 21st century college education, the AAC&U's Liberal Education & America's Promise (LEAP) initiative defined an essential set of learning outcomes to equip students with the attitudes, knowledge, and skills to be prepared for the challenges of a complex world (American Association of Colleges & Universities, 2022). Among the four learning outcomes is engaging the personal or social responsibility of students, which includes the development of the foundations and skills to learn for themselves, essential for lifelong learning. The LSJT developed here is one such way for students, as well as those dedicated to their success, to assess these essential skills for learning. This instrument could be administered across students' tenure within a course, program, or degree to examine how these skills develop over time. Such application of this instrument could serve students by promoting opportunities for self-reflection, as well as instilling the idea that readiness to learn is a constellation of skills that develop over the course of the learning journey.

Declarations

The authors have no conflicts of interest to declare.
All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.
We certify that the submission is original work and is not under review at any other publication.

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Appendix A

Results of the EFA on Readiness scale at University A

Factor	Eigen values	% variance explained	Item	Factor Loadings				*M*	*SD*
Self-regulation Efficacy	5.63	22.52	SRE 8. How well do you keep up with weekly readings and assignments?	**.78**	-.07	-.03	.05	3.02	.79
α = .79			SRE 1. How well do you finish homework assignments by the deadlines?	**.73**	-.01	.004	-.001	3.32	.73
			SRE 5. How well do you motivate yourself to do coursework?	**.73**	-.02	.03	.05	2.88	.79
			SRE 6. How well do you create a plan to complete the given assignments?	**.70**	.03	.03	-.15	2.87	.93
			SRE 7. How well do you complete tasks independently?	**.64**	.01	.03	.03	3.54	.64
			ECC 4.I put my coursework on hold when life becomes challenging. *	**.50**	.02	-.06	.14	2.95	.68
			SRE 4. How well do you arrange a place to study without distractions?	**.44**	.09	.14	.01	2.82	.94
Technology Efficacy α = .73	2.28	9.12	TE 1. How comfortable are you downloading and installing new software on your computer or other device?	-.05	**.81**	-.03	.05	3.40	.78
			TE 4. How comfortable are you navigating an online learning platform (learning management system such as Canvas)?	.03	**.77**	-.03	.05	3.50	.63
			TE 2. How comfortable are you finding and listening/watching assigned audio or video resources on the Internet?	.07	**.73**	.03	.03	3.73	.49

			ET 3. How comfortable are you using social networking sites such as Facebook, Twitter, Instagram, Snapchat, or others like them?	.02	**.60**	.04	-.16	3.21	.95
			LCT 1. When I am asked to download new software that I'm not familiar with, I'm unable to get assignments done. *	-.06	**.58**	.05	.25	1.50	.61
Communication Efficacy α = .78	2.11	8.42	CE 6. How well do you communicate with your instructor in writing?	.06	-.10	**.74**	.03	3.18	.78
			CE 7. How well do you clearly ask your instructor or teaching assistant (TA) questions?	.01	-.08	**.74**	.11	2.97	.83
			CE 8. How well do you express your opinions to the instructor respectfully?	-.07	-.04	**.66**	.18	3.37	.73
			CE 5. How well do you give appropriate feedback to others, even when you disagree?	-.10	.04	**.65**	-.11	2.85	.80
			CE 4. How well do you actively communicate when working as part of a group?	.03	.08	**.65**	-.11	3.15	.76
			CE 2. How well do you express your opinion in writing to others?	.05	.05	**.60**	-.02	3.15	.84
			CE 3. How well do you contribute your fair share of work in a group?	.18	.16	**.46**	-.05	3.54	.60
			ECC 1.I seek help when there are challenges in my life.	.05	.02	**.41**	.05	2.89	.73
Locus of Control α = .70	1.55	6.19	LOC 7. My grades are basically determined by things beyond my control, and there is little I can do to change that. *	.07	-.02	.04	**.74**	1.40	.55

	LOC 4. How well I do in my classes is often determined by chance.*	.04	-.07	.10	**.65**	1.52	.59
	LOC 2. No matter what I do, I can't seem to do well in my classes. *	.21	.11	-.05	**.63**	1.52	.56
	LOC 6. When I do poorly in a class, it's usually because I haven't given it my best effort.	-.16	.11	-.03	**.61**	3.22	.69
	LOC 5. There is little I can do about my performance in college. *	.14	.02	.06	**.56**	1.30	.54

** Item was reverse coded.*