Student Satisfaction and Perceived Learning in Online Learning Environments: An Instrument Development and Validation Study

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The *Student Learning and Satisfaction in Online Learning Environments (SLS-OLE)* is an easy to administer 19-item, self-report measure of student learning and satisfaction in online learning environments. Past studies have reported a measure of four domains of perceived learning and satisfaction associated with their experiences with online learning in higher education. The purpose of this paper was to examine the factor structure of the SLS-OLE with a large sample of graduate students at one university located in the southeastern United States. To assess the fit of the data to the four-factor structure, a confirmatory factor analysis was employed on data collected from 337 participants pursuing an online graduate degree in educational leadership. Results indicate the model adequately fits the data and findings signify that instructor presence is the best predictor of both student satisfaction and perceived learning.

Keywords: course structure and organization, learner interaction, instructor presence, student engagement, and online learning, instrument validation

Background

Studies have shown that course structure or organization, learner interaction, student engagement, and instructor presence accounts for considerable variance in student satisfaction and perceived learning in online learning environments through a range of pathways. The present research will investigate the psychometric properties of the researcher created instrument used to measure the various relationships. This study aims to further test and refine the Student Learning and Satisfaction in Online Learning Environments Instrument (SLS-OLE). The results of this study should provide educators with a psychometrically-sound instrument that can be used to measure the impact of course structure or organization, learner interaction, student engagement, and instructor presence on both student satisfaction and perceived learning.

Online learning environments are becoming the norm rather than the exception in higher education. As such, it is important to understand what students report about what makes them satisfied with their experiences in online courses as well as their beliefs about their learning based on those experiences. Past studies that investigated various aspects of course design, student engagement, instructor presence and feedback, and how students interact with one another in the learning environment have shown contradictory results (Eom et al., 2006; Gray & DiLoreto, 2016; Swan, 2001). Thus, the need for additional investigation is a worthy undertaking. Using the past research to guide the development of a questionnaire for use to investigate specific aspects of course design, student engagement, instructor presence, and learner-to-learner interaction, the researchers developed a 19-item questionnaire.

Review of the Literature

Building upon a previous study by Eom et al. (2006), this study investigates the relationships of learning interaction (with instructor and one another), course structure, and instructor presence within online learning environments. Eom et al. (2006) surmised that course structure, instructor feedback, learning style, interaction, self-motivation, and instructor facilitation all significantly affected student satisfaction. However, the researchers (Eom et al., 2006) found that only learning style and instructor feedback significantly influenced perceived student learning outcomes. Student satisfaction was also a significant predictor of learning outcomes (Eom et al., 2006).

Richardson and Swan (2003) discovered that students who perceived high levels of instructor social presence in courses had greater satisfaction with their instructors. Student engagement and active learning are essential to increase student learning, which can lead to greater retention in programs (Richardson & Swan, 2003). Active discussion, positive interaction with instructors, and clarity of course design significantly impacted students' levels of perceived learning and satisfaction (Swan, 2001).

Many studies have investigated the effect of student engagement in online settings. Kuh and his colleagues discovered students perceived themselves to have greater learning gains and engagement in learning and coursework, as well as improved social skills (Barber, 2020; Hu & Kuh, 2001; Khan et al., 2021; Kuh & Hu, 2001; Kuh & Vesper, 2001; Surani & Hamidah, 2020). Based upon items from the National Survey of Student Engagement (NSSE) instrument (2008), Chen et al. (2010) explored the effects of student engagement. As students worked more

collaboratively, based upon course expectations, their perceptions of their participation in courses and engagement in their learning was increased (Duderstadt et al., 2002; Surani & Hamidah, 2020; Thurmond & Wambach, 2004). In understanding the factors that affect the engagement of online students, instructors can design better courses using effective instructional strategies to engage and promote active learning (Khan et al., 2021; Kucuk & Richardson, 2019; Misopoulos et al., 2018).

Course Structure and Organization

The design and development of course curriculum, resources, strategies, schedule, and overall planning are important aspects of course organization and structure before, during, and after teaching a course (Garrison et al., 2000). Course expectations for assignments, guidelines, assessment rubrics, due dates, and content-related resources are provided to support student learning and academic success (Gray & DiLoreto, 2015). Instructional management includes the "explicit and implicit structural parameters and organizational guidelines" of a course (Garrison et al., 2000, p. 101). Course structure, including communication of expectations and objectives, is considered one of the most important variables that affects students' perceptions about online courses (Misopoulos et al., 2018; Moore, 1991).

A course should be user-friendly, organized in a logical manner, and detailed about what is expected for students to learn and achieve (Eom et al., 2006). Instructors "need the expertise to develop a class structure" that promotes rigorous standards, social interaction, and independent learning for students (Muirhead, 2004, p. 50). Additional support, assistance, or training should be provided to those teachers lacking the appropriate skills to plan, design, and develop courses that are engaging (Vargas, 2014). How students view the 'overall usability' of a course is likely correlated to their levels of learning and satisfaction. If a course is logically laid out and well-organized, students are more likely to be satisfied with what they learn in the course (Eom et al., 2006). Jaggars and Xu (2016) surmised that quality online courses had the following characteristics in common: a variety of interpersonal interactions (with other students and instructor), effective use of technology, well-organized content, and well-defined objectives.

Learner Interaction

In online learning environments, students often feel distanced and disconnected from their instructor and other students. Learner interaction includes communication with the instructor, classmates, and course content (lessons, discussions, etc.) which may occur formally or informally (Alqurashi, 2019). By connecting course content and assignments to current problems or issues from the field of study, students are able to connect the theoretical to their professional or practical experience. This allows for deeper involvement in assignments and discussions with colleagues (Shearer, 2003).

Instructors can strengthen their connections with their students by offering detailed and constructive feedback about class performances and suggesting specific ways to improve their writing and such (Muirhead, 2004). Further, choices and options to allow for flexibility in completing assignments allows students to take more ownership of their learning and to have a more individualized learning experience (Collis, 1998). Instructors can integrate the following

strategies to encourage greater interaction among students in the online learning environment: promoting critical thinking, sharing biographical posts (students and instructors alike), offering constructive and positive feedback about assignments, integrating examples and stories into course discussions and content, allowing flexibility within the structure and schedule of the course, and connecting the current and relevant issues (Muirhead, 2004). In requiring students to think about their thinking, the instructor can model metacognitive and reflective thinking skills (Muirhead, 2004).

When designing the course content and assignments, a variety of research-based resources and perspectives should be considered to allow students to question their assumptions and beliefs about content (Collision et al., 2000; Muirhead, 2004). Sufficient time should be provided to allow for deeper thinking, critical reflection, and more interaction with classmates via discussions (Garrison et al., 2000). The level of interpersonal interaction was found to be a predictor of student grades. Students enrolled in low-interaction courses tend to earn a letter grade lower than those in high-interaction courses (Jaggars et al., 2013).

Instructor Presence

How a course is organized, designed, supported, and taught with many opportunities for positive interaction between the students and teacher promotes greater instructor presence (Jaggars et al., 2013; Karmin et al., 2006). Social presence, slightly different than instructor presence, has been described as the "degree of feeling, perception, and reaction of being connected by computer mediated communication" (Tu & McIsaac, 2002, p. 40). Establishing the instructor's presence and personality in discussions, assignments, and discussions are very important in online courses (Shea et al., 2006). Instructors can also embed a "sense of caring by soliciting student feedback about the course and using that feedback to enhance the course" (Jaggars et al., 2013, p. 6).

There are three indicators for instructor presence: direct instruction, building understanding, and instructional management (Garrison et al., 2000). Direction instruction involves indirect and direct teaching including lectures (video, audio, etc.), asynchronous and synchronous sessions, the selection of all course content (readings, videos, etc.), and all feedback provided to students (Garrison et al., 2000). By actively engaging with students, an instructor can redirect attention, draw in those less engaged, validate others' contributions to discussions, and guide the learning process (Barber, 2020; Garrison et al., 2000; Park & Kim, 2020). Finally, how the course is organized and structured, which have already been described, are considered to be the instructional management of the course.

The sense of a learning community and the instructor's presences in online courses tend to have a reciprocal relationship, in that one influences the development or depth of the other (Shea et al., 2006). Online learning tools and resources can assist instructors in establishing an approachable and knowledgeable presence in their courses (Jaggars et al., 2013). Some argue that teachers have to be more intentional in connecting with students in an online setting, which can be more challenging than in face-to-face courses (Jaggars et al., 2013; Park & Kim, 2020). Students are more likely to excel in courses where they have more opportunities for interpersonal communication and interaction (Jaggars et al., 2013). Continuous communication

detailed and consistent feedback, and opportunities for critical reflection promote greater instructor presence in online learning environments (Garrison et al., 2000; Jaggars et al., 2013).

Integrating audio and video synchronously and asynchronously gives students the chance to connect with their instructors on a more personal level (Anderson et al., 2001). Professors can share relevant examples or personal experiences related to the course discussion or content and respond immediately to students' questions, which can alleviate concerns or worries (Anderson et al., 2001; Park & Kim, 2020). In responding promptly to students, seeking student feedback about ways to improve the course, and asking follow-up questions, instructors' presence is perceived as greater by students (Jaggars et al., 2013). By allowing students to participate in interactive sessions, students feel as though they are more familiar and acquainted with their instructors and fellow students (Gray & DiLoreto, 2015). Using interactive technologies can improve academic performance and student learning outcomes (Jaggars et al., 2013).

In comparing students' perceptions of instructor presence and a sense of community, students who receive asynchronous audio feedback, versus those who only are given text-based feedback, are more satisfied (Ice et al., 2007). Students perceive the audio feedback shows their professors care more and provide clearer communication, which they three times more likely to make the recommended changes (Ice et al., 2007). Instructors who facilitate online learning by combining video, audio, discussion, practical activities, chats, and other online tools develop more supportive learning environments than those who do not (Jaggars et al., 2013).

Student Engagement

Student engagement is a "students' willingness, need, desire, and compulsion to participate in, and be successful in, the learning process" (Bomia et al., 1997, p. 294).

Different pedagogical strategies are needed for online learning environments to promote engagement and learning opportunities. Moving beyond any skills that can be learned, engagement emphasizes a person's attitudes or dispositions about past experiences related to learning (Mandernach et al., 2011). Student engagement includes how students interact with others in a course, the level of interest they show, and their desire or motivation to learn about the subject area (Briggs, 2015).

Attitude, motivation, personality, effort, and self-confidence are several of the affective factors that relate to student engagement (Mandernach et al., 2011). According to Jaggars and Xu (2016) the quality of course interaction is positively correlated to online students' grades. In considering the affective aspects of student engagement, professors are able to develop and plan more effective activities and lessons to encourage more active participation in course assignments and learning (Jennings & Angelo, 2006; Mandernach et al., 2011).

There are several kinds of student engagement, including behavioral emotional, cognitive, and agentic (Alqurashi, 2019; Barber, 2020; Ferrer et al., 2020; Fredricks et al., 2004; Kucuk & Richardson, 2019; Reeve & Tseng, 2011). Behavioral engagement is defined as "students' attention, effort, and persistence in learning" (Kucuk & Richardson, 2019, p. 198). Emotional engagement relates to having high levels of interest and positive emotions about a course (Kucuk & Richardson, 2019). Students' sharing of strategic thinking and strategies used to learn demonstrate cognitive engagement (Fredricks et al., 2004; Kucuk & Richardson, 2019; Reeve & Tseng, 2011). Finally, academic engagement is described as the "students' constructive

contribution to the flow of the instruction they receive (Ferrer et al., 2020; Kucuk & Richardson, 2019; Reeve & Tseng, 2011).

When students are willing to exert more effort than expected, invested in a desire to learn and grow, and motivated to succeed in classes, they tend to be more engaged in their coursework and education (Mandernach et al., 2011). Traditionally, instructional effectiveness is measured by students' perceptions of satisfaction in their learning and how they master course objectives. Course engagement extends to "considerations of the impact of instructional activities on student engagement provides a more complete picture of the teaching-learning dynamic" (Mandernach et al., 2011, p. 277). In determining the level of student engagement, instructors can adapt their pedagogical practices to respond to changes in students' attitudes, involvement, and motivation about their education (Ferrer et al., 2020; Kucuk & Richardson, 2019; Mandernach et al., 2011).

Online instructors have access to many tools to gather formal and informal data about how their students are participating and engaging in a course. Professors can analyze student time online, views of content (videos, modules, readings, etc.), log-in data, and other self-reported data (surveys, discussions, reflections, etc.) as ways to assess student engagement (Gray & DiLoreto, 2016). It is also important to determine if students have enough opportunities to interact with one another and the instructor in meaningful and challenging ways that enrich their educational experience (Khan et al., 2021; Langley, 2006). At the end of the semester, student feedback and survey results can be analyzed and considered as a part of an effort to improve a course from term to term.

Student Satisfaction

Numerous studies have been conducted to determine the level of student satisfaction in traditional and online environments (Barber, 2020; Beqiri et al., 2010; Marsh & Roche, 1997; Misopoulos et al., 2018; Shea et al., 2003; Wang et al., 2004). Wang et al. (2004) found that students were more apt to rate professors and courses positively if they perceived the instructors to facilitate and encourage learning, communicate effectively, organize the course well, evaluate coursework fairly, and show genuine interest in students' progress and learning in the course. Marsh and Roche (1997) created a model for determining students' perceptions of satisfaction, which measured instructor enthusiasm, rapport, coverage of content, learning value of subject area, interaction, organization, and assessment. In another study, students who were enrolled in cohorts and received specific, detailed feedback from and positive interaction with instructors were more satisfied with their educational experiences (Shea et al., 2003).

There are four factors related to student satisfaction in an online learning environment to include: amount of on-task time, engaged and active learning, cooperation among students, and faculty and student communication and interaction (Bangert, 2006). In comparing student satisfaction based upon types of feedback received, Ice et al. (2017) discovered students preferred text and embedded asynchronous audio feedback, rather than just text feedback. The communication was clearer and sincere concern of the professor was conveyed. Students were three times more likely to make the suggested changes when they received audio feedback (Ice et al., 2007).

Beqiri et al. (2010) determined that graduate courses were better suited for graduate students, as opposed to undergraduate students who benefitted from face-to-face courses. Finally, students who had prior knowledge about course content were more likely to be satisfied with online course delivery (Beqiri et al. 2010). Additionally, students who liked how a course was structured were more likely to be satisfied with their perceptions about what they learned in the course (Adams, 2017; Tu & Corry, 2002). Finally, Kucuk and Richardson (2019) found cognitive and teaching presence, as well as emotional, behavioral, and cognitive engagement, to be significant predictors of student satisfaction.

Perceived Learning

For this study, students were asked to assess their perceptions of their learning in a specific course for spring 2015 semester. It was requested that students reflect upon the course assignments, level of learning they experienced, and benefits gained from the course (Gray & DiLoreto, 2016). The educational leadership students were also asked how well the course prepared them as future instructional leaders. As more online programs are being offered, especially at the graduate level, it is important to consider the needs of the adult learner (Trekles, 2013). For example, if students evaluate what was learned in a course as limited or minimal, then instructors are responsible for redesigning the course, improving instructional strategies, and providing more effective assessment in the course (Gray & DiLoreto, 2015).

Research Questions

1. What is the factor structure of an instrument designed to assess student satisfaction and perceived learning?
2. How does the model fit the data collected from students completing an online graduate educational leadership program?

Methods

Participants and design

We conducted this validation study in two steps. First, we performed an exploratory factor analysis on a sample of graduate educational leadership students (*N* = 156) age 18 years or older at a public Southeastern university during the fall semester of 2015. Students completed a questionnaire using Qualtrics. All study procedures were approved by the university's IRB. Students had, on average, completed eight online courses in their program of study (*SD* = 1.02); 46 (29.5%) were men; 107 (68.6%) were women; 3 (1.9%) did not indicate their gender. 32 (20.6%) were 21-30 years old; 55 (35.5%) were 31-40 years old; 55 (35.5%) were 41-50 years old; 13 (8.4%) were over 50 years old.

Next, the optimal factor structure that resulted from the first was cross-validated using a different sample of graduate educational leadership students (*N* = 337) age 18 years or older at the same institution during the spring semester of 2018. As before, students completed a questionnaire using Qualtrics and the study procedures were approved by the university's IRB.

Half (*n* = 171; 50.3%) of the students had completed at least seven online courses in their program of study; 70 (20.6%) were male; 269 (79.1%) were female; 1 (0.3%) did not indicate their gender. Sixty-two (18.2%) were 21-30 years old; 150 (44.1%) were 31-40 years old; 98 (28.8%) were 41-50 years old; 30 (8.8%) were over 50 years old.

Measures

Course Quality

We began with a pool of 19 items derived from a review of the literature. We hypothesized that the items reflected the underlying dimensions of "course structure and organization," "learner interaction," "student engagement," and "instructor presence." Responses were given on a six-point scale (1 = strongly disagree; 2 = mostly disagree; 3 = slightly agree; 4 = moderately agree; 5 = mostly agree; 6 = strongly agree). In the Exploratory Analysis sample, the scales were acceptable to strong internal consistency: course structure and organization (α =.89); learner interaction (α = .86); student engagement (α = .73); instructor presence (α = .82). In the Confirmatory Analysis sample, the scales were acceptable to strong internal consistency: course structure and organization (α =.89); learner interaction (α = .86); student engagement (α = .73); instructor presence (α = .82).

Student Satisfaction

Student Satisfaction was a scale composed of the average scores across five items that were rated on a six-point scale (1 = strongly disagree; 2 = mostly disagree; 3 = slightly agree; 4 = moderately agree; 5 = mostly agree; 6 = strongly agree). The items were (1) I am satisfied with my overall experience in the course; (2) I am satisfied with the level of student interaction that occurred in the course; (3) I am satisfied with my learning in the course; (4) I am satisfied with the course instructor; and (5) I am satisfied with the course content. In the Exploratory Analysis, the scale had a strong internal consistency, α =.86. In the Confirmatory Analysis sample, the scales were acceptable to strong internal consistency: course structure and organization (α =.89); learner interaction (α = .86); student engagement (α = .73); instructor presence (α = .82).

Perceived Learning

Perceived Learning was a scale composed of the average scores across four items that were rated on a six-point scale (1 = strongly disagree; 2 = mostly disagree; 3 = slightly agree; 4 = moderately agree; 5 = mostly agree; 6 = strongly agree). The items were (1) The learning tasks enhanced my understanding of the content; (2) I learned skills that will help me in the future; (3) The learning activities promoted the achievement of the student learning outcomes; and (4) The course contributed to my professional development. In the Exploratory Analysis, the scale had a strong internal consistency, α = .88. In the Confirmatory Analysis sample, the scales were acceptable to strong internal consistency: course structure and organization (α =.89); learner interaction (α = .86); student engagement (α = .73); instructor presence (α = .82).

Analysis plan

Exploratory Analysis

For the first step, we used exploratory factor analysis (principal axis factoring with direct oblimin rotation) to determine the optimal factor structure of the four theoretical dimensions of course quality. We used an oblique rotation strategy because our goal was to account for the relationships among the factors. We have no theoretical evidence to suggest the underlying course quality dimensions would not be related to one another. Researchers have argued that oblique rotations should be used first and can even be used if the factors are uncorrelated (Beavers et al., 2013; Fabrigar et al., 1999).

Following the best practices outlined by Field (2018), Costello and Osbourne (2004), and Henson and Roberts (2006), we tested the hypotheses of the factor analysis by examining the Kaiser-Meyer-Olkin (KMO) and Bartlett chi square statistics and communality coefficients. We examined the underlying dimensionality of the factors using Kaiser's criteria and a visual inspection of the scree plot. The pattern and structure matrices were examined to determine if the factor loadings were sufficient and to identify any potential concerns with cross loading. The factor correlation matrix verified the hypothesized interrelationship among the dimensions of course quality.

For evidence of convergent validity, we correlated the four course design dimensions with the two outcome measures. We also sought to provide early evidence of predictive validity by regressing the dimensions on each outcome after controlling for age, gender, and the number of online courses a student had previously completed. All analyses at this step used SPSS (version 25).

Confirmatory Analysis

For the second step, we used confirmatory factor analysis (maximum likelihood estimation) to cross validate the proposed factor structure of the four theoretical dimensions of course quality. Consistent with traditional CFA approaches, we tested several models: a null model, a model with correlated factors and uncorrelated item error variances, and a model with correlated factors and error variances. Factor loadings were fully estimated, meaning the latent factor variances were each fixed at 1.0. Model adequacy was assessed relative to several benchmarks (Hu & Bentler, 1999; Schreiber et al., 2006): normed chi-square (χ^2/df) < 5.0; CFI and TLI > .90; and root mean square error of approximation (RMSEA) < .08. We conducted these analyses using AMOS (version 23).

We also sought to cross validate the early evidence of convergent and predictive validity found in step one by replicating the process in the second sample. As before, we correlated the four dimensions with the two outcome measures and regressed the four dimensions on each outcome after controlling for age, gender, and the number of online courses the student had previously completed. We conducted these analyses using SPSS (version 25).

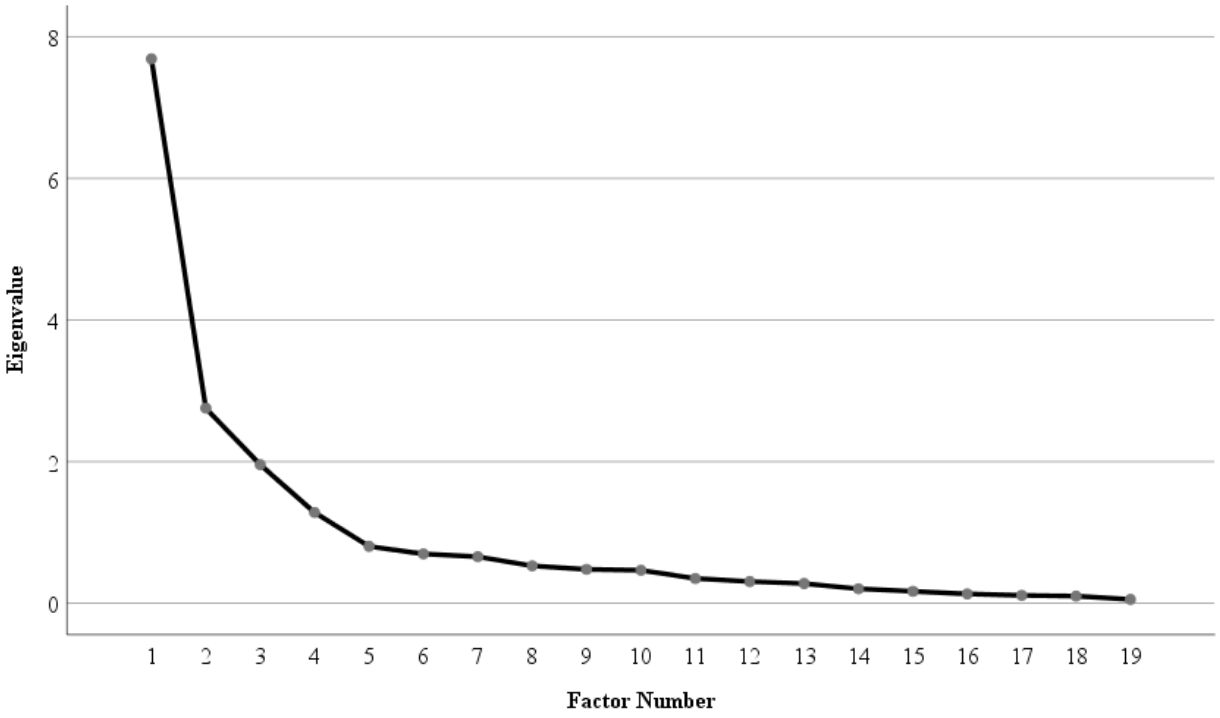
Results

Exploratory Analysis

The KMO and Bartlett statistics verified the sampling adequacy for the initial pool of items, KMO = .83, $\chi^2(171) = 2021.99$, $p < .001$. Item communalities ranged from .38 to .90 after extraction. Four factors emerged with eigenvalues greater than 1.0 and explained 72.00% of the variance. The scree plot (Figure 1) showed inflections that would justify retaining four factors.

Figure 1

Screen Plot of Inflections for Four Factors



The pattern matrix indicated two items that required further investigation. In one case, an item related to participation in class discussions (a hypothesized engagement variable) cross-loaded on two factors (student engagement and instructor presence). We could not justify mapping that item to the instructor's presence and removed it from the pool. In a second case, an item cross loaded on the "student engagement and instructor feedback dimensions. After inspection, we deduced that the potential source of the cross-loading was the word "feedback" found in the item description. That word is prevalent among multiple items in the instructor presence dimension when referring student-instructor feedback and communication. The student engagement construct (to which this item was ultimately retained) dealt explicitly with peer feedback.

The resulting structure matrix indicated no significant cross-correlations among the items and factors. The factor correlation matrix confirmed that the four underlying dimensions were significantly correlated with one another. The final factor analysis results from the 19 retained items are displayed in Table 1. The overall scale alpha was .91.

Table 1

Results from Exploratory Factor Analysis

		h^2	Factor Loadings			
			1	2	3	4
			Instructor Presence	Course Structure & Organization	Student Engagement	Learner Interaction
1.	Student learning outcomes were aligned to the learning activities.	.79		**.86**		
2.	Course navigation was arranged in a logical manner.	.40		**.64**		
3.	Instructions about student participation were clearly presented.	.77		**.86**		
4.	The purpose of the course was clearly presented.	.85		**.91**		
5.	I frequently interacted with other students in the course.	.69				**-.78**
6.	The learning activities promoted interaction with others.	.73				**-.82**
7.	I had the opportunity to introduce myself to others in the class.	.53				**-.76**
8.	I communicated often with other students in the course.	.55				**-.73**
9.	I received ongoing feedback from my classmates.	.57	.32			**-.37**
10.	I frequently interacted with my instructor of this course.	.58	.38		**.57**	
11.	I discussed what I learned in the course outside of class.	.38			**.35**	
12.	I completed my readings as assigned during the course.	.49			**.65**	
13.	I participated in synchronous and/or asynchronous chat sessions during the course.	.52			**.71**	

14. I was actively engaged in the activities required in the course.				**.39**	
15. The instructor's feedback on assignments was clearly stated.	.90	**.96**			
16. The instructor's feedback on assignments was constructive.	.83	**.90**			
17. The instructor provided timely feedback about my progress in the course.	.78	**.84**			
18. The instructor cared about my progress in the course.	.65	**.62**			
19. I learned from the feedback that was provided during the course.	.73	**.64**			
Factor correlations (Variance Explained)					
Instructor Presence		(40.5%)			
Course Structure & Organization		.26	(14.5%)		
Student Engagement		.29	.04	(10.3%)	
Learner Interaction		-.47	-.27	-.48	(6.7%)

To provide initial evidence of convergent validity, we estimated the correlations between the four course design dimensions and the two outcome measures. The correlation between student satisfaction and perceived learning was extremely large (r =.89, p < .001). For student satisfaction, the correlations were: Course Structure & Organization (.32), Learner Interaction (.68), Student Engagement (.65), and Instructor Presence (.68). For Perceived Learning, the correlations were: Course Structure & Organization (.37), Learner Interaction (.55), Student Engagement (.62), and Instructor Presence (.68).

To provide initial evidence of predictive validity and assess the impact of the dimensions on the outcomes, we conducted two linear regressions. In the regression to assess the relative impact of the course design dimensions on student satisfaction. The model for student satisfaction was statistically significant (R^2 = .65, F(4,151) = 68.45, p<.001). After controlling for age, gender, and number of online courses completed, three significant predictors emerged: Learner Interaction (β = .28, p<.001), Student Engagement (β = .30, p < .001), and Instructor Presence (β = .32, p<.001). The model for perceived learning was also statistically significant, R^2 = .60, F(7,145) = 30.50, p< 001. After controlling for age, gender, and number of online courses completed, three significant predictors emerged: Course Structure & Organization (β = .16, p=.005), Student Engagement (β = .30, p<.001), and Instructor Presence (β = .47, p<.001).

Confirmatory Analysis

The null model was a terrible fit to these data: $\chi^2(171) = 3785.62$, $p < .001$; TLI = .00, CFI = .00, RMSEA = .251, 90CI [.244, .258]. A single factor model where all items represent course design broadly was an improvement over the null model, but still a poor fit: $\chi^2(152) = 1088.24$, $p < .001$; TLI = .709, CFI = .741, RMSEA = .135, 90CI [.128, .143].

The four-factor uncorrelated model generated from the exploratory analysis fit these data significantly better than the single factor model: $\chi^2(152) = 1064.60$, $p < .001$; TLI = .716, CFI = .748, RMSEA = .134, 90CI [.126, .141]. To improve model fit, we correlated the four factors as further suggested by the exploratory analysis. Model fit improved over the four-factor uncorrelated version: $\chi^2(146) = 404.48$, $p < .001$; TLI = .916, CFI = .928, RMSEA = .073, 90CI [.064, .081]. We next examined the potential correlation of item error variances within a factor. The decision to correlate these residuals was done in consideration of the conceptual validity to do so. One pair of items within the "Learner Interaction" factor was correlated, $\vartheta_{5,8}$ ($r = .467$). The resulting model was an improvement over the four-factor correlated model: $\chi^2(145) = 363.52$, $p < .001$; TLI = .929, CFI = .940 RMSEA = .067, 90CI [.058, .076]. The results from model testing are displayed in Table 2. The final structural model is depicted in Figure 2. The overall scale alpha was .92 in this sample.

Table 2

Results from the Confirmatory Factor Analyses

	χ^2/df	CFI	TLI	RMSEA [90% CI]
Null Model	22.14	.00	.00	.25 [.24, .26]
1-Factor Model	7.16	.74	.71	.14 [.13, .14]
4-Factor Uncorrelated Model	7.00	.75	.72	.13 [.13, .14]
4-Factor Correlated Model	2.77	.93	.92	.07 [.06, .08]
4-Factor Correlated Model w/ Item Covariances	2.49	.94	.93	.07 [.06, .08]

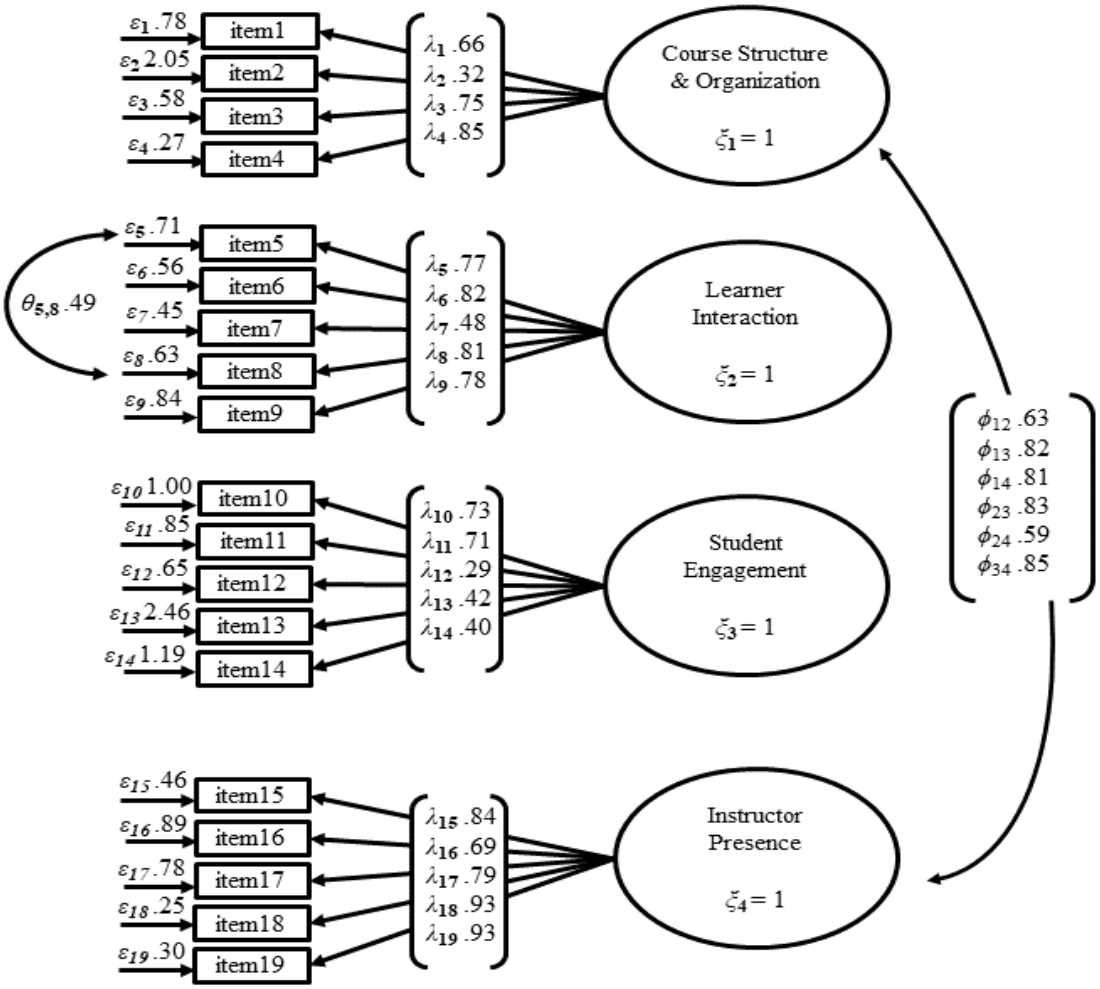
	Factor			
Factor correlations	1	2	3	4
1. Instructor Presence	--			
2. Course Structure & Organization	.81	--		
3. Student Engagement	.85	.82	--	
4. Learner Interaction	.59	.63	.83	--

To provide additional evidence of convergent validity, we estimated the correlations between the four course design dimensions and the two outcome measures. The correlation

between student satisfaction and perceived learning was extremely large, r =.89, p < .001. For student satisfaction, the correlations were: Course Structure & Organization (.71), Learner Interaction (.59), Student Engagement (.66), and Instructor Presence (.87). For Perceived Learning, the correlations were: Course Structure & Organization (.70), Learner Interaction (.56), Student Engagement (.64), and Instructor Presence (.74).

Figure 2

Confirmatory factor analysis of course quality. ε = error. ϑ = item correlation. λ = factor loadings. ξ = factor variances. ϕ = factor correlations



To provide additional evidence of predictive validity and assess the impact of the dimensions on the outcomes, we conducted two linear regressions. In the regression to assess the relative impact of the course design dimensions on student satisfaction. The model for student satisfaction was statistically significant, R^2 = .80, F(7, 325) = 193.15, p<.001. After controlling for age, gender, and number of online courses completed, all four dimensions were statistically significant predictors: Course Structure & Organization (β = .15, p<.001) Learner Interaction (β = .12, p=.001), Student Engagement (β = .13, p<.001), and Instructor Presence (β = .63, p<.001). The model for perceived learning was also statistically significant, R^2 = .66, F(7, 325) = 90.30, p<.001. After controlling for age, gender, and number of online courses completed, all

four dimensions were statistically significant predictors: Course Structure & Organization (β = .26, *p*<.001) Learner Interaction (β = .11, *p*=.016), Student Engagement (β = .19, *p*<.001), and Instructor Presence (β = .39, *p*<.001).

Discussion

This study examined the factor structure of an instrument designed to assess course quality in a sample of educational leadership graduate students. We report results from exploratory and confirmatory factor analyses. We also provide early evidence of convergent and predictive validity by correlating the four dimensions of course quality with two outcome measures, student satisfaction and perceived learning. The results from both factor analyses showed a strong degree of concordance. The 19 items of the proposed scale were mapped to four distinct, yet interrelated factors. All items loaded onto their respective factors and the final model had acceptable fit.

Regression results indicated two important findings. First, instructor presence is the best predictor of student satisfaction and perceived learning. Despite being such a significant factor, the other three dimensions also uniquely contributed to the model in a statistically significant way. Therefore, we propose that all four dimensions are needed to best determine the potential impact on student satisfaction and perceived learning.

Limitations

This study had several limitations. First, data were based on self-reports, which can be subject to social desirability and other biases. Assurances of anonymity were employed in the study design to enhance response accuracy and reduce threats to validity. We also used a convenience sample of graduate students in online courses in only one program of study. This type of sampling strategy potentially reduces the generalizability of study findings and does not permit causal inferences.

Participants were asked to complete the questionnaire with one course in mind. However, we realize this may have limited how they responded to the context of the various constructs. Additionally, students were permitted to complete the questionnaire more than once by using other courses as the basis for their responses. We acknowledge that these responses may have inflated the results for each participant.

Conclusions and Future Research

Past studies have shown contradictory findings about the perceived learning and student satisfaction. This particular study was conducted by the researchers to solidify evidence of validity and reliability of the Student Learning and Satisfaction in Online Learning Environments (SLS-OLE) instrument. Results of EFA and CFA show promising evidence of a four-factor, correlated model including instructor presence, course structure/organization, student engagement, and learner interaction.

The researchers suggest future studies using participants at various degree-seeking levels (i.e., undergraduate and graduate) and from multiple disciplines. It is unclear how the reliability

and validity will change with other populations of students. Furthermore, it is unclear if the scale is invariant across groups (undergraduate versus graduates). Additional research is warranted to better understand the implications of the impacts of these factors on both perceived learning and student satisfaction.

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