Assessment of Online Learning Environments: Using the OCLES(20) with Graduate Level Online Classes

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Abstract

Online education for post-secondary instruction is a rapidly expanding enterprise among public and private universities. While the quantity of courses over the past 10 years has exponentially increased, the quality of these courses has not. As universities accept the challenge of creating effective and responsive online learning programs to address student demand, real concern about the best design for these online learning opportunities has arisen. In traditional classrooms and educational activities, student interaction and teacher control are negotiated to support the intellectual development and knowledge acquisition of learners. These constructivist teaching practices have proved most effective in traditional classrooms—should this not be the same in an online classroom? To this purpose, this article describes the progressive development of a valid and reliable assessment tool, Online Constructivist Learning Environment Survey—OCLES(20) with Demographic Data, for determining the constructivist design of online teaching environments. This student self-report survey seeks to provide guidance for the development of online learning environments through collection of student perceptions of teaching strategies and practices in online classrooms. Data collection beyond the initial field test of the OCLES(20) has provided further validation and suggests recommendations for further refinement of the instrument.

Introduction

To insure quality instruction, the task of assessing the constructivist nature of learning environments has been a growing field of focus in educational research over the past decades (Adams, 2007; Fraser & Fisher, 1986; Johnson & McClure, 2000; Taylor & Fraser, 1991; Walker, 2005). However, only recently has assessment of online learning environments become a focus for research. As Palloff and Pratt (2001) indicate, there is high demand for both institutions and students to enter into meaningful online learning experiences. To serve this need, work was undertaken to develop a valid and reliable instrument to assess the constructivist nature of online learning environments.

The original Constructivist Learning Environment Survey (CLES), developed for use with high school math and science students and teachers in 1991, included 35 items, seven in each of five key dimensions (Taylor, Fraser, & White, 1994). The five dimensions of concern for assessing constructivist learning environments are as follows: (a) personal relevance, (b) uncertainty, (c) critical voice, (d) shared control, and (e) student negotiation. Table 1 provides descriptions of the dimensions identified by Taylor et al. (1994).

Table 1

Dimensions for Assessing Constructivist Learning Environments

Dimension	Description
Personal relevance	"…concerned with the connectedness of school [experiences] to students' out-of-school experiences. We are interested in teachers making use of students' everyday experiences as a meaningful context for the development of students'…knowledge."
Uncertainty	"…has been designed to assess the extent to which opportunities are provided for students to experience…knowledge as arising from theory dependent inquiry, involving human experience and values, evolving and non-foundational, and culturally and socially determined."
Critical voice	"…assesses the extent to which a social climate has been established in which students feel that it is legitimate and beneficial to question the teacher's pedagogical plans and methods, and to express concerns about any impediments to their learning."
Shared control	"…concerned with students being invited to share control with the teacher of the learning environment, including the articulation of their own learning goals, the design and management of their learning activities, and determining and applying assessment criteria."
Student negotiation	"…assesses the extent to which opportunities exist for students to explain and justify to other students their newly developing ideas, to listen attentively and reflect on the viability of other students' ideas and, subsequently, to reflect self-critically on the viability of their own ideas."

Johnson and McClure (2000) modified the original CLES by keeping the same five dimensions but reduced the number of individual items to four per dimension for a total of 20 items after field testing the instrument and validating it using the same exploratory factorial analysis process conducted in the study by Taylor, Fraser, and White (1994). This newer form of the survey is referred to as the CLES(20) and has reported an internal consistency alpha coefficient of .88. Both the CLES and the CLES(20) are designed to assess the constructivist teaching and learning practices in traditional classrooms.

McClure and Gatlin (2007) designed an online version of the CLES(20), referred to as the OCLES(20). This revised version of the CLES(20) was designed to measure online constructivist learning environments using the same five dimensions and was field tested in 2005 with 127 Walden University doctoral students. No demographic questions were included with the OCLES(20). Preliminary analysis, using these 127 students, was conducted by Singh (as cited in McClure & Gatlin, 2007) and supported the five dimensions of the CLES(20). However, it was noted that the ratio of subjects to variables in the analysis was only slightly above the 5:1 minimum which is recommended for factor analysis.

In January 2006, the instrument was further modified to include collection of demographic data and was named the OCLES(20) with Demographic Data. The inclusion of demographic data was considered an important modification of the instrument. The issues of age, gender, technology expertise, and previous experience in online classrooms were identified as impacting variables on the student perceptions of online classrooms. Data collection continued with the same student population for six semesters. The purpose of this study was to further examine the OCLES(20) with Demographic Data using a larger set of data. The inclusion of demographic information also allowed for preliminary analyses using male and female subgroups.

Methods

The OCLES(20) with Demographic Data is a modified version of the CLES(20) by Johnson and McClure (2003) and was developed to more accurately reflect online learning environments with an emphasis on doctoral level research. The survey consists of 20 items (see Table 2) to which the respondent selects one of five options ranging from Almost Always (5) to Almost Never (1). All of the items are positively worded, so a response of Almost Always reflects a favorable response within a constructivist environment.

Table 2

Items Contained on the OCLES(20)

Dimension	Items abbreviations* and description
Relevancy	
R1	The things I learn are relevant to me.
R2	New learning relates to experiences or questions I have that are related to my professional goals.
R3	The things that I learn about are relevant to my current and/or future educational environments.
R4	I learn things that are relevant to my professional growth.
Uncertainty	
U1	I learn that research cannot always provide clear answers to problems.
U2	I learn that academic explanations to phenomena have changed over time.
U3	I learn that research can be influenced by people's experiences, opinions, and values.
U4	I learn that good research is a way to seek better answers and generate new questions.
Critical voice	
CV1	I feel safe questioning what or how I am being taught.
CV2	I believe I learn better when I am allowed to question what or how I'm being taught.
CV3	It's OK for me to request clarification about activities that are confusing.
CV4	It's acceptable for me to express concerns about anything that gets in the way of my learning.
Shared control	
SC1	I help plan what I am going to learn.
SC2	I help to decide how well I am learning.
SC3	I help to decide which activities work best for me.
SC4	I let the instructor know when I need more or less time to complete assignments.
Student negotiation	
SN1	I dialogue with other students about how to solve problems.
SN2	I explain my ideas to other students.
SN3	I ask other students to explain their ideas.
SN4	I am asked by other students to explain my ideas.

*Abbreviations are used in future tables

The survey was administered to students in the foundational research course of an Ed.D. curriculum at Walden University. The survey was placed on the Survey Monkey® platform and made available to all Walden Ed.D. students enrolled in the foundational research course beginning in the summer of 2005 and continuing through spring 2007. Instructors for these courses were provided information about the survey to assist them in encouraging their students to complete the survey in a timely manner. An email explaining the survey and the significance of their involvement in the study was disseminated to all enrolled students.

Sample

A total of 778 surveys were submitted, and because the first two administrations did not request demographic information, 261 submissions did not contain this information. These submissions are included in the total sample analysis but were not able to be included in the subsample analyses. Table 3 contains demographic information for all but the first two administrations. The table shows that over three-fourths of the students were female and the years of experience were evenly distributed across three of the four available categories. Like experience, teaching assignments were evenly distributed across the three categories of schools. With respect to experience in online programs, almost 80% of the students reported that they had not previously completed a degree program online. However, nearly 60% of the students reported previous experience with online learning activities.

Table 3

Demographics Characteristics of Students (n = 517)

Demographic	*n*	% [a]
Gender		
Female	418	80.9
Male	87	16.8
Years of experience		
0-3 years	14	2.7
4-7 years	151	29.2
8-15 years	197	37.1
15+ years	143	27.7
Previously pursued online degree		
Yes	104	20.1
No	402	77.8
Previously participated in online learning activities		
Yes	294	56.9
No	208	40.2
Major teaching assignment [b]		
k-3	151	29.2
4-6	120	23.2
7-12	179	34.6
k-12	63	12.2
Vo-tech, college, university	39	7.5
Major teaching field [b]		
Self-contained	136	26.3
Science	52	10.1
Mathematics	50	9.7
English, Foreign Languages	55	10.6
Social Studies	43	8.3
Music	9	1.7
Special Education	51	9.9
Physical Education, ROTC	13	2.5
Vo-Tech, College, University	20	3.9

[a] Percents are based on $n = 517$

[b] Multiple response item

Results

Factor analyses were conducted using eigenvalues greater than 1 as the extraction criteria and Promax rotation which allows for correlated factors. Using Stevens' (as cited in Field, 2005) recommendation that .40 is the smallest loading that should be interpreted, only loadings greater than an absolute value of .40 were included in the displayed output. As stated previously, preliminary analysis reported in McClure and Gatlin (2007) only included the first 127 students from the current dataset. It was noted by McClure and Gatlin that there was room for error and further study was necessary because the student to variable ratio was only slightly higher than the 5:1 minimum recommended for factor analysis. However, Field (2005) recommends a more stringent ratio of 10:1 or 15:1, and Hair, Anderson, Tatham, and Black (1995) state that some researchers recommend a ratio of 20:1. Since the survey contained 20 items, these recommendations would suggest a sample size of 200-400. The analysis for the total sample was based on data collected from 778 students and resulted in a student to variable ratio close to 40:1.

Factor Analyses

Table 4 contains the rotated factor loadings for the total sample. The analysis resulted in a five-factor model with items loading on the expected factors with values greater than .70, except for three items. One item that loaded on the Critical Voice dimension had a loading of .569 which is considered acceptable. However, one item related to Shared Control did not have a loading greater than .40 on any dimension, and the final item, which was considered part of the Uncertainty dimension, had a weak loading only on the Relevancy dimension.

Table 4
Rotated Factor Loadings for Total Sample

	Dimension				
Item	Relevancy	Negotiation	Voice	Control	Uncertainty
R3	.935				
R4	.901				
R2	.896				
R1	.881				
U4*	**.432**				
SN3		.921			
SN2		.888			
SN1		.876			
SN4		.793			
CV4			.942		
CV3			.928		
CV1			.788		
CV2*			**.569**		
SC4*	-	-	-	-	-
SC3				.906	
SC1				.890	
SC2				.783	
U1					.846
U3					.777
U2					.745
Percent variance explained	35.99	10.20	8.66	8.35	6.30

*Items with loadings < .70 for the total sample analysis

Table 5 contains the rotated factor loadings for the female and male subsamples. Since the first two administrations of the survey did not include demographic information, the subsample analyses were based 418 females and 87 males. This resulted in student-to-variable ratios of approximately 20:1 and 4:1, respectively. Because the ratio for the male subsample was below the recommended minimum, the results must be interpreted with caution.

Table 5

Rotated Factor Loadings for Female and Male Subsamples

	Females (n = 418)				
	Dimension				
Item	Relevancy	Negotiation	Voice	Control	Uncertainty
R3	.923				
R4	.888				
R2	.871				
R1	.869				
U4*	**.401**				
SN3		.909			
SN2		.893			
SN1		.871			
SN4		.767			
CV4			.916		
CV3			.902		
CV1			.741		
CV2*			**.550**		
SC4*	-	-	-	-	-
SC3				.919	
SC1				.871	
SC2				.789	
U1					.825
U2					.745
U3					.739
Percent variance explained	32.03	10.55	8.93	8.68	6.74

	Males (n = 87)				
Item	Relevancy	Negotiation	Voice	Control	Uncertainty
R3	.927				
R4	.875				
R1	.850				
R2	.796				
U4*	**.658**				
SN3		.917			
SN4		.861			
SN2		.843			
SN1		.806			
CV3			.922		
CV4			.886		
CV1			**.613**		
SC1				.877	
SC3				.733	
SC2				.713	
SC4*				**.498**	

U1					.813
U2					.720
CV2*					**.528**
U3	-	-	-	-	-
Percent variance explained	35.12	12.10	9.82	8.38	5.86

*Items with loadings < .70 for the total sample analysis

Using the same extraction and reporting criteria that were used for the total sample, both analyses resulted in five factor models. The loadings for the female subsample ranged from a low of .401 to a high of .923 with only 3 loadings less than .70. The three items identified in the total sample analysis with weak loadings also had weak loadings for the female sample. One item related to Shared Control did not load have a loading greater than .40 on any dimension (the same item identified in the total sample analyses).

The displayed factor loadings for the male sample ranged from a low of .455 to a high of .927. Unlike the previous analyses, five items produced loadings less than .70 with one item that did not have a loading greater than .40 on any dimension. Further, three of the five items that produced loadings less than .70 were the same as those identified in the previous analyses.

Reliability Analyses

The internal consistency estimates for each dimension using the proposed items are presented in Table 6. The estimates ranged from a high of .92 for the Relevancy dimension to a low of .73 for Uncertainty with a total scale reliability of .89. As shown in Table 5, the reliability estimates for each subsample were similar and consistent with the total sample analysis. Because some items had low loadings, item deletion statistics were examined for the total sample analysis. The deletion statistics show that the removal of the Uncertainty item did not substantially change the reliability estimate. However, the removal of the Shared Control item, which did not load on any dimension, resulted in a change in the reliability estimate from .746 to .856.

Table 6

Reliability Estimates for Full Sample, Females Only, and Males Only

	Sample		
Dimension	Total	Females	Males
Relevancy	.919	.905	.903
Uncertainty	.726	.690	.665
Critical voice	.832	.800	.797
Shared control	.746	.733	.813
Student negotiation	.890	.882	.886
Total dimension	.893	.870	.894

Discussion

As online educational opportunities increase and sometimes replace more traditional learning practice, learners find themselves faced with the decision to adopt online learning as a method of academic endeavor. The technology experience, expertise, and general feelings

toward the use of online learning play a significant role in student success in online classrooms. Measurement of these dimensions of experience and predispositions toward the online classroom may provide insight into student perception of the constructivist nature of a virtual learning environment. A more effective survey may seek to collect this information.

The OCLES(20) with Demographic Data is a modified version of the CLES(20) by Johnson and McClure (2000) developed to more accurately reflect online learning environments with an emphasis on doctoral level research. Factor and reliability analyses were conducted using a sample of over 700 doctoral students enrolled in a doctoral-level foundational research course. The results of these analyses supported the five dimension structure identified for the original CLES(20) (Johnson & McClure, 2000) and were consistent with the pilot results for the OCLES(20) identified by McClure and Gatlin (2007).

Although the results were consistent with previous research and provide further validation of the instrument, the analyses did identify two items of concern. The first item related to the Uncertainty dimension. This item produced a factor loading below .50, and its highest loading (.43) occurred on another dimension, Relevancy. However, the reliability analysis indicated that the removal of the item did not affect the level of reliability for the Uncertainty dimension. The second item of concern related to the Shared Control dimension. This item did not load above .40 on any of the five dimensions. Additionally, the reliability analysis indicated that the removal of the item increased the level of reliability by .11.

Through this further validation of the OCLES(20), a number of recommendations for revision of the instrument are proposed:

1. Create generic stem statements that reflect the constructivist principles that underpin each question. This will broaden the target population and reflect the myriad topics and levels of academic engagement currently available through online learning.
2. Validate the survey with different level students (e.g., Master's and undergraduate). For it to be truly useful to direct online learning practices, a broader audience should be used to provide more robust validation.
3. Investigate those items with low factor loadings to refine the item to more directly address the constructivist dimension targeted by that item.
4. Consider addition of items that seek to determine the degree to which students have adopted online learning technologies as part of their academic endeavor.

In summary, the constructivist instructional strategies in a virtual environment are considered critical to the learner's strategic use of the knowledge. Broad acceptance of constructivist educational theory that has been successful in traditional learning environments exists and should provide guidance as we seek to construct rich virtual learning environments that create whole learning experiences. To this end, continued refinement of this survey to identify the degree of constructivist instructional strategies in an online classroom seeks to contribute to this effort.

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