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Abstract:

The design of virtual learning environments for post-secondary instruction is rapidly increasing among public and private universities. While the quantity of online courses over the past 10 years has exponentially increased, the quality of these courses has not. As universities increase their online teaching activities, real concern about the best design for these online learning opportunities underscores the need to create effective and responsive virtual learning environments. Adams (2007) developed the Recursive Model for Knowledge Development in Virtual Environments. The premise of this model is the belief that good teaching and engaged learning should not be determined by the use of certain instructional tools but by the guiding principal that learning is an active and recursive process, where knowledge must be contextualized to be relevant to the learner. To this purpose, this article describes the initial development in the ongoing process of designing a valid and reliable assessment tool, the Virtual Learning Environment Survey – VLES, for exploring the degree to which the Recursive Model for Knowledge Development relates to effective design of online learning environments. This student self-report survey will seek to provide guidance for the assessment of online learning environments through collection of student perceptions of teaching strategies, knowledge approach, and knowledge ownership in online classrooms.

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Measuring Conditions Conducive to Knowledge Development in Virtual Learning Environments: Initial Development of a Model-Based Survey

Nan B. Adams, Thomas A. DeVaney, & Susan G. Sawyer
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Introduction

The social aspects of teaching, learning, and educational practice are changing to accommodate rapidly emerging communication technologies. Educational institutions are trying to respond to the growing demand for delivery of educational activities that are not tied to a physical place or set time. In the past few years, online learning practices have evolved into virtual learning environments. The positive side of this change is the ability to create high quality, responsive, and engaging learning environments that foster engagement between teachers and students (Topper, 2007). The negative side of this change is when poor teaching practice is merely translated into an online environment (Kanuka & Kelland, 2008; Smith & Mitry, 2008). It is critical that a positive outcome of this change be established as a focus for all involved – student, teacher, administrator, and institution. To aid in this process, it is imperative that quality assessment tools that authentically assess teaching and learning practices in the virtual classroom be developed to guide the quality of educational programs so they do not suffer in this transition from face to face classrooms to virtual learning environments.

For educators that endeavor to develop effective learning practices in the new cyber landscape, the changed teacher and learner roles in virtual environments should be central to the design of responsive virtual learning environments. To do this, basic assumptions about appropriate teaching and participant learning roles in these virtual settings must first be defined, how the intentions of these roles guide practice in virtual learning spaces must then be described, and measures of the degree to which these roles are present in virtual classrooms must be developed.

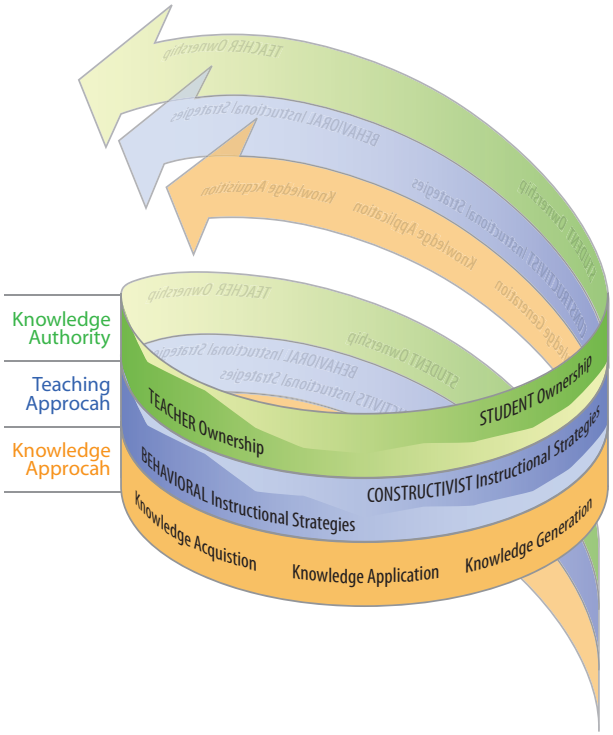
Adams' (2007) Recursive Model for Knowledge Development in Virtual Environments provides a framework for the roles of teachers and learners within virtual instructional environments. This article reflects the initial development of the Virtual Learning Environment Survey (VLES), by validating the three dimensions of teaching assumptions that drive practices included in Adams' model.

Supporting Theories and Research

Adams (2007) developed a meta-model based on Bruner (1966) and Vygostsky's (1978) teaching theories of constructivism; Krathwald, Bloom, and Masia's Affective Domain (1973); Maslow's Hierarchy of Needs (1954); Kolbs' Adult Learning Theory (1984); and Change Theory based on Fuller's concerns theory (1970) and refined by Hall, George, and Rutherford (1979). The Recursive Model for Knowledge Development in Virtual Environments was designed to demonstrate predictable Stages of Concern about changes that take place during a complete learning cycle. The premise of this model is the belief that good teaching and engaged learning should not be defined by the use of specific instructional tools but by the guiding principal that learning is an active and recursive process, where knowledge must be contextualized to be relevant to the learner, personal experiences are integral to the construction of knowledge, and learners socially negotiate their knowledge construction. Each of the contributing theories are well established in educational belief and practice, but none of these teaching and learning theories has been reviewed in light of the emerging communication technologies and their impact upon the social construction of educational practice in virtual settings.

The Recursive Model for Knowledge Development in Virtual Environments is depicted in Figure 1 (next page). This model identifies three dimensions for consideration in the virtual learning environment: (a) Knowledge Authority, (b) Teaching Approach, and (c) Knowledge Approach. The model seeks to graphically demonstrate a recursive learning process that assumes a gradual progression in each of the identified dimensions.

Figure 1: Recursive Model for Knowledge Development in Virtual Environments (Adams, 2007)



Knowledge Authority refers to who possesses strategic control of the knowledge in a teaching environment. Vygotsky (1978) discusses the gradual release of knowledge from teacher or knowledgeable other to student or learner. In the online environment, this may be controlled by timed offering of certain material and certain activities, much as it is controlled by class meetings in the physical environment. However, unlike traditional learning environments, an advantage of virtual environments is that students may be invested with the authority to move freely throughout the virtual learning landscape created by the teacher or even choose to access other resources simultaneously to enhance their learning. Even in the most controlled online learning environments, as learning progresses, students gain more control of their own navigation through the virtual classroom. With this understanding, it is the task of the teacher to guide the students to take strategic control over their own learning process. For example, in a skills-based course that may be found early in a program of study, it is expected that the teacher will possess the greatest amount of Knowledge Authority, and students a lesser amount. The assumption is that the teacher is the authority with regards to the course content or knowledge, and students are expected to accept the teacher's construction of the knowledge. In more advanced courses, students should gain

more possession of Knowledge Authority to allow for their own strategic control of the knowledge. This gives students the authority to organize and present their logical constructions of the knowledge as a reasoned response to solve more complex problems that then demonstrates the students' own authority over use of the knowledge.

The Teaching Approach dimension of the model refers to the teaching strategies employed to develop skill sets and foster engagement and creative use of the knowledge as skill and understanding are increased. Using the same example, in a skills-based course that may be found early in a program of study, the Teaching Approach may include more behavioral or foundational types of activities, such as drill and practice and templated assignments. As knowledge increases, the teaching approach may take on a more constructive, student or problem centered design that requires students to fashion their own logical constructions of the knowledge.

The Knowledge Approach refers to the actual teaching objectives and instructional intent of the class or course. Depending on whether the course is a single learning activity or part of a larger curriculum of study, the Knowledge Approach should be determined in terms of the desired student learning outcomes, either knowledge acquisition, knowledge application, or ownership of the knowledge demonstrated by the generation of new knowledge based on knowledge gained. For a skills based class, the desired student Knowledge Approach may be that of acquiring understanding of knowledge structures, where more advanced courses would be focused on knowledge application, such as solving hypothetical scenarios, and ultimately knowledge generation to solve new and unique problems.

To provide support for the theoretical dimensions of the Recursive Model for Knowledge Development in Virtual Environments (Adams, 2007), a series of existing surveys that focused on describing favorable learning conditions for online learning and teaching were reviewed. Three were identified as having dimensions with similar constructs as those described by Adams' model. These surveys were The Online Constructivist Learning Environment Survey-20 (OCLES-20) (McClure & Gatlin, 2007), the Constructivist On-Line Learning Environment Survey (Taylor & Maor, 2000) and the Web-based Learning Environment Inventory (Chang & Fisher, 2001).

The Online Constructivist Learning Environment Survey (OCLES-20) is a modified version of the Constructivist Learning Environment Survey (CLES) which was developed "to enable teacher-researchers to monitor their development of constructivist approaches to teaching" (Taylor, Dawson, & Fraser, 1995, p.1). The dimensions under study are Personal Relevance, Uncertainty, Critical Voice, Shared Control, and Student Negotiation. McClure and Gatlin (2007) designed a 20-item online version of the CLES, referred to as the OCLES-20.

The Constructivist On-Line Learning Environment Survey (COLLES) was designed to "monitor the quality of innovative online teaching and learning" (Taylor & Maor, 2000, para. 3). It was designed to generate a profile of student perceptions that will provide an indication of the extent to which the virtual learning environment is fostering learning. The scales of this survey were developed from the theory of social constructivism (Taylor & Maor, 2000).

The Web-based Learning Environment Inventory (WEBLEI) was developed to assess student perceptions of online learning (Chang & Fisher, 2001). This survey is based upon Connected Communities Learning (CCL) by Tobin (2002), which focuses on the convenience of online learning, the efficiency of online learning, and the autonomy for emancipatory activities in online learning.

Methods

Instrumentation

Two surveys were used to collect information related to virtual instructional environments. The first survey was based on the OCLES-20, a 20-item survey designed to assess five dimensions of a constructivist learning environment (see Table 1). Each of the five dimensions of the OCLES-20 is composed of four items with response options ranging from Almost Never (1) to Almost Always (5). Prior research (DeVaney & Adams, 2008) has suggested that each dimension can be reduced to three items without negatively impacting reliability or the five dimension structure of the survey. This resulted in a more efficient 15-item survey that was used in this article.

Table 1: Dimensions of OCLES-20

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."

(DeVaney & Adams, 2008)

The second survey consisted of 20 items. Eleven items were derived from subscales located in previously validated instruments. These items related to the following four dimensions: (a) Emancipation (Chang & Fisher, 1998), (b) Qualia (Chang & Fisher, 1998), (c) Reflective thinking (Taylor & Maor, 2000), and (d) Coparticipation (Chang & Fisher, 1998). The remaining 9 items were proposed statements that were designed to align with the three dimensions of Adams' model (2007). A description of each dimension is presented in Table 2. The response options for these items were aligned with the OCLES-20 and included Almost Never (1) to Almost Always (5).

Table 2: Dimensions Represented by Items Contained in the Virtual Instructional Environment Surveys

Dimension	Description
Knowledge Authority*	Refers to who possesses strategic control of the knowledge in a teaching environment (Adams, 2007)
Teaching Approach*	Refers to the teaching strategies employed to develop skill sets and foster engagement and creative use of the knowledge as skill and understanding are increased (Adams, 2007)
Knowledge Approach*	Refers to the actual teaching objectives and instructional intent of the class or course (Adams, 2007)
Emancipation	The convenience, efficiency, and autonomy for learning activities (Chang & Fisher, 1998)
Qualia	Knowledge embodied in neural networks as vectors of electric charge that reflect life experiences of individuals (Chang & Fisher, 1998)
Reflective Thinking	Extent to which critical reflective thinking is occurring in association with online discussion (Taylor & Maor, 2000)
Coparticipation	Presence of a shared language which can be accessed by all participants to engage the activities of the community with a goal of facilitating learning (Chang & Fisher, 1998)

* Newly proposed items developed for these dimensions)

In addition to the data related to virtual instructional environments, selected demographic information was collected. The items contained in both surveys are located in Appendix A.

Sample

The surveys were distributed electronically to 93 students enrolled in multiple sections of an undergraduate educational psychology course. The virtual environment comprised at least 50% of each section. Students were notified of the survey through an email that contained an introduction and link to the surveys. Additionally, students were informed that they would receive extra points for completing the surveys. In order to

identify students who completed the survey, a second form was created that asked students to provide their name and course information. When the students submitted their responses, a thank you page appeared that contained the link to the second form. The name, course, and section data was stored separately from the survey responses in order to maintain anonymity.

A total of 86 surveys were completed which resulted in a return rate of 92.5%. Table 3 contains demographic information and shows that only three students were male. The results also show that three-fourths of the students were 25 years old or younger and over three-fourths of the students had previously taken an online course.

Table 3: Demographics Characteristics of Students (n = 86)

Demographic	n	%
Gender		
Female	83	3.5
Male	3	96.5
Age		
18-25	65	75.6
26-35	12	14.0
36 or older	9	10.5
First online course?		
No	66	79.5[a]
Yes	17	20.5[a]

[a] Percents are based on n = 83

Results

Validation of Modified OCLES-20

Because the current article used a modified 15-item version of the OCLES-20 that was validated by DeVaney and Adams (2008), factor and reliability analyses of the modified OCLES-20 were conducted using eigenvalues greater than 1 as the extraction criteria and Varimax rotation. 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. This was also the display criteria used in the study by DeVaney and Adams. A minimum sample size to variable ratio of 5:1 is commonly recommended for factor analysis (Field, 2005; Hair, Anderson, Tathum, & Black, 1995). Because the current analysis includes 15 items, the minimum recommended sample size would

be 75; therefore the current analysis, which is based on a sample of 86, satisfies this recommendation.

Table 4 contains the rotated factor loadings and proportions of variance explained for the modified OCLES-20. The analysis validated the expected five factor model with item loadings greater than .60 for all items except one Relevancy item that had a loading of .478. The proportion of variance explained by each rotated factor ranged from 17.44 to 11.93 with a total variance explained of 73.55%. The alpha reliability estimates ranged from a .56 to .87 with a total survey reliability of .78.

Table 4: Rotated Factor Loadings for Modified OCLES-20 items

	Dimension				
Item (Scale-Question)	**Student Negotiation**	**Shared Control**	**Uncertainty**	**Relevancy**	**Critical Voice**
Negotiation-3	.926				
Negotiation-2	.891				
Negotiation-1	.873				
Control-1		.910			
Control-3		.860			
Control-2		.851			
Uncertainty-1			.850		
Uncertainty-2			.808		
Uncertainty-3			.700		
Relevancy-2				.936	
Relevancy-3				.929	
Relevancy-1				.478	
Critical Voice-2					.850
Critical Voice-3					.691
Critical Voice-1					.616
Percent Variance Explained	17.44	16.22	14.06	13.91	11.93
Reliability	.87	.86	.73	.73	.56

Examination of Additional Dimensions Related to Virtual Learning Environments

Because the second survey contained items from a variety of surveys and newly proposed items, a factor analysis was conducted to determine the number of dimensions present in the survey. The results of the factor analysis are contained in Table 5. Because the number of variables increased from 15 to 20, the minimum recommended sample size for this analysis was 100, which was larger than the current sample size. Consequently, the criteria for displaying factor loadings was increased to a more stringent .50 – the level recommended by Field (2005). Although the 20 items included in the analysis were designed to represent seven dimensions, only 5 factors were identified. This suggests that some of the items/scales from different surveys and proposed items were related to common underlying dimensions. As shown in Table 5 (next page), the first factor contained all three proposed Knowledge Authority items and two items from Chang and Fisher's (1998) Qualia subscale. Likewise, factor 2 contained five of the six proposed items related to Teaching Approach and Knowledge Approach. Factors 3 and 4 included Chang and Fisher's Emancipation and Taylor and Maor's (2000) Reflective Thinking items, respectively. The fifth factor only contained two items: one each from the Learning Strategies and Qualia subscales. The proportion of variance accounted for by the factors ranged from 19.20 to 7.51 with a total variance explained of 69.24%.

Table 5: Rotated Factor Loadings for Additional Dimensions Related to Virtual Learning Environments

	Dimension				
Item (Scale-Question #)	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
Knowledge Authority-2	.855				
Knowledge Authority-1	.849				
Qualia-1	.789				
Knowledge Authority-3	.776				
Qualia-2	.721				
Knowledge Approach-3		.810			
Teaching Approach-1		.758			
Knowledge Approach-2		.710			
Teaching Approach-2		.679			
Knowledge Approach-1		.574			
Coparticipation-1	—	—	—	—	—
Emancipation-3			.845		
Emancipation-2			.757		
Emancipation-1			.734		
Coparticipation-1	—	—	—	—	—
Reflective Think-1				.863	
Reflective Think-3				.808	
Reflective Think-2				.754	
Teaching Approach-3					.686
Qualia-3					.656
Percent Variance Explained	19.20	17.00	12.86	12.66	7.51

Because the Coparticipation items did not load above the specified .50 criteria on any factor, they were eliminated from further analysis. Additionally, because the final factor only contained two items (from different dimensions) and the proportion of variance accounted for was substantially less than the preceding factor, the two items that composed this factor were eliminated from further analysis. Consequently, the factor analysis of the seven original dimensions related to learning environments produced four factors: (a) Knowledge Authority/Qualia, (b) Knowledge Approach/Teaching Approach , (c) Emancipation, and (d) Reflective Thinking.

Is There a Relationship Between the Scores for Scales Identified on the OCLES-20 and Four Additional Subscales?

Because the items comprising each subscale identified through the factor analyses used the same response format but the scales contained different numbers of items, scores for each scale were calculated as the mean of the responses to the items contained in the scale. In order to determine if a potential relationship existed between the dimensions identified in the two surveys, a correlation matrix was generated. Table 6 contains the correlation coefficients for the five subscales from the modified OCLES-20 and four additional subscales identified in Table 5. The results identified four moderate relationships (r >.40) among subscales of the OCLES-20 and additional subscales. Additionally, the value of six coefficients exceeded ranged from .30 to .40. The presence of these correlations suggests that underlying dimensions may exist that are common to the OCLES(20) and additional subscales.

Table 6: Correlations Among OCLES(20) and Subscales

	OLCES(20) Subscales				
Subscale	**Relevancy**	**Uncertainty**	**Critical Voice**	**Shared Control**	**Student Negotiation**
Knowledge Authority/ Qualia	.471	.137	.327	.405	.215
Knowledge Approach/ Teaching Approach	.420	.171	.326	.347	.388
Emancipation	.119	.374	–.011	.203	.243
Reflective Thinking	.268	.248	.295	.305	.518

Because the correlation matrix suggests possible relationships among the dimensions contained on the two surveys, the nature of these relationships was further examined through a factor analysis. Consistent with previous analyses, the factor analysis was conducted using eigenvalues greater than 1 as the extraction criteria and Varimax rotation. Based on a review of the items that compose each scale, it was expected that the Knowledge Authority/Qualia, Relevancy, and Shared Control subscales would define the Knowledge Authority dimension from Adams' model. Further, Student Negotiation, Reflective Thinking, and Critical Voice would define the Knowledge Approach dimension. Finally, Emancipation and Uncertainty would define the Teaching Approach dimension. Because the items concerning Knowledge Approach and Teaching Approach loaded

on the same factor in the previous analysis, it was unclear which dimension the scale would help define.

The factor analysis results are presented in Table 7 and illustrate a three factor model consistent with the Recursive Model for Knowledge Development in Virtual Environments. Each of the scales loaded as expected. Factor 1 included the Knowledge Authority/Qualia, Relevancy, Shared Control, and Knowledge Approach/Learning Teaching Approach subscales, and Factor 2 included Student Negotiation and Reflective Thinking as well as the addition of the Critical Voice subscale. Finally, the only subscales that loaded on Factor 3 were Emancipation and Uncertainty. It is also worth noting that the Knowledge Approach/Teaching Approach subscale had similar loadings on Factors 1 and 2.

Table 7: Rotated Factor Loadings for Nine Subscales

	Dimension		
Subscale	**Factor 1**	**Factor 2**	**Factor 3**
Knowledge Authority/Qualia	.809		
Relevancy	.754		
Shared Control	.580		
Knowledge Approach/ Teaching Approach	.573	.519	
Student Negotiation		.843	
Reflective Thinking		.715	
Critical Voice		.584	
Emancipation			.826
Uncertainty			.730
Percent Variance Explained	24.00	21.88	16.30
Dimensions of Adams' Model	Knowledge Authority	Knowledge Approach	Teaching Approach

Conclusion

Based on a review of existing theories of teaching and learning, Adams' Recursive Model for Knowledge Development in Virtual Environments (2007) proposed three dimensions of an online learning environment that are of concern to learning. The analyses presented in this study suggest that the 9 subscales contained in previously validated surveys along with several newly developed items may align to the dimensions identified in Adams' model as demonstrated in Table 7. Through this investigation into the factors affecting environments conducive to effective instruction and knowledge development in virtual learning environments, a number of recommendations for revision of the instrument are proposed:

1. Investigate the items within each of the factors identified in Table 7 to determine their alignment with the dimensions of Adams' Recursive Model for Knowledge Development in Virtual Environments.
2. Refine items to more completely capture the three dimensions reflected in Adams' Recursive Model for Knowledge Development in Virtual Environments, particularly for the newly developed items related to Knowledge Approach and Teaching Approach. It is possible that students had difficulty distinguishing between actual activities (Teaching Approach) and the instructor's intentions (Knowledge Approach). The ability of students to distinguish between these two dimensions when completing the survey is critical in providing information to guide instructors as they design responsive and effective virtual learning environments.
3. 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.
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 and the degree to which this relates to knowledge development.

Continued refinement through these recommendations may serve to reveal more considerations for creation of virtual learning environments and allow for a more complete development of the Recursive Model for Knowledge Development in Virtual Environments. The continued focus of this inquiry is to provide guidance for the development of more responsive and effective virtual learning environments.

References

Adams, N.B. (2007). Toward a model for knowledge development in a virtual environment: Strategies for student ownership. *International Journal for Social Sciences, 2*(2), 71–77.

Bruner, J. (1966). *Toward a theory of instruction*. Cambridge, MA: Harvard University Press.

Bloom, B.S. (1956). *Taxonomy of educational objectives, handbook 1: The cognitive domain*. New York: David McKay Co.

Chang, V., & Fisher, D. (2001, December). *The validation and application of a new learning environment instrument to evaluate online learning in higher education*. Paper presented at the Australian Association for Research in Education, Fremantle. Retrieved November 2, 2007 from http://www.aare.edu.au/01pap/cha01098.htm.

DeVaney, T.A., & Adams, N.B. (2008). Assessment of Online Learning Environments: Using the OCLES(20) with Graduate Level Online Classes. *Journal of Interactive Online Learning.* 7(3).

Field, A. (2005). *Discovering statistics using spss*. London: Sage.

Fuller, F.F. (1970). *Personalized education for teachers: An introduction for teacher educators*. The University of Texas at Austin, Research and Development Center for Teacher Education.

Hair, J.F., Jr., Anderson, R.E., Tatham, R.L., & Black, W.C. (1995). *Multivariate data anlaysis with readings*. Englewood Cliffs, NJ: Prentice Hall.

Hall, G.E., George, A., & Rutherford, W.L. (1979) *Measuring stages of concern about the innovation: A manual for use of the SoC Questionnaire (Report No. 3032)*. Austin: University of Texas at Austin, Research and Development Center for Teacher Education. (ERIC Document Reproduction Service No. ED 147 342)

Kanuka, H., & Kelland, J. (2008). Has e-learning delivered on its promises? Expert opinion on the impact of e-learning in higher education. *Canadian Journal of Higher Education, 38*, 45–65.

Kolb D.A. (1984) Experiential Learning: Experience as the source of learning and development New Jersey: Prentice-Hall.

Krathwohl, D.R., Bloom, B.S., Masia, B.B. (1973). *Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: The Affective Domain*. New York: David McKay Co.

Maslow, A. (1954). *Motivation and personality*. New York: Harper.

McClure, R. & Gatlin, L. (2007). Assessment of online learning environments using the OCLES(20). *National Social Science Journal, 28*(2), 127–132.

Smith, D.E., & Mitry, D.J. (2008). Investigation of higher education: The real costs and quality of online programs. *Journal of Education for Business, 83*, 147–152.

Taylor, P., Dawson, V., & Fraser, B. (1995). *Classroom learning environments under transformation: A constructivist perspective*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco: CA.

Taylor, P., & Maor, D. (2000, February). *Assessing the efficacy of online teaching with the Constructivist On-Line Learning Environment Survey*. In A. Herrmann and M.M. Kulski (Eds), *Flexible Futures in Tertiary Teaching*. Proceedings of the 9th Annual Teaching Learning Forum, Perth: Curtin University of Technology. Retrieved November 2, 2007 from http://lsn.curtin.edu.au/tlf/tlf2000/taylor.html.

Tobin, K.G. (2002). Learning to teach science using the internet to connect communities of learners. In P.C. Taylor, P.J. Gilmer, and K.G. Tobin (Eds.), *Transforming undergraduate science teaching*. New York: Peter Lang Publishing.

Topper, A. (2007). Are they the same? Comparing the instructional quality of online and face-to-face graduate education courses. *Assessment and Evaluation in Higher Education, 32*, 681–691.

Vygotsky, L S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.

Appendix A

Survey questions from OCLES-20

1. New learning relates to experiences or questions I have that are related to my professional goals.
2. The things that I learn about are relevant to my current and/or future educational environment(s).
3. I learn things that are relevant to my professional growth
4. I learn that current knowledge about {a subject area} cannot always provide answers to problems.
5. I learn that academic explanations to phenomena {in a subject area} have changed over time.
6. I learn that current knowledge about {a subject area} can be influenced by people's experiences, opinions and values.
7. I feel safe questioning what or how I am being taught.
8. It's OK for me to ask my instructor for clarification about activities that are confusing.
9. My instructor encourages me to ask questions to clarify ideas, or deepen my understanding.
10. I have the opportunity to help to plan what I am going to learn.
11. I have the opportunity to help to decide how well I am learning.
12. I have the opportunity to help to decide which activities work best for me.
13. I have the opportunity to talk with other students about how to solve problems.
14. I have the opportunity to ask other students to explain their ideas.
15. I have the opportunity to be asked by other students to explain my ideas.

Questions from additional surveys

1. I have the opportunity to think critically about my own ideas
2. I have the opportunity to think critically about other students' ideas
3. I have the opportunity to think critically about ideas in the readings and course material.
4. I can access the learning activities at times convenient to me
5. I am allowed to work at my own pace to achieve learning activities
6. I decide when I want to learn
7. This mode of learning enables me to interact with other students and the tutor asynchronously.
8. In this learning environment, I have to be self-disciplined to learn.
9. I felt a sense of satisfaction and achievement about this learning environment
10. I enjoy learning in this environment.
11. I felt a sense of boredom towards the end of my course of study.
12. This course focused on understanding concepts and the ability to explain these concepts.*
13. This course focused on creating products that demonstrate my ability to demonstrate my understanding of the concepts.*
14. This course requires me to be creative and brainstorm ideas to solve problems posed about the concepts presented in this class.*
15. The activities in this class included demonstrations of my ability to define and organize concepts presented as part of the material covered.*
16. The activities in this class required me to participate in simulations where I must apply the concepts presented as part of this course.*
17. The activities in this class required me to make associations among concepts presented that may not have been discussed or presented as part of the class material.*

18. As a result of this course, I feel that I possess an understanding of the topics presented*
19. As a result of this course, I feel that I can apply the concepts learned in this course to situations similar to those presented as part of learning activities*
20. As a result of this course, I feel that I can use the concepts learned in this course to creatively address problems that may not directly relate to the activities and situations discussed in this course.*

* denotes newly proposed items

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Author Biographies

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