



WCES-2011

Validating the instrument of web based collaborative learning competences using factor analysis

Hüseyin Bicen ^{a*}, Fezile Özdamlı ^b

^a *Near East University, Department of Computer Education and Instructional Technology Nicosia, Cyprus*

Abstract

There is no available instrument which determines teacher candidates' competences of web based collaborative learning. Our study has provided findings about teacher perceptions in Cyprus. This article describes the development, testing and application of a suitable instrument. Research data for the tests of reliability and validity was obtained from a sample of 300 teacher candidates from the education faculty of Near East University in 2010. The final version of Web based collaborative learning competence scale (WBCL - CS) includes dimensions seeking teacher candidates' feedback on two facets of the web based collaborative learning. Sub-dimensions are defined as, "Using and development of materials" and "Material sharing and communication". Validity has been established by the use of factor analysis. Internal consistency coefficient and reliability of the scale showed that this instrument can be used for the future studies. According to the results of this research teacher candidates exhibited above medium levels of competence towards web based collaborative learning.
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Keywords: Technology; collaborative; teacher candidates; web based collaborative learning

1. Introduction

Web based collaborative learning instruments provides opportunity to students to work co-operatively others and produce projects. Web based collaborative learning is a form of education which uses online information and communication technologies to provide a link between student-student, student-teacher, educational foundations and educational resources. Principle of web based collaborative learning is to provide interaction between individuals via web tools. By using Project based learning and Problem based learning teachers may be able to make students work co-operatively and thus increase the expected performance of the students. Individuals can carry out projects via written, audio and video communication by means of internet. In technology based learning environments both students and teachers can express themselves better when compared to conventional learning applications. Wikispaces, Wiki, e-mail, Skype, MSN, Learning Management System (LMS), blog, discussion boards, Electronic Conferances and chat programs are some examples of web based collaborative learning instruments. Advances in technology have had an effect on the techniques used by the teachers Educational alterations together with the advances in technology has provided novel insights educational methods. Internet has been an important part of our lives since its first use. In recent years use of internet communication tools has been really popular and its

* Hüseyin Bicen. Tel: +90 392 2236464

E-mail address: huseyin_bicen@hotmail.com

use in education is accelerating. There has been significant advances in educational technology and distance learning fields and novel tools and terms have been introduced. (Cavus, Uzunboylu & Ibrahim, 2008; Valderrama, R., & Cruz, A., 2009). Lecturers have started to use Wikis in education which are based on a constructive approach. Wikis include creating web sites, collaborative web site notifications, students revising their work with others, problem solving, discussion and project solving. (Synteta, 2002; Cavus, 2007). Collaborative learning relies on communication between individuals and collaborative learning activities. (Puntambekar, 2006). A lot of work has been carried out on web based collaborative learning. Odabasi and Kabakci (2007) has mentioned that the first step in technology use in education should be development of educational programs. In recent years technology education has started to be included in educational curriculum of teacher candidates (Robson, 2004). When literature was analyzed although scales for individual thoughts were found, no scales of qualification was met. (Lantin & Sangalang 2009) This study aims to maintain a scale for web based collaborative learning qualifications of teacher candidates.

2. Related Research

According to many researches an efficient collaborative learning environment could be created by providing communication between the students via internet based tools. (Özdamlı & Uzunboylu, 2008; Cavus, Uzunboylu & Ibrahim, 2007; Uzunboylu, Bicen & Cavus, 2011). In a promising work carried out by Huang, Chen & Chen (2009) formed heterozygous groups and created a discussion environment on Moodle System. At the end of their work they indicated that the students were positively affected from this discussion environment. Huang, Huang & Hsieh (2008) used several collaborative learning tools including Jigsaw method, wireless communication tools and digital note taking systems to create collaborative learning environments. The study concluded that the students had been learning and at the same time enjoying it. Ashcraft (2008) used social constructive theory based web based collaborative learning and revealed that this technique resulted in an increase in students' successes. In addition to this, Jia (2005) stated that students enjoy web based collaborative learning more than classical methods. A work carried out by Oravec demonstrates that sharing web links and updated information reveals personal experiences and potential of blogs that provide collaborative learning. In the same work it was also stated that these blogs helped students to think more critically and analytically. Mathew, Felvegi & Callaway (2009) together with teacher candidates carried out language art methods in Wiki environments. According to the results teacher candidates worked in this environment had deepened their knowledge and improved technology using skills.

3. The Aim of the Research

The purpose of this research was to develop a likert type scale to determine the competences of teacher candidates towards Web Based Collaborative Learning.

4. Methods

4.1 Participants

The participants were 300 teacher candidates from Near East University from education faculty that were randomly asked to answer the scale. Data for the tests of reliability and validity was obtained from different departments. The ratio of female teacher candidates out of 300 teacher candidates participated as a percentage was 49.70 (151), while this ratio was 50.3 (151) for males.

4.2 Development of Web Based Collaborative Learning Competence Scale (WBCL-CS)

Study was carried out in four stages. In the first stage, a literature review was done. In forming the items of the WBCL-CS, 10 teacher candidates were asked to write a composition about their web based collaborative learning. As a result of the literature review and content analysis of compositions, 23 items were written about web based

collaborative learning. In the second stage, the language of scale was examined by language specialists. Regarding the content and the validity of appearance of the scale, the views of 5 lecturers were consulted, who work in educational technologies in the university. Experts suggested that three items had to be taken out. Changes had been made in accordance with the recommendations and trial version of scale was completed. In the third stage, trial version of scale for testing reliability and validity analysis was applied to 100 teacher candidates as a pre-trial group. In the study, 5 point likert-type was preferred for scale. Participants were selected one for each item: “Strongly disagree”, “disagree”, “neutral”, “agree” or “strongly agree”. To obtain the total score for each participant, 5 points to most positive and one point to the most negative were given, and the total number of responds was graded 1 to 5. It was required for selection of the items in the scale that the coefficient of total item correlation was above .30. The average of the scale items was between 3.22 – 4.55, whereas the standard deviation was between 0.89 and 1.32. After item total correlations analysis, only one item was below .30 and the rest was above .30. The item which was below .30 was taken out of the scale. The coefficient of reliability of scale was calculated $\alpha=.908$. Considering the results of the pre-trial, it was maintained that the items were comprehensive except a few which needed reformulation.

In the fourth stage, the scale was applied to the pre-trial group, having its final form completed. Questionnaires were applied to the teacher candidates ($n=300$). After distributing the scale to the teacher candidates, all necessary instructions were given. 15 minutes later, the scales were collected and analyzed.

5. Results

Since the scale contained 19 items, the minimum point one can get was 19, the maximum was 95, and its range was 76. The minimum point, obtained by the scale was 21 and the maximum obtained point was 95. The range was measured as 74. The mean was 70.11 whereas the standard deviation point was calculated as 13.41. In the analysis, the skewness was calculated as .41, whereas the kurtosis was 1.05. These findings showed that the data, obtained from 300 teacher candidates, had an available distribution.

5.1 Validity

A factor analysis was applied to test the reliability of the construction of the scale. KMO and Bartlett Sphericity tests were applied to measure whether the number of data and sample were appropriate to the factor analysis. For the appropriation of data to the factor analysis, the KMO must be over 0.60 and the Bartlett test results must be valid and meaningful (Büyüköztürk, 2004). In this study, the coefficient of appropriation in KMO sample was calculated as 0.905. The fact that the value of KMO was available for factor analysis. Bartlett's test of sphericity (BTS) was also used to measure the hypothesis “correlation matrix=unit matrix”. The rejection of the hypothesis showed that correlation between the variables was different from 1 and the factor analysis is appropriate for the variables (Hutcheson & Sofroniou, 1999). Approximately χ^2 value for BTS was found 2992.626 ($p<.001$) for the study.

In determining the items of the scale, the factor load was to be minimum 0.30 as a result of Varimax rotation analysis. Two factors were found in WBCL- CS. The total variance obtained by two factors was estimated as 53.270 percent. Since it is difficult to reach higher values in social sciences, the variance percentage over 40 - 60 is considered acceptable in various resources (Namlu & Odabasi, 2007). Therefore in this study, variance percentage was found over 50 percent which is at the acceptable border. The first factor described 41.38 percent of the variant (eigen value: 7.86) and the second factor described 11.89 percent of the variant (eigen value: 2.25). The percentage of the variant in two factors obtained by Varimax rotation was as follows: The first factor was 28.45 percent, and the second was 24.82. The estimated factor load was between 0.461 to 0.828 values.

Table 1 WBCL-CS mean, factor and reliability results

Items and Factors	Mean	SD	Item Total	Component factor load	Varimax factor load
<i>Factor I: Using and development of materials $\alpha=.893$</i>					
7. I can create personal blogs	3.51	1.20	.612	.703	.565
10.I can convert my powerpoint slides into video	3.66	1.12	.572	.648	.529
13. I can make entegrations of my course notes to my web site	3.51	1.13	.674	.738	.670
14. I can create online groups for collaborative learning (Yahoo groups, google groups)	3.51	1.20	.652	.688	.675
15.I can make entegrations of online calendar to my blog	3.17	1.08	.678	.650	.801
16. I can use embed codes for my website	3.17	1.13	.733	.674	.828
17. I can create blog sites for collaborative learning studies	3.25	1.15	.736	.691	.822
18. I can organize online activities for collaborative learning	3.29	1.13	.677	.652	.747
20. I can use Wiki for collaborative learning	3.66	1.13	.549	.573	.608
4. I can create videos related to my topics	3.66	1.04	.448	.577	.362
Factor I Total	3.41	.81			
<i>Factor II: Material sharing and communication $\alpha=.869$</i>					
5. I can share my own vidoes on video sharing sites (youtube, teachertube vb.)	3.51	1.21	.512	.695	.418
1. I can communicate with my friends on internet	4.32	.88	.623	.526	.789
2. I can share my course notes on internet	3.94	1.01	.652	.617	.697
3. I can share my documents in different formats (pdf., doc., ppt)	3.90	1.03	.600	.606	.690
6. I can use social network sites (Facebook, Hi5, Myspace vb.)	4.27	1.07	.626	.599	.707
8. I can use instant messenger programs (MSN, Skype, Yahoo Messenger vb.)	4.37	.89	.628	.566	.785
9. I can communicate scynhoronously with my group friends	3.92	1.05	.618	.653	.605
11. I can communicate ascynhoronously with my group friends	3.83	1.15	.554	.628	.504
12. I can use social network sites for sharing information and materials with my collaborative studies (Facebook, Hi5, Myspace etc.)	3.91	1.10	.656	.710	.638
Factor II Total	4.00	.73			

The scale can be summed under two dimensions according to the results of the analysis. The contents of the items, which are obtained from the factors and their appropriateness to the theoretical structure, are taken into consideration in giving titles for these two sub-dimensions. Therefore, the sub-dimensions are called “Using and development of materials” (10 items) and “Material sharing and communication” (9 items).

5.2 Reliability

To measure the reliability of the scale, Cronbach alpha was utilized for each sub-dimension, determined as a result of the whole scale and varimax rotation. Cronbach’s alpha is the most commonly used measure to assess the reliability because of its convenience and efficiency. This coefficient (α) is a general form of the KR-20 formula, used in calculating the reliability of items that were not scored as right versus wrong, as in some essay-type tests where more than one answer was possible (Ozdamli, 2009; See, 1951). The results of the analyses of the questionnaire revealed that the items were appropriate parameters. The average of the items varied from 3.17 to 4.37 whereas the standard deviation value varied from 0.88 to 1.22. The total correlation of the item fluctuated between .473 and .690. For the whole scale, Cronbach alpha (α) value was 0.921.

For the “Using and development of materials”, sub-dimension, Cronbach alpha (α) value was calculated as 0.893. For the “Material sharing and communication”, Cronbach alpha (α) value was measured as 0.869. The assessment of internal reliability is important in scales. According to researchers (Hung et al., 2010; Sekaran, 2003), the closer the reliability coefficient value gets to 1.0, the better is the reliability of the forum becomes. In general, reliability score which is less than 0.60, is considered poor; those between 0.60 and 0.70 are acceptable, and those over 0.80 are good. Thus, the internal consistency reliability of the measures used in this study could be considered as good.

6. Discussion

Rapid changes taking place in technology field have been changing roles of teachers. Teacher candidates' technology skills and qualifications must be satisfactory. Researches carried out revealed that there is an increase in the use of internet by both students and teachers every day. The researches have also shown that applications carried out in collaborative environments increased students' motivation and success. These changes taking place must be analyzed in education environments. Many work has been carried out on integration of web technologies in education. However, there is not sufficient work on how efficient the teachers are able to use web technologies. Thus, scales have been developed to determine teacher candidates' web based collaborative learning qualifications. As a result of the applications in this study, an WBCL-CS with 19 items was developed.

For determination of the factor structure, paraphrasing and verifying factor analysis were done; it was observed that in the analysis, the items of the scale were added in two dimensions. Then, these items are examined, and regarding the features that have been assessed, these factors were defined as, are "Using and development of materials" and "Material sharing and communication". The sub-dimension of "Using and development of materials" contains statements which describes using of web tools for collaborative learning. The sub-section of "Material sharing and communication" contains statements about the sharing and development course materials in web based environment.

At the end of the study, it was asserted that the criteria for the reliability and validity of the scale are high. The scale in this study had sufficient merits to justify further research in the area. The WBCL-CS, developed in North Cyprus, could also be utilized in other countries for determining the competences of teacher candidates on this issue.

7. Conclusion

By specifically focusing on competences of teacher candidates to web based collaborative learning, the current study adds to available evidence of the reliability and the validity of the "WBCL-CS". Based on this study, it was concluded that the "WBCL-CS" is an appropriate tool. The use of online tools in education has gained world-wide popularity. Integration of web based applications to education primarily requires determining teachers' competences of web based collaborative learning by means of the scale we developed. As in every study, there were a number of limitations attached to this research. The first limitation of this research was that sample of the study was in only one university. For further researches other universities' teacher candidates could be used as participants. This study could lay the foundation for further research in this area and development of "web based collaborative learning perception" scales.

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