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A Confirmatory Factor Analysis of the Teaching and Learning Conceptions Questionnaire (TLCQ)

Sami Şahin and Harun Yılmaz

This study examines pre-service teachers' conception about teaching and learning using the perspectives of Traditional Teaching (TT) and Constructivist Teaching (CT). Using the Teaching and Learning Conceptions Questionnaire (TLCQ) by Chan and Elliot (2004), data were collected from460 pre-service teachers in Turkey through an online questionnaire. An exploratory factor analysis and confirmatory factor analysis were conducted to validate the TLCQ that was translated into Turkish. The results revealed a factor model, with nine items. Correlations between CT and TT was moderate suggesting a distinct relationship.

Keywords: Pre-Service Teachers, Constructivist Teaching, Traditional Teaching, Teaching and Learning Conception

Changes in society require educators to constantly adjust their teaching and learning approaches. In education, the shift from traditional teaching to learner-centered teaching, which emphasizes constructivism, has become especially popular. However, many teachers tend to resist changing their teaching practices (Duffy and Roehler, 1986).

Constructivism has been widely used in the classroom environment. It refers to teaching with a focus on student centered learning instead of teacher-centered learning. In order to make students more active, teachers use various strategies and tools. However, many teachers do not willingly accept alternative tools and strategies such as rubrics and project-based learning (Jonassen, 1999). Constructivist teachers do not act as a center of information and are not responsible for transmitting knowledge to students. They create learning environments in which students interact with peers and teachers, and provide students with opportunities to use previous knowledge to construct new knowledge. In constructivist learning environments, teachers facilitate the learning process of students by giving directions and clues (Jonassen, 1999). Constructivism also proposes that students build their knowledge based on previous knowledge, so students need to be actively involved in their own learning process. In good classrooms, students interact with each other as well as the content, which enables them to be active participants, and responsible for their learning process. Since different students learn in different ways and each student has unique needs, technology offers tailored environments and contents based on students' levels and needs. Differences in student learning styles and learning pace, technology especially computers all offer great opportunities for both students and teachers.

When looking at the traditional way of teaching, teachers teach in a didactic manner, and they function as an information source during teaching (Brooks and Brooks, 1999). They are also responsible for disseminating information to students. Teachers look for the correct answer to know whether students learn what is taught or not. However, constructivist teachers are responsible for setting up the learning environment for students and facilitating interactions among students and themselves. While constructivist teachers need more time to prepare a learning environment than traditional teachers, traditional teachers cover the learning subject in a shorter

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time than constructivist teachers.

Pre-service teachers tend to teach as they were taught (Kim and Sharp, 2000). Therefore, before starting their teaching careers, pre-service teachers should be trained about knowledge and skills of constructivist approach. Also, pre-service teachers need to be informed about how constructivism can be merged in the class practice. Pre-service teachers gain teaching experience in the classroom during their teacher education, and this experience affects their beliefs about constructivism. Teachers have been affected by their own teachers, and they teach accordingly (Stuart and Thurlow, 2000).

Since teachers' beliefs play a crucial role in teaching and these beliefs are hard to change, it is important to know what teachers' beliefs are. According to Richardson (1996), there is a direct connection between teachers' beliefs and their teaching practices. If preservice teachers' beliefs are not developed according to constructivism, the teachers are likely to fail when they start constructivist teaching (Guyton, 2000). Therefore, it is important for both teachers and teacher candidates to be exposed to constructivist teaching to construct or reconstruct their beliefs about teaching.

Method

The survey method was used in this study. The survey questionnaire was delivered through the Internet. In order to locate students to participate in the study, an announcement was made on the websites of various teacher education programs in Turkey and an e-mail was sent to students of those programs. Both the announcement and email gave students the information that the study was voluntary and no credit would be given. The announcement and e-mail asked students to click on a URL to fill in the webbased survey questionnaire. About 2,500 students from teacher education programs in Turkey were solicited to participate in the study. Out of 2,500 students, 460 students (18.4%) volunteered to participate in the study. Participants consisted of 280 males and 210 females. The participants' class level distribution was: 194 from the freshman, 106 from sophomore, 100 from junior, and 60 from senior. The participants distributed around various areas of disciplins (primary education, english language education, elementary mathematics education, elementary biology education, science education, social studies education, religion education, computer education, turkish language, chemistry educationare). Consequetly, the participants' demographic characteristics are seen in that they are distributed across both genders, all class levels, and subject areas from various teacher education programs at universities throughout Turkey so that a generalization of the results is possible for Turkey and the other countries from similar economical and cultural states.

Data were collected using the Teaching and Learning Conceptions Questionnaire (TLCQ) developed by Chan and Elliot (2004). They carried out the validation study among 385 teacher education students of a territory institution in Hong Kong. The questionnaire used a 5-point Likert type scale (1, Never; 2, Rarely; 3, Sometimes; 4, Often; 5, Always). Its overall Cronbachs' alpha reliability coefficient was reported 0.84. They carried out a principal component extraction to test construct validity and proved 30 items with factor loadings ranging between 0.33 and 0.67 in two parts, "classical teaching" and "constructivist teaching."

The questionnaire was translated into Turkish by researchers and reviewed by an English language expert. During the translation process, some words and concepts were clarified through further explanation. After translation, the draft questionnaire was delivered to 30 teacher education students to obtain feedback on the usability and readability. After that, corrections were made to the questionnaire and it was finalized to be delivered to the target participants.

Results

The construct validity of the adapted TLCQ was done by executing an Exploratory Factor Analysis (EFA) and a Confirmatory Factor Analysis (CFA). Using CFA after EFA is a common method in construct validity inquires (Worthington and Whittaker, 2006). Principal component analysis (PCA) technique was used for the EFA at this study. The purpose of PCA was to define the components under which the questionnaire items were loaded (Tabachnick and Fidell, 2007).

Before the PCA, Kaiser-Meyer-Olkin (KMO) test was used to test the adequacy of the sample size for factor analysis and found 0.91. Additionally, Barlett test was used to test the normality of the distribution of the sample and find $\chi^{2}_{36} = 1746 (p < 0.001)$. These results confirmed that the sample size and the normality is proper to continue with the PCA (Leech, Barrett, and Morgan, 2005). As a result of the PCA, the adapted TLCQ items were collected under two construct and they explain 69.47% of the total variance. In addition, conducting a parallel analysis two factor solution was also confirmed. All the nine items of the adapted TLCO had loadings over 0.600. The critical value in PCA that item loadings should be over is 0.300 (Hair, Black, Babin, Anderson and Tatham, 2006).

As a result of the PCA, The adapted TLCQ had 4 items under CT. The first item was "It is important that a teacher understands the feelings of the students". This item was "In good classrooms there is a democratic and free atmosphere which stimulates students to think and interact". This item was "The focus of teaching is to help students construct knowledge from their learning experience instead of knowledge communication". This item was "Different objectives and expectations in learning should be applied to different

students". This item was named as Individual Differences. The adapted TLCQ had 5 items under TT. The first item was "Learning means remembering what the teacher has taught". This item was named as Memorization. The second item was "No learning can take place unless students are controlled". This item was named as Control. The third item was "Learning simply means listening the ideas from lecturers without questioning them". This item was named as Listening. The fourth item was "Teaching is simply telling, presenting or explaining the subject matter". This item was named as Lecturing. The fifth item was "The major role of a teacher is to transmit knowledge to students". This item was named as Transmitting.

The CFA was executed at the second stage of the construct validity of the adapted TLCQ. Analyzing the CFA model it was seen that a correlation between Lecturing and Transmitting significantly increase the goodness of the fit indicies of the model. When these two items were seen relavant, it was decided to correlate their errors. After that the CFA model was analyzed again. The final parameters of the adapted TLCQ are presented in Figure 1. The correlation between CT and TT is 0.31. This correlation suggests that CT and TT are seen somewhat related, but the correlation is not so high as to suggests that they are all measuring the same construct. The factor loadings are shown on the arrows from the latent variables to the observed variables in the model. The loadings for the four variables on CT range from 0.60 to 0.70. The loadings for the five variables on TT range from 0.63 to 0.75. All loadings and correlations among the latent variables are found significant (p < 0.001). Using the rules of Tabachnick and Fidell (2007), all the factor loadings are considered fair to excellent, and all indicator variables significantly load on the expected latent variable.

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Figure 1: The CFA Model of TLCQ

Various fit indices are used to test the adequacy of CFA models. Researchers commonly use chi-square goodness, goodness of fit index (GFI), normed fit index (NFI), relative fit index (RFI), comparative fit index (CFI), incremental fit index (IFI), root mean square residuals (RMR), and root mean square error of approximation (RM-SEA). Values over 0.90 indicates good fit for GFI, NFI, RFI, CFI and IFI (values close to 1 indicates perfect fit while values close to zero indicates bad fit) and values below 0.05 indicates good fit for RMR and RMSEA (Schumacker and Lomax, 2004; Meyers, Gamst, and Guarino, 2006; Raykov and Marcoulides, 2006). The fit indices of the CFA model confirmed two factor model with nine items (GFI=0.980, NFI=0.974, RFI (0.963), CFI=0.964,; IFI=0.988, RMR=0.019, and RMSEA=0.041). Internal reliability of the questionnaire was calculated by Cronbach's alpha. The alpha coefficient was found to be 0.88 for items of CT and 0.80 for items of TT. These results confirm that the adapted TLCQ is realiable to understand pre-service teachers' conception of teaching and learning. Calculating mean and standart deviations; CT items scored between 4.16 and 4.41; their average was 4.28. This result indicated that the pre-service teachers were positive about CT in most situations. On the other hand, the TT items scored between 2.14 and 2.52; their average was 2.32. This result indicated that the pre-service teachers were negative about TT in most situations. The standard deviations of the items in CT ranged below 1, while the standard deviations of the items in TT ranged above 1. This result indicates that teacher candidates were more homogeneous in their views of CT than in their views of TT.

Discussion and Conclusion

In this study, by executing a principle component analysis, 21 items were removed from the Teaching and Learning Conceptions Questionnaire (TLCQ) since their low and confusing loadings. This result indicates cultural differences on understanding teaching and learning in the context of the TLCQ. The confirmatory factor analysis proved the two factor model (CT-TT) with nine items. These nine items are the most remarkable characteristics of constructivist teaching versus traditional teaching from the perspectives of the Turkish pre-service teachers. The model indicated that CT and TT somewhat correlated, but the correlation is not so high as to suggests that they are all measuring the same construct.

The constructivist conception of teaching and learning estimate the variability in the belief that "It is important that a teacher understands the feelings of the students" by 0.70; "In good classrooms there is a democratic and free atmosphere which stimulates students to think and interact" by 0.74; "The focus of teaching is to help students construct knowledge from their learning experience instead of knowledge communication" by 0.57; and "Different objectives and expectations in learning should be applied to different students" by 0.60.

The traditional conception of teaching and learning estimate the variability in the belief that "Learning means remembering what the teacher has taught" by 0.64; "No learning can take place unless students are controlled" by 0.67; "Learning simply means listening the ideas from lecturers without questioning them" by 0.63; "Teaching is simply telling, presenting or explaining the subject matter" by 0.75; "The major role of a teacher is to transmit knowledge to students" by 0.72. In addition the latter two belief have a correlation by a coefficient of 0.46.

This study showed that Turkish teacher candidates believe in constructivist teaching more than traditional teaching. This is similar with Chai and Khine's (2008) study resulted in that Singaporean pre-service teachers are inclined towards constructivist teaching. Since teachers require adopting a student-centered teaching and constructivism in practice, preservice teachers should be prepared for the application of this philosophy. However, it is not well known to what extent they see a constructivist teaching as applicable and how they apply constructivism in teaching.

It is essential that teacher educators support the development of beliefs teaching and learning among pre-service teachers (Fang, 1996; Schommer-Aikins, 2004; Pajares, 1992; Alsup, 2006). Pre-service teachers' beliefs were difficult to change, but that change is possible if these beliefs are repeatedly challenged through the creation of cognitive dissonance as part of the teacher education program. Pajares (1992) proposed that beliefs about the nature of knowledge and what it means to be a teacher are formed concurrently over the course of many years of exposure to educational practices. He found that, since these beliefs about knowledge and teacher identity are interwoven components of a central belief structure that begins to develop when pre-service teachers are very young, they are particularly resistant to change. As Cheng, Chan, Tang, and Cheng (2009) indicated in their study, teacher education schools must focus on teacher candidates' beliefs and constructivist practices, and efforts by teacher education schools to foster teacher candidates' beliefs and views about constructivism are also recommended. It seems that Turkish pre-service teachers are positively affected by practices and efforts conducted in teacher education schools. In this study, self-report data were collected through a survey questionnaire; in future studies may need to focus on using more data collection methods such as focus groups and interviews.

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