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Analysis of Variables that Affect Teaching Learning Approaches and Epistemological Beliefs of Pre-Service Teachers by Structural Equation Model

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Abstract

Teachers are expected to update their instructional strategies. Teaching learning approaches and epistemological beliefs may affect teaching practices. The aim of this study is analyzing the relation of variables that effect epistemological beliefs and teaching learning approaches of teacher candidates on a statistical model. According to literature, self-efficacy perceptions, individual innovativeness positions, gender and English success levels, are expected to have direct or indirect effects on epistemological beliefs and teaching learning approaches. Many studies examined these relations, but there is not any study examining all of these relations on a statistical model. In addition, the effect of individual innovativeness on epistemological beliefs and teaching learning approaches was not examined on any model previously. A theoretical model established in line with the literature and has been tested with path analysis method. Results indicate that the model gave fit with the data within acceptable limits. According to the model, learning teaching approaches of individuals with sophisticated epistemological beliefs are more constructivist. In this case epistemological belief, individual innovativeness, general self-efficacy, gender, English success level and alma mater can be said to have direct or indirect effects on teaching learning approaches of teacher candidates.

Introduction

Teachers are expected to adopt constructivist and depth learning teaching approach to support active learning (Aypay, 2011b; Cano, 2005; MEB, 2017; Schunk, 2015). Education is viewed as creative self-learning, active process in which learner reconstructs their knowledge. Teachers and learners should plan the activities together. Students are responsible for their own learning and teachers should guide for inquiry and agent (Ornstein, 2015). However, when in class practices are examined it is observed that constructivist and in-depth learning teaching approach has not been accomplished to live in many cases (Akpınar & Gezer, 2010; Aykaç & Ulubey, 2012; Duru & Korkmaz, 2010). Student centered instructional approaches taking place in the official program does not guarantee that these will be used in the implemented program.

Theoretical Framework

Teacher qualifications are considered important in order to carry constructivist and in-depth learning teaching practices into effect in schools. In order to provide these qualifications, the importance of preservice teacher education is undeniable. In order to carry these practices into effect in schools, teacher candidates shall graduate in a way that they have adopted constructivist and in-depth learning teaching approach. Therefore, analyzing teaching learning approaches of teacher candidates and variables that affect these, may bring significant contributions to understanding the existing situation and organizing training for teacher candidates. Hence the purpose of this study is to analyze variables that affect teaching learning approaches of teacher candidates by structural equation model.

Teaching Learning Approaches

Teaching learning approaches involve the meaning of learning and teaching and beliefs on what is the roles of students and teachers (Chan and Elliott, 2004). In constructivist or in-depth learning teaching approaches, the

student is not the passive receiver of the information but has the role of accessing, processing and structuring the information actively. Teachers that have this perspective are expected to set their active learning perspectives more to work, to support cooperation among students, and to encourage students more on undertaking the learning responsibility (Schunk, 2015). In the meantime, students that have this perspective can be said to have important advantages like solving unstructured problems, developing a positive attitude towards learning, being successful academically (Cano, 2005; Schunk, 2015). Teachers and students who have this perspective are expected to adopt modern education philosophies more (Ornstein, 2015). However, in traditional or surface learning teaching approach teacher is the source of information and the student is the passive information receiver. In this approach teacher centered strategies are more likely to be set to work. Furthermore, we can say that students that have this perception are more incompetent in solving unstructured problems, developing a positive attitude towards learning, and with regards to academic success (Cano, 2005; Schunk, 2015). Teachers and students that have traditional or surface learning teaching approach perspective are expected to adopt traditional education philosophies (Ornstein, 2015).

Many variables have an effect on teaching learning approaches. These variables can be aligned with epistemological beliefs, individual innovativeness, general self-efficacy, gender (Cano, 2005; Lee & Tsai, 2005; Saçıcı, 2013; Sadi & Dağyar, 2015; Schommer, 1990). With regards to gender effect, while some researchers mention that men are more inclined to constructivist approach (Aydın, Tunca, & Şahin, 2015), some found out that women's constructivist approach is higher (Aypay, 2011b; Baş, 2014). In addition, there are also some researchers stating that gender has no effect on teaching learning approaches (Engin & Daşdemir, 2015). It is seen that there is not complete agreement on this subject in literature.

Epistemological Beliefs

One of the variables stated to be in relation to teaching learning approaches is epistemological beliefs (Aypay, 2011b; Cano, 2005; Phan, 2008). Epistemology is a dimension of philosophical perspective that is concerned with the nature of knowledge, information, and justification of beliefs (Phan, 2008). Epistemological beliefs shall be handled as a multidimensional structure involving knowledge, intelligence and learning dimensions (Aypay, 2011b; Schommer, 1990). According to Schommer (1990), individuals' epistemological beliefs may be at different complexity levels. Persons, whose belief tendency are sophisticated, believe that considerable part of knowledge is still developing, a part of knowledge will be discovered, and only a small part of knowledge is changeless. These people approach critically to what they read and believe that effort is the most important way of obtaining knowledge. On the other hand, persons whose belief tendency is naive, believe that considerable part of knowledge is certain, a part of knowledge will be discovered, and only a small part of knowledge has changed. These persons as they cannot approach critically, are more open to get affected from what they read. Furthermore, they support the opinion that talent is more important than effort in obtaining knowledge (Aypay, 2011b; Schommer, 1990, 1993). Epistemological beliefs may be examined in the dimensions of effort, innate ability, and certain knowledge (Deryakulu & Büyüköztürk, 2005).

Personal epistemological beliefs have a significant effect on person's cognitive and metacognitive processes (Schommer, 1994). Epistemological beliefs are important for numerous academic experiences, have been shown to be correlated with learning in various ways, affect reasoning and judgment throughout our lives, and have implications for teaching (Hofer, 2001). In many researchers in literature, epistemological beliefs are mentioned to have effect to a certain extent on learning approaches, academical success, active participation in learning, being insistent in difficult duties, understanding written material and coping with unstructured problems (Aypay, 2011b; Hofer, 2001; Kapucu & Bahçivan, 2015; Phan, 2008; Phillips, 2001). Students with sophisticated epistemological beliefs, can use more qualified cognitive data processing strategies, control more frequently and correctly at which level they have learned education materials in metacognitive terms, show higher levels of academic success, have more positive behaviours against school, believe more in advantages of education and create more complex and multiple ideas (Cano, 2005; Deryakulu & Büyüköztürk, 2005; Hacıömeroğlu, 2011; Hofer, 2001; Phillips, 2001; Schommer-Aikins, Duell, & Hutter, 2005).

When the relationship between epistemological beliefs and teaching learning approaches is analyzed, students with sophisticated beliefs would prefer to use a deep learning or constructivist approach more frequently. Similarly, students with naive epistemological beliefs will tend to view a surface or traditional learning approach (Aypay, 2011b; Cano, 2005; Kember & Gow, 1989; Phan, 2008). Furthermore, when the constructivist approach is implemented in class environments, epistemological beliefs are also reported to develop (Islıcık, 2012).

Researchers who analyze sub-dimensions of epistemological beliefs and sub-dimensions of teaching learning approach have also obtained similar results. According to Taşkın (2012) while belief dimension as epistemological beliefs learning is subject to effort predicts deep learning approach significantly, belief dimension as certain knowledge exists, predicts surface learning approach significantly. While students who adopt significant/in-depth learning approach believe that scientific knowledge may change, students who adopt rotely/surface learning approach mention that they believe that knowledge is certain and does not change (Özkal, 2007). While there is a positive relation between in-depth learning approach and belief that learning is subject to the effort, there is a positive relation between surface learning approach and knowledge is subject to talent and belief that certain knowledge exists (Ayaz, 2009).

General Self-Efficacy

Another variable stated to have an effect on teaching learning approaches, and epistemological beliefs is general self-efficacy (Baltacı, 2013; Gürol, Altunbaş, & Karaaslan, 2010; Kapucu & Bahçivan, 2015; Saçıcı, 2013; Uredi, 2015; Y. Wang, Tsai, & Wei, 2015). Self-efficacy is the belief of a person that he/she can do the required behaviors successfully to obtain the desired results in a situation (Bandura, 1977). General self-efficacy is the belief in one's ability to deal with a broad range of stressful or challenging attempts, whereas specific self-efficacy is constrained to a particular task at hand. In other words, general self-efficacy express individual's efficiency belief in coping with stressful and challenging life cases (Luszczynska, Scholz, & Schwarzer, 2005). Self-efficacy perceptions have an effect on starting, continuing behaviors and coping with challenges. These perceptions designate how much effort will the persons make on a specific subject, how long they will continue their behaviors despite inhibitor and antipathetic experiences (Aypay, 2010; Bandura, 1977). While some researchers mention that general self-efficacy differentiates according to gender (Aypay, 2010; Scholz, Doña, Sud, & Schwarzer, 2002), some researchers stated that gender is not an effective variable in determining self-efficacy (Temelli, 2011). While Aypay (2010) says that men's self-efficacy is higher than women, Scholz et al. (2002) state that difference between women and men differs according to culture, while in some cultures women's self-efficacy perceptions are higher, in some cultures men's self-efficacy perceptions are higher. Furthermore, teacher candidates with high self-efficacy perception are stated to have more constructivist teaching learning approaches (Saçıcı, 2013) and more sophisticated epistemological beliefs generally (Alemdağ, 2015; Baltacı, 2013; Gürol et al., 2010). Also, it is mentioned that sophisticated epistemological beliefs affect self-efficacy positively (Kapucu & Bahçivan, 2015).

Individual Innovativeness

Another variable known to have an effect both on teaching learning approaches and epistemological beliefs is the openness to change or individual innovativeness (Kurt, 2010; Lee & Tsai, 2005). Innovation is an idea, practice, or object that is perceived as new by a person or organization. Innovativeness can be defined as adaptation and use of new ideas or practices by individuals, units or groups before other individual or units (Rogers, 1983, s.11). Innovativeness is accepted as an umbrella concept that also involves the features of concepts like taking the risk, being open to experience, creativity, opinion leadership. Acceptance and diffusion of innovation may differentiate between individuals or units. While innovative individuals tend to update practices more quickly, not innovative individuals will tend to continue previous practices (Kılıçer & Odabaşı, 2010; Rogers, 1983).

While in some studies that analyze innovativeness statuses of teachers and teacher candidates, it is stated that innovativeness does not change according to gender (Çuhadar, Bülbül, & Ilgaz, 2013; Demir Başaran & Keleş, 2015; Korucu & Olpak, 2015). There are also researchers stating that there is a significant relation between genders of teacher candidates and their individual innovativeness statuses (Erdoğan & Güneş, 2013; Kılıç & Tuncel, 2014). Besides gender self-efficacy is said to affect the innovativeness (Kwon, Choi, & Kim, 2007; Nisula & Kianto, 2015; Wang, Li, & Hsieh, 2013). We can say that there is also a relation between individual innovativeness and epistemological beliefs also (Kurt, 2010; Lee & Tsai, 2005). Kurt (2010) states that there is a significant relationship between teachers' naive epistemological beliefs and resistance to change which is defined as a negative state of innovativeness. As resistance to change increases, epistemological beliefs are affected negatively from this. In addition, Lee and Tsai (2005) have also stated that there is a significant relationship between organizations' innovativeness and learning orientations. In this aforesaid study, the relation will be tested to analyze whether it is also valid for teacher candidates or not.

Department, Gender, and English Professioncy

Another variable stated to affect epistemological beliefs, and teaching learning approaches are the department where teacher candidates study (Oğuz & Sarıçam, 2015; Tümkaya, 2012; Yılmaz, 2014). According to Tümkaya (2012)'s findings, social sciences studying students' belief that learning is subject to the effort is higher, health area students' belief that learning is subject to talent is higher, and science-technical area students' belief that certain knowledge exists is higher.

There are many researchers reporting that there is a positive relation between sophisticated epistemological beliefs and academic success of students. (Cano, 2005; Demirel, 2014; Hofer, 2001; Phillips, 2001; Schommer-Aikins et al., 2005; Uysal, 2010). Sophisticated epistemological beliefs have a positive effect not only on school success but also on out-of-school success and lifetime learning (Hofer, 2001). In addition as university admission scores of students get higher, epistemological beliefs are also observed to be more sophisticated (Erdamar & Alpan, 2011). In this case, students with high success can be said to have higher epistemological beliefs. Academic achievement and English proficiency level has a relationship with self-efficiency, student with higher self-efficacy has higher English achievement (Kotaman, 2008; Wolters & Pintrich, 1998). Additionally, the students with higher English achievement use high level cognitive learning strategies (Pintrich & de Groot, 1990). So examining direct and indirect effects of English proficiency level on general self-efficacy, epistemological beliefs and teaching learning approaches is important.

Another variable mentioned to have an effect on epistemological beliefs is gender. In literature generally, epistemological beliefs of women are stated to be more developed than men (Aypay, 2011b; Biçer, Er, & Özel, 2013; Cano, 2005; Demirel, 2014; Hofer, 2001; Schommer, 1993; Taşkın, 2012). Even so, all these differences observed in gender are slight and account for only a small proportion of the variance (Cano, 2005). However, Chan & Elliott (2002) mention that gender variable does not have an effect on epistemological beliefs.

Purpose of the Study

The purpose of this study is to analyze the relation between teacher candidates' teaching learning approaches, epistemological beliefs, self-efficacy perceptions, individual innovativeness statuses, genders and English success levels on a model. Analysing teaching learning approaches is important both with regards to revealing teacher candidates' perspectives on the learning process and providing opinion on teaching approaches that they will use in the future. Explaining variables that affect teaching learning approaches, may support taking decisions based on evidence with regards to teacher education.

In literature there are some researchers that analysed the relation between teaching learning approaches and epistemological beliefs on statistical model (Cano, 2005; Phan, 2008; Sadi & Dağyar, 2015; Wang et al., 2015); and also there are researchers that analyse effects of variables like general self-efficacy, individual innovativeness, gender on teaching learning approaches without establishing a statistical model (e.g., Cano, 2005; Hofer, 2001). However, there is no study that explains all these variables on only one model. The study in this respect is expected to have theoretical contributions to literature. Furthermore, the relation between innovativeness and learning orientations have been analyzed at the level of institutions (Lee & Tsai, 2005). Testing the relationship between innovativeness and learning approaches for teacher candidates also will bring contributions to literature. As a result, as the study analyses effects of many variables on teaching learning approaches, it is expected to have significant contributions to literature. In line with this, in light of relations reached in literature, a model has been established, this model has been tested by path analysis (see. Figure 1). According to established model on teaching learning approaches, epistemological beliefs are expected to have a direct relation (Aypay, 2011b). Furthermore, in literature, general self-efficacy, individual innovativeness, and department are stated to have an effect on epistemological beliefs (Aypay, 2011b; Cano, 2005; Phan, 2008; Schommer, 1993; Tümkaya, 2012). Figure 1 shows the relations of mentioned variables on the theoretical model.

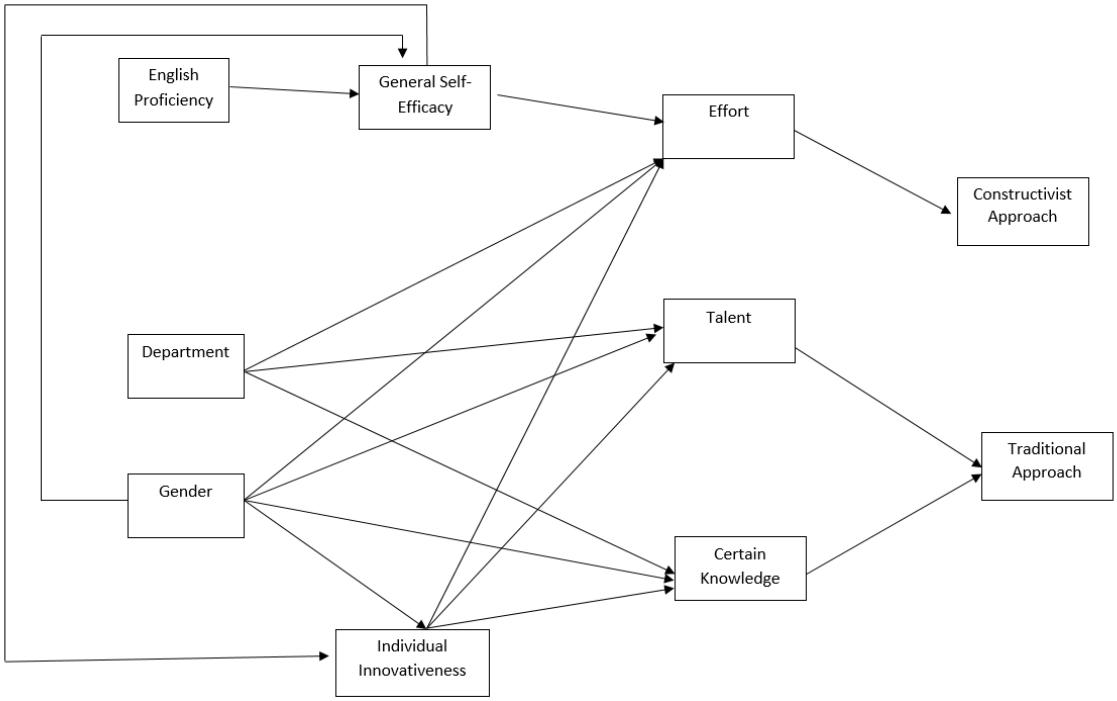

Figure 1. Theoretical model

Method

In this section research model, data collection process, data collection tools, and analysis have been explained.

Research Model and Data Collection Process

This study, with regards to its investigation on relation between variables, is a correlational study. Compliance with the model established in the light of literature and data has been analyzed with path analysis method. Research's population is formed of senior class teacher candidates that study at Ege University Faculty of Education. Sampling has been designated with purposeful sampling method. In order to provide maximum variety, both faculty of education and pedagogical formation certification program students have been included. In addition representation of students from different departments has been provided. As a result, 522 teacher candidates have participated the research. 410 of teacher candidates have marked the gender as woman, 110 have marked as man and 2 have not answered the question. 254 of these teacher candidates are faculty of education students, and 264 are pedagogical formation certification program students.

Data Collection Tools

General Self-efficacy Scale

General self-efficacy scale has been developed by Schwarzer and Jerusalem (1995; cited by, Aypay, 2010) and adapted to more than 25 languages. The original scale which is unidimensional, consists of 10 items and factor loadings of clauses vary between .76 and .90 (Aypay, 2010; Scholz et al., 2002). The scale has been adapted to Turkish by Aypay (2010). In Turkish version of the scale, two dimensions that explain 47% of total variance have raised. Factor loadings of items vary between .41 and .79. Items in the factor of "effort and resistance" emphasize showing effort and being resistant in coping with challenges, items in the factor of "talent and confidence" emphasize talent and self-confidence in coping with challenges. Cronbach Alfa internal validity coefficient calculated for scale's factors are respectively.79 and .63. This value has been calculated as .83 for the whole scale. The total score can be calculated from the scale and low scores indicate lower self-efficacy, high scores indicate higher self-efficacy (Aypay, 2010). The Cronbach Alfa internal validity coefficient values for the implementation of this research was calculated .84 for the whole scale and, .80.66 for subscales respectively

Individual Innovativeness Scale

Individual innovativeness scale has been developed by Hurt et al. (1977). The scale consists of twenty items and four factors. The total score can be calculated by adding 42 points after deducting negative item points from positive item points. According to obtained score interval, persons may be commented as innovators, early adopters, early majority, late majority, and laggards. Scale adapted to Turkish by Kılıçer and Odabaşı (2010), consists of four dimensions explaining 52,5% of total variance. These dimensions are named as resistance to change, opinion leadership, being open to experience and taking the risk. Factor loadings of scale's clauses vary between .36 and .78 (Kılıçer & Odabaşı, 2010). The Cronbach Alfa internal validity coefficient values for the implementation of this research was calculated .67 for the whole scale and, .82, .79, .76, .61 for subscales respectively.

Epistemological Beliefs Scale

Epistemological Beliefs Scale developed by Schommer has been adapted to Turkish by Deryakulu and Öztürk (2002, 2005). Turkish form of the scale consists of 34 items (Deryakulu & Büyüköztürk, 2002, 2005). The scale consists of three dimensions; Belief that Learning is Subject to Effort, Belief that Learning is Subject to Talent and Belief that there is Certainty knowledge. Cronbach Alpha internal validity coefficients of three dimensions that explain 28% of total variance have been calculated respectively as .83, .62 and .59. This value is .71 for the whole scale. Values obtained as a result of confirmatory factor analysis indicates that model data fit is within acceptable limits (x2 = 1331,96 sd = 524, p<.001, x2/sd = 2.54, RMSEA = 0.05, RMS = 0.09, standardised RMS = 0.07, GFI = 0.89 and AGFI = 0.87) (Deryakulu & Büyüköztürk, 2005). Assessment of scores from the scale is made on factor basis, scores from the whole scale cannot be calculated (Deryakulu & Büyüköztürk, 2002, 2005). The Cronbach Alfa interal validity coefficient values for the implimetation of this research was calculated .76 for the whole scale and, .82, .72, .68 for sub scales respectively.

Teaching Learning Approaches Scale

Teaching learning approaches scale has been developed by Chan & Elliott (2004). The original scale consists of 30 items and two factors. Cheng et al., (2009) stated that confirmatory factor analysis results of the scale is within acceptable limits in the practice they made (chi-sq = 304.27, df = 64, NNFI = 0.95, CFI = 0.96, GFI = 0.93, AGFI = 0.90, RMSEA = 0.079). Original scale has been adapted to Turkish by Aypay (2011b). After language validity has been provided, the testing practice has been done, and confirmatory factor analysis has been implemented. While chi-square value has been stated to be significant (x2=1020,3 N=341, sd=404, p=0.00) fit indexes have been reported as partly low (RMSEA:0.067, NFI:0.72, CFI:0.80). As RMSEA has been reported to be the most information giving regarding model-data fit, these fit indexes indicate that model is partly compatible. The scale consists of two dimensions; constructivist and traditional. The reliability coefficient calculated for the whole scale as .71 , it was calculated for sub-dimensions respectively as .88 and .83. (Aypay, 2011b). The Cronbach Alfa interal validity coefficient values for the implimetation of this research was calculated .75 for the whole scale and, .86 and .87 for sub scales respectively.

Analysis of Data

Missing data analysis has been made to check random dispersion of missing data. For randomness; as Pearson correlation coefficients were .50 and less, and there was no significant differences between Listwise averages and all value averages; missing data were decided to be random (Kalaycı, 2008). Missing data have been changed with serial averages.

Compliance between theoretically established model and data has been analyzed with path analysis method. A path analysis can be considered as the application of multilinear regression, the assumptions of multilinear regression were checked (Leech, Barrett, & Morgan, 2014). The first assumption was the normal distribution of variables. As skewness values were distributed between nearly -1/+1, it means that variables were normally distributed (Leech et al., 2014). The correlation between dependent and independent variables was examined to test whether linearity hypothesis was fulfilled, and a linear correlation was observed. Tolerance values were examined to test the multicollinearity problem, and these values were found to be higher than $1\text{-}R^2$ for the independent variables. Accordingly, the absence of multicollinearity problem was confirmed (Leech et al., 2014). As a result, the multilinear regression's assumptions of normal distribution of variables and normality of

relation between dependent and independent variables have been met. The path analysis has been conducted with the help of Lisrell package program and the estimation method was maximum likelihood.

Results

In this section findings obtained as a result of path analysis have been presented in graphs and tables. When the theoretically established first model has been tested, model data fit was not between acceptable intervals (chi-square/df >5, RMSEA:.133, AGFI:.94, GFI:.97). In this case, it has been decided to make some changes in the model. Firstly relations with insignificant t values have been removed from the model. Afterwards direct effects on teaching learning approaches of gender (Akyıldız, 2016; Cano, 2005) and innovativeness (Lee & Tsai, 2005) variables have been added in the model. Afterwards, the relation has been established between the belief that learning talent comes from birth and certainty of knowledge belief which are both deemed as naive epistemological beliefs (Aypay, 2011b; Schommer, 1990, 1993). The new model obtained as result of arrangements has been tested with path analysis again. For this model, model data fit seemed as acceptable. Various fit indexes and error values were examined to determine the fit between the established model and the data. Fit indexes were close to one and error values were close to zero, showing an adequate model-data fit (Hu and Bentler, 1999; Jöreskog and Sörbom, 1993). Fit indexes obtained for the model are as follows: chi-square:84.71, df:25, chi-square/df < 4, GFI:.97, AGFI:.94, NNFI:.93, CFI:96, SRMR:.065, RMSEA:.068. Accordingly, the model-data fit was found to be adequate. Relations between variables and standardized solutions have been given in Figure 2. Then fit indexes, and regression equalizations obtained from path analysis have been given in tables.

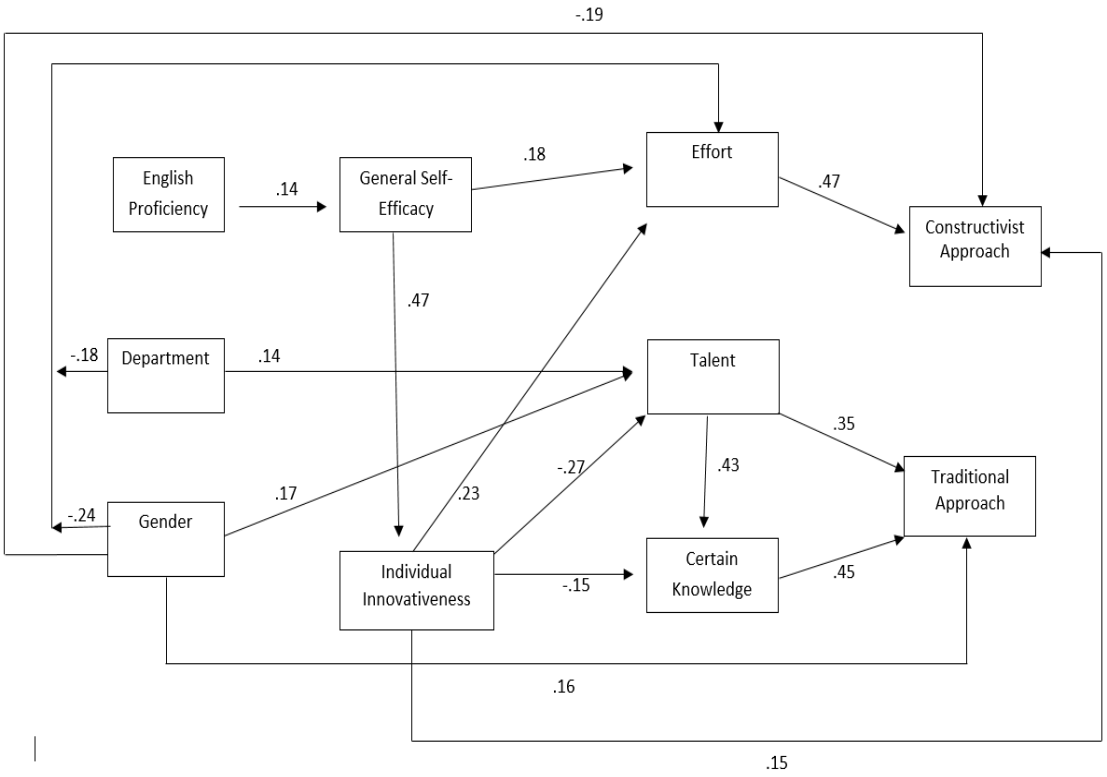

Figure 2. Presentation of variables accounting for general self-efficacy, epistemological beliefs, learning and teaching approaches (standardized results)

Variables with a direct effect on learning and teaching approaches integration to account for 52% of total variance for traditional approach and 37% of the variance for constructivist approach. Direct effects of talent (Beta=.33), certain knowledge (Beta=.44), gender (Beta=.09) were found to be significant on the traditional approach. Effort (Beta=.55), individual innovativeness (Beta=.008) and gender (Beta=-.10) have a significant effect on the constructivist approach. Regression equations are given below.

Traditional Approach = 0.33* Talent + 0.44* Certain Knowledge + 0.093*Gender, Errorvar.= 0.17 , R^2 = 0.52
Constructivist Approach = 0.55* Effort + 0.008* Individual Innovativeness - 0.10*Gender, Errorvar.= 0.15 , R^2 = 0.37

Effort = 0.21* General Self-Efficacy + 0.011* Individual Innovativeness - 0.012*Department - 0.098*Gender, Errorvar. = 0.14, $R^2 = 0.20$
Talent = 0.11*Gender - 0.019* Individual Innovativeness + 0.014* Department, Errorvar.= 0.35 , $R^2 = 0.12$
Certain Knowledge = - 0.01* Individual Innovativeness + 0.41* Talent, Errorvar.= 0.28 $R^2 = 0.24$
Individual Innovativeness = 11.71* General Self-Efficacy., Errorvar.= 62.98, $R^2 = 0.22$
General Self-Efficacy = 0.081*English, Errorvar.= 0.13 , $R^2 = 0.020$

Direct effects of exogenous variables (English proficiency, department, gender, general self-efficacy, individual innovativeness, effort, talent, certain knowledge) on endogenous variables (general self-efficacy, individual innovativeness, effort, talent, certain knowledge, constructivist approach, traditional approach) are presented in Table 1.

Table 1. Direct effects of the factors on the model (non-standardized coefficients)

Exogenous (Independent) Variables	Endogenous (Dependent)Variables						
	General self-efficacy	Individual innovativeness	Effort	Talent	Certain knowledge	Constructivist approach	Traditional approach
English proficiency	.14	-	-	-	-	-	-
Department	-	-	- .18	.14	-		
Gender	-	-	- .24	.17	-	- .21	.16
General self-efficacy	-	.47	.18	-	-	-	-
Individual innovativeness	-	-	.23	- .27	- .15	.15	-
Effort	-	-	-	-		.47	
Talent	-	-	-	-	0.43	-	.35
Certain knowledge	-	-	-	-	-	-	.45
R^2	.02	.22	.20	.12	.24	.37	.52

When direct effects are examined, the most effective variable on constructivist learning approach is the dimension of epistemological beliefs that learning is subject to the effort. Accordingly, when the opinion that knowledge is subject to effort increases, constructivist teaching learning approach also increases. The secondary effective variable is gender. Women's constructivist approach scores are higher than men's. Furthermore, the most important variable that has an effect on traditional approach is the certain knowledge dimension of epistemological beliefs. The dimension of knowledge is subject to talent follows this.

When variables that have a direct effect on epistemological beliefs are examined, variables that are most effective on effort dimension are gender, individual innovativeness, and general self-efficacy. Women's epistemological beliefs can be said to be more sophisticated. In addition when general self-efficacy and individual innovativeness increase belief on knowledge is subject to effort also increases, namely epistemological beliefs become more sophisticated. Besides the direct effects, the indirect effects of exogenous variables on learning and teaching approaches were examined. Absolute magnitudes of indirect effects of exogenous variables vary between .004 and .48. Values related to indirect effects are presented in Table 2.

When totals of direct and indirect effects in table 3 are examined, the variable that has the strongest effect on constructivist approach is the belief that epistemological beliefs knowledge is subject to the effort (.48). General self-efficacy (.28) and gender (-.26) follow this. According to this, when self-efficacy scores increase teacher candidates' teaching-learning approaches become more constructivist. The variable that has the lowest effect on constructivist approach is the department where teacher candidates study.

For the traditional approach, the belief that knowledge is subject to talent (.53) is the variable with the highest effect. Respectively certainty of knowledge (.45) and gender (.22) follow this. When women are taken as a reference, while men's constructivist learning approach scores decrease by %33, their traditional learning approach scores increase by %22.

Table 2. Direct, indirect and total effects of independent variables on technology integration (calculated by multiplying over the model)

Independent variable	Mediating variable	Dependent variable	Indirect effect	Direct effect	Total
English proficiency	→ General self-efficacy → Effort → General self-efficacy → Indiv.Innov → Effort →	Constructivist approach	.02*		.02*
English proficiency	→ General self-efficacy → Indiv.Innov → Talent → → General self-efficacy → Indiv.Innov → Cert.Know →	Traditional approach	-.01*		-.01*
Department	→ Effort →	Constructivist approach	-.01*		-.01*
Department	→ Talent → → Talent → Cert.Know →	Traditional approach	.01*		.01*
Gender	→ Effort →	Constructivist approach	-,05*	-.21*	-.26*
Gender	→ Talent → → Talent → Cert.Know →	Traditional approach	.06*	.16*	.22*
General self-efficacy	→ Effort → → Indiv.Innov.→ → Indiv.Innov.→Effort →	Constructivist approach	.28*		.28*
General self-efficacy	→ Indiv.Innov.→ Cert.Know → → Indiv.Innov.→ Talent→Cert.Know →	Traditional approach	-.16*		-.16*
Individual innov.	→ Effort →	Constructivist approach	.01*	.15*	.16*
Individual innov.	→ Talent→ → Talent→ Cert.Know → → Cert.Know →	Traditional approach	-.01*		-.01*
Effort		Constructivist approach		.48*	.48*
Talent	→ Cert.Know →	Traditional approach	.18*	.35*	.53*
Certain knowledge		Traditional approach		.45*	.45*

*The difference is statistically meaningful

Conclusion, Discussion, and Suggestions

In this study variables that affect teacher candidates' teaching learning approaches have been analyzed with structural equalization model. As fit indexes obtained from the analysis of the first model established in light of literature were not within acceptable limits, some changes both in light of analysis results and literature have been made in the model. Fit indexes between established second model and data have been observed to be within acceptable limits. Therefore, it can be said that epistemological beliefs, individual innovativeness, general self-efficacy, gender, English success level and studied department have a direct or indirect effect on teacher candidates' teaching learning approaches.

When these relations have been examined, variable that has the strongest effect on constructivist approach is the dimension that epistemological beliefs knowledge is subject to the effort. When belief that knowledge is subject

to effort increases, the constructivist approach also increases. Similarly, in literature, many researchers have stated that there is a significant relationship between sophisticated epistemological beliefs and in-depth or constructivist teaching learning approaches (Aypay, 2011b; Cano, 2005; Cano & Cardelle-Elawar, 2004; Kember & Gow, 1989; Phan, 2008). This relation between epistemological beliefs and constructivist teaching learning approach may be explained by considering philosophical basis of constructivist beliefs. In constructivist teaching learning approach based on paradigm beyond positivism, knowledge is not accepted fixedly and individuals structuring on knowledge is significantly important. So the effort of the learner is very important on structuring the knowledge (Yurdakul, 2007). Furthermore, students with sophisticated epistemological belief are stated to have many positive features like processing the knowledge, assessing their own learning, believing in benefit of education (Cano, 2005; Deryakulu & Büyüköztürk, 2005; Hacıömeroğlu, 2011; Hofer, 2001; Phillips, 2001; Schommer-Aikins et al., 2005). These features can be said to be important also with regards to constructivist teaching learning approach.

Obtained findings indicate that gender is also important on constructivist teaching learning approach; when women's scores are fixed, men's constructivist approach scores decrease. In literature, it is seen that there is no consensus on that matter. While some researchers mention that women adopt constructivist approach more (Aydın et al., 2015) some researchers mention that men adopt constructivist approach more (Aypay, 2011b; Baş, 2014). Gender has a direct effect also on epistemological beliefs. When women's scores are fixed, men's belief that knowledge is subject to effort decreases, belief that knowledge is subject to talent increases. In this case, women's epistemological beliefs can be said to be more sophisticated. Similarly, Aypay (2011a) indicates that women's epistemological beliefs are more sophisticated them men. According to some researchers, the reason of this is that women believe that learning takes place gradually; acceptance on slowly learning occurs gradually provides an advantage with regards to sophisticated epistemological beliefs (Cano, 2005; Schommer, 1993). Furthermore, Smith & Miller (2005) state that women focus on their own learning and structuring the knowledge more than men. In addition, there are researchers saying that epistemological beliefs do not differ according to gender (Chan & Elliott, 2002). People's self-efficacies are also changing based on gender. Huang (2013) indicates that males and females self-efficacies are changing based on the topic. For example, females have higher language arts self-efficacy than males. On the other hand, males have higher mathematics, computer and social sciences self-efficacy than females (Huang, 2013).

Besides gender, individual innovativeness also has a direct effect on constructivist learning approach and epistemological beliefs. When individual innovativeness increases, constructivist teaching learning approach, and sophisticated epistemological belief scores also increase. In this case, it can be said the more individual innovativeness, the more constructivist approach, and sophisticated epistemological beliefs. In literature, there are researchers supporting these findings (Kurt, 2010; Lee & Tsai, 2005). One of the reasons for this situation may be exposure of teacher candidates involved in sampling to more traditional education practices during their primary and secondary educations. Although the constructivist approach has entered the official program in 2005 in Turkey, frequently traditional education practices are reported to be continued in classes (Akpınar & Gezer, 2010; Aykaç & Ulubey, 2012; Duru & Korkmaz, 2010). Thus constructivist practices involve innovations for teacher candidates. Furthermore, as innovativeness includes features like taking risk and being open to experience, (Kılıçer & Odabaşı, 2010; Rogers, 1983) innovative individuals may be expected to spend more effort to structure the knowledge. This situation is one of the indications of both constructivist teaching learning approaches and sophisticated epistemological beliefs.

In addition to individual innovativeness, one of the variables effective on the model is general self-efficacy. General self-efficacy has an indirect effect on teaching learning approaches when general self-efficacy increases teacher candidates' constructivist approach scores increase. Individuals that have high general self-efficacy besides teaching learning approaches have higher individual innovativeness scores and their epistemological beliefs are observed to be more sophisticated. Many researchers indicate that self-efficacy effects constructivist approach positively (Saçıcı, 2013; Temiz & Topcu, 2013). Similarly many studies in literature state that general self-efficacy affects both the belief that knowledge is subject to the effort (Alemdağ, 2015; Baltacı, 2013; Gürol et al., 2010) and individual innovativeness (Kwon et al., 2007; Nisula & Kianto, 2015; W. Wang et al., 2013) positively. General self-efficacy is defined as person's beliefs about him/herself that he/she can obtain the results he/she desires (Bandura, 1977). In this context, it is mentioned that as self-efficacy increases person's possibility to be active and spend effort increases (Bandura, 1977; Locke, 1987). Thus individuals with high self-efficacy may be expected to spend more effort to structure the knowledge and adopt innovations easier.

Another variable analyzed in the model is the department studied. The Department that has an indirect effect on teaching learning approaches effects epistemological beliefs directly. While constructivist approach scores of technical and basic science departments like computer and chemistry are lower than others, departments

expected to be addressed to early age groups like preschool teaching and classroom teaching have higher constructivist approach scores than others. Both in classroom teaching and preschool teaching programs, child psychology, and development oriented lesson number is more than technical and basic science departments like computer and chemistry. In this context, it is an expected result that constructivist approach that includes accepting individual differences and conducting education in line with these is affected positively by better understanding the child's nature. Similarly, in literature, there are researchers reporting that both teacher candidates' departments and teachers' branches have an effect on teaching learning approaches and epistemological beliefs (Akpınar & Gezer, 2010; Oğuz & Sarıçam, 2015; Tümkaya, 2012; Yılmaz, 2014).

Besides department English efficiency level also has an indirect effect on the constructivist approach. As teacher candidates' English efficiency levels increase, their constructivist approaches also increase. Similarly Demirel, Kozikoğlu, & Özkan (2014) state that there is a significant relationship between students' English success levels and their in-depth learning approaches. There are researchers reporting that in addition to English success level, general success level also has an effect on teaching learning approaches being constructivist (Aypay, 2011b; Cano, 2005). English efficiency level also has a direct effect on general self-efficacy. In literature many researchers mention that even there is no direct English success level, previous successes affect general self-efficacy positively (Aypay, 2010; Luszczynska et al., 2005). In line with this, it can be said that as students with high English efficiency feel more successful and their general self-efficacy is higher than the students with low English efficiency.

Besides constructivist approach, variables that affect traditional teaching learning approach have been analyzed. Primarily it is observed that dimension of certainty of knowledge of epistemological beliefs affects traditional approach directly. Respectively dimension of learning talent comes from birth and gender follows this. Similarly many researchers in literature state that individuals with naive epistemological beliefs have more traditional teaching learning approaches (Hofer, 2001; Phan, 2008; Phillips, 2001). When indirect effects on traditional approach are examined, individual innovativeness, general self-efficacy, and English efficiency are seen to have an effect. While there is a positive relationship between these variables and constructivist approach, there is a negative relation with traditional teaching learning approach. In other words, as individuals' individual innovativeness, general self-efficacy and English efficiency increase, constructivist approach increases, but traditional approach decreases.

Limitations, Weaknesses, and Suggestions

We can say that there are some limitations and weaknesses in this research. First of all study group has been limited to 523 teacher candidates studying in a university. Furthermore, variables that affect teaching learning approaches have been limited by epistemological beliefs, general self-efficacy, individual innovativeness, gender, department and English success level. Besides limitations, some weaknesses may be mentioned. Limiting the sampling with teacher candidates who study at only one university may be accepted as a weakness for the research. Besides, these limitations and weaknesses, some suggestions for research and practice can be offered in line with obtained results.

The established model has been tested by collecting data from teacher candidates. The same model may be tested by collecting data from in-service teachers. There are English forms of measurement tools used for all tested variables. In addition to Turkish culture, researchers may be performed to reveal the relation between teaching learning approaches, epistemological beliefs, innovativeness levels and self-efficacies of teacher candidates and teachers from different cultures. Gender is one of the variables that affect teaching learning approaches and epistemological beliefs. In literature, different findings may be found on gender's effect. Thus performing deep researches on gender's effect may contribute in explaining this relationship.

The most important variable that has an effect on teaching learning approaches is effort dimension of epistemological beliefs. Maturation of epistemological beliefs affects constructivist learning approach positively. Therefore during teacher education, precautions for epistemological beliefs maturation shall be taken. It is seen that all attempts aimed at developing teacher candidates' epistemological beliefs do not have the same effect, while some attempts' effect fails to satisfy, some attempts are more successful (Demir, Bay, Bagceci, Vural, & Avcı, 2015; Lahtinen & Pehkonen, 2013; Valanides & Angeli, 2005). It can be said that teacher candidates oriented attempts in the first years are more effective on the maturation of epistemological beliefs (Lahtinen & Pehkonen, 2013). Thus performing appropriate training devoted to the development of epistemological belief in the first years of teacher candidates, will also support constructivist teaching learning approaches.

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