

*Full Length Research Paper*

# Examining Social Studies and science and technology preservice teachers' epistemological beliefs regarding different variables

Yavuz Topkaya

Kilis 7Aralık University, Muallim Rifat Education Faculty, Department of Elementary Education, Kilis, Turkey.

Received 11 August, 2015; Accepted 16 September, 2015

The purpose of this study is to determine epistemological beliefs of pre-service teachers who attend social studies and science and technology teaching programs; and to investigate how these beliefs varies regarding grade level, gender and departments. The sample of the study is composed of 300 social studies, 260 science and technology pre-service teachers who attended Ataturk University Kazım Karabekir Education Faculty in 2013-2014 academic year. In the study, Epistemological Beliefs Scale that developed by Schommer (1990) and adapted to Turkish by Deryakulu and Öztürk (2005) was used. According to the research findings it is determined that there are significant differences in epistemological beliefs of social studies and science and technology teachers regarding the variables of gender, department and grade level. Significant differences were found regarding gender in favor of females; between first and fourth grades social studies pre-service teachers, in favor of first graders; between first and fourth grades science and technology pre-service teachers, again, in favor of first graders. Regarding department variable it is determined that first grade social studies pre-service teachers have more sophisticated epistemological beliefs than four grade social studies pre-service teachers and both first and fourth graders of science and technology teaching department.

**Key words:** Epistemological beliefs, pre-service teacher.

## INTRODUCTION

When changing and developing education understandings are historically examined we see many essential changes. The most important change of the last years is to internalizing the learner centered education philosoph. When we analyze the roots of this understanding we see some study areas that affect constructivist approach which is popular in last years. One of these most affective interdisciplinary areas is epistemology. With the integration

of philosophy and education areas with each other, studies on knowledge and learning increase and the epistemology concept appears as newly realized study area with its importance and place (Demir and Akinoğlu, 2010). Epistemology consists of episteme and logos words in Greek (Buehl and Alexander, 2001). Today, acknowledgements of nature of the knowledge and knowing (Hofer, 2001), and the process of gaining

E-mail: [dryavuztopkaya@gmail.com](mailto:dryavuztopkaya@gmail.com).

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

knowledge (Schommer, 1994) are described with the term epistemology. Epistemology is a philosophical movement that inquiring knowledge and grounded on individual's personal interpretations and epistemological beliefs on how individual learns and teaches. Epistemological belief is used for determining viewpoints on what is knowledge based on reality; how is it learned and taught; how to determine the accuracy of different and discordant knowledge; how to evaluate new knowledge; and how to understand substantial decisions that affect their own and others' lives (Kuhn 1991; King and Kitchener, 1994). The concept epistemology is inquired by Perry at first. He took attention to four different positions related with epistemological beliefs during pre-service teachers' training. Perry explains these situations as dualism, multiplism, relativism, and commitment. Dualistic individuals think that absolute rights and wrongs regarding nature of the knowledge and believe that knowledge come only from experts or authorities. When they think with multiplistic viewpoint in the next stage, they believe that some rights and wrongs could not be known in an absolute way and for this reason knowledge includes both ultimate truths and personal beliefs together. The other level individuals will take place in is relativistic view point. In this stage a substantial change comes up at individual epistemological mentality. Beyond their intuitions and personal opinions, individuals think that knowledge actualizes by constructing the meaning. There is no absolute truth anymore. Because, truth changes relatively depends on individuals' personal interpretations. In the last stage, commitment, relative thinking is still the key feature. But particular beliefs are more important than others and it is believed that commitment is actualized in more flexible manner (Brownlee, 2003). Because of the effectiveness of individuals' beliefs on their behaviors and decisions, the belief concept has too often being emphasized in last years (Brown and Cooney, 1982). Individuals are classified in terms of having beliefs as developed or undeveloped. Individuals who have undeveloped epistemologic beliefs believe that knowledge is simple, consist of absolute facts and transferred by an authority. Individuals who have developed epistemologic beliefs on the other hand are tend to believe that knowledge is more complex and relative, its truthfulness depends on the context and rather than transferred facts by an authority, a continuously changing construct depends on social interactions (Bromme et al., 2010). Besides, students who have developed epistemological beliefs use numerous and more qualified cognitive knowledge processing strategies; metacognitively control their learning level of teaching materials more often and correctly; show more academic success; having more academic attitudes to school; believe the usefulness of education more; and construct more complex, deep and sophisticated opinions (Deryakulu and Büyüköztürk, 2005). Students'

undeveloped epistemological beliefs prevent the critical aspects of learning. On the contrary, developed beliefs expedite high level learning and critical thinking (Schommer, 1994). For this reason, it is emphasized that epistemological beliefs have important effects on learning and teaching processes of individuals (Schommer, 1990; Deryakulu, 2004). The tendency in education about beliefs is to evaluate beliefs as factors conduct our behaviors. Based on the hypothesis beliefs could be changed, students to be more affective learners and actualize more qualified learnings can be provided and their academic success could be affected in a positive way and more importantly they could be more competent for lifelong learning and successful in various stages of their life. If we look from teachers' aspect, by having teachers more sophisticated epistemological beliefs, we can make them improve their professional development more effectively and arrange more effective learning environments for their students (Karhan, 2007).

Epistemological beliefs are one of the most important cognitive variables that affect learning-teaching processes. Research findings prove that epistemological beliefs are an important element of students' learning (Hofer, 2001). Epistemological beliefs affect students' academic success both directly and indirectly by the effect on their learning approaches (Cano, 2005). Researches also show that epistemological beliefs have important effect on person's cognitive and metacognitive process (Schommer, 1994) and students' motivation style to learn (Paulsen and Feldman, 1999).

Epistemologic belief has such a remarkable impact on students' learning that it has been investigated according to different variables. There are several researches about gender variable (Chan and Elliot, 2002; Chan, 2003; Conley et al., 2004; Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Kurt, 2009; Gürol et al., 2010; Aypay, 2011; Önen, 2011; Özkal et al., 2011; Demir, 2012; Köse and Dinç, 2012; Saban and Yüce, 2012; Şeref et al., 2012; Taşkın, 2012; Tümkaya, 2012; Bayrak, et al., 2013; Biçer et al., 2013). The studies examining epistemologic belief with department variable were conducted (Chan, 2003; Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Can and Arabacıoğlu, 2009; Kurt, 2009; Tümkaya, 2012). There are also studies investigating epistemologic belief based on level of grades (Işıksal et al., 2007; Aypay, 2011; Önen, 2011; Şeref et al., 2012; Aydemir et al., 2013) In the present study, epistemologic belief of prospective social studies teachers and prospective science teachers was investigated in terms of aforementioned three variables in detail.

### **Purpose of the study**

The main purpose of this study is to determine the changing of social studies and science and technology

**Table 1.** Epistemological Attitude Scale's and its subdimensions' disparities based on gender.

Variable	Group	N	M	Sd	df	t	p
EBS	Female	277	121.22	20.65	558	2.44	<b>.015</b>
	Male	282	125.63	21.91			
Factor 1	Female	277	61.88	10.49	558	2.32	<b>.020</b>
	Male	282	64.01	11.10			
Factor 2	Female	277	21.61	6.36	558	2.47	<b>.014</b>
	Male	282	32.98	6.74			
Factor 3	Female	277	27.72	5.89	558	1.78	.074
	Male	282	28.63	6.11			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

pre-service teachers' epistemological beliefs regarding gender, grade level and departments.

## METHODOLOGY

### Research design

This correlational study was designed by quantitative approach. Researchers attempt to explore relationship between independent variable and dependent variable in quantitative research (Cohen et al., 2000). As a general rule, explaining or comprehending complications of existent phenomenon is aimed in correlational researches (McMillan and Schumacher, 2006).

Exploring individual differences on variables is also applied in correlational study (Barker et al., 2002). Based on the nature of correlational study, gender, grade level and course type are assessed as a source of individual differences and differences in epistemological with regard to the gender and grade level are investigated.

### Population and sample

The population of the study is composed of social studies, and science and technology pre-service teachers who attended Ataturk University Kazım Karabekir Education Faculty in 2013-2014 academic year. The sample of the study is composed of 300 social studies pre-service teachers (150 first graders and 150 fourth graders) and 260 science and technology pre-service teachers (150 first graders and 110 fourth graders). There are 278 female and 282 male students in the study group.

### Data collection tool

Epistemological Beliefs Scale is developed by Schommer (1990) and adapted to Turkish by Deryakulu and Öztürk (2002). Adapted scale consists of three factors and 35 items. Afterwards, to determine how the Epistemological Belief Scale's three factor construct appropriate is, confirmatory factor analysis is made. For each factor in the scale Cronbach alfa internal coefficient of

consistence accounted as in turn 0.84, 0.69, 0.64 and for the whole, 0.81. According to exploratory factor analysis results 24<sup>th</sup> item was extracted and the 10<sup>th</sup> item removed to second factor from the first. The scale is three factored, consisting of 34 item and five likert type.

### Data analysis

The independent t test and one way ANOVA were applied to compare the mean value of epistemological based on gender, grade level and course type. Overall, these analyses were conducted via SPSS 17.0.

## FINDINGS

In this part of the study statistical findings of the change of social studies and science and technology pre-service teachers' epistemological beliefs regarding gender, grade level and departments took place (Table 1).

As seen in Table 1 students' epistemological beliefs ( $t_{(558)} = 2.44$ ,  $p < .05$ ), factor 1 scores ( $t_{(558)} = 2.32$ ,  $p < .05$ ) and factor 2 scores ( $t_{(558)} = 2.47$ ,  $p < .05$ ) differed significantly according to gender. With regard to the results of independent t test, performed to determine which groups these differences originate from, epistemological beliefs scores ( $M = 125.63$ ,  $Sd = 21.91$ ), factor 1 scores ( $M = 64.01$ ,  $Sd = 11.10$ ) and factor 2 scores ( $M = 32.98$ ,  $Sd = 6.74$ ) for male students were higher than those of female students. Therefore, these results were commented as the source of observed differences (Table 2).

According to results of independent t test, students' epistemological beliefs ( $t_{(558)} = 2.62$ ,  $p < .05$ ), factor 1 scores ( $t_{(558)} = 2.71$ ,  $p < .05$ ) and factor 2 scores ( $t_{(558)} = 2.60$ ,  $p < .05$ ) differed significantly with regard to the type of department. Epistemological beliefs scores ( $M = 126.01$ ,  $Sd = 23.51$ ), factor 1 scores ( $M = 64.29$ ,  $Sd =$

**Table 2.** Epistemological Attitude Scale's and its subdimensions' disparities based on program type.

Variable	Group	N	M	Sd	df	t	p
EBS	Social	300	121.28	19.13	558	2.62	.009
	Science	260	126.01	23.51			
Factor 1	Social	300	61.82	9.40	558	2.71	.007
	Science	260	64.29	12.17			
Factor 2	Social	300	31.64	6.56	558	2.60	.010
	Science	260	33.08	6.55			
Factor 3	Social	300	27.82	6.33	558	1.58	.113
	Science	260	28.63	5.61			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

**Table 3.** Epistemological Attitude Scale's and its subdimensions' disparities based on grade level.

	Source of Variance	SS	df	MS	F	p	Bonferroni Test
EBS	Between groups	68031.47	3	22677.15	67.15	.000	1-2, 1-3, 1-4, 3-4, 2-3
	Within groups	187756.34	556	337.69			
	Total	255787.82	559				
Factor 1	Between groups	13465.72	3	4488.57	47.74	.000	1-2, 1-3, 1-4, 2-3, 3-4
	Within groups	52268.75	556	94.00			
	Total	65734.48	559				
Factor 2	Between groups	5582.45	3	1860.81	55.33	.000	1-2, 1-3, 1-4, 2-3, 2-4
	Within groups	18696.23	556	33.62			
	Total	24278.68	559				
Factor 3	Between groups	4978.56	3	1659.52	60.42	.000	1-2, 1-3, 1-4, 2-3, 2-4, 3-4
	Within groups	15270.43	556	27.46			
	Total	20248.99	559				

EBS: Epistemological Belief Scale; SS: Sum of Squares, MS: Means of Squares, df: degrees of freedom.

12.17) and factor 2 scores (M = 33.08, Sd = 6.55) for the science teaching students were higher than the social studies students. In addition results indicated that there were not significant differences in factor 3 according to the type of department ( $t_{(558)} = 1.58, p > .05$ ).

One-way analysis of variance was used to determine whether epistemological belief scores, factor 1, factor 2 and factor 3 scores varied with grade level or not (Table 3). The results of one way analysis of variance indicated significant differences among groups for epistemological belief scores ( $F_{(3,556)} = 67.15, p < .001$ ), for factor 1 scores ( $F_{(3,556)} = 47.74, p < .001$ ), for factor 2 scores ( $F_{(3,556)} =$

$55.33, p < .001$ ), and for factor 3 scores ( $F_{(3,556)} = 60.42, p < .001$ ). Bonferroni post hoc analysis was employed to investigate those groups among which there was a difference. According to the results of Bonferroni analysis, those differences stem from lower scores of 1<sup>th</sup> grade social studies students than 4<sup>th</sup> grade social studies students, 1<sup>th</sup> and 4<sup>th</sup> grade science teaching students for all subscales and total scale. Additionally, epistemological belief scores, factor 1, factor 2 and factor 3 scores for 4<sup>th</sup> grade social studies students were higher than 1<sup>th</sup> grade science teaching students. Finally, epistemological belief scores, factor 1, factor 2 and factor

**Table 4.** Epistemological Attitude Scale's and its subdimensions' disparities based on social studies first and fourth graders.

Variable	Group	N	X	Sd	df	t	p
EBS	Social 1	150	107.09	8.76	298	19.16	.000
	Social 4	150	135.48	15.89			
Factor 1	Social 1	150	55.59	6.40	298	15.28	.000
	Social 4	150	68.04	7.65			
Factor 2	Social 1	150	27.62	5.20	298	13.40	.000
	Social 4	150	35.66	5.18			
Factor 3	Social 1	150	23.87	5.22	298	13.82	.000
	Social 4	150	31.77	4.57			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

**Table 5.** Epistemological Attitude Scale's and its subdimensions' disparities based on science and technology first and fourth graders.

Variable	Group	N	X	Sd	df	t	p
EBS	Science 1	150	122.46	22.12	258	2.88	.004
	Science 4	110	130.86	24.55			
Factor 1	Science 1	150	62.63	11.56	258	2.59	.010
	Science 4	110	66.56	12.66			
Factor 2	Science 1	150	31.96	6.37	258	3.30	.001
	Science 4	110	34.62	6.49			
Factor 3	Science 1	150	27.86	5.18	258	2.58	.010
	Science 4	110	29.67	6.02			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

3 scores for 1<sup>th</sup> grade science teaching students were lower than 4<sup>th</sup> grade science teaching students. These results could be assessed as the source of observed differences (Table 4). The independent t test was employed to explore whether or not there were significant differences between 1<sup>th</sup> and 4<sup>th</sup> grade students' scores for social candidates. The results of independent t test demonstrated there were significant differences between 1<sup>th</sup> and 4<sup>th</sup> grade social studies students' EBS scores ( $t_{(298)} = 19.16$ ,  $p < .001$ ), factor 1 scores ( $t_{(298)} = 15.28$ ,  $p < .001$ ), factor 2 scores ( $t_{(298)} = 13.40$ ,  $p < .001$ ) and factor 3 scores ( $t_{(298)} = 13.82$ ,  $p < .001$ ). Epistemological belief scores ( $M = 135.48$ ,  $Sd = 15.89$ ), factor 1 scores ( $M = 68.04$ ,  $Sd = 7.65$ ), factor 2 scores ( $M = 35.66$ ,  $Sd = 5.18$ ) and factor 3 scores ( $M = 31.77$ ,  $Sd = 4.57$ ) for 4<sup>th</sup> grade students were higher than those of other 1<sup>th</sup> grade

students scores (Table 5).

There appeared significant differences between 1<sup>th</sup> and 4<sup>th</sup> grade science teaching students' EBS scores ( $t_{(258)} = 2.88$ ,  $p < .05$ ), factor 1 scores ( $t_{(258)} = 2.59$ ,  $p < .05$ ), factor 2 scores ( $t_{(258)} = 3.30$ ,  $p < .05$ ) and factor 3 scores ( $t_{(258)} = 2.58$ ,  $p < .05$ ). Moreover, epistemological belief scores ( $M = 130.86$ ,  $Sd = 24.55$ ), factor 1 scores ( $M = 66.56$ ,  $Sd = 12.66$ ), factor 2 scores ( $M = 34.62$ ,  $Sd = 6.49$ ) and factor 3 scores ( $M = 29.67$ ,  $Sd = 6.02$ ) for 4<sup>th</sup> grade students scores were higher than those of other 1<sup>th</sup> grade students scores.

## RESULTS AND DISCUSSION

While epistemological beliefs affects people's all

decisions and the reasons of the behaviors because of these decisions for their life, their epistemological beliefs' formation and development are also affected by mental development, culture, family, environment, age, education level, learning area and gender (Deryakulu, 2004; Bayrak et al., 2013). This study is made to put forth the social studies and science and technology pre-service teachers' epistemological beliefs differentiated or not regarding gender, grade level and departments. Obtained findings showed that there are significant differences in social studies and science and technology pre-service teachers' epistemological beliefs regarding gender, departments and grade level. Obtained results are presented below in details.

When we examine the distribution of epistemological beliefs, male students' points are higher than the females'. If we think that low points mean maturity of the epistemological beliefs according to scale, we can say that female students' epistemological beliefs are more mature than male students'. The least maturity that female pre-service teachers show is the dimension learning depends on effort (first dimension). But the most maturity that female pre-service teachers show is the dimension learning depends on ability (second dimension). This result is similar to Köse and Dinç (2012)'s and Gürol et al (2010)'s studies that done with pre-service teachers. The least maturity that male pre-service teachers show like females is the dimension learning depends on effort. But the most maturity that female pre-service teachers show is the dimension there is only one truth (third dimension). In this study when we look at female and male pre-service teachers' points related with the subdimensions in comparison; it is determined that in Learning Depends on Effort and Learning Depends on Ability dimensions, there is significant differences in favor of female pre-service teachers. It is determined that in these two dimensions males' points are higher than females'. That means females have more sophisticated beliefs than males. While we encounter the studies with different epistemological studies and samples show females have higher degree epistemological beliefs (Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Kurt, 2009; Önen, 2011; Saban and Yüce, 2012; Taşkın, 2012; Şeref et al., 2012); there are also some studies show that males have higher degree epistemological beliefs (Gürol et al., 2010, Aypay, 2011; Özkal et al., 2011; Bayrak et al., 2013). On the contrary, there are studies put forth that epistemological beliefs do not differ regarding gender variable (Chan and Elliot, 2002; Chan, 2003; Conley et al., 2004; Demir, 2012; Tümkaya, 2012; Biçer et al., 2013). As it seen, in terms of the relationship between gender and epistemological beliefs there are many contradicting research results in the literature. The reason of the inconsistencies might be cultural factors, studying with different sample groups, using different data collection tools, and intergroup differentiation of psychometric

features in measurements (Yeşilyurt, 2013).

At the end of the statistical analyses, regarding department variable it is determined that there is significant differences between social studies and science and technology pre-service teachers' scientific epistemological beliefs in the dimensions of Learning Depends on Effort and Learning Depends on Ability, in favor of social studies pre-service teachers. In these two dimensions it is determined that science and technology pre-service teachers' points are higher than social studies pre-service teachers. That means social studies pre-service teachers have higher level matured epistemological beliefs. There is no significant difference determined in the last dimension: There is Only One Truth. When we examine the researches in the literature we see different results between the department variable and the subdimensions of epistemological beliefs. Terzi (2005)'s research show that social studies pre-service teachers have more positivist science understanding than the science-literature students.

Deryakulu and Büyüköztürk (2005) proved that social studies and classroom teaching students have more matured epistemological beliefs comparing with Computer Education and Instructional Technology students. Can and Arabacıoğlu (2009) in their study with mathematics and science education pre-service teachers, found significant differences in favor of mathematics pre-service teachers. Tümkaya (2012) determined that social, science and health sciences students have different epistemological beliefs in all three dimensions. In the first dimension, social sciences students are higher than science and health science students; in the second dimension health science students are higher than social sciences and science students; and in the third dimension social sciences students are higher than health sciences and social sciences students in terms of sophistication of epistemological beliefs. Kurt (2009) determined that students in quantitative areas have more sophisticated beliefs than students in qualitative areas. But in contrast with the studies like above, there are studies in the literature show no significant difference in epistemological beliefs of students in different departments (Chan, 2003).

According to another study there are significant differences between epistemological belief levels and grade variable in terms of both in groups and between groups. At the end of the statistical analyses, the significant difference is like that: For all the sub dimensions and the general results of the Epistemological Beliefs Scale first grade social studies pre-service teachers' points are lower than fourth grade social studies pre-service teachers' and both first and fourth grade science and technology pre-service teachers' points. When the scale's point scoring system is taken into consideration this result shows that there is a significant difference in favor of social studies pre-service teachers and they have more sophisticated belief than

the other groups. According to one between groups statistical result, for the all three sub dimensions, fourth grade social studies pre-service teachers' points are higher than first class science and technology pre-service teachers'; and for this reason, they have less sophisticated epistemological beliefs than first grade science and technology pre-service teachers. According to one another between groups result, first grade science and technology pre-service teachers' points are lower than fourth grade science and technology pre-service teachers. That means they have more sophisticated beliefs than fourth grade science and technology pre-service teachers. In group statistical analyses show following results: total epistemological beliefs points and for all three sub dimensions there is significant difference in favor of first grade science and technology pre-service teachers. The points of first grade science and technology pre-service teachers are significantly lower than the points of fourth grade science and technology pre-service teachers. According to this result it could be said that first grade science and technology pre-service teachers' epistemological beliefs are more sophisticated than fourth graders'. While literature supports our results for the dimension Learning Depends on Ability, contradicts with the other two dimensions. It could be thought that the reasons of lower level of epistemological sophistication of fourth graders are preparing lots of central examinations like KPSS and ALES, by doing that getting far from those terms' courses relatively, and as last grade students overcome by languor psychologically. When the studies related with epistemological beliefs in literature are examined from the point of grade variable, we come across many studies that support our results (Şeref et al., 2012; Aydemir et al., 2013); but on the other hand, there are some contradicting studies (Işıksal et al., 2007; Aypay, 2011; Önen, 2011) in the literature.

When epistemological beliefs and its sub dimensions are examined it is seen that different results are obtained and there is no consistency. The reason of this might be many environmental factors like different teachers, accordingly different teacher attitudes, difficulty level of the course, perceived class atmosphere, study and evaluation conditions (Tümekaya, 2012), methods and strategies that teachers use in classes, school's facilities, and general success level of class.

### Implications

1. Course contents should be revised in Education faculties and and given place to implementations for developing these beliefs.
2. When the literature is examined it could be seen that there are limited number of qualitative studies. For this reason it must be concentrated on qualitative studies also for reaching detailed results for the reasons of students'

epistemological beliefs.

3. And lastly, for students to have sophisticated epistemological beliefs, at least starting with the elementary education, multidirectional, quizzical, critical and creative thinking activities should be chosen and students should be directed to make researches.

### Conflict of Interests

The author has not declared any conflicts of interest.

### REFERENCES

- Aydemir N, Aydemir M, Boz Y (2013). High School Students' Epistemological Beliefs. *Kastamonu Educ. J.* 21(4):1305-1316.
- Aypay A (2011). Adaptation of Epistemological Beliefs Questionnaire in Turkish and Investigation of Pre-Service Teachers' Beliefs. *Eskişehir Osmangazi University J. Soc. Sci.* 12(1):1-15.
- Barker C, Pistrong N Elliott R (2002). *Research methods in clinical psychology: An introduction for students and practitioners (2<sup>nd</sup> ed.)*. Chichester: John Wiley & Sons.
- Bayrak E, Çınar V, Çoban B, Coşkun Z (2013). Prospective Teachers Of Physical Education And Sport Schools And Faculty Of Education Student Teachers Scientific Epistemological Beliefs In Terms Of Different Variables Comparison Of (Example Of Firat University). *J. Acad. Soc. Sci. Stud.* 6(2):1817-1828.
- Biçer B, Er H, Özel A (2013). The Relationship Between The Epistemological Beliefs And Educational Philosophies Of The Teacher Candidates Adopted. *J. Theory Pract. Educ.* 9(3):229-242.
- Brown, C. & Cooney, T.J. (1982). *Research on teacher education: A philosophical orientation*. *J. Res. Dev. Educ.* 5(4):13-18.
- Bromme, R., Pieschl, S. & Stahl, E. (2010). Epistemological belief sare standards for a daptive learning: a function al the ory about epistemological belief sandmetacognition. *Metacognition Learn.* 5:7–26.
- Brownlee, J. (2003). Paradigm shifts in pre-service teacher education students: case studies of changes in epistemological beliefs. *Austr. J. Educ. Dev. Psychol.* 3: 1-6.
- Buehl, M.M. & Alexander, P.A. (2001). Beliefs about academic knowledge. *Educational Psychological Review*, 13(4): 385-418.
- Can B, Arabacıoğlu S (2009). The Observation of the Teacher Candidates' Epistemological Beliefs According to Some Variables. *Proc. Soc. Behav. Sci.* 1:2799-2803.
- Cano, F. (2005). Epistemological beliefs and approach to learning: Their change through secondary school and the irinfluence on academic performance. *Br. J. Educ. Psychol.* 75:203-221.
- Chan K (2003). Hong Kong Teacher Education Students' Epistemological Beliefs and Approaches to Learning. *Res. Educ.* 69:36-50.
- Chan K, Elliott RG (2002). Exploratory study of Hong Kong teacher education students' epistemological beliefs: Cultural perspectives and implications on beliefs research. *Contemp. Educ. Psychol.* 27:392-414.
- Cohen L, Manion L, Morrison K (2000). *Research methods in education (5th ed.)*. New York: Routledge Falmer.
- Conley AM, Pintrich PR, Vekiri I, Harrison D (2004). Changes in epistemological beliefs in elementary science students. *Contemporary Educ. Psychol.* 29:186-204.
- Demir S, Akinoğlu O (2010). Epistemological Beliefs In Teaching Learning Processes. *M.Ü. Atatürk Education Faculty J. Educ. Sci.* 32:75-93.
- Demir, M.K. (2012). Investigation Of The Epistemological Beliefs Of Primary School Candidate Teachers. *Uludag University J. Educ.* 25(2):343-358.
- Deryakulu D, Büyüköztürk Ş (2002). Validity and Reliability Study of

- the Epistemological Beliefs Scale. *Eurasian J. Educ. Res.* 2(8):111-125.
- Deryakulu D (2004). "Epistemological Beliefs" in *Individual Differences in Education*. (Ed. Kuzgun and Deryakulu). Ankara: Nobel Yayın- Dağıtım.
- Deryakulu D (2004). The relationships between university Students' learning and study Strategies and their epistemological Belief. *Educational Administration: Theory Pract.* 38:230–249.
- Deryakulu D, Büyüköztürk Ş (2005). Re-examination of Factorial Analysis of Epistemological Beliefs Scale: A Comparison of Epistemological Beliefs in Terms of Gender and Discipline. *Eurasian J. Educ. Res.* 5(18):57-70.
- Gürol A, Altunbaş S, Karaaslan N (2010). A Study Of Self Efficacy An Epistemological Beliefs Of Prospective Teachers. *e-Journal of New World Sciences Academy* 5(3):1395-1404.
- Hofer BK (2001). Personal epistemology research: Implications for learning and teaching. *J. Educ. Psychol. Rev.* 13(4):353-383.
- İşıksal M, Kurt G, Doğan O, Çakıroğlu E (2007). Epistemological Conceptions of Pre-service Elementary Mathematics Teachers: Effects of University and Grade Level. *Elementary Educ. Online* 6(2):313-321.
- Karhan İ (2007). The investigation of epistemological beliefs of primary school teachers according to some demographic variables and their information technology use. Ph. D. Thesis. Unpublished. Istanbul: Yıldız Technical University.
- King PM, Kitchener KS (1994). *Developing reflective judgment*. San Francisco: Jossey-Bass.
- Köse S, Dinç S (2012). The Relationships Among Pre-Service Science and Technology Teachers Biology Self Efficacy Perceptions and Epistemological Beliefs. *Journal of Mustafa Kemal University Graduate School Of Social Sciences* 9(18):121-141.
- Kuhn D (1991). *The skills of argument*. Cambridge, England: Cambridge University Press.
- Kurt F (2009). Investigating students' epistemological beliefs through gender, grade level, and fields of the study. M.A. Thesis. Unpublished. Ankara: Middle East Technical University.
- McMillan JH, Schumacher S (2006). *Research in education: Evidence-based inquiry* (6<sup>th</sup> ed.). New York: Pearson Education.
- Önen AS (2011). The effect of candidate teachers' educational and epistemological beliefs on professional attitudes. *Hacettepe University Journal of Education* 40:300-309.
- Özkal K, Tekkaya C, Sungur S, Cakiroglu J, Çakıroğlu E (2011). Elementary students' scientific epistemological beliefs in relation to socio-economic status and gender. *J. Sci. Teach. Educ.* 22:115-127.
- Paulsen MB, Feldman KA (1999). Student motivation and epistemological beliefs. *New Directions for Teaching and Learning*, 78:17-25.
- Saban Aİ, Yüce SG (2012). İlköğretim 6., 7. ve 8. Sınıf öğrencilerinde problem çözme, bilişsel farkındalık ve epistemolojik inançlar. *Int. J. Human Sci.* 9 (2):1402-1428.
- Schommer M (1990). Effects of beliefs about the nature of knowledge on comprehension. *J. Educ. Psychol.* 82:498-504.
- Schommer M (1994). Synthesizing epistemological belief research: Tentative understandings and provocative confusions. *Educ. Psychol. Rev.* 6(4):293-319.
- Şeref İ, Yılmaz İ, Varışoğlu B (2012). A Review On Scientific Epistemological Beliefs Of Turkish Teacher Candidates. *J Adiyaman Univ. Graduate School, Soc. Sci.* 10:399-418.
- Taşkın ÇŞ (2012). Epistemological Beliefs: As Predictors Of Preservice Teachers' Learning Approach. *J. Mustafa Kemal Univ. Graduate School, Soc. Sci.* 9(19):273-285.
- Terzi AR (2005). A Research On Scientific Epistemological Beliefs Of University Students. *J. Afyon Kocatepe University Graduate School, Soc. Sci.* 7(2):315-330.
- Tümkiye S (2012). The investigation of the epistemological beliefs of university students according to gender, grade, fields of study, academic success and their learning styles. *Educ. Sci. Theory. Practice* 12(1):88-95.
- Yeşilyurt E (2013). Scientific Epistemological Beliefs of Primary School Students. *J. Acad. Soc. Sci. Stud.* 6(1):1587-1609.