



HOW DO EPISTEMOLOGICAL BELIEFS DIFFER BY GENDER AND SOCIO-ECONOMIC STATUS?

EPİSTEMOLOJİK İNANÇLAR CİNSİYETE VE SOSYOEKONOMİK STATÜYE GÖRE NASIL DEĞİŞMEKTEDİR?

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ABSTRACT: The present study explores the differences in students' epistemological beliefs by gender and socio-economic status (SES). The Epistemological Beliefs Questionnaire (Conley, Pintrich, Vekiri, & Harrison, 2004) was adapted and administered to 1230 seventh grade students. The multivariate analysis of variance (MANOVA) revealed differences in epistemological beliefs among students by gender and SES. While girls had more sophisticated beliefs in justification of knowledge than boys, girls and boys appeared to be similar in their beliefs in the Source/Certainty and Development dimensions. According to the results, students having medium and high SES had more sophisticated beliefs on the Source/Certainty dimensions when compared with low SES group.

Key words: gender, epistemological beliefs, socio-economic status.

ÖZET: Bu çalışmada cinsiyetin ve sosyoekonomik statünün (SES) ilköğretim öğrencilerinin epistemolojik inançlarına olan etkisi incelenmiştir. Çalışmaya 1230 yedinci sınıf öğrencisi katılmıştır. Veriler, Epistemolojik İnançlar Ölçeği (Conley, Pintrich, Vekiri & Harrison, 2004) ile toplanmıştır. Ölçek Özkan (2008) tarafından Türkçe'ye uyarlanmıştır. Sosyoekonomik statünün ve cinsiyetin değişkenler üzerindeki etkisi Çoklu Varyans Analizi (MANOVA) kullanılarak test edilmiştir. Analiz sonucunda, öğrencilerin epistemolojik inançlarının cinsiyete ve sosyoekonomik statüye bağlı olarak değiştiği saptanmıştır. Sonuçlar, çalışmaya katılan kız öğrencilerin Bilginin Doğrulanması alt boyutunda erkek öğrencilere göre daha sofistike inançlara sahip olduğunu gösterirken, kız ve erkek öğrencilerin Bilginin Kaynağı/Kesinliği ve Bilginin Gelişmesi alt boyutlarında benzer inanışları olduğunu ortaya koymuştur. Sonuçlar ayrıca, düşük SES grubundaki öğrencilerle karşılaştırıldığında orta ve yüksek SES gruplarındaki öğrencilerin Bilginin Kaynağı/Kesinliği alt boyutunda daha sofistike inançlara sahip olduğunu göstermektedir.

Anahtar sözcükler: cinsiyet, epistemolojik inançlar, sosyoekonomik statü.

1. INTRODUCTION

Epistemological beliefs are the theories about the structure of knowledge and about the nature of knowledge acquisition (Hofer & Pintrich, 1997). The research on epistemological beliefs has intensified over the past two decades (see Hofer & Pintrich, 2002). Emerged initially as one of the keystones of philosophy, epistemology has become increasingly prevalent in psychology in recent years (Hofer, 2001).

Dating back to the mid-1950s, psychologists (e.g. Baxter Magolda, 2004; Kitchener & King, 1981; Kuhn, 1993; Perry, 1970) have proposed a broad range of models about the conceptualization of epistemological beliefs. In a recent line of research, Schommer (1990) has considered the epistemological ideas as a system of beliefs which may be more or less independent rather than reflecting a coherent developmental structure. Schommer suggested five dimensions for epistemological beliefs including Simple Knowledge (Knowledge is simple or complex), Omniscient Authority (Knowledge is handed down by authority or derived from reason), Certain Knowledge (Knowledge is certain or tentative), Innate Ability (The ability to learn is innate or acquired), and Quick Learning (Learning is quick or gradual). Pointing out some concerns about the construct validity of some of Schommer's factors, Hofer and Pintrich (1997) propose another theoretical structure for the personal epistemology. Hofer and Pintrich argued that two general areas represent the core structure of individuals epistemological theories; beliefs about the nature of knowing and beliefs about the nature of knowledge.

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Within its historical development, there has been an increasing interest in the area of educational psychology in examining students' knowledge beliefs, the contributor variables of epistemological predispositions, and the way those beliefs affect or mediate the knowledge acquisition. Not surprisingly, numerous studies have examined those beliefs in relation to specific learner characteristics in an attempt to understand the factors contributing to variations in students' epistemological beliefs (Buehl, 2003). For example, some of the earlier investigations of students' epistemological beliefs focused on how those beliefs changed depending on gender. An analysis of existing studies highlighting the gender differences, however, in epistemological beliefs shows a mixed pattern of results. That is, while the results of some of these studies indicate that there are no differences between males and females in terms of their epistemological beliefs, other studies identify differences in students' beliefs by gender. For example, focusing on the gender differences in science-related self-regulated learning and causal relations among external and internal variables of self-regulated learning in science/physics, Neber and Schommer (2002) examined the gender differences of gifted elementary students' beliefs about knowledge and knowing. The results revealed gender-related differences in epistemological beliefs but those differences were restricted to the belief in quick learning which was stronger for males than for females. In addition, male students attending both elementary and high school were identified to hold identical naïve beliefs in quick learning in science/physics whereas this epistemological belief was significantly weaker with high school females compared to elementary school females. This result also supported the Schommer's (1993a) finding that males were more likely to endorse beliefs in quick learning and fixed ability than females. In an earlier investigation, Bendixen, Schraw, and Dunkle (1998) reported that certain knowledge variable differed between males and females, with males having more naïve beliefs in that epistemological belief dimension. The abovementioned gender differences were also supported by the findings of Schommer and Dunnell (1994) which indicated that female students were less likely to believe in fixed ability and quick learning than males. In Chen and Pajares' (2010) work, compared to female students, male students reported stronger views about the incremental nature of science ability. Although several studies presented evidence for the potential gender differences in students' epistemological beliefs, other investigations did not identify gender differences in beliefs about nature of knowledge and knowing (Buehl, Alexander, & Murphy, 2002; Chan & Elliott, 2002).

In addition to the role of gender, researchers have also investigated the relationships between students' epistemological beliefs and their home environment, specifically their socio-economic background variables. In an early work, Schommer (1990) examined student characteristics and home background variables that predict epistemological beliefs. The results suggested that parents' level of education and parents' expectation of their children to take responsibilities in the home and for their own thinking were significantly related to students' beliefs about simplicity of knowledge and speed of knowledge gaining. That is, the more education the parents have and the more the opportunity for independence they provide to their children, the more likely the children will develop a sophisticated system of epistemological beliefs. The results of other research studies appear to support this finding. For instance, in her study comparing postsecondary students' beliefs about nature of knowledge and learning, Schommer (1993b) found that background variables, such as age, gender, and parental education contributed to differences among junior college and a large university students. Two group comparisons were made, one between schools (junior college versus university) and one between domains (social science-education majors versus technological science-and physics/engineer majors). Results of the investigation revealed that the more education parents had and the more encouragement they gave for independent decision making, the less likely students were to believe in simple knowledge. Likewise, the more education parents had, the farther along in school students were, the less likely students were to believe in quick learning. Conducting a large-scale longitudinal study with high school students to explore the relationship between beliefs in certainty of knowledge, school achievement, and future field of study,

Trutwein and Lüdtke (2007) found that certainty beliefs correlated significantly and negatively with SES, cultural capital, final school grade, and cognitive abilities. It can be inferred from this result that the higher the students' SES, the more the students believe in the tentativeness of knowledge. As a part of their study investigating the changes in the epistemological beliefs of elementary science students, Conley et al. (2004) also examined the potential moderating role of gender, ethnicity, and SES in the epistemological development. In line with the previously reported results, they reported strong SES differences in how students think about knowledge and knowing. The results suggested that lower SES students had less sophisticated beliefs. More specifically, students tended to believe that scientific knowledge is certain and resides in authorities, and is less likely to change. Lower SES students were also found to be less likely to support statements regarding the importance of evidence in the justification of knowledge. No evidence for main effects of gender or for any moderating effects of gender on development over time, however, was found at the end of this investigation. Conley et al. concluded that for the science domain and for their sample, males and females seem to be very similar in their beliefs about the nature of knowledge and knowing. Accordingly, the researchers concluded that epistemological beliefs appear to be influenced more strongly by education than by income. More recently, Özkal et al. (2010) reported that students having high SES family tended to believe that knowledge is uncertain and not handed down by authority than students coming from low SES family. Their research did not demonstrate relationship between father work-status, buying daily newspaper, and epistemological beliefs. Compared to girls, boys were reported to have tentative beliefs.

Despite a long history of interest in Western and non-Western literature, researchers in Turkey are newly beginning to turn attention to the area of epistemological belief (e.g. Kızılgüneş, Tekkaya, & Sungur, 2009; Özkal, Tekkaya, Çakıroğlu, & Sungur, 2009; Topçu & Yılmaz-Tüzün, 2009). Therefore, lack of related research on young students' epistemological beliefs in Turkey is a key reason for conducting this investigation. Accordingly, current study, aims to examine Turkish elementary school students' epistemological beliefs using the multiple-dimension paradigm and to investigate the differences in students' epistemological beliefs by gender and SES. It is hoped that current study can provide a framework for the recognition of students' epistemological beliefs both in Turkey and abroad. The following research question guided the study: Is there a significant difference in epistemological beliefs of the elementary school students in terms of gender and SES?

2. METHOD

2.1. Sample

A total of 1230 seventh grade students (637 boys and 593 girls) attending public elementary schools in a large district of Ankara participated in the study. Cluster random sampling integrated with convenience sampling was used to obtain the representative sample from the accessible population.

2.2. Measures and Variables

2.2.1. The Epistemological Belief Questionnaire (EBQ)

The Turkish version of the EBQ (see Özkan, 2008), originally developed by Conley et al. (2004) using Hofer and Pintrich's (1997) framework, was used to collect data about the epistemological beliefs of seventh grade Turkish students. The questionnaire was designed specifically to measure scientific epistemological beliefs of elementary level students. It consists of four dimensions, namely Source (beliefs about knowledge residing in external authorities), Certainty (beliefs in a single right answer), Justification (beliefs in the role of evidence and evaluating claims for the justification of knowledge), and Development (beliefs in the evolving and changing nature of science) with a total of 26 items which requires students' responses in a 5-point Likert scale (5= completely agree to 1= completely disagree). These four

dimensions represent the two general areas argued by Hofer and Pintrich (1997) in the conceptualization of epistemological beliefs. The Source and Justification dimensions reflect beliefs about the nature of knowing. The other two dimensions (Certainty and Development) reflect beliefs about the nature of knowledge.

Contrary to the original questionnaire, the Turkish version included three dimensions which are Justification ($\alpha = .77$), Development ($\alpha = .59$), and Source/Certainty ($\alpha = .70$) (for more information see Özkan, 2008).

2.2.2. The Demographical Questionnaire

This questionnaire was designed primarily to provide information about the SES of the participants. SES was measured by asking seven separate questions about (1) the mother's educational level, (2) the father's educational level, (3) the family income, (4) presence of computer at home, (5) daily newspaper at home, and (6) presence of private study room at home. The students' responses to these questions were converted to standardized scores and added up to obtain a total SES score. The students were then grouped as having low, medium, and high SES based on these scores. The cut off points in the data set were considered while deciding different SES groups. That is, the students below the 33 percentile were grouped as having low SES, whereas the students above the 66 percentile were classified as high SES students. The students between 33 and 66 percentile, on the other hand, were considered as medium SES group. Information about gender was also obtained.

2.3. Data Analysis

The data obtained from this study were analyzed by using Multivariate Analysis of Variance (MANOVA). The dependent variables were scores belonging to the Justification, Development, and the Source/Certainty dimensions. The independent variables were gender and SES.

3. RESULTS

3.1. Descriptive Statistics

The descriptive statistics results according to gender and SES were presented in Table 1 and Table 2, respectively. According to Table 1, there is an evident difference in the mean scores of Justification dimension among boys and girls. Girls' mean score ($M = 4.09$, $SD = .56$) is higher than that of boys ($M = 3.89$, $SD = .68$) implying that girls tended to have more sophisticated views in Justification dimension when compared with boys. This result suggests that girls believe more than boys that knowledge is constructed through critical examination of the evidence and the opinions of experts.

Table 1: Descriptive Statistics for the Epistemological Beliefs Dimensions across Gender

Gender	Dimension	N	Min.	Max.	M	SD
Girls	Source/Certainty	593	1.56	4.88	3.26	0.64
	Development	593	1.33	5.00	3.60	0.59
	Justification	593	1.67	5.00	4.09	0.56
Boys	Source/Certainty	637	1.33	5.00	3.30	0.63
	Development	637	1.00	5.00	3.59	0.62
	Justification	637	1.00	5.00	3.89	0.68

Table 2 reveals the increase in the mean scores for each dimension as SES increases from low to high. Accordingly, there is an apparent discrepancy among low and high SES

groups in each dimension of epistemological beliefs. This result indicates that students tended to have more sophisticated beliefs in each epistemological belief dimension as their SES increased.

Table 2: Descriptive Statistics for the Epistemological Beliefs Dimensions across Socio-Economic Status (SES)

SES	Dimension	N	Min.	Max.	Item mean	Item SD
Low	Source/Certainty	409	1.56	4.78	3.17	0.57
	Development	409	1.33	5.00	3.51	0.62
	Justification	409	1.67	5.00	3.84	0.62
Medium	Source/Certainty	402	1.67	5.00	3.29	0.63
	Development	402	1.00	5.00	3.59	0.61
	Justification	402	1.00	5.00	3.99	0.61
High	Source/Certainty	419	1.33	5.00	3.38	0.67
	Development	419	1.50	5.00	3.67	0.58
	Justification	419	1.33	5.00	4.12	0.64

3.2. Multivariate Analysis of Variance

Multivariate analysis of variance (MANOVA) was conducted to determine gender and SES differences on three dependent variables, namely Source/Certainty, Development, and Justification. Before the analysis, the assumptions of MANOVA were checked. MANOVA has assumptions of multivariate normality, homogeneity of the covariance matrices, independence of observations, and homogeneity of variances. The first assumption, multivariate normality, was checked through the use of histograms and Skewness and Kurtosis values for each dependent variable. Both of them provided enough evidence that the dependent variables are normally distributed. The homogeneity of the covariance matrices assumption was confirmed by using the Box's M value. A non significant Box's M value ($p > .05$) indicated that the covariance matrices for the dependent variables were equal and this assumption was met. The administration period was under the control of the researchers and students were observed to ensure that every respondent was expressing his/her own thoughts without getting affected by another. Consequently, it can be inferred that the third assumption, independence of observations, was met and subject scores on the dependent variables were not influenced by the other respondents. The homogeneity of variance assumption was verified by using the Levene's test. This test examines whether the variances of the dependent variables are same or not. Levene's test was significant for the Source/Certainty ($F(8, 1231) = 2.31, p = .003$) and the Justification ($F(8, 1231) = 2.68, p = .006$) dimensions, therefore results should be interpreted with caution. Since the F values were not large for these two dimensions, MANOVA could be carried out.

After the assumptions were checked, MANOVA was conducted to assess the differences in epistemological beliefs among students by gender and SES. The MANOVA results indicated overall effect by gender (Wilks' Lambda = .97, $F(6, 2460) = 5.44, p = .000, \eta^2 = .013$) and by SES (Wilks' Lambda = .99, $F(6, 2458) = 2.74, p = .012, \eta^2 = .007$). The multivariate η^2 value of .013 and .007, which were considered as small effect sizes (Cohen, 1988), indicated that 1.3% and 0.7% of the multivariate variance of the dependent variables were associated with gender and SES, respectively. These results indicated that seventh grade male and female students were different in terms of their epistemological beliefs and students having different social status seem to be different in their thinking about knowledge and knowing.

Following the apparent gender and SES differences in epistemological beliefs, analyses of variance (ANOVA) on each dependent variable was conducted as follow-up test to the MANOVA. Using the Bonferroni method, the ANOVAs were tested at the .0167 (alpha level divided by the number of dependent variables) level in order to reduce the chance of committing a Type 1 error. The results revealed that there was a statistically significant mean difference

between girls and boys with respect to Justification dimension, $F(2, 1231) = 14.74, p = .000, \eta^2 = .023$, implying that female students ($M = 4.09, SD = .56$) on the average had more sophisticated beliefs on this dimension than male students ($M = 3.89, SD = .68$).

The univariate ANOVAs also showed that the mean scores on the Source/Certainty dimension was significantly different with respect to the SES, $F(2, 1231) = 5.34, p = .005, \eta^2 = .009$. Post hoc analyses were conducted to determine which pairs cause the significant SES difference with respect to that dimension of the epistemological beliefs. According to the results of the Tukey HSD test, students having medium and high socio-economic status had more sophisticated beliefs on the Source/Certainty dimensions when compared with low SES group. That is, medium and high SES groups were more likely to believe that knowledge is not constructed by the authority (e.g., teachers, books) and that there may be more than one right answer.

4. DISCUSSION AND CONCLUSION

Current study provided an evidence for the potential gender difference in elementary school students' epistemological beliefs. The gender-related differences in those beliefs, however, were limited to the belief of the justification of knowledge which was stronger for females than for males. This result suggests that females believed more in the role of experiments and the use of data to support arguments than did males. This result is consistent with the previous studies reporting epistemological advantage for females. In one of these studies, for example, Neber and Schommer (2002) discussed gender-related differences in epistemological beliefs, specifically belief in quick learning which was stronger for males than for females. In another study, females were found less likely to endorse beliefs in certain knowledge than males (Bendixen et al., 1998). Similarly, the study of Schommer and Dunnell (1994) identified significant gender differences in epistemological beliefs where female students were less likely to believe in fixed ability and quick learning than males. Topçu and Yılmaz-Tüzün (2009) found that girls in lower grades (i.e. 4th and 5th) developed more sophisticated beliefs in quick learning and innate ability. In higher grades (6th-8th), on the other hand, girls developed less sophisticated beliefs in omniscient authority beside quick learning and innate ability. On the current study, girls were found to have more sophisticated beliefs in the Justification dimension when compared with boys. One implication of this finding is that the science teachers may consider the apparent gender differences in their efforts to encourage the epistemological development of the students. They may consider how boys and girls respond to science instruction and the debates about the epistemological beliefs. The teachers may then act accordingly to help both boys and girls for developing their epistemological beliefs. It seems likely that both the teachers and the classroom environment can influence the development of epistemological beliefs of boys and girls. Therefore, teachers are better to take the students' epistemological beliefs into consideration and try to enhance these beliefs. Teachers should first be informed about the meaning and importance of epistemological beliefs, and also how to measure and develop them in the classroom. Teachers, educators, researchers, and policy makers may collaborate for this purpose organizing small workshops and meetings as a part of their in-service trainings. Having sufficient background knowledge, teachers may then adopt special teaching methods and instructional strategies such as discovery, inquiry, and hands-on activities for developing students' epistemological beliefs in the classroom. Encouraging students to construct their own knowledge and deemphasizing the dominant role of the teacher in the classroom as a knowledge provider may also help to improve students' epistemological beliefs.

In particular, it is also important to note that, current study indicated differences in the epistemological beliefs of students having low and high SES. It can be concluded that seventh graders with different SES were different in their thinking of the source/certainty of knowledge. Paralleling to the research reporting social status differences in epistemological beliefs, the

results of this study was able to confirm a relation between socio-economic variables and epistemological beliefs. In one of these studies, Trutwein and Lüdtke (2007) suggested that certainty beliefs correlated significantly and negatively with socio-economic status and cultural capital. Similarly, Conley et al. (2004) reported strong SES differences in how students think about knowledge and knowing. They suggested that lower SES students did have less sophisticated beliefs. Schommer (1990, 1993b) also provided evidence for the apparent relationships between epistemological beliefs and parents' level of education. Both studies revealed that the more education the parents had, the more likely their children will develop a sophisticated system of epistemological beliefs. Additionally, Topçu and Yılmaz-Tüzün's (2009) study indicated that students having educated parents tended to hold more sophisticated epistemological beliefs compared to others. What is more, Özkal et al.'s (2010) study recommended that there is an urgent need in science education for a special emphasis on students from lower SES to improve their scientific epistemological beliefs. This result is encouraging for the science teachers who desire to promote epistemological development of their students as epistemological beliefs were shown to be related with science achievement. This implies that if teachers struggle enough for improving the epistemological beliefs of the students, science achievement of the students from lower SES groups may increase. The finding that there were differences in the students' epistemological beliefs by SES is perhaps more important for future investigations to focus on the reasons behind these differences. That is, future studies may focus on the specific SES related variables like parents' education, parents' occupation, income, characteristics of family structure to better understand the relation between SES and epistemological views.

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Genişletilmiş Özet

Bilginin ve bilmenin doğası olarak tanımlanan epistemolojik inançlar, geçmişten günümüze felsefe biliminin temel yapı taşlarından birisi olarak kabul edilmiştir. Felsefe bilimcilerin çok uzun süredir ilgi alanına giren “epistemoloji” kavramı 1950’li yıllardan itibaren psikolojik bilimlerle uğraşanların çalışma alanlarına dâhil olmuş, son yıllarda da eğitim psikolojisi konusunda çalışan araştırmacıların ilgi alanına girmiştir. Eğitim psikolojisi alanında yapılan pek çok çalışmada epistemolojik inançlar, öğrenenle ilgili çeşitli değişkenlerle birlikte ele alınmış ve öğrencilerin epistemolojik inançlarında gözlemlenen farklılıklar açıklanmaya çalışılmıştır (Buehl, 2003). Özellikle son 25 yılda yapılan çalışmalar, epistemolojik inançların öğrencilerin yaş ve eğitim düzeyleri (Schommer, 1998; Schommer, Calvert, Gariglietti, & Bajaj, 1997), cinsiyetleri (Buehl, Alexander, & Murphy, 2002; Chan & Elliott, 2002; Neber & Schommer, 2002; Schommer, 1993a), kültürel farklılıkları (Chan & Elliott, 2002; Youn, 2000), aile ve ev ortamları (Schommer, 1990, 1993a), becerileri ve zekâları (Kardash & Howell, 2000; Schommer, 1993), öğrenim gördükleri alanlar (Hofer, 2001; Paulsen & Wells, 1998) ve öğrenme ortamları (Neber & Schommer, 2002) ile anlamlı bir şekilde ilişkili olduğunu ortaya koymuştur. Tüm bunlar, öğrencilerin bilginin ve bilmenin doğasına yönelik sahip oldukları inançlarının bireysel ve çevresel pek çok farklı değişkenle etkileşimi sonucunda şekillendiğini ve geliştiğini göstermektedir. Epistemolojik inançların gelişimini etkileyen değişkenlerin belirlenmesi söz konusu inanışların geliştirilebilmesi ve üst seviyelere taşınabilmesi için oldukça önemlidir.

Eğitim psikolojisi alanında epistemolojik inançlar ile ilgili yapılan çalışmaların başka bir bölümü ise epistemolojik inançların öğrenme çıktılarına nasıl etki ettiğini belirlemeye çalışmıştır. Araştırma sonuçları, epistemolojik inançların bilişsel süreçler, farklı öğrenme çıktıları, eğilimleri ve yetenekleriyle ilişkili olduğunu göstermiştir (Buehl, 2003). Bu çalışmalar ayrıca bilginin ve bilmenin doğasına yönelik sahip olunan inançların kişilerin öğrenme stratejilerini kullanmalarını (Kardash & Howell, 2000; Neber & Schommer, 2002; Paulsen & Feldman, 1999), anlama ve okuduklarını anlamlandırma becerilerini (Kardash & Scholes, 1996; Schommer, 1990; Schommer & Walker, 1995), bilgiyi yapılandırma ve kavramsal değişim yeteneklerini (Qian & Alvermann, 1995), akademik performanslarını (Hofer, 2000; Schommer,

1993b; Schommer, Mau, Brookhart, & Hutter, 2000) ve düşünme eğilimlerini (Kardash & Scholes, 1996; Qian & Alvermann, 1995) etkilediğini ortaya koymuştur.

Bütün bu bulgular, eğitim öğretim sürecinde epistemolojik inançların önemli rol oynadığını göstermektedir. Tüm dünyada farklı kültürlerde epistemolojik inançlar ile ilgili pek çok çalışma yapılmış olmasına rağmen ülkemizde bu konudaki çalışmalara yeni yeni başlanmaktadır. Ülkemizde bu konunun tüm boyutları ile incelenmesi, epistemolojik inanışların gelişimine etki eden faktörlerin belirlenmesi ve epistemolojik inançların hangi öğrenme çıktılarına etki ettiğinin saptanması oldukça önemlidir. Gelecekte bu konu ile ilgili yapılacak araştırmalara öncü olabilmek ve konuya çok daha fazla ilgili duyulmasını sağlamak amacıyla bu çalışmada yedinci sınıf öğrencilerinin epistemolojik inançlarının cinsiyete ve sosyoekonomik statüye göre nasıl değişiklik gösterdiğinin incelenmesi hedeflenmiştir.

Çalışmaya Ankara ili Çankaya ilçesindeki 21 ilköğretim okulunda öğrenim görmekte olan toplam 1230 yedinci sınıf öğrencisi katılmıştır. Örneklem 637 erkek ve 593 kız öğrenciden oluşmaktadır. Ulaşılabilir evren içinden örneklem seçilirken seçkisiz kümeleme örnekleme ve uygun örnekleme yöntemleri kullanılmıştır. Veri toplamak amacıyla çalışmaya katılan öğrencilere iki farklı bölümden oluşan bir anket uygulaması yapılmıştır. Anketin ilk bölümünde öğrencilerin cinsiyetleri ve sosyoekonomik durumları hakkında bilgi elde edilmesini sağlayan demografik bir bölüm yer almaktadır. Öğrencilerin sosyoekonomik durumları, bu bölümde yer alan yedi farklı soru (annenin eğitim durumu, babanın eğitim durumu, aylık toplam gelir, evdeki bilgisayar olanağı, eve günlük gazete alınıp alınmaması, öğrenciye ait oda bulunup bulunmaması) ile tespit edilmiştir. Anketin ikinci bölümünde ise Conley ve arkadaşları (2004) tarafından geliştirilen ve Özkan (2008) tarafından Türkçe'ye adapte edilen Epistemolojik İnançlar Anketi bulunmaktadır. Öğrencilerin bilginin kaynağı, bilginin kesinliği, bilginin gelişmesi ve bilginin doğrulanması alt boyutlarında sahip oldukları inançlarını ölçmeyi hedefleyen bu anket, Likert tipi toplam 26 maddeden oluşmaktadır. Açıklayıcı faktör analizi sonuçları, ankette yer alan maddelerin üç alt boyutta toplandığını ortaya koymuştur. Bilginin Doğrulanması ($\alpha = .77$) ve Bilginin Gelişmesi ($\alpha = .59$) alt boyutları, bu çalışmada da ayrı alt boyutlar olarak görülürken, diğer iki alt boyut birleşerek Bilginin Kaynağı/Kesinliği ($\alpha = .70$) alt boyutunu oluşturmuştur. Veriler Çoklu Varyans Analizi (MANOVA) kullanılarak değerlendirilmiştir. Bu analizde cinsiyet ve sosyoekonomik statü bağımsız değişken, Bilginin Doğrulanması, Bilginin Gelişmesi ve Bilginin Kaynağı/Kesinliği alt boyutlarına ait puanlar ise bağımsız değişken olarak atanmıştır. MANOVA analizinden önce analiz ile ilgili sayıtlar kontrol edilmiştir. Analiz sonucunda, öğrencilerin epistemolojik inançlarının cinsiyete ve sosyoekonomik statüye bağlı olarak değiştiği saptanmıştır. Sonuçlar, çalışmaya katılan kız öğrencilerin Bilginin Doğrulanması alt boyutunda erkek öğrencilere göre daha sofistike inançlara sahip olduğunu gösterirken, kız ve erkek öğrencilerin Bilginin Kaynağı/Kesinliği ve Bilginin Gelişmesi alt boyutlarında benzer inanışları olduğunu ortaya koymuştur. Elde edilen bu sonuç, kız öğrencilerin erkek öğrencilere göre bilimsel tartışmaları desteklemede deneylerin ve bilimsel verilerin rolüne daha fazla inandıklarını göstermektedir. Bu sonuçtan yola çıkarak, fen ve teknoloji dersi öğretmenlerine öğrencilerin epistemolojik inançlarını geliştirmeye çalışırken kız ve erkekler arasında epistemolojik inançlar açısından gözlemlenen farklılığı göz önünde bulundurmaları önerilmiştir. Öğretmenler, kız ve erkek öğrencilerin fen ve teknoloji dersi öğretimine nasıl tepki verdiklerini gözlemleyerek dersi tüm öğrencilerin epistemolojik inançlarını geliştirmek üzere planlayabilirler.

Çalışmanın ortaya koyduğu bir diğer sonuç da düşük SES grubundaki öğrencilerle karşılaştırıldığında orta ve yüksek SES gruplarındaki öğrencilerin Bilginin Kaynağı/Kesinliği alt boyutunda daha sofistike inançlara sahip olduğunu göstermektedir. Bu sonuca göre, sosyoekonomik statü yükseldikçe öğrencilerin bilginin sadece öğretmen ve kitap gibi kaynaklar tarafından aktarılamayacağına, kişinin bilgiyi kendisinin yapılandırabileceğine ve bir sorunu çözebilecek birden fazla doğru yol bulunduğuna olan inançları artmaktadır. Fen ve teknoloji öğretmenleri SES ve epistemolojik inançlar arasında gözlemlenen bu ilişkiyi göz önünde bulundurmalı ve özellikle düşük SES grubundaki öğrencilerin epistemolojik inançlarını

geliştirmeye çalışmalıdırlar. Pek çok araştırma, epistemolojik inançlar ve akademik başarının ilişkili olduğunu ortaya koymuştur. Tüm bunlar düşünüldüğünde, epistemolojik inançların geliştirilmeye çalışılması özellikle düşük sosyoekonomiye sahip öğrencilerin fen başarılarının artmasına yardımcı olabilir.