

## Examining the Differences among Undergraduate Students' Epistemological Beliefs

### Üniversite Öğrencilerinin Epistemolojik İnançları Arasındaki Farklılıkların İncelenmesi

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#### Öz

Bu çalışmada, öğrenim gördükleri alanlara, cinsiyetlerine ve sınıf düzeylerine göre, üniversite öğrencilerinin epistemolojik inançları arasındaki farklılıklar incelenmiştir. Çalışmaya Güzel Sanatlar Eğitimi, Beden Eğitimi ve İşletme alanlarında öğrenim gören toplam 248 öğrenci katılmıştır. Çalışmanın sonuçları, üniversite öğrencilerinin epistemolojik inançlarının alan-odaklı olmadığına, ancak alan-genel olduğuna ilişkin daha önceki araştırmaların sonuçlarını desteklemektedir. Bununla birlikte, öğrencilerin epistemolojik inançları arasında cinsiyet farklılıkları ortaya çıkmazken, sınıf düzeylerine göre anlamlı bir farklılık elde edilmiştir. Ancak, yaş değişkeni ortak değişken olarak analizlere dâhil edildiğinde sınıf düzeylerine göre elde edilen farklılık, yaşın etkisiyle ortaya çıktığını gösterir şekilde anlamlı bulunmamıştır.

*Anahtar Sözcükler:* Epistemolojik inançlar, üniversite öğrencileri, kişisel epistemoloji.

#### Abstract

This study examined the differences among epistemological beliefs of undergraduate students with respect to fields of study, gender and year of study. A total of 248 undergraduate students taking degrees in Fine Arts Teaching, Physical Education and Business Administration participated in the study. The results of the study supported the early results that undergraduate students' epistemological beliefs are not domain-specific, but domain-general. In addition, gender differences did not emerge among the students' epistemological beliefs, whereas significant grade level differences were found. However, when the age was entered as covariate into the analysis year of study differences disappeared, indicating that these differences arose from the effect of age.

*Keywords:* Epistemological beliefs; Undergraduate students; Personal epistemology.

#### Introduction

Empirical investigations of personal epistemology have been conducted in various branches of psychology and education under a range of labels (Burr & Hofer, 2002; Hofer, 2001). Epistemological beliefs or beliefs about the nature of knowledge and learning are one of these labels (Schommer, 1990, 1994). Contrary to developmental stage models (Perry, 1970; King & Kitchener, 1994), in which beliefs about knowledge and knowing are integrated hierarchically (Hofer, 2000); Schommer (1990) proposed that epistemological beliefs can be reconceived as a system of more or less independent beliefs. In fact, epistemological beliefs have recently become a focal point (Schommer- Aikins, Brookhart, Hutter & Mau, 2000), regarding various fields of study in education such as learning (Kardash & Scholes, 1996; Chan & Elliott, 2004; Braten &

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Stromso, 2006), motivation (Cavallo, Rozman, Blickenstaff & Walker, 2003; Paulsen & Feldman, 1999; Braten & Stromso, 2004), academic achievement (Trautwein & Lüdtke, 2006; Schommer-Aikins & Easter, 2006), conceptual change (Qian & Alvermann, 1995), strategic processing (Kardash & Howell, 2000), and study orchestrations (Rodriguez & Cano, 2006).

However, both the work by Perry and the initial studies by Schommer operated under the assumption that epistemological beliefs are essentially domain general. That is to say, when assessing students' epistemological beliefs these researchers asked various general questions about knowledge without regard to specific fields of study (Buehl et al., 2002). Recently, this assumption has been investigated by researchers using different subject designs (e.g. Schommer & Walker, 1995; Paulsen & Feldman, 1998). Studies in this area can be divided into those involving between-subject designs and those involving within-subject designs. Between subject designs examine the issue of domain specificity by sampling students from different disciplines and comparing students' beliefs across those disciplines. In within-subject designs, in contrast, students are asked to rate their beliefs about different disciplines, and assessments are made as to whether student beliefs about those disciplines are similar or different (Muis, 2004). These studies were summarized below according to their design.

#### *Between Subjects Design Researches*

Studies that have specifically focused on domain differences between different fields of study support the notion of domain specificity in epistemological beliefs (Muis, 2004). Paulsen and Wells (1998), for example, examined the differences in the epistemological beliefs of college students across fields of study such as humanities fine arts, social sciences, natural sciences, education, business, and engineering regarding their epistemological beliefs, and found that students' beliefs about the nature of knowledge and learning are related to the disciplinary contexts in which students select and experience their specialized course work in college. Jehng, Johnson and Anderson (1993), found evidence that university students' epistemological beliefs vary as a function of their fields of study. According to this evidence, students who study in the social sciences and arts/humanities have a stronger tendency to believe that knowledge is uncertain, are more reliant on their independent reasoning ability, and have stronger feeling that learning is not an orderly process in comparison with students in engineering and business fields.

Following Jehng, Johnson and Anderson (1993), Strobel, Jernusca and Jonassen (2004) grouped students' majors in humanities, social studies, business administration, and natural sciences/engineering in their study, which investigated whether or not there are any significant differences between students' epistemological beliefs depending on their field of study. Strobel and his colleagues (2004) obtained two important conclusions based on the results of their study: epistemological beliefs are multidimensional and individual epistemological beliefs tend to depend upon a student's field of study. In addition to these studies, in their longitudinal study Trautwein and Lüdtke (2006) investigated the possibility that such results obtained from earlier research, summarized above, may stem from self-selection processes, from socialization effects, or from a combination of the two effects. According to the results of their study, both the self selection hypothesis (students aspiring to different fields of study already differed in their certainty beliefs at the end of the secondary education), and the socialization hypothesis (students' certainty beliefs differed through their education process) were supported. On the other hand, in their research Deryakulu and Büyüköztürk (2005) compared the Turkish university students' epistemological beliefs in terms of gender and programme type. Results showed that the pre-service classroom teachers and social studies teachers have more sophisticated epistemological beliefs as compared to pre-service computer teachers.

#### *Within Subjects Design Researches*

Compared with between-subjects design research, studies that have examined whether students hold different beliefs about various disciplines have controversial results (Muis, 2004).

Schommer and Walker (1995), for example, test the "epistemological beliefs are domain independent" assumption through a within-subject design research, and obtained moderate correlations among students' epistemological beliefs regarding two domains (social science and mathematics). Based on these results, they concluded that students' epistemological beliefs are moderately domain independent. In their later study of epistemological beliefs across domains using Biglan's classification, Schommer-Aikins, Duell and Barker (2003) examined the students' epistemological beliefs about mathematics social sciences and business. Results of their study supported a moderate to moderately strong domain general hypothesis. More recently, Schommer-Aikins, Duell and Hutter (2005) found that both general and domain-specific epistemological beliefs of middle school students predicted academic performance, from which is inferred, as Buehl and Alexander (2001) also indicated, that both domain specific and domain general epistemological beliefs may be an issue of 'both/and' instead of 'either/or'.

Hofer's (2000) research is one of the studies in which epistemological beliefs were considered as both domain general and domain specific. In her within-subject design research, Hofer (2000) found strong disciplinary differences, suggesting that 1<sup>st</sup>-year college students see knowledge in science as more certain and unchanging than knowledge in psychology, and are more likely to regard personal knowledge and first hand experience as a basis for justification of knowing in psychology, and that truth is attainable by experts. On the other hand, Estes, Chandler, Horvath and Backus (2003), who investigated American and British college students' epistemological beliefs about research on psychological and biological development, demonstrated that epistemological beliefs can differ substantially between the two closely related fields. Buehl, Alexander and Murphy (2002), examined the domain specificity of students' beliefs about academic knowledge (mathematics and history) in three related studies. Overall, the results of their investigation suggest that students possess certain domain-specific beliefs about knowledge in mathematics and history. More recently, Knight and Mattick (2006) found some evidence of domain specificity in medical students' epistemological beliefs. In their qualitative study, they found that some students expressed their differing views on the nature of knowledge and of knowing about physiology and human sciences in terms of how comfortable they were with the notion of uncertainty and how they affected priorities within their learning. Researchers interpreted this evidence as students holding differing beliefs across disciplinary domains and contexts.

#### *Gender Differences in Epistemological Beliefs*

Gender differences have also been investigated in different lines of research related to personal epistemology (Paulsen & Wells, 1998; Hofer, 2000; Belenky, Clinchy, Goldberger & Tarule, 1986; Baxter-Magolda, 1992). Hofer (2000), for example, found that men were more likely than women to see knowledge as certain and unchanging, and in regard to source of knowledge, men were significantly more likely than women to view authority and expertise as the source of knowledge. Paulsen and Wells (1998) found that women were less likely than men to have naïve beliefs in fixed ability and quick learning. Similar results about gender differences were also obtained by Deryakulu and Büyüköztürk (2005), and Öngen (2003) in their samples which consisted of Turkish undergraduate students. In general, they found that women have more sophisticated epistemological beliefs as compared to men. However, gender differences are not so common in research related to personal epistemology. For example, Chan (2003), and Strobel and his colleagues (2004) did not find any significant differences between the epistemological beliefs of men and women. Similarly, based on a sample of Turkish high school students, Mert and Bulut (2006) also found that there was no statistically significant mean difference between male and female students regarding their beliefs about mathematics.

#### *Year of Study Differences in Epistemological Beliefs*

Year of study is controlled as a background variable or considered as an independent variable in some research carried out at different educational levels (Jehng, et al., 1993;

Schommer-Aikins et al., 2000; Strobel et al., 2004; Aksu, Demir & Sümer, 2002; Öngen, 2003; Mason, Boldrin & Zurlo, 2006). In their research, in which Turkish primary school students' beliefs about math were investigated, Aksu and her colleagues (2002) found that there were significant differences between the year of study on the process of learning mathematics, and the nature of math subscales, indicating that children's beliefs about mathematics is developed through their mathematics experience. On the other hand, no significant differences were found for year of study (7<sup>th</sup> graders and 8<sup>th</sup> graders) in Schommer-Aikins and her colleagues' (2000) research which was based on a sample of middle school students. In a university setting, Strobel and his colleagues (2004) also did not find significant differences among the university students' epistemological beliefs regarding their year of study (major and minor school year). More recently, Mason and her colleagues' (2006) study, in which was aimed to measure Italian elementary (5<sup>th</sup>), middle (8<sup>th</sup>), and high-school students (11<sup>th</sup> and 13<sup>th</sup> grades) epistemological understanding in different judgment domains (e.g. personal taste, aesthetics, values) with respect to gender, grade level, and curriculum, demonstrated that a critical step in the development of epistemological thinking occurs with the shift from elementary to middle school years. Here, whether or not those differences regarding year of study are really based on the educational experience of students emerged as an important question. In other words, year of study can be considered as one of the indicators of students' epistemological development, just as age (Conley, Pintrich, Vekiri & Harrison, 2004; Hofer, 2001; Mason et al., 2006). However, the former is an educational variable, while the latter is a biological variable. As they are different in nature, it seems reasonable to control the possible reciprocal effects of the age and year of study level variables in research in which both of them are questioned. Therefore, this subject is considered in the present research.

Overall, although there is growing acceptance of the idea that domain general and domain specific beliefs co-exist in a complex network of beliefs (Fives & Buehl, 2004, cited in LaFrazza, 2005), the research summarized above regarding both within-subject designs and between-subject designs indicated that domain generality and domain specificity in epistemological beliefs are currently open to question. Furthermore, the literature has indicated an increased sensitivity to the influence of contextual factors on reported learning outcomes. Academic domains are one of the factors for which these contextual effects have been apparent. So, there are practical and theoretical reasons to explore the domain-specific character of epistemological beliefs (Buehl et al., 2002). On the other hand, as culture is an important background variable in epistemological belief research (Schommer-Aikins, 2004; Chan, 2003; Chan & Elliott, 2000, 2004a) and continued work is needed in examining the nature and role of epistemological beliefs in different cultural contexts (Buehl & Alexander, 2006), it may be valuable to see whether the Turkish students' epistemological beliefs differ according to their fields of study or not. Indeed, domain differences in epistemological beliefs were reported mostly in North American, European and Asian studies, but not in Eurasian studies, except the one carried out by Deryakulu and Büyüköztürk (2005).

#### *Aim and Research Questions*

The aim of this study is to examine the differences among epistemological beliefs of Turkish undergraduate students who read Fine Arts Teaching (FAT), Physical Education Teaching (PET) and Business Administration (BA) majors with regard to their gender and year of study. Two research questions were determined:

1. What are the epistemological beliefs held by the undergraduate students who study in the fields of Fine Arts Teaching, Physical Education Teaching and Business Administration?
2. Are there any significant differences in undergraduate students' epistemological beliefs with respect to their fields of study, gender, and year of study?

## Method

Based on the survey method, a total of 248 undergraduate students (129 first years, 119 second years; 113 male and 135 female; ranging in age from 17 to 25 and over,  $M=20.84$   $SD=1.73$ ), who take degrees in FAT (99), PET (82) and BA (67) in Abant İzzet Baysal University, participated in the study. According to the Biglan's (1973, cited in Paulsen & Wells; Schommer-Aikins et al., 2003) classification, the fields of FAT, PET, and BA can be classified as "soft-applied" domains. That is to say, FAT, PET and BA disciplines have similar degree of paradigmatic development, and they also have similar degree of emphasizing on applications to practical problems (Biglan, 1973, cited in Paulsen & Wells, 1998). The purpose of preferring such a homogeneous classification is to explore whether the epistemological beliefs can differ among closely related fields or not.

*Material*

Students' epistemological beliefs were assessed with an instrument that was developed by Deryakulu and Büyüköztürk (2002). Deryakulu and Büyüköztürk (2002) are conducted a study in which is aimed to determine the validity and reliability of the Schommer's (1990) epistemological questionnaire (SEQ) in a group of Turkish university students. Unlike the original form, the Turkish version of SEQ (TVSEQ) had three factors, named as "the belief of learning depends on effort", ranging from "learning is unrelated to hard work" to "learning requires hard work" (e.g. everyone needs to learn how to learn); "the belief of learning depends on ability", ranging from "fixed at birth" to "improvable" (e.g. some people are born as good learners, others are just stuck with limited ability); and "the belief that there is only one unchanging truth", ranging from "certain and unchanging" to "tentative and evolving" (e.g. truth is unchanging), and consisted a total of 35 items: 18, 8, and 9 respectively. Participants responded to statements on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). In the present study, high points indicated sophisticated epistemological beliefs regarding effort beliefs, whereas low points indicated sophisticated epistemological beliefs regarding both ability beliefs and unchanging truth beliefs.

Later studies of TVSEQ replicated the three factor structure, and showed that it was a valid and reliable scale to assess undergraduates' epistemological beliefs (Deryakulu & Büyüköztürk, 2005; Öngen, 2003). Similarly, based on the sample of the present study, confirmatory factor analyses (by STATISTICA 6) showed that three latent variables have an acceptable fit to their related manifest variables ( $\chi^2=928.68$ ,  $p<0.001$ ,  $df=560$ ;  $\chi^2/df=1.66$ ;  $GFI=.83$ ;  $AGFI=.80$ ;  $RMSEA=.05$ ). On the other hand, Cronbach's alpha reliabilities for effort beliefs, ability beliefs, unchanging truth beliefs, and for whole scale, were calculated as .72, .62, .66, and .70 respectively. Thus, it can be said that both fit indices and reliability coefficients are in acceptable ranges in the context of the sample of this study (Stevens, 1996; Weinberg & Abramowitz, 2002). Unlike previous studies (Schommer & Walker, 1995; Hofer, 2000; Schommer-Aikins et al., 2003), it did not instruct students to keep in mind while they were responding to TVSEQ (Paulsen & Wells, 1998).

As Paulsen and Wells (1998) indicate, the academic disciplines or domains that students "select" as their major fields of study constitute academic sub-environments or contexts within which a substantial portion of students' academic experience take place. However, according to the student selection and placement system for the undergraduate level in Turkey, students are sometimes enrolled in programmes, such as business or teacher education, that they did not really want to enter (Özgün-Koca & Şen, in press). So, orienting the students' attention to a particular field, which is not really selected, may be cause to "don't care effect" that the students' do not really reflect their response to statements. Therefore, it can be said that not to instruct students' to keep in mind while they were responding to TVSEQ, may expose more valid results regarding the effects of fields of study, even for the students that did not select their fields of study (see Paulsen & Wells, 1998 for a similar approach).

### Procedure

After getting permissions from the deans of the faculties, the TVSEQ was presented to students with instructions that contained the objective of the study, and brief explanation about how to respond to items. Instructions were read aloud at the beginning of the process, before the TVSEQ was presented. Demographics (gender, age, year of study) were assessed by self report on TVSEQ. Administration lasted approximately 15-20 min. Data were obtained during the spring session of 2005-2006 instruction year by the researcher.

### Data Analyses

For research question 1, descriptive statistics (means and standard deviations) were calculated. To address research question 2, multivariate analysis of variance (MANOVA) was conducted using the fields of study, gender, and year of study as independent variables and the three epistemological belief dimensions (effort beliefs, ability beliefs, unchanging truth beliefs) as dependent variables. As a matter of fact, the results of Box's M test of equality of variance-covariance matrices indicated that fields of study (Box's  $M=16.12$   $F=1.32$   $p>.05$ ), year of study (Box's  $M=9.76$   $F=1.61$   $p>.05$ ), and gender (Box's  $M=13.31$   $F=1.63$   $p>.05$ ) variables all met the multivariate normality assumption. Further, following each MANOVA analysis, a series of analysis of variance (ANOVA) conducted on each of the three dependent variables (Weinberg & Abramowitz, 2002). To control for type I error across multiple ANOVAs, the Bonferonni adjustment was utilized. As 0.05 is divided by the number of dependent variables according to this procedure, p value is considered as less than 0.017 in the present study (Brace, Kemp & Snelgar, 2003). On the other hand, as noted earlier, age was also considered because of the year of study is determined as one of the independent variables in the present research. Therefore, multivariate analysis of covariance (MANCOVA), in which the age was determined as covariate variable, was conducted to see whether the former results with respect to gender, fields of study, and year of study had changed or not.

### Findings

Before running the SPSS for descriptive statistics, minimum, maximum and mid-points of each scale were calculated to determine the developmental level of students' epistemological beliefs. According to this, for effort belief factor (18 items), the minimum point is 18 (18x1), the maximum point is 90 (18x5) and the mid-point is 54 (18x3). For ability belief factor (8 items), the minimum point is 8 (8x1), the maximum point is 40 (8x5) and the mid-point is 24 (8x3). Finally, for unchanging truth belief factor (9 items), minimum point is 9 (9x1), maximum point is 45 (9x5) and mid-point is 27 (9x3). Afterwards, addressing research question 1 means and standard deviations of students' effort beliefs, ability beliefs, and unchanging truth beliefs were calculated regarding their fields of study (see Table 1).

Table 1.  
*Descriptive statistics (n = 248)*

Epistemological Belief	Means (Standard Deviations)		
	FAT	PET	BA
Effort beliefs	72.40 (6.89)	73.06 (7.58)	72.21 (6.46)
Ability Beliefs	18.55 (5.34)	18.40 (3.68)	18.51 (4.68)
Unchanging truth beliefs	27.12 (6.17)	27.94 (5.29)	26.51 (5.26)

As shown in Table 1, means of the students' effort beliefs are higher than the mid-point (54) which was calculated for effort belief factor, indicating that students who study in FAT ( $M=72.40$   $SD=6.89$ ), PET ( $M=73.06$   $SD=7.58$ ) and BA ( $M=72.21$   $SD=6.46$ ) fields have sophisticated effort beliefs. Likewise, students' ability beliefs are also sophisticated compared with mid-point of the ability factor (24). In other words, students who study in FAT ( $M=18.55$   $SD=5.34$ ), PET ( $M=18.40$   $SD=3.68$ ) and BA ( $M=18.51$   $SD=4.68$ ) fields have sophisticated ability

beliefs. Students' beliefs about unchanging truth, however, are almost identical with the mid-point (27), indicating that students who study in FAT (M=27.12 SD=6.17), PET (M=27.94 SD=5.29) and Business Administration (M=26.51 SD=5.26) fields have neither sophisticated nor naïve beliefs with respect to the dimension of unchanging truth.

To address research question 2, a series of MANOVA and ANOVA, using a Bonferroni adjusted alpha level of .017 (Brace et al., 2003), was conducted to determine the possible effects of fields of study, gender, and year of study on three epistemological belief dimensions (Stevens, 1996). Following MANOVA, MANCOVA was also conducted, in which age was determined as covariate. MANOVA and MANCOVA results were reported in Table 2.

Table 2.  
 MANOVA and MANCOVA results

Variables	MANOVA			MANCOVA		
	F	Wilks' Lambda	p	F	Wilks' Lambda	p
Fields of study	.553	.986	.768	.477	.988	.826
Gender	1.586	.981	.193	1.667	.980	.175
Year of study	6.659	.924	.000**	1.955	.976	.121
Age	-	-	-	3.721	.956	.012*

\*p<.05 \*\*p<.001

As can be seen in table 2, for fields of study, the MANOVA analyses gave the following values: Wilks' Lambda=.986, multivariate  $\eta^2=.007$ ,  $F(6,486) = .553$ ,  $p=.768$ . However, the ANOVA results for effort beliefs ( $F(2,245)=.317$ ,  $p=.728$ ), ability beliefs ( $F(2,245)=.022$ ,  $p=.978$ ), and unchanging truth beliefs ( $F(2,245)=1.210$ ,  $p=.300$ ), also showed that there was no significant differences among students' epistemological beliefs regarding their fields of study (see Table 3).

On the other hand, for gender, MANOVA results were as follows: Wilks' Lambda=.981, multivariate  $\eta^2=.019$ ,  $F(3,244)=1.586$ ,  $p=.193$ . ANOVA results for effort beliefs ( $F(1,246)=4.015$ ,  $p=.046$ ), ability beliefs ( $F(1,246)=1.258$ ,  $p=.263$ ), and unchanging truth beliefs ( $F(1,246)=.045$ ,  $p=.831$ ) also showed that there was no contribution of gender variable. For year of study, Wilks' Lambda=.924, multivariate  $\eta^2=.076$ ,  $F(3,244)=6.659$ ,  $p=.000$  (see Table 3). MANOVA results indicated that there was a significant effect of grade level on the combined dependent variables. Thus, ANOVA was conducted on each dependent variable (see Table 2). ANOVA results showed that grade level groups differed in terms of effort beliefs ( $F(1,246)=6.490$ ,  $p=.011$ ) and unchanging truth beliefs ( $F(1,246)=14.461$ ,  $p=.000$ ), but not in terms of ability beliefs ( $F(1,246)=.468$ ,  $p=.494$ ) (see Table 3). On the other hand, MANCOVA results for fields of study, Wilks' Lambda = .988, multivariate  $\eta^2=.006$ ,  $F(6,484)=.477$ ,  $p=.826$ , and for gender, Wilks' Lambda=.980, multivariate  $\eta^2=.020$ ,  $F(3,243)=1.667$ ,  $p=.175$ , showed that age had no considerable effect on epistemological beliefs in context of both gender and fields of study. With respect to the fields of study, ANCOVA results for effort beliefs ( $F(2,244)=.407$ ,  $p=.524$ ), ability beliefs ( $F(2,244)=.024$ ,  $p=.877$ ), and unchanging beliefs ( $F(2,244)=1.296$ ,  $p=.275$ ) were similar to those detected above. Again, with respect to gender ANCOVA results for effort beliefs ( $F(1,245)=3.998$ ,  $p=.052$ ), ability beliefs ( $F(1,245)=.960$ ,  $p=.328$ ), and unchanging truth beliefs ( $F(1,245)=.016$ ,  $p=.900$ ) were also similar those obtained through ANOVA analyses. However, when compared with the result of the former analysis, significant changes were detected for year of study by getting rid of the effects due to age, Wilks' Lambda=.976, multivariate  $\eta^2=.020$ ,  $F(3,243)=1.955$ ,  $p=.121$ , as well as by ANOVA (effort beliefs  $F(1,245)=3.930$ ,  $p=.049$ ; ability beliefs  $F(1,245)=.655$ ,  $p=.419$ ; unchanging truth beliefs  $F(1,245)=1.268$ ,  $p=.261$ ), indicating that the age (Wilks' Lambda=.956, multivariate  $\eta^2=.044$ ,  $F(3,243)=3.721$ ,  $p=.012$ ) had a significant effect on epistemological beliefs in context of the year of study. In short, when the age was entered as covariate into the analysis of year of study, former significant differences regarding year of study disappeared (see Table 4 for comparisons of ANOVA and ANCOVA results).

Table 3.  
ANOVA Results

Variable	Fields of study	M (SD)	F	P	Gender	M(SD)	F	P	Year of study	M(SD)	F	P
Effort beliefs	FAT	72.40(6.89)			Male	71.70(6.62)			First year	74.04(7.11)		
	PET	73.06(7.58)	.317	.728	Female	73.89(7.35)	4.015	.046	Second year	71.18(6.85)	6.490	.011*
	BA	72.21(6.46)										
Ability beliefs	FAT	18.55(5.34)			Male	28.49(4.65)			First year	29.53(4.34)		
	PET	18.40(3.68)	.022	.978	Female	27.90(4.20)	1.258	.263	Second year	28.60(4.60)	.468	.494
	BA	18.51(4.68)										
Un. Truth beliefs	FAT	27.12(6.17)			Male	26.04(4.88)			First year	26.85(5.09)		
	PET	27.94(5.29)	1.210	.300	Female	25.94(5.49)	.045	.831	Second year	23.01(5.65)	14.461	.000*
	BA	26.51(5.26)										

\*p<.017

Table 4.  
Comparisons of ANOVA and ANCOVA results

Variable	Fields of study	F	P	F <sup>a</sup>	P <sup>a</sup>	Gender	F	P	F <sup>a</sup>	P <sup>a</sup>	Year of study	F	P	F <sup>a</sup>	P <sup>a</sup>
Effort beliefs	FAT					Male					First year				
	PET	.317	.728	.407	.524	Female	4.015	.046	3.998	.052	Second year	6.490	.011*	3.930	.049
	BA														
Ability beliefs	FAT					Male					First year				
	PET	.022	.978	.024	.877	Female	1.258	.263	.960	.328	Second year	.468	.494	.655	.419
	BA														
Un. Truth beliefs	FAT					Male					First year				
	PET	1.210	.300	1.296	.275	Female	.045	.831	.016	.900	Second year	14.461	.000*	1.268	.261
	BA														

\*p <.017



## Discussion

The descriptive analyses of the present study lead to two major results. The first is that the undergraduate students who study in FAT, PET, and BA have sophisticated effort and ability beliefs regardless of their fields of study. In other words, undergraduate students tend to believe that learning depends on effort, but they do not tend to believe that learning depends on ability, regardless of their fields of study. These results are consistent with previous literature on Turkish undergraduate students' epistemological beliefs (Deryakulu, 2004; Deryakulu and Büyüköztürk, 2005; Öngen, 2003). Deryakulu and Büyüköztürk (2005), Deryakulu, (2004), and Öngen (2003) found that Turkish undergraduate students have sophisticated effort and ability beliefs. The second is that undergraduate students have neither naïve nor sophisticated unchanging truth beliefs regardless of their fields of study, indicating that they are in a "transitional phase" with respect to unchanging truth beliefs factor. This result is consistent with the result of Öngen's (2003) study, according to which Turkish undergraduate students' unchanging truth beliefs were not as sophisticated as their effort and ability beliefs. However, this result is not supported by previous research conducted in contexts of developmental models in which qualitative changes were assumed to occur in students' epistemological and intellectual development along the continuum or stages reflecting an increasing maturity of thought (Katung, Johnstone & Downie, 1999; Perry, 1970; King & Kitchener, 1994). This result may be attributed to cultural differences. Although Turkey is not a typical Asian or Middle Eastern country, and the assimilative effects of globalization or forces that have flattened the world (Friedman, 2005) are also valid for Turkey as well as for rest of the world, Turkish culture of belief in authority and respect for elders are still evident. Furthermore, multiple-choice examinations (e.g. the student selection and placement exams), which contain only one correct answer for each question, are very important in the Turkish education system. Considering the fact that the students are likely to adapt to the demands of the education system, and learn to navigate the choppy waters of the curriculum (Cano, 2005), the advantage for Turkish undergraduate students to focus moderately on unchanging beliefs is comprehensible.

On the other hand, means for each epistemological belief factor are almost identical across academic domains. Based on this finding, it can be said that the significant differences among students' epistemological beliefs may not be expected, and the MANOVA and ANOVA results confirmed this expectation. To be more specific, the results which were obtained by MANOVA and ANOVA analyses provide support for the notion that epistemological beliefs are domain general. This result is not consistent with the results of the other between-subject designs research in which the domain differences in epistemological beliefs were supported (Paulsen & Wells, 1998; Jehng et al., 1993; Strobel et al., 2004), but consistent with the results of some within-subject design research in which the domain differences in epistemological beliefs were not supported (Schommer & Walker, 1995; Schommer et al., 2003). However, the soft-applied nature of the domains, domain general nature of TVSEQ and not orienting the students' attention to a particular field are all controversial points. Even if these facts are considered to be valid, the question of how students can have such similar epistemological beliefs regardless of their fields of study remains unchallenged. In addition to the facts that each of them may be a potential source of explanation for the present question, one possible explanation is that the students may all be attributed to the same or similar epistemological resources which can be defined as a range of cognitive resources for understanding knowledge (Hammer & Elby, 2002, 2003; see also Louca, Elby, Hammer & Kagey, 2004), while they were responding to TVSEQ. Because items in TVSEQ were domain-general, and the students' consciousness awareness was not directed to a specific domain, students might have reflected their responses in a socially desirable sense regardless of their educational experiences. In other words, when there was no instruction regarding a particular epistemological resource to refer to, the students might have referred to normative resources (what should be) instead of descriptive resources (what is). Despite the fact that this interpretation needs further investigation, if this was the case for fields

of study, gender differences may not be expected because it is reasonable to assume that such normative responses tend to be dominantly gender-free (e.g. effort is important for all, regardless of gender). As a matter of fact, gender differences were not found in the present study, indicating that there were no significant differences between the men and women with respect to epistemological belief dimensions. This result is consistent with the results of the researches carried out by Chan (2003), and Strobel et al (2004), who also found no significant differences between the epistemological beliefs of men and women. However, this result of the present study differs from the studies of Hofer (2000), Deryakulu and Büyüköztürk (2005), and Öngen (2003), who found that women have more sophisticated epistemological beliefs than men.

The findings about the year of study indicate that first year university students showed a more significant tendency than the second years to believe that learning depends on effort, and the latter have a significant tendency to believe that truth is changing when compared with the former. In other words, first year students seem to have more sophisticated effort beliefs than second year students, while the latter seem to have more sophisticated unchanging truth beliefs than the former. However, results of the MANCOVA analysis showed that the significant differences which were obtained for year of study can be attributed to age. So, it seems the effect of age on epistemological beliefs plays a more important role than that of year of study. If this was the case, it can be said that the older the students the less they believe in effort, and the younger the students the more they believe that there is only one truth. Both longitudinal (Schommer, Calvert, Gariglietti & Bajaj, 1997; Perry, 1970) and cross-sectional (Kuhn, 1991; Ryan, 1984) studies showed that education can affect epistemological development even in shorter periods of time when specific instruction is given (Chang, 2005). Furthermore, in studies involving people of all ages and various educational backgrounds, education, not age, appears to be responsible for developmental differences in epistemological understanding (Weinstock & Cronin, 2003). Although the theoretical framework of this study was not a developmental framework, considering the year of study as one of the developmental indicators for the students' epistemological beliefs, which were expected to be more sophisticated in higher grade levels of education than lower levels, it seems age, but not education, appears to be responsible for the differences among the epistemological beliefs of Turkish undergraduate students. In short, it seems that age played a more important role than the year of study for the differences that were obtained regarding Turkish undergraduate students' effort and unchanging truth beliefs. This result can be interpreted in the context of the logic mentioned above. If students referred in turn to normative resources instead of descriptive resources and reflected their responses in a general sense regardless of their educational background, the effect of year of study as an educational variable with respect to the effort and unchanging truth beliefs may be overshadowed by age as biologic and developmental variable, where the effort-made educational background is not thought as a valid resource for a ready-made or clichéd normative responses. Although this interpretation needs further investigation, based on this logic, the finding that the younger the students the more they believe that there is only one truth is consistent with previous intellectual development literature (Perry, 1970; Katung et al., 1999). However, the finding that the older the students the less they believe in effort is not consistent with the previous literature, because, in the developmental psychology literature, the development of epistemological thinking is conceived in terms of a logically evolving sequence of cognitive structures comprising of coherent representations, which can characterize a level or stage of the cognitive development (Mason, 2002). According to this conceive, however, older students' effort beliefs tend to display reverse linearity in the present study. One possible explanation of this appearance is that as students grow older they may think effort is important, but not everything. In other words, second year students might have formulated their effort beliefs as "effort is important for learning, but it also requires effective strategy use, self-efficacy, motivation, planning etc." (See Dahl et al., 2005; Paulsen & Feldman, 1999), while the first years had formed more simplistic formulation compared to sophisticated formulation of sophomores, as "nothing else, but learning depends on effort".

Three main issues should be considered in future research. First, even though it is a between-subject design research, the present study showed that students' epistemological beliefs were very similar with respect to their fields of study. So, both between- and within-subject designs should be used instead of either between- or within-subject designs for further investigations of domain differences in epistemological beliefs. Second, results of the present study demonstrated that the effect of the year of study was overshadowed by the effect of age. This aspect may arise from the mediation effect of age that needs further investigation. Third, to have a broader view of domain differences in epistemological beliefs, it seems reasonable to think that epistemological resources are one of the important factors that underlying the differences among epistemological beliefs of students who study in different domains.

Considering the evidence that links epistemological beliefs to various aspects of learning (Kardash & Scholes, 1996; Dahl et al., 2005) as well as instructional designs on students' epistemological beliefs (Chang, 2005), it may be said that helping students to develop more sophisticated epistemological beliefs may be an important step for their academic achievement (Gill, Ashton & Algina, 2004). However, although some research showed that considering the epistemological beliefs as domain dependent can also be valid and crucial in this step (e.g. Paulsen & Wells, 1998); the results of the present study suggest that students' epistemological beliefs tend to be domain general. Thus, it can be assumed that students' epistemological beliefs may also have similar aspects of sophistication or naivety in different fields of study (Schommer & Walker, 1995). Overall, the domain-general nature of epistemological beliefs, which was evident in the present study, should be considered in learning and instruction processes in particular, and curriculum studies in general.

#### Conclusion

This study was aimed to examine the differences among epistemological beliefs of undergraduate students who read Fine Arts Teaching (FAT), Physical Education Teaching (PET) and Business Administration (BA) majors with regard to their gender and year of study. The results of the present study support the early assumption that students' epistemological beliefs are domain-general. In addition, gender differences did not emerge, whereas differences for year of study were found among the students' epistemological beliefs. However, when the age was entered as a covariate variable into the analyses, year of study differences disappeared, indicating that the grade level differences dominantly arose from the effect of age. On the other hand, the results of the present study should cautiously be interpreted due to the several limitations like small sample size, collecting data from only one university, the cross-sectional design, and using only quantitative statistical techniques.

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