



ACADEMIC SELF – EFFICACY BELIEFS OF UNDERGRADUATE MATHEMATICS EDUCATION STUDENTS

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Abstract: The present paper investigated academic self – efficacy beliefs of undergraduate mathematics education students with respect to gender, academic performance and grade level. The participants were a total of 244 undergraduate students (195 females and 49 males) enrolled to department of mathematics education (57 freshmen, 106 sophomores and 81 junior) of a government university located west side of Turkey. 2 (gender) \times 3 (academic performance) \times 3 (grade level) between – groups of analysis of variance were used to analyze the data gathered by “Academic Self – efficacy Scale” (ASES). The results revealed that students’ academic self – efficacy beliefs were moderate level and there was a significant effect of factors academic performance and grade level on ASES scores. Significant interactions between gender and academic performance; gender and grade level and academic performance and grade level were not observed and three – way interaction of gender, academic performance and grade level also failed to reach significance level.

Key words: Academic Self – Efficacy, Undergraduate Mathematics Education, Gender.

1. Introduction and Literature Review

Self – efficacy concept was defined by Bandura (1997) as the belief in one’s capabilities to organize and execute courses of action required to produce given. Here, *self* means “cognitive structures that provide references mechanisms” and “a set of sub functions for perception, evaluation and regulation of behavior” (Bandura, 1978). In relation with self – efficacy concept, a considerable number of studies have been implemented by researchers in recent years, because people with high self – efficacy are more focused on task requirements and less distracted by performance anxiety and off – task cognitions (Bandura, 1997). With the constructivism window, Bandura also suggested that individuals, based on their experiences, develop general perspectives to causes and effects. Integration of the word *academic* to self – efficacy, researchers opened a door to different aspects of learning and teaching process. According to Schunk (1991), academic self – efficacy refers to individuals’ convictions that they can successfully perform given academic tasks at designated levels. A similar definition also expressed by Midgley et al. (2000) as “academic self – efficacy refers to students’ perceptions of their competence to do their classwork”. Altunsoy et al. (2010) state that “the concept of academic self – efficacy includes the beliefs about the capabilities to achieve the tasks in certain academic fields”.

Zhu et al. (2011) focused the deep meanings of academic and self by saying that “academic self – efficacy has been traditionally discussed concerning a specific task or domain; however, there has been research on the generality of academic self – efficacy to determine how far self – efficacy motivation and performance relationships can be broadened”. In the related literature, there are various factors affecting academic self – efficacy. According to Altunsoy et al. (2010), these studies have usually focused on only one factor, and most of them have examined especially whether the level of academic self – efficacy differs according to gender. Moreover, recent studies have also confirmed that academic self – efficacy is related to a lot of variables. Altunsoy et al. (2010) assessed the factors that influence biology teacher candidates’ academic self – efficacy beliefs. They found that biology teacher candidates’ academic self – efficacy levels were above the medium level and a significant difference between students’ academic self – efficacy levels and their gender (in favor of males) was observed. There was also a significant difference between academic self – efficacy levels and students’ grade level. It was also determined that the level of academic self – efficacy levels changed most under the influence of general academic achievement. Similarly, Fettahlioğlu and Ekici (2011)

investigated the effect of science teacher candidates' academic self – efficacy beliefs towards their science motivation. They detected that 20% of teacher candidates' total variance related to their motivations towards science was explained with the academic self – efficacy belief. They also observed that prospective teachers had medium level academic self – efficacy beliefs. In recent studies, researchers dealt with psychological perspective of academic self – efficacy beliefs. For instance, Vasile et al. (2011) determined that there is a direct correlation between academic self – efficacy and cognitive load within the academic environment. Shams et al. (2011) investigated the mediating role of academic self – efficacy in the relationship between the personality traits and mathematics performance. They confirmed that there is a mediating role of academic self – efficacy between five factor model and math performance. In a similar study implemented by Ferla, Valcke and Cai (2009), detected that students' academic self-concept strongly influenced their academic self – efficacy beliefs and academic self-concept was a better predictor (mediator) for affective motivational variables, while academic self – efficacy was the better predictor (mediator) for academic achievement.

Nie, Lau and Liao (2011) investigated whether academic self – efficacy could moderate the maladaptive relation between task importance and test anxiety. Results of this showed that high levels of academic self – efficacy were related to low levels of test anxiety. In another study, Zhu et al. (2011) investigated the relationship between vocational high school students' information seeking activities on the internet, academic self – efficacy and academic performance. The authors interpreted that there was a positive effect of internet information seeking on students' academic performance was mediated through academic self – efficacy. In this interesting report, they also found that academic self – efficacy moderated the relationship between internet seeking and academic performance. Similar to this work, Odaci (2011) investigated whether academic self – efficacy and academic procrastination can act as predictors of problematic internet use among university students. She found that there was a significant negative correlation between academic self – efficacy and problematic internet use. Besides, academic self – efficacy was determined to be a significant predictor of problematic internet use. Finally Oğuz (2012) investigated prospective primary school teachers' academic self – efficacy beliefs with respect to several variables. The author found that there was a significant difference between students' academic self – efficacy scale scores according to variables grade level and thought for becoming teacher and there was not a significant difference with respect to gender, age, academic achievement and program preference.

Odaci (2011) expressed that “students' belief in their academic self – efficacy and their ability to begin and continue their studies is also highly important” (p. 1110). This fact is very important for education and training process for prospective teachers. Because, it is expected that students with high level academic self – efficacy are more self-confident and have more positive attitudes towards future profession. Here, it is useful to say that the concepts of academic self – efficacy and teacher self – efficacy may be perceived as same concepts for educational faculty students. However, academic self – efficacy refers to achievement in tasks through training process. It can be also interpreted that students who have high level academic self – efficacy give more importance to their future graduate studies.

In sum, related literature reports that gender, grade level and academic performance are well-known factors effecting students' academic self – efficacy beliefs. And in Turkey, in light of available literature, we detected that academic self – efficacy beliefs of undergraduate mathematics education students has not yet been investigated. So this work posed the following questions:

1. What are the undergraduate mathematics education students' academic self – efficacy levels?
2. Is there a significant effect of
 - i) gender,
 - ii) grade level,
 - iii) academic performance and interactions of
 - iv) gender and department,

- v) gender and academic performance,
- vi) department and academic performance and
- vii) gender, department and academic performance on academic self – efficacy scores?

2. Methodology

Participants

In the present study, 244 undergraduate students are volunteered to participate. They were 195 females and 49 males with age range 17 to 24 ($M = 19.73$, $SD = 1.19$) who are enrolled to departments of mathematics education (of 57 are freshmen, 106 sophomore and 81 are junior level) of a government university located in the western Turkey.

Instruments

ASES originally developed by Jerusalem and Schwarzer (1981) with German language. They obtained a .87 reliability coefficient for 7 items measuring one factor. ASES are rated by each participant on a 4 – item Likert scale as: very appropriate, appropriate, not appropriate and not appropriate at all. The scale has only one negative item (7). Turkish version of ASES was developed by Yılmaz, Gürçay and Ekici (2007) applying the scale to 672 undergraduate students. They found a .79 Cronbach – alpha value with same 7 items, which is acceptable. Recent studies are also confirmed its reliability. For instance, Fettahloğlu and Ekici (2010) had .78 and Shams et al. (2011) found .75 Cronbach – alpha coefficient. Minimum score of the ASES is 7, the maximum score is 28.

Procedure

All the data were collected by the author in the spring semester of 2011 – 2012 academic year with small groups consisting of max 30 subjects. Before the scale was given to students, a consent form includes details about aim of the work and ASES is provided. Thereafter, all subjects of the study filled out information about their grade point average (GPA). ASES was given to students in a booklet consisting of one A – 4 page.

Data Analysis

In the present work, undergraduate mathematics education students' academic performances were regarded as GPA values (0 – 1.99, 2 – 2.49, 2.5 – 2.99, 3 – 3.49, 3.5 – 4). Due to lack of numbers in some of GPA cases, groups were reorganized as the following: 0 – 2.49, 2.5 – 2.99, 3 – 4. In the work, descriptive statistics (mean, standard deviations and standard errors) are used and three between – subject factors on ASES scores were analyzed with respect to gender (females and males), academic performance and grade level. Since one 2 (gender) \times 3 (academic performance) \times 3 (grade level) between – groups of analysis of variance (ANOVA) were used according to dependent variable for ASES scores. Effect sizes d (Cohen, 1988) are considered as the following: the effect sizes of .20 are small, .50 are medium and .80 are large effects. After the data was gathered, it were analyzed by the aid of SPSS 17 package software. Negative ASES item was recoded while transferring the data to the computer.

3. Results

Descriptive Results

Table 1 gives the means, standard deviations of ASES scores of the participants. Range of means was from 17 to 22.5 and standard deviations was from .70 to 8.91. According to Table 1, freshman level undergraduate mathematics education students' mean ASES score was $M = 19.50$, $SD = 3.14$, sophomore level undergraduate mathematics education students' mean was $M = 18.62$, $SD = 3.32$ and junior level undergraduate mathematics education students' mean was $M = 20.07$, $SD = 3.25$.

Besides, mean and standard deviations of the total sample were $M = 19.31$, $SD = 3.31$. Cronbach – alpha value was found as .78 for 244 participants.

Table 1. Descriptive Statistics of ASES Scores

Gender	GPA	Grade Level	<i>M</i>	<i>SD</i>	<i>N</i>
Female	0 – 2.49	Freshman	18.75	1.83	8
		Sophomore	17.94	3.36	35
		Junior	19.23	2.61	17
		Total	18.41	3.01	60
	2.5 – 2.99	Freshman	19.87	2.96	16
		Sophomore	18.78	3.56	41
		Junior	20.51	3.82	27
		Total	19.54	3.59	84
	3 – 4	Freshman	19.80	3.25	20
		Sophomore	20.00	2.13	15
		Junior	19.87	3.38	16
		Total	19.88	2.95	51
	Total	Freshman	19.63	2.91	44
		Sophomore	18.65	3.33	91
		Junior	19.98	3.39	60
		Total	19.28	3.30	195
Male	0 – 2.49	Freshman	18.37	4.53	8
		Sophomore	17.14	2.91	7
		Junior	19.22	3.59	9
		Total	18.33	3.70	24
	2.5 – 2.99	Freshman	19.75	3.09	4
		Sophomore	20.33	2.87	6
		Junior	20.90	2.02	10
		Total	20.50	2.41	20
	3 – 4	Freshman	22.00	.	1
		Sophomore	17.00	5.65	2
		Junior	22.50	.70	2
		Total	20.20	4.08	5
	Total	Freshman	19.07	3.94	13
		Sophomore	18.40	3.39	15
		Junior	20.33	2.86	21
		Total	19.40	3.37	49
Total	0 – 2.49	Freshman	18.56	3.34	16
		Sophomore	17.80	3.27	42
		Junior	19.23	2.91	26
		Total	18.39	3.20	84
	2.5 – 2.99	Freshman	19.85	2.90	20
		Sophomore	18.97	3.49	47
		Junior	20.62	3.41	37
		Total	19.73	3.40	104
	3 – 4	Freshman	19.90	3.20	21
		Sophomore	19.64	2.64	17
		Junior	20.16	3.29	18
		Total	19.91	3.02	56
	Total	Freshman	19.50	3.14	57
		Sophomore	18.62	3.32	106
		Junior	20.07	3.25	81
		Total	19.31	3.31	244

ANOVA Results

There was a significant effect of academic performance $F(2, 244) = 4.09, p < .05, \eta_p^2 = .035$ and grade level $F(2, 244) = 3.24, p < .05, \eta_p^2 = .028$. The independent variable gender $F(1, 244) = .16, p = .685, \eta_p^2 = .001$ failed to reach significance. Interactions between gender and academic performance $F(2, 244) = .38, p = .678, \eta_p^2 = .001$, gender and grade level $F(2, 244) = .75, p = .473, \eta_p^2 = .007$, academic performance and grade level $F(4, 244) = .25, p = .904, \eta_p^2 = .005$, and three – way interaction of gender \times academic performance \times grade level $F(4, 244) = .90, p = .463, \eta_p^2 = .016$, also failed to reach significance level. A summary of the ANOVA results are given in Table 2.

Table 2. Results of $2 \times 3 \times 3$ between – groups of analysis of variance for ASES scores

Source	Type III Sum of Squares	df	Mean Square	F	p	η_p^2
Gender	1.754	1	1.754	.164	.685	.001
Academic Performance	87.335	2	43.668	4.094	.018	.035
Grade Level	69.212	2	34.606	3.244	.041	.028
Gender \times Academic Performance	8.289	2	4.145	.389	.678	.003
Gender \times Grade Level	16.015	2	8.007	.751	.473	.007
Academic Performance \times Grade Level	11.020	4	2.755	.258	.904	.005
Gender \times Academic Performance \times Grade Level	38.506	4	9.627	.902	.463	.016
Error	2410.681	226	10.667			
Total	93658.000	244				
Corrected Total	2662.328	243				

Figure 1 shows that junior level undergraduate mathematics education students' ASES scores ($M = 20.37, SE = .50$) were significantly greater than sophomore level ($M = 18.53, SE = .52$) students (Bonferroni corrected) with Cohen's $d = .44$, which indicates a medium size grade level effect. While freshman level students' ASES scores ($M = 19.75, SE = .61$) greater than sophomore level students, a significant difference was not found. Precisely, a significant difference between other groups was not observed.

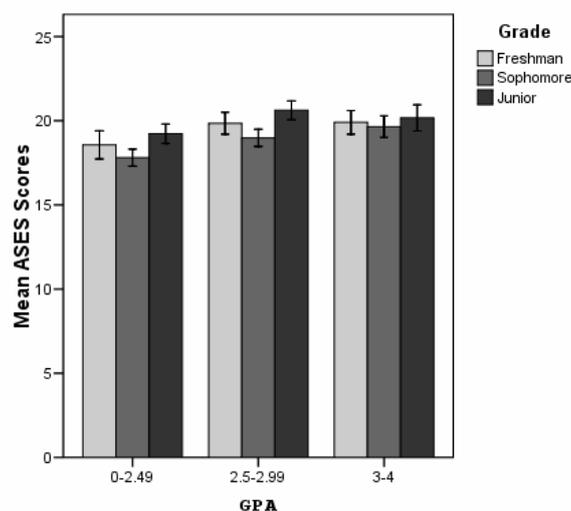


Figure 1. ASES Scores (means and standard errors) of the participants with respect to GPA and grade level

Figure 1 also implies that ASES scores of the students who have 2.5–2.99 GPA ($M = 20.02$, $SE = .43$) were greater than students have 0–2.49 GPA ($M = 18.44$, $SE = .21$) (Bonferroni corrected) with Cohen's $d = .40$, which shows a medium size group effect. Similarly, in this group, a significant difference between other groups did not observed, as well.

3. Conclusion and Discussion

The main purpose of the present study was to examine undergraduate mathematics education students' academic self – efficacy beliefs as a function of gender, grade level and academic performance. More precisely, we used a mixed ANOVA model in order to analyze the obtained data. First, by the aid of descriptive statistics, we found that undergraduate mathematics education students' academic self – efficacy beliefs were over moderate level for total and each grade level. This result is consistent with other studies interpreted in Turkey with similar participants (Altunsoy et al. 2010; Fettahlioğlu & Ekici, 2010; Odaci, 2011; Oğuz, 2012; Yılmaz, Gürçay & Ekici, 2007). Secondly, we concluded that there was a significant effect of grade level on ASES scores. Junior level undergraduate students' academic self – efficacy level was greater than those are sophomore level. Cohen's d showed medium size group effect. Although freshman level students' academic self – efficacy level was greater than sophomore level students, there was not a significant difference between these groups. This fact is supported with the findings reported in the literature (Altunsoy et al., 2010, Oğuz, 2012). It was also found that there was a significant effect of academic performance. Students who have 2.5–2.99 GPA had a greater academic self – efficacy level than students have 0–2.49 GPA. Cohen's d indicated medium size group effect. While this fact is supported by the paper Altunsoy et al. (2010), however, it is contradicted with the finding of Oğuz (2012). As Oğuz (2012) states “other than teachers' academic self – efficacy beliefs, learning skills, competencies and motivation levels of self-regulation as well as other variables that affect the success can be considered to be associated with academic achievement” (p. 24). This statement can be reason of significant difference not obtained in other GPA group. Thirdly, there was not a significant effect of gender on ASES scores of undergraduate mathematics education students. This result is also consistent with the findings of Oğuz (2012). Interactions gender and grade level, gender and academic performance and grade level and academic performance failed to research significance. Besides, three – way interaction of gender, grade level and academic performance had not a significant effect on undergraduate mathematics education students' academic self – efficacy beliefs. The presence of these factors, similar studies can be conducted in large samples. This fact may be of interest and researchers may treat it as such in the future.

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