The Relationship between English and Math Success & some Variables at Freshman Level

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Abstract

Recent studies show that proficiency or success in a subject might correlate with some other subjects. For example; if a student is good at math, s/he tends to be successful in physics or chemistry. Starting from this point and based on our own observations, an interest about the possible relationship between success in English as a foreign language learning and mathematics emerged. Therefore, the intend of present study was to examine the link between the freshman students' success in foreign language learning (Leng 101 course) and mathematics (Math 151 course) at the Faculty of Engineering at the University of Gaziantep in relation with some variables namely; their gender and departments they studied. The results revealed significant relation between Leng 101 and Math 151 final grades ($p<0,01$) and a significant difference among the departments in terms of success in foreign language ($p<0,01$). Moreover, an independent samples test revealed a significant difference in English as a foreign language success between genders ($p<0,01$).

Key words: English success, mathematics success, freshman students

1. Introduction

Much research has been done dealing with the relationship between language skills and success in mathematics. Therefore, this study is centered on the notion that overall language proficiency could have an effect on math success because the medium of instruction in some institutions is English, especially at universities. For example, Maleki & Zangani (2007) pointed out that having difficulties fully grasping the contents and concepts of the course given in the target language, which is English, seems to be one of the most serious problems that students face in their particular course of study. This might be due to their weaknesses in general English, which may have a drastic impact on their academic success.

According to Valdés and Figueroa (1994; p.34) " knowing a language and knowing how to use a language involves a mastery and control of a large number of independent components and elements that interact with one another and that are affected by the nature of the situation in which communication takes place". Besides English proficiency in relation to many variables, English success has been studied in correlation with some other subjects. For example; if a student is good at math, s/he tends to be successful in physics or chemistry. Starting from this point and based on observations at freshman classes at the Faculty of Engineering, an interest in the possible relationship between success in English as a foreign language learning and mathematics emerged.

All of the freshman students at the Faculty of Engineering at the University of Gaziantep have to study English and mathematics. During English classes, four language skills; namely reading, writing, listening and speaking, are taught. At the end of the term students are expected to reach the level of proficiency which is necessary for successful university-level work. However, it has been observed that some freshman students, most of whom study in certain engineering departments, are less successful than the others. In other words, sometimes they have to take the freshman English course two or three times in order to have knowledge of the language sufficient for their further study.

During the collection of data, it was observed that there are more male students than females. Therefore, it was essential to search for the gender difference in foreign language success to realize whether there is a difference or not. To this end, gender difference in foreign language success was next investigated. However, when it was observed by the instructors, the difference wasn't directly more important than the difference between success in English as a foreign language and mathematics. Since it is necessary to conduct scientific research in order to come to a conclusion, gender difference was examined.

The main purpose of this study is to examine the relationship between the freshman students' success in foreign language learning and mathematics at the Faculty of Engineering at the University of Gaziantep. In addition, the study aimed to figure out the differences in language success among seven different departments at the Faculty

of Engineering. Finally, differences in English success on the basis of gender were investigated. To be able to conduct this study, the following hypotheses were formulated;

1) There is a significant relationship between freshman students' success in foreign language and mathematics at the Faculty of Engineering at the University Gaziantep.

2) There is a significant difference between female and male students' success in foreign language.

3) There is a significant difference among seven different departments at the Faculty of Engineering.

Several studies have indicated that the language problem is one of the major factors contributing toward the poor performance of many students in mathematics; especially those who are bilingual and multilingual (Secada, 1992; Barton & Barton, 2003). Similarly, bilingual or multilingual students who are not really fluent in either of the two or more languages tend to experience difficulty in mathematics. (Ellerton & Clarkson, 1996, cited in Yushau & Bokhari, 2005). Furthermore, in another study, there is some evidence indicating that language proficiency is related to science content knowledge (Torres & Zeidler, 2002). However, there have been few studies dealing purely with the potential relationship between success in English as a foreign language and mathematics. Therefore, in this study the relationship between the freshman students' success in foreign language learning and mathematics at the Faculty of Engineering at the University of Gaziantep was investigated.

Educational scientists claim that Hispanic English language learners might become quite proficient in English language learning skills; that is, grammar, vocabulary and sentence structure; however, they may not have the necessary cognitive academic language proficiency to study the subjects which are presented to them in science classrooms. In other words, language proficiency is related to science knowledge (Torres & Zeidler, 2002). Moreover, Stepanek (2004) agrees with Torres and Zeidler. He explains this by referencing the research of Cocking, Chipman(1988) and Secada (1992) and states that language proficiency plays a role in mathematics achievement. However, English is not the only language studied in relation to math success. There are also studies investigating the relationship between other languages as a second language and math success. For example, Han and Ginsburg (2001; p.207) studied Chinese as a second language, and they indicated that "the more Asian schooling, the greater the competence in Chinese language, and hence, the higher the performance on the mathematics test". According to the findings of the above studies and to Bernardo and Colleja (2005) and Clarkson (2007), students' language competencies impact their mathematical performances in a number of different contexts including word problems. Thus, educational researchers also tend to agree that language proficiency (or competency) is one of the most important factors influencing English language learning students' mathematics performance (Bernarodo & Calleja, 2005: Clarkson, 2007).

Some scientists mention that gender is an important factor in foreign language learning. Andreou et al (2005) studied gender and concluded that "subjects who achieved higher scores on L2 tasks had strong second language aptitude skills since they were those who had obtained a professional degree in the second language. Females performed better than males in syntax and semantics which is explained by the general female superiority on the verbal tasks based on differences in hemispheric specialization for language functions between the sexes." In another study, Na (2007) researched high school students' English learning anxiety and indicated that "students indeed had comparatively high anxiety in English learning. Males have higher anxiety about English classes than females. In addition, it was also found that high anxiety plays a somewhat debilitating role in high school students' language learning."

1.2 Assumptions of the study

In the research, it was assumed that the grades of the students were valid and reliable. No other external learner factors such as intelligence, age, aptitude, instructor or instruction factors were taken into consideration. The subjects were supposed to have similar backgrounds. Furthermore, it was assumed that all the participants had English skills basic enough to understand Math instructions in English (as they all went through a preparation class which provides them with upper-intermediate level of English.)

1.3 Limitations

The findings of this study cannot be generalized because of the limitations. Only the grades of the students were searched. Intelligence is also important in learning math and English.

2. Methodology

2.1 Participants

The number of students who took part in this study was 365 engineering students. Among them, 83 were females and 282 were males, both of them were taking Leng 101 (English for freshmen students) and Math 151 (Mathematics for freshmen students).

Table 1. Number of male and female students in departments.

	# of Students							TOTAL
	EE	IE	PE	FE	CE	ME	TE	
MALE	49	21	48	30	42	76	16	**282**
FEMALE	10	17	12	31	3	2	8	**83**
TOTAL	59	38	60	61	45	78	24	**365**

In the table EE, IE, PE, FE, CE, ME and TE stand for Electrical and Electronics Engineering, Industrial Engineering, Physics Engineering, Food Engineering, Civil Engineering, Mechanical Engineering and Textile Engineering, respectively.

The sample participating in the study is the whole student body attending at least 70% of the classes. Since engineering departments, especially CE, EE and ME, are generally preferred by male students, the number of female students is smaller than the males.

2.2 Procedure

The major purpose of the study was to examine the link between freshman students' success in English as a foreign language and their success in mathematics at the Faculty of Engineering at the University of Gaziantep. In order to reveal this, the end-of-the-term grades of the participants for Leng 101 (English for freshmen students) and Math 151 (Mathematics for freshmen students) were used as the success criteria. The grades for each student were obtained and success figures of each student for the given courses built up. Then, in the correlational study of the grades a Pearson Correlation was conducted to reveal the relationship between freshman students' success in English as a foreign language and mathematics.

In addition, the study aimed to figure out the differences in language success among seven different departments at the Faculty of Engineering. In order to see the significant difference the participants were grouped according to their departments. Another purpose of the current study was to demonstrate the difference between English success of students at given departments. For this, a one way Anova test was employed.

Finally, differences in English success on a gender basis were investigated. So as to see if there is any difference between the males' and females' success in English as a foreign language, an independent samples T-test was conducted.

3. Findings

The results of the analyses were evaluated in line with the hypotheses formulated at the beginning of the study to see whether the hypotheses were validated.

One of the purposes of this study was to examine the relationship between the freshman students' success in foreign language learning and mathematics at the Faculty of Engineering at the University of Gaziantep. In order to see the relationship between the two subject matters, end-of-the-term grades, out of 4.00, were collected and analyzed for each student. According to the results of the statistical analyses, there is a significant correlation between freshman students' success in foreign language and mathematics ($r = ,711$; $p < .001$). Based on the findings, it can be concluded that students who are successful in English also tend to be successful in Math 151; and, the ones who are successful in Math 151 are more likely to succeed in English, too.

Another major purpose of the study was to investigate the difference between female and male students' success in foreign language. For this purpose an independent samples test was conducted to see the difference in English as a foreign language success between genders. The results of the test are provided in Table 2.

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Table 2. Gender difference in Leng 101

Gender	Female			Male					
	N	X	S	N	X	S	df	t	P
Leng 101	83	1,82	,1	282	1,39	,35	113	-3,87	.000

Table 2 presents the results of the t-test analysis conducted to figure out the difference between male and female students' success in English. According to the table, there is a significant difference between genders (T_{113} – – 3,87, P<001). Therefore the hypothesis stating that there is a significant difference between female and male students' success in foreign language. Although the table displays a difference, a conclusion about which one of the genders is more successful cannot be reached using this evidence alone. As can be seen in Table 3, the mean grades of female students are higher than those of males.

Finally, the study aimed to figure out the differences in language success among seven different departments at the Faculty of Engineering. The One Way Anova test was conducted to see how these students' performances in given departments differ from one another. Descriptive statistics of the test are given in table 3 below.

Table 3. One way Anova descriptive statistics regarding the students' success in Leng 101 at engineering departments

Department	N	X	S
PE	60	1,3	,66
CE	45	1,16	,60
FE	61	2,03	,81
ME	78	1,59	,77
TE	24	1,45	,48
IE	38	2,1	,83
EE	59	1,42	,53

As could be seen in table 3 above, although the average Leng 101 grades of the students from different engineering departments are close to each other; the mean grades of the students at industrial engineering (IE) had the highest mean score, and the civil engineering (CE) students got the lowest mean score ($_X$=2,1 and 1,16; relatively). The results of the one way ANOVA statistics are given in table 4 below.

Table 4. One way Anova results of the Leng101 scores of different engineering departments

	Sum of Squares	df	Mean Square	F	P	Bonferroni
Between Groups	21,08	6	3,51	8,313	.000	EE>PE; IE>EE,ME,CE,TE,FE,PE
Within Groups	151,36	358	,42			FE>PE
Total	172,45	364				

 The results of the ANOVA statistics have revealed that Leng 101 mean scores of the students in different engineering departments are significantly different ($F_{(6-358)}$=3,313, p<.001). In order to see the difference among departments, a Bonferroni test was conducted and the results of this test are also given in the Table 6 above. This statistical analysis clearly put it forward that the mean scores of the students at IE are significantly higher than all the other departments. Similarly, students at EE had significantly higher Leng 101 mean scores than the ones at PE; and students at FE had higher mean scores than the students at PE. Therefore, these findings prove the hypothesis stating that there is a significant difference among seven different departments at the Faculty of Engineering.

4. Results and Discussion

After data analysis was completed and hypotheses were tested, our findings indicated important results. Related to the first hypotheses, which regards the difference between freshman students' success in foreign language and

mathematics at the Faculty of Engineering of Gaziantep University, it was observed that students who are successful in English also tend to be successful in Math. The students' university entrance exam scores might also be thought to be a significant variable correlating with their English and Math course success; however, one could easily see that this is not the case when he compares Leng 101 mean grades of FE (X=2,03) and IE (X=2,1), which admitted students with 306,538 and 332,062 ÖSS score in 2007 respectively, with the ones of EE (X=1,42), which admitted students with 337,067 ÖSS score in 2007. This difference can be best explained in detail by the two following hypotheses' results since they are related to this one which is more general than the others.

Secondly, there is a difference between the success of male students and that of females, which can easily be observed in Table 2. To have an idea about the successful gender group, their Leng 101 mean difference was searched and the result showed that female students are more successful than males. This affects the success of departments which have more female students. This also explains the success of FE and IE students over EE students above. FE and IE departments' student body is composed of almost 50 percent of female students; however, 84 percent of EE students are male. Although EE department admitted students with the highest ÖSS score in 2007, FE and IE departments, with more female/male ratio, were found to be more successful than EE. Therefore, the department with less female students is less successful in Leng 101 than the ones with more female students. This finding is also in line with Andreou et al. (2005), who explained there is a general female superiority on verbal task-based differences in hemispheric specialization for language functions between genders.

Finally, when investigated carefully, it was observed that there is a significant difference in Leng 101 grades between IE and all of the other six departments. However, among other engineering departments, the difference is not so pronounced. As also explained above the reason for this could be that the higher number of female students in the IE department along with its relatively higher ÖSS entrance score. In a similar vein, PE Leng 101 grades are significantly lower than EE, IE and FE students' Leng 101 grades. This could also be explained by the low ÖSS entrance score of PE and low rate of female students in the department. According to 2007 ÖSS results, the PE department admitted students with the lowest grades (292,616) among engineering departments, especially with EE and IE which have the highest ÖSS scores in the Engineering Faculty. To conclude, the two variables, gender and ÖSS score, were both found to be effective in Leng 101 success.

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