

Emotional intelligence in engineering education

Mehmet Tekerek

Kahramanmaraş Sütçüimam University, Computer Education and Instructional Technology Department,
Kahramanmaraş, Turkey, tekerek@ksu.edu.tr

Betül Tekerek

Kahramanmaraş Sütçüimam University, Mathematics and Science Education Department, Kahramanmaraş,
Turkey, btekerek@ksu.edu.tr

ABSTRACT In this study, emotional intelligence levels of engineering students from different universities in Turkey were investigated. Data were collected by “Emotional Intelligence Scale” developed by Schutte and et al (1998). 98 engineering students from different engineering faculties were selected as the participants of the study. The participants participated in the TUBITAK Alternative Energy Car Races before the study. Findings of the study showed that there is no significant difference in students’ emotional intelligence scores in terms of age and gender. Additionally, the students who have similar hobbies regarding developing design had higher emotional intelligence score. In terms of being engineer in the family, students showed higher performance in emotional intelligence score. Students who don’t have professional pessimism have higher emotional intelligence score.

Keywords Engineering Education, STEM Education, Emotional Intelligence

Mühendislik eğitiminde duygusal zeka

ÖZ Bu araştırmanın amacı, TUBITAK Alternatif Enerjili Araba Yarışları’na katılan ve Türkiye’nin farklı üniversitelerinin mühendislik fakültelerinde öğrenim görmekte olan öğrencilerin duygusal zeka düzeylerini cinsiyet, yaş, günlük hayatta tasarım geliştirmeye benzer hobisi olma, ailesinde mühendis olma durumu ve mesleki kötümserlik gibi değişkenler açısından incelemektir. Bu amaçla yapılan çalışmada tarama modeli kullanılmıştır. Elde edilen veriler Schutte ve Ark.’ı (1998) tarafından geliştirilen “Duygusal Zeka Ölçeği” aracılığıyla mühendislik fakültelerinde eğitim gören 98 öğrenciden toplanmıştır. Bulgular öğrencilerin duygusal zeka puanlarında yaş ve cinsiyet açısından önemli bir farklılık olmadığını göstermiştir. Ayrıca tasarım geliştirmeye yönelik benzer hobisi olan, ailesinde mühendis olan, ve mesleki kötümserlik sahibi olmayan öğrencilerin duygusal zeka puanlarının diğerlerine göre daha yüksek olduğu ortaya çıkmıştır.

Anahtar Kelimeler Mühendislik Eğitimi, STEM Eğitimi, Duygusal Zeka

INTRODUCTION

Emotional Intelligence (EI) was defined in Psychology Today (2016) as; “Emotional intelligence is the ability to identify and manage your own emotions and the emotions of others. It is generally said to include three skills: emotional awareness; the ability to harness emotions and apply them to tasks like thinking and problem solving; and the ability to manage emotions, which includes regulating your own emotions and cheering up or calming down other people.”

Recently, many researchers investigated EI from different aspects such as the relationship between EI and academic achievement, team learning, evaluating managerial success, students’ demographic characteristics and critical thinking tendency (Arıcıoğlu, 2002, Dutoğlu&Tuncel, 2008, Erdoğan, 2008, Erdoğan &Kenarlı, 2008, Günsel, Akgün & Keskin, 2010). Because of the interest toward it, the meaning of EI has become important. Cassidy and Boseck (2008) emphasized that EI has a long history underlining that Thorndike, a famous American psychologist, was the first to use ‘social intelligence’ term that was combined with EI’s definition in 1920. Salovey and Mayer (1990) described EI as a subset of social intelligence and stated that it “involves the ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and actions” (p. 189).

Daniel Goleman’s 1995 book named *Emotional Intelligence: Why It Can Matter More Than IQ* has significantly drawn attention when EI is concerned. In addition to Salovey and Mayer (1990), Goleman (1995) defined EI in his book as an intelligence which includes self-consciousness, effort, breaking the stimulations and the ability sharing others’ emotions. Additionally, he emphasized that EI is more important than IQ since there is a probability about being unsuccessful with high IQ in daily life. According to Goleman (1998), the following factors are important for emotional intelligence: self-awareness, self-confidence, self-control, commitment, integrity, ability to communicate and influence, initiating, and accepting changes. Thus, it could be claimed that a person with high EI is aware of feelings, has the capability of overcoming the feelings, has personal motivation, empathizes with others and manages both his/her self’s and others feelings.

Moreover, Abraham (2006) stated that EI level of graduate students is important for their career and success, and emphasized that educators have to consider students’ needs and to integrate EI skills into educational programs. Additionally, he pointed that educators should attach significance to the graduates’ technical and emotional training in order to raise qualified and equipped individuals business.

Brandenburg, et al. (2011) propose that engineering students should have advanced technical skills. However, only these skills will not be sufficient to be better in their field. From these perspectives, Zhou (2010) offer two possible reasons for the importance of EI in engineers’ success First, “EI is significantly related to cognitive capability, with markedly strong effects on high scholastic achievement” (p.10). As cited in Riemer (2003), the second one is communication. Students’ communication skills could be increased based on industry and improvement of EI elements Additionally, Riemer (2003) emphasized that engineering graduates with high EI will show better performance in their business life.

Erdoğan (2008) conducted a study with the purpose of revealing the relationship between university students’ the Emotional Quotient Scale points and certain socio-demographic features. The participants of the study were 532 students from Faculty of Science, Faculty of Engineering, School of Sport Sciences, School of Law, Faculty of Letters, Faculty of Fine Arts and Faculty of Dentistry. One of the research’s findings showed that students attending Faculty of Fine Arts, and those attending School of Sport Sciences got the highest and lowest EI scores, respectively. Additionally, no significant difference was found among the students’ EI scores regarding the faculties they were attending. Another study conducted by Behnke and Greenan (2011) investigated the relationship between postsecondary students’ emotional-social intelligence and attitudes toward computer-based instructional materials and found a negative correlation. Brandenburg, et al. (2011) investigated emotional intelligence and academic performance of engineering students’ and the difference in emotional intelligence of students in terms of demographic and experiential characteristics. The researchers recommended enhancement of engineering students’ EI, and integrating EI besides leadership training into educational programs.

Thus, the purpose of the present study is to investigate EI levels of the engineering students studying at various universities in Turkey who participated in the TUBITAK Alternative Energy Car Races in 2011 in terms of several variables such as gender, age, having similar hobbies in daily life, having an engineer in family, and professional pessimism.

METHODOLOGY

In this study, EI levels of the Turkish engineering students from different universities who participated in the TUBITAK Alternative Energy Car Races were investigated. For this purpose, a descriptive model was utilized in the survey.

Survey models are research methods which aim to describe a past or existing case as it is. The important thing is to observe it properly and to determine (Karasar, 1994).

The relationship between EI and variables (having similar hobbies in daily life, having an engineer in family, state of professional pessimism) was evaluated. Additionally, t-test was used in order to determine whether there is a relationship between gender and EI levels of the students. One-way ANOVA was used to reveal whether there is a relationship between age and EI. Significance level was used as $p=.05$.

Participants

98 engineering students who participated in the TUBITAK Alternative Energy Car Races were selected as the participants of the study. Gender and age of the students were given in Table 1.

Table 1. Students' Demographic Features

		F	%
Gender	Female	22	22,4
	Male	76	77,6
Age	19-21	50	51,0
	22-24	42	42,9
	25-28	6	6,1

As seen in Table 1, 22.4 % of the students were female (N=22) and 77.6% were male (N=76). The majority of the students were in 19-24 age group (N=92).

Data Collection Tool

Students' EI levels were determined by "Emotional Intelligence Scale" (Schutte et al., 1998). Original scale's Cronbach's Alpha value was calculated between .87-.90. Cronbach's Alpha value was calculated as .93 for this study. Frequencies and percentages were used for expressing students' demographic features. The scale consists of two sections. In the first part, demographic features of the participants were determined. In the second part, a 5 Likert type scale was used to determine their EI scores. It has 30 positive and 3 negative items. high EI score was represented by high scores. The positive items were pointed from 1 (Totally disagree) to 5 (Totally agree). . Negative items were also pointed from 1 to 5 and reversely coded. In order to investigate the items based on students' opinions, mean score (emotional intelligence score) was detected based on the calculated values as below.

1.0 - 1.49 very low emotional intelligence score

1.50 - 2.49 low emotional intelligence score

2.50 - 3.49 average emotional intelligence score

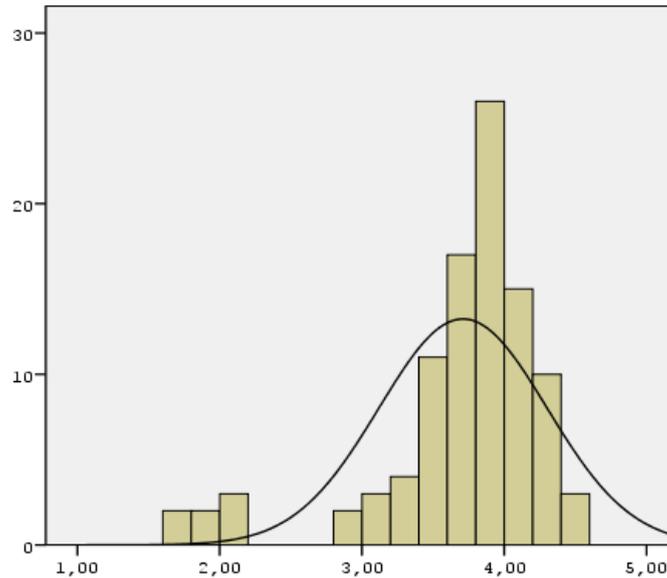
3.50 - 4.49 high emotional intelligence score

4.50 - 5.00 very high emotional intelligence score

The following section offers findings and related discussion.

FINDINGS

Students' emotional intelligence scores were given in Graph 1.



Graph 1.
EI Scores Histogram Mean:3,71, Std.Dev.:0,59, N: 98

In Graph 1, students' EI score's mean was calculated as $X=3,71$ ($N=98$). To investigate the relationship between these scores and gender, the independent sample t-test was conducted. The results of t-test was given in Table 2.

Table 2
Independent Sample t-Test Results for gender variable

	C	N	\bar{X}	Ss	Levene Test		t	Df	p
					F	p			
Emotional intelligence	Female	22	3,7851	0,45583	1,722	0,193	0,676	96	0,500
	Male	76	3,6882	0,62472					

*p=0,05

According to Table 2, mean of female students' EI score was higher ($\bar{X}=3,7851$) than that of male students' ($\bar{X}=3,6882$). It could be claimed that female students' EI level was higher than male students'. Additionally, no relationship was found between gender and EI levels of the students ($t=0,676$; $p>0,05$).

One way-ANOVA was conducted to investigate the relationship between students' EI and age. The results were given in Table 3.

Table 3
One-way ANOVA result according to age

Age		Sum of Squares	Df	Mean of Squares	F	p
19-21	Between Groups	0,528	2	0,264	0,754	0,473
22-24	Within Groups	33,266	95	0,350		
25-28						

As shown in Table 3, there is no significant relationship between students' EI levels and age [$F(2, 95) = 0,754$; $p > 0,05$].

In the study, whether engineering students have similar hobbies regarding designing in their daily lives was investigated. The results were given in Table 4.

Table 4

The students having similar hobbies regarding developing design in their daily lives

	f	%
Yes	82	83,7
No	16	16,3

According to Table 4, 82% of the students have similar hobbies regarding designing. This finding can be related to getting engineering education.

In the study, whether students' having similar hobbies in their daily lives affect their EI was investigated. For this purpose, those who have similar hobbies regarding developing design in their daily lives and who don't have similar hobbies regarding developing design in their daily lives were compared in terms of their emotional intelligence scores. The results were given in Table 5.

Table 5

EI scores and having similar hobbies regarding developing design.

	N	X	SD
Students who have similar hobbies	82	3,7775	0,53329
Students who don't have similar hobbies	16	3,3636	0,75121
Total	98	3,7100	0,59025

Table 5 indicates that the students who have similar hobbies regarding developing design have higher emotional intelligence score ($X=3,7775$) than those who don't ($X=3,3636$).

In the study, it was aimed to determine whether the students have an engineer in their family. The results were given in Table 6.

Table 6

Having an engineer in their own family

	N	%
Yes	33	33,7
No	65	66,3

As seen in Table 6, 33.7% of the students have an engineer in ($N=33$) in their family while 66.3% of them don't ($N=65$).

Subsequently, whether this significantly affects their EI was investigated. For this purpose, those who have an engineer in the family and who don't were compared in terms of their emotional intelligence scores. The results were given in Table 7.

Table 7

Comparison of EI scores of the students who have engineer in the family and who don't have.

	N	X	SD
Have	33	3,7603	0,51109
Don't have	65	3,6844	0,62885
Total	98	3,7100	0,59025

According to Table 7, the former had higher emotional intelligence score ($X=3,7603$, $N=33$) than the latter ($X=3,6844$, $N=65$).

In the study, it was aimed to reveal whether the students who participated in Alternative Energy Car Races have professional pessimism. The related test results were given in Table 8.

Table 8

Students' having professional pessimism

	N	%
No	63	64,3
Yes	35	35,7

According to Table 8, while 64.3 % of the students do not have professional pessimism ($N=63$), 35.7% of them do ($N=35$).

Whether students' having professional pessimism affects their emotional intelligence or not was investigated. For this purpose, students who have professional pessimism and who don't were compared in terms of their EI scores. The results were given in Table 9.

Table 9

Comparison of EI scores of the students who professional pessimism and who don't have.

	N	X	SD
Have profession pessimism	63	3,7566	0,56679
Don't have profession pessimism	35	3,6260	0,62996
Total	98	3,7100	0,59025

According to Table 9, the students who don't have professional pessimism had higher emotional intelligence score ($X=3,7566$, $N=63$) than those who have professional pessimism ($X=3,6260$, $N=35$).

DISCUSSION and CONCLUSION

The purpose of this study was to investigate EI levels of engineering students who are attending some activities which are related to their major profession. Findings of the study showed that there is no significant difference in the students' emotional intelligence scores in terms of age and gender. However, it was found that female students' EI scores were higher than the male students'. Zhou (2010) also concluded that female civil engineering students showed higher performance in overall EI performance than the male students. Similarly, BalcıÇelik and Deniz (2008) found that there is no significant difference in scouts' emotional intelligence scores in terms of gender. In contrast, Yılmaz (2007) and Erdoğan (2008) concluded that there is a significant difference in terms of gender in favor of female students.

Additionally, the students who have similar hobbies regarding designing have higher EI scores than those who do not. Having similar hobbies regarding designing significantly affects their EI.

The students who have engineer in their family had higher EI scores than those who do not, which might be attributed to the fact that the former group is likely to take him/her as a role model.

And, the students who don't have professional pessimism had higher EI scores than those who do not. As in other professional fields, having positive views and feelings towards engineering might have affected the students' EI positively.

Consequently, it could be claimed that EI is an important concept in terms of engineering education since the students with higher EI have a hobby similar to engineering profession. Thus, these students attend to working groups as TUBITAK Formula-G Races. This participation provides engineering students to have experience of engineering profession, to see the applications of the field and to participate in R&D and P&D activities. Additionally, these kinds of organizations provide students to integrate STEM fields for their own project realizations and specified purposes. This integration would also be affected by students' EI levels. For this reason, not only engineering education but also all STEM fields should consider EI in all educational level. These organizations can motivate students to obtain engineering skills. To increase their EI levels, different activities should be organized. Engineering students' EI could also be investigated in terms of other variables in future studies no significant difference was found between the students' EI scores in terms of gender and age in the present study.

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TÜRKÇE GENİŞLETİLMİŞ ÖZET

Bu araştırmanın amacı, TUBITAK Alternatif Enerjili Araba Yarışları'na katılan ve Türkiye'nin farklı üniversitelerinin mühendislik fakültelerinde öğrenim görmekte olan öğrencilerin duygusal zeka düzeylerini cinsiyet, yaş, günlük hayatta tasarım geliştirmeye benzer hobisi olma, ailesinde mühendis olma durumu ve mesleki kötümserlik gibi değişkenler açısından incelemektir. Bu amaçla yapılan çalışmada tarama modeli kullanılmıştır. Tarama modelleri geçmişte ve gelecekteki bir durumu olduğu gibi tanımlamayı amaçlar. Önemli olan onu uygun şekilde gözlemlemek ve belirlemektir (Karasar, 1994). Elde edilen veriler Schutte ve Ark.ı (1998) tarafından geliştirilen "Duygusal Zeka Ölçeği" aracılığıyla mühendislik fakültelerinde eğitim gören 98 öğrenciden toplanmıştır. Duygusal zeka ve diğer değişkenler (cinsiyet, yaş, günlük hayatta tasarım geliştirmeye benzer hobisi olma, ailede mühendis olması, mesleki kötümserlik durumu) arasındaki ilişki belirlenmeye çalışılmıştır. Cinsiyet ve duygusal zeka arasındaki ilişkiyi belirlemek için t-testi kullanılmıştır. Yaş ve duygusal zeka arasındaki ilişkiyi görmek için ise tek yönlü varyans analizi kullanılmıştır. Anlamlılık düzeyi $p=.05$ olarak belirlenmiştir. Çalışmaya katılan öğrencilerin %22.4 ü kız (N=22) ve %77.6 'sı ise erkek öğrencidir (N=76). Öğrencilerin büyük bir çoğunluğu 19-24 yaş aralığında (N=92) bulunmaktadır. Öğrencilerin duygusal zeka seviyeleri Shutte ve diğerleri (1998) tarafından geliştirilen "duygusal zeka ölçeği" ile belirlenmiştir. Orjinal ölçeğin Cronbach's Alpha değeri .87 ile .90 aralığında hesaplanmıştır. Bu çalışma için Cronbach's Alpha değeri .93 olarak hesaplanmıştır. Öğrencilerin demografik özelliklerini vurgulamak amacıyla frekans ve yüzdeler kullanılmıştır. Ölçek iki bölüme ayrılmıştır. Birinci kısımda katılımcıların demografik özellikleri belirlenmiştir. İkinci kısımda ise, öğrencilerin duygusal zeka puanlarını belirlemek için 5 li likert tipi ölçek kullanılmıştır. Ölçekte 30 pozitif ve 3 negatif madde bulunmaktadır. Yüksek duygusal zeka puanı yüksek puanla gösterilmiştir. Pozitif maddeler 1 (Tamamamen katılmıyorum)'den 5 'e (Tamamen katılıyorum) puanlanmıştır. Negatif maddeler de aynı şekilde 1'den 5'e fakat ters şekilde kodlanmıştır. Öğrencilerin puanlarını yorumlayabilmek için ortalama duygusal zeka puanı hesaplanmıştır. 1.00 ve 1.49 arası çok düşük, 1.50 ve 2.49 arası düşük, 2.50 ve 3.49 arası ortalama, 3.50 ve 4.49 arası yüksek, 4.50 ve 5.00 arası ise çok yüksek duygusal zeka olarak yorumlanmıştır. Bulgular öğrencilerin duygusal zeka puanlarında yaş ve cinsiyet açısından önemli bir farklılık olmadığını göstermiştir. Ayrıca tasarım geliştirmeye yönelik benzer hobisi olan, ailesinde mühendis olan, ve mesleki kötümserlik sahibi olmayan öğrencilerin duygusal zeka puanlarının diğerlerine göre daha yüksek olduğu ortaya çıkmıştır. Sonuç olarak, duygusal zekanın mühendislik eğitimi açısından önemli bir olgu olduğu savunulabilir. Çünkü yüksek duygusal zekaya sahip öğrenciler mühendislik mesleğine benzeyen bir hobiye sahip olmaktadır. Bu yüzden bu öğrenciler TUBITAK Formula-G yarışları gibi organizasyonlara katılmaktadırlar. Bu organizasyonlara katılmak, mühendislik öğrencilerinin mühendislik mesleği ile ilgili tecrübe kazanmasına, alanlarının uygulamalarını görmelerine ve ARGE ve ÜRGE aktivitelerine katılmalarını sağlamaktadır. Ek olarak bu tür organizasyonlar öğrencilerin özel amaçlarına ulaşmaya yönelik proje uygulamalarında FeTeMM alanlarının ilişkilendirilmesine ortam sağlar. FeTeMM ilişkilendirmesi öğrencilerin duygusal zeka seviyelerinden de etkilenecektir. Eğitimin her düzeyinde duygusal zeka sadece mühendislik eğitiminde değil aynı zamanda tüm FeTeMM disiplinlerinde göz önüne alınması gereken bir kavramdır. Bu tür organizasyonlar, öğrencilerin mühendislik becerilerini elde etmeleri için motive edici olabilir. Öğrencilerin duygusal zeka seviyelerini artırmak için farklı aktiviteler organize edilmelidir. Bu çalışmada öğrencilerin duygusal zekalarının cinsiyet ve yaş açısından bir farklılığa rastlanmadığı için, mühendislik öğrencilerinin duygusal zekaları başka çalışmalarda farklı değişkenler açısından incelenebilir.