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Analysing of High School Students' Problem Solving Skills¹

(Lise Öğrencilerinin Problem Çözme Becerilerinin Analizi)

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Abstract

Individuals should possess problem solving skills to reach the desired aims in their life. Because of this, this skill is believed as a critical item of education. The purpose of the present study was to examine if there is a meaningful relationship between the high school students' problem solving skills according to their gender, the types of high school, departments, and classes. This study was conducted during 2016-2017 academic year with the participation of 181 female and 193 male students studying at Zubeyde Hanim Vocational and Technical Anatolian High School and Gazi Industrial Vocational High School. The information about the ability to study was gathered through a questionnaire developed by Heppner and Peterson (1982) and adapted in Turkish by Sahin, Sahin and Heppner (1993). Data were analysed using One-Way ANOVA, t-test, and the Scheffe's test. According to ANOVA results, it was seen that the department differentiation influenced their problem solving skills, while class differentiation did not have any effect on their problem solving skills. Also, T-test results indicated that their high schools and gender are significant variables on students' problem solving skills.

Keywords: Problem Solving Skills, High School Students

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1. Introduction

Education is an active process which is the necessity for the individual to access to knowledge easily, and to have critical thinking skills (Altun, 2003; Saracaloglu, Yenice, & Karasakaloglu, 2009). Altun (2003) suggests the aim should help learners to attain and develop the knowledge, skills and attitudes for her/him to overcome the problems she/he faces with the scope of the active education process. And, Gok and Erdogan (2011) underline this makes bringing up creative individuals who can think critically and solve problems. They also believe it is the most important duty of the educational institutions.

2. Literature review

2.1. Problem, Problem Solving, and Problem Solving Skills

Problem is described as an obstacle against available difficulties gathered by a person in order to reach her/his aim (Bingham, 1983). It is also defined as the difference between the available and expected situation of something (Keeneland, 1999). Ustun and Bozkurt (2003) state that a person lives get meaning with the solution of these problems, since she/he faces many problems continuously. And, Heppner, Witty and Dixon (2004) highlight it is difficult to separate problems and life owing to these reasons.

There are different definitions for problem solving. For example, according to Gagne (1970), it is the highest level of learning from the problem solving skill as the unavoidable life skill. It is also expressed as a thinking process, where individuals discover the composition of previously principles which they have learned to solve a problem (Gagne, 1977). Moreover, it is defined as the result of the implementation of certain knowledge to understand a problem (Ashmore, Frazer, & Cassey, 1979), and as a scientific research task (Perez & Torregrorse, 1983). Bingham (1998) also states that problem solving is a process which requires a set of targets that relate to moving some obstacle to reach an exact target. It is defined by Morgan (1995) as a process which one feels the problem as finding a solution to it. Problem solving is explained as coping with the problem by Heppner and Krauskopf (1987).

Guclu (2003) interprets problem solving skill as a skill that a person has to be an individual, getting along with her/his environment, living a healthy life and protect her/his mental health. And, it is underlined higher order thinking skills such as visualization, association, abstraction, comprehension, manipulation, reasoning, analysis, synthesis, and generalization are involved in problem solving. In our days, there is a strong movement in education to integrate problem solving as a main component of the curriculum (Kirkley, 2003).

There are many researches on problem solving skills of the individuals at different age groups and several educational levels. It is found out there is not a significant relationship between gender and university students' problem solving skills in his study in which he examined the relationship between the individual properties of university students and their problem solving skills (Dundar, 2009). Also, Forgatch (1989) concludes the level of the students effects their problem solving skills. Taylan's (1990) study shows while there is a meaningful difference according to the curriculum, there is not a significant relationship between the students' problem solving skills and their genders, department, and class levels. Aylar and Aksin (2011) realizes that there is not a significant difference between the Social Sciences Teaching students' graduated high school, grade and problem solving skills. However vocational high schools students' and university students' problem solving skills have received considerable concern from employers to the public at large, many researchers such as Nickerson (1994) and Woods, Wright, Hoffman, Swartman, and Doig (1997) state that they are not acquiring this skill. So, it can be said there is much more study requirement on the vocational high schools students to determine their problem solving perceptions since educational systems aim to make the right decision about the solutions in globalized world today (Gucray, 2003).

The purpose of the current study is to explore there is a meaningful relationship between the high school students' problem solving skills according to their gender, their high schools, departments, and classes. For this purpose, answers to the following questions are sought:

1. Is there a significant difference between female and male students in terms of problem solving skills?

2. Is there a significant relationship between high school students' problem solving skills and their high schools?
3. Is there any significant difference in high school students' problem solving skills in terms of their departments?
4. Is there any significant difference in high school students' problem solving skills in terms of their classes?

3. Method

3.1. Participants and Setting

This study was conducted during 2016-2017 academic year with the participation of 181 female (48.39 %) and 193 male (51.61 %) students who are studying at Zubeyde Hanim Vocational and Technical Anatolian High School and Gazi Industrial Vocational High School. Their levels are from 9th to 12th and departments are beauty, graphic, child development, informatics, public relations, gastronomy, metal, furniture, and electric. All participants took part in the study voluntarily.

3.2. Data Collecting Instrument

This study is based on survey design. Problem Solving Inventory developed by Heppner and Peterson (1982) adapted in Turkish by Sahin, Sahin and Heppner (1993) was used in order to assess students' problem solving skills. The scale has 35 items. For each item, respondents were asked to rate themselves on a six-point Likert scale (1 = always, 6 = never).

3.3. Analysis of Data

Data acquired by means of the applications of Problem Solving Inventory was analysed using independent samples t-test, one-way ANOVA via SPSS (Statistical Package for Social Sciences) 21.0 software program. The analysis of independent samples t-test was used to examine whether there was a significant difference in high school students' problem solving skills in terms of gender and their high schools. Also, the analysis of one-way ANOVA was administered to determine if there were differences in high school students' problem solving skills according to departments and classes.

4. Findings

The data was analysed as it intends to explore the students' gender, high schools, departments, and classes in their problem solving skills in this section. It is summarised descriptive statistics on students' problem solving skills in Table 1.

Table 1. Means, Standard Deviations and Maximum Scores

	N	Min.	Max.	Mean	Std. D.	Std. Er.
Gender	374	1.00	2.00	1.48	.50	.02
High school	374	1.00	2.00	1.48	.50	.02
Department	374	1.00	9.00	4.40	2.06	.10
Class	374	1.00	4.00	2.83	1.04	.05
Total	374	107.00	44.00	98.46	18.79	.97

Table 2 focuses on the differences between male and female students in terms of problem solving skills.

Table 2. Differences between male and female students in terms of problem solving skills

Gender	N	Mean	S. D.	t	p
Male	193	100.06	20.32	-1.59	.00
Female	181	96.96	17.16		

* The mean difference is significant at the .05 level

In Table 2, based on t-test result, it could be reported that male students' problem solving skills (M=100.06) is higher than female students' problem solving skills (M=96.96). In view of this, it was observed a significant difference in favour of male students (t=-1.59, p<.05). According to this finding, it can be suggested that gender is a significant variable on students' problem solving skills.

Table 3 addresses the students' problem solving skills in terms of their high schools.

Table 3. Differences the high school students' problem solving skills in terms of their high schools

High school	N	Mean	S. D.	t	p
Zubeyde Hanim Vocational and Technical Anatolian High School	252	282.62	39.15	2.52	.00
Gazi Industrial Vocational High School	122	292.39	35.70		

* The mean difference is significant at the .05 level

As it is observed in Table 3, it could be reported problem solving skills of students who are studying at Gazi Industrial Vocational High School are higher (M=292.39) based on T-test results. And, there is a statistically significant difference in favour of the type of Industrial Vocational High School (t=2.52; p<.05). In accordance with this finding, it can be suggested their high schools are a significant variable on students' problem solving skills.

One-Way ANOVA test was conducted in order to determine if there were any significant differences in high school students' problem solving skills in terms of their departments and classes. Table 4 and 5 show the descriptive statistics of One-Way ANOVA analysis.

Table 4. The descriptive statistics of the high school students' problem solving skills according to their departments

Groups	Sum of Squares	df	Mean	F	p
Between Groups	10153.39	9	1269.17	3.80	.00
Within Groups	121633.65	365	333.24		
Total	131787.04	374			

Table 5. The descriptive statistics of the high school students' problem solving skills according to their classes

Groups	Sum of Squares	df	Mean	F	p
Between Groups	1960.48	4	653.49	1.86	.13
Within Groups	129826.56	370	350.88		
Total	131787.04	374			

It is seen that there is a significant difference in the students' problem solving skills according to their departments (F=3.80; p<.05) in Table 4. The test's result displays that department differentiation influenced their problem solving skills. It is also supported that there were differences between groups. Yet, as it is observed in Table 5, there is no significant difference in the high school students' problem solving skills according to their classes (F=1.86; p>.05). The ANOVA test's result shows that class differentiation did not affect their problem solving skills. It is confirmed that there was no differences between groups.

In this study, owing to ANOVA test results, it was concluded that there were significant differences in the high school students' problem solving skills according to their departments. To find out the significant differences from which departments arise, the Scheffe's post-hoc test was conducted. The Scheffe's test results shows there are significant differences between informatics and public relations departments ($p=.02$, $p<.05$), public relations and furniture departments ($p=.00$, $p<.05$) within problem solving skills.

5. Discussion

Problem solving skills of high school students' have been examined in the frame of department, gender, their high schools, and class in the current study. The findings showed that the male students' problem solving skills is higher than the females. These results are in line with Ayaydin and Ozbay's (2003), Soyer and Bilgin's (2010), and Tamres, Janicki, and Helgeson's (2002) study's findings. But, Alver (2005), Aylar and Aksin (2011), Dundar (2009), Genc ve Kalafat (2010), Saygili (2000), Yenice (2012), and Yildirim and Yalcin (2008) could not find any meaningful difference at the result of comparing gender of the students and their problem solving skills.

As the results are analysed with regards to the relationship between students' problem solving skills and their high schools, it was noticed that there is a statistically significant difference. But, this result doesn't correspond with the results of Buluc, Kuru, and Taneri (2010) and Yenice (2012) study's findings. They could not find a difference in problem solving skills of students according to their graduated high schools. And, according to the research findings, it was found out that problem solving skills of the high school students' show a meaningful difference according to their departments. This shows a parallelism with many researches such as Alver (2005), Otacioglu (2007), and Yenice (2012).

Another result is that there is not a significant difference in problem solving skills of the students' according to class level of them. This result doesn't correspond with the results of Serin (2004). According to Serin (2004), problem solving skills of students increase in upper class levels. Also, Dundar (2009), Forgatch (1989), and Genc and Kalafat (2010) state that there is a meaningful difference between class level and problem solving skills. Dundar (2009) underlines that problem solving skills of 4th grade students is higher than the lower classes. And, Genc and Kalafat (2010) find out 3th grade students' problem solving skills is higher than 4th grade students'. They believed this result is related with 4th grade students' concerning for future more. However the literature does not show a parallelism in not changing problem solving perception related with the class level in this research. Similar to the current research finding, Soyer and Bilgin's (2010) study show the class level does not create a significant difference in high school students' problem solving success.

6. Recommendations

When the findings of the study are considered, it can be suggested some ideas for the researchers for further research. First of all, this study investigated and evaluated the information of the students by the questionnaires. Because of this, more qualitative data may be collected through observation or interview techniques. Secondly, the current study conducted with the participation of 374 students who are studying at beauty, graphic, child development, informatics, public relations, gastronomy, metal, furniture, and electric departments. For this reason, further studies may be carried out with a larger and studying at different departments sample group.

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