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Examination of Turkish Junior High-School Students' Perceptions of the General Problem-Solving Process

Didem Inel Ekici[1]

[1] Science Education Department, Uşak University, Uşak, Turkey

Correspondence: Didem Inel Ekici, Uşak University, Faculty of Education, Uşak, Turkey. Tel: 90-276-221-2130. E-mail: dideminel@gmail.com

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Abstract

This study aimed to determine Turkish junior high-school students' perceptions of the general problem-solving process. The Turkish junior high-school students' perceptions of the general problem-solving process were examined in relation to their gender, grade level, age and their grade point with regards to the science course identified in the study. The study included 604 junior high-school students who study at eight different schools. A perception scale about problem solving was used as the data collection tool. The study's method was the survey model. The results from the data analysis revealed that Turkish junior high-school students had a positive perception of the general problem-solving process. It was seen that the perception of the students regarding their problem-solving skills was at a high level but that their willingness and determination regarding the problem-solving process was at a medium level. The results revealed that perceptions of the general problem-solving process of female students, students with a lower grade level, younger students and students who were more successful in the science course were significantly more positive than those of other students.

Keywords: general problem solving, perception, skill, junior high-school students

1. Introduction

1.1 Introduce the Problem

At present, the development of students' lifelong learning skills is of great importance in developing generations of students with the ability to search, question and criticize, as well as solve problems and learn autonomously by using information gained through acquisition methods. Globalisation, in particular, has meant that students are required to acquire notional knowledge at a good level and also develop their problem-solving, communication and creative and critical thinking skills (Tarmizi, Tarmizi, Lojinin, & Mokhtar, 2010). Therefore, ensuring that students only acquire knowledge related to their learning field is deemed to be insufficient during the education process. It is considered important that students are capable of solving problems that they encounter and that they are able to think critically in order to ensure that they are more efficient in their personal lives or professional careers (Snyder & Snyder, 2008). According to Denton (2013), people need to be able to solve any problem that they face at any stage of their lives and to think critically in order to be successful in their lives. Therefore, the development of skills such as teamwork, problem solving and communication skills during the education process requires more attention (Wilkinson, 2009). Problem solving, one of the skills used by individuals during their lives, is one of the higher order thinking skills that aids individuals in formulating solutions to problems. Researchers define problems faced by individuals in any field of their life as a situation that creates a hindrance, which prevents achievement of the desired target and which needs to be eliminated, or as a question for which the answer is being pursued (Erdamar & Alpan, 2013; Otacıoğlu, 2008; Türkçapar, 2009). Chen (2008) similarly notes that problems are struggles of small or great difficulty faced during daily life in both professional environments and during social interactions with other people. Problems frequently involve visible and invisible facts that need to be explained (Chiriac, 2008). Problems, which differentiate according to their nature and structure (Bulu & Pedersen, 2010), are grouped into two basic categories: structured and semi-structured problems (Yu, She & Lee, 2010). While structured problems are generally met during courses, semi-structured problems are those that are faced in daily life. If individuals are capable of solving problems that arise at school and in their daily life, their life will be healthier, more relaxed and happier. An individual's success and enjoyment of life depends on their having the skills to solve problems in the most appropriate

manner (Saracaloğlu, Serin, & Bozkurt, 2001). This is why problem solving is thought to be one of the basic skills needed by students (Syafii & Yasin, 2013).

1.2 Literature Review about Problem Solving and the Aim of the Current Study

Problem solving, which is a necessity and an instinctive action for the survival of humans, is a spread activity performed in daily life (Chen, 2008; Kuchey & Flick, 2014). In addition, it is not only science and maths education but all education processes that involve problem solving or problem-solving preparation processes. From mathematical calculations (what is the result of this equation?) to illiteracy analysis (what does this mean?), from science experiments (how and why did this happen?) to historical research (what happened and why did it happen?), teachers direct students towards problem solving (Delisle, 1997). This is why the problem-solving process is an important activity faced by individuals both during their school life and daily life. Problem solving, which means overcoming a problem, is a complex process related to cognitive, affective and behavioural activities (Serin, Serin, & Saygılı, 2009). In general, problem solving is the process of using achieved information in order to define a problem and to propose solutions (Agran, Blanchard, Wehmeyer, & Hughes, 2002). Problem solving, which is a part of thinking, is performed in definite stages. The first thing required in order to solve a faced problem is knowledge regarding the solution process (Armağan, Sağır, & Çelik, 2009). Individuals who have the knowledge, background and experience related to the problem-solving process are able to solve the problems they face by using definite strategies. Therefore, teaching the problem-solving process to students and the development of the skills used by students during this process hold great importance. Also, in general, there are two approaches for teaching students how to solve problems in educational environments. In the traditional approach, teachers ask students to solve problems by applying the concepts and principles they have learned in class (Lee, 2010). In this process individuals primarily learn the concepts and principles of the subject. Later, they use the concepts and principles they have learned for the solution of structured problems. In the second approach, which considers the problem-solving process, students are expected to structure their knowledge while solving real problems. This approach is based on the constructivist learning theory that Chen (2010) advocates, in which learning is mostly realised as a result of social processes, which require problem solving and communication with others (Annerstedt, Garza, Huang-DeVoss, Lindh, & Rydmark, 2010). Within this approach, teachers expect students to learn the concepts and principles of the subject and develop their problem-solving skills during the process of solving a given problem. Problems are used in this process as a tool that stimulates students' creative thinking (Osburn & Mumford, 2006). The students, who play an active role in the problem-solving process, also solve the problems they encounter by using various strategies. According to Tambychik and Meerah (2010), the problem-solving process has three stages: reading and understanding the problem, determining the strategy and solving the problem and verifying the answer and process. During the problem-solving process, students first interpret the problem, then they collect the information they require, determine possible solutions, evaluate the options and present the solutions (Shamir, Zion, & Levi, 2008). According to Hong and Diamond (2012), scientific problem solution strategies involve the performance of estimations and observations, an analysis of information and the establishment of results. These strategies involving the problem-solving process may simultaneously develop students' learning, their discussion skills and higher order thinking skills (Hou, 2011). This is why, in recent years, methods including semi-structured problems have been used in educational research with the aim to develop students' learning and their higher order thinking skills (Cavagnetto, 2010; Chin & Chia, 2004; Hsu, 2004; Naylor, Keogh, & Downing, 2007). This is intended to teach students the problem-solving process stages and problem-solving skills they will use throughout their entire life by the semi-structured problems given to the students for the learning process in question. One of the most important targets of education is to develop students' skills for thinking and solving problems they encounter, thus preparing them for life (Phumeechanya & Wannapiroon, 2013). Therefore, the development of problem-solving skills is of great importance in educational research (Mettas & Constantinou, 2007).

In recent years, studies conducted on thinking skills and problem-solving skills have been the subject of great interest among researchers (Nair & Ngang, 2012). There have been several studies conducted in order to determine the problem-solving processes and skills of individuals in different fields such as medicine, education, engineering and many more. Within these studies, problems are classified in different ways. While interpersonal problem-solving skills (Serin & Derin, 2008; Erozkan, 2013) and social problem-solving skills (Chang & Hirsch, 2015; Dubow & Tisak, 1989; Ju, Zhao, Zhang, & Deng, 2015; Trunzo et al., 2014) were emphasised in some studies, mathematical problem-solving skills (Günbas, 2015; Passolunghi & Mammarella, 2012; Yee & Bostic, 2014) and general problem-solving (Pezzuti, Artistico, Chirumbolo, Picone, & Dowd, 2014) skills were also underlined in other studies. Educational research has focused more on the determination and development of the

mathematical, social and general problem-solving skills of students and the relevant factors that influence these skills. Descriptive and experimental research methods have been used for the studies in question. The effects of different teaching strategies, methods and techniques on students' development of mathematical thinking or general problem-solving skills were examined in studies where experimental methods were used (Bicer, Capraro, & Capraro, 2013; Fede, Pierce, Matthews & Wells, 2013; Gu, Chen, Zhu, & Lin, 2015; Hwang, Hung, & Chen, 2014; Ferreira & Trudel, 2012; Phumeechanya & Wannapiroon, 2013; Yu, Fan and Lin, 2014). The descriptive studies aimed to determine the problem-solving skills of students at different grade levels and the factors influencing these skills. On examining these studies, it can be seen that the studies concentrate more on students studying at the high-school and university level. In some of the descriptive studies, the researchers conducted studies regarding the determination of problem-solving skills of university students studying in different departments of higher education and the factors influencing these skills (Aslan & Uluçınar-Sağır, 2012; Bagley & Copeland, 1994; Chang, Sanna, Riley, Thornburg, Zumberg, & Edwards, 2007; Godshall & Elliott, 1997; Heppner, Pretorius, Wei, Lee & Wang, 2002; Saracaloğlu, Serin, & Bozkurt, 2001). Similar studies have been conducted on students studying at the high-school level, too. Also, Huang & Flores (2011) developed a problem-solving inventory for high-school students while Traube, Chasse, McKay, Bhorade, Paikoff, and Young (2007) investigated the social problem-solving skills of African and American students in preadolescence. Çelikkaleli and Gündüz (2010) determined the problem-solving skills developed in secondary education and examined students' skills alongside variables such as gender and academic achievement. Similarly, Korkut (2002) determined the problem-solving skills of high-school students and examined the influence of gender, school type, age level and educational status of parents on the skills in question.

As a result, the studies performed by researchers with any content and in different fields frequently emphasise the importance of problem solving (Greiff & Neubert, 2014). The Programme for International Student Assessment (PISA), which conducted a broad and comprehensive assessment since the use of problem-solving skills in daily life is important, has emphasised the importance of problem solving in educational content. PISA determined problem solving as one of the evaluation criterions in their 2012 study (Greiff, 2012). The results of the 2012 study, which involved more than 40 countries, emphasised that general problem-solving skills might be neglected in contemporary education (Greiff, Wüstenberg, Csapó, Demetriou, Hautamäki, Graesser, & Martin, 2014). Yet the development of problem-solving skills, one of the important skills to be developed in the twenty-first century, is deemed to be one of the basic targets of education (Phumeechanya & Wannapiroon, 2013). Thinking and problem-solving skills are important for students in accessing more information about the world and in aiding students to contribute to the construction of a modern and progressive society in the new age of information technologies (Ngang, Nair, & Prachak, 2014). Therefore, it is necessary to conduct more studies on problem solving, which is one of the most important skills of the twenty-first century. Since it is thought that students' perceptions of the problem-solving process will influence their problem-solving behaviour, the aim of the current study is to determine Turkish junior high-school students' perceptions of the general problem-solving process and the factors influencing their perceptions. The problem sentences regarding the aims of the study are as follows:

1) What is the level of Turkish junior high-school students' perceptions of the general problem-solving process?
2) What is the level of Turkish junior high-school students' perceptions of problem-solving skills and their willingness and determination perceptions of problem solving?
3) What are the effects of gender, grade level, age and grade points with regards to the science course on Turkish junior high-school students' perceptions of the general problem-solving process and problem-solving skills and their willingness and determination perceptions of problem solving?

2. Method

The survey model, which was one of the descriptive research methods used in this study, was used in order to determine the students' perceptions of the problem-solving process and to examine different variables. Survey studies aim to define behaviours and to determine the perceptions, behaviours, attitudes and beliefs of persons related to an issue, situation or problem. Survey studies are the most widespread method used for data-based education studies (Lodico, Spaulding, & Voegtle, 2006). The current study attempted to describe students' perceptions of the general problem-solving process. The effects of gender, age, grade level and grade points with regards to science course of the students on students' perceptions of the general problem-solving process were also evaluated. The grade points determining academic success at Turkish schools range from one (poor) to five (excellent). Therefore, the course points of students in the previous year were taken into consideration and the

point system with a quinary rating (one=poor, five=excellent) was used for the evaluation of students' academic success.

2.1 Participants

The population of the study involved students studying at junior high schools in the centre of the Uşak Province located in Western Turkey. The stratified random sampling method was used to determine the sampling of the study. Stratified random sampling is a process in which certain subgroups, or strata, are selected for the sample in the same proportion as they exist in the population (Fraenkel, Wallen, & Hyun, 2012, p. 95). Primarily, six junior high schools were selected randomly in the centre of the Uşak Province during the determination of the sampling of the study. Then, one fifth-grade, one sixth-grade, one seventh-grade and one eighth-grade class were identified at each junior high school in the centre of the Uşak Province and they were selected by the cluster sampling method. Participants included 604 students. Of the students participating in the study, 49.0% were female (n=296) and 51.0% were male (n=308). Of the students, 23.0% (n=139) were in the fifth grade, 25.8% (n=156) were in the sixth grade, 27.6% (n=167) were in the seventh grade and 23.5% (n=142) were in the eighth grade.

2.2 Data Collection Tool

The problem-solving inventory developed by Inel-Ekici and Balım (2013) for junior high-school students was used in the study. In the pilot application of the scale, 850 students participated. It was determined that the scale consisted of two factors: the "perception of problem-solving skills" and "the willingness and determination perceptions of problem solving". These were determined as a result of the factor analysis applied to the data obtained from the study. The variance values regarding the factors were determined to be 30.239% for the first factor and 9.976% for the second factor. Also, the Cronbach Alpha Reliability regarding the overall scale was determined to be .88. The scale consisted of 22 items; 15 were positive and seven were negative.

2.3 Data Analysis

Primarily, the consistency of the normal distribution was examined in order to determine the statistical method to be used in the study. This was because the data needs to be consistent with the normal distribution in order for the researcher to be able to use the parametric tests, which assume that the sampling bears definite features of the population (Greasley, 2008). The Kolmogorov-Smirnov normal distribution test was performed for the consistency of the data with the normal distribution. Since the meaningfulness value was lower than 0.05, it was determined that the data did not show a normal distribution and the Mann-Whitney U test and Kruskall Wallis test, which are non-parametric tests, were used for data analysis.

3. Findings

3.1 Junior High-School Students' Perceptions of the Problem-Solving Process

The arithmetic mean value of the junior high-school students' scale score was calculated in the study in order to determine students' perceptions of the problem-solving process. The scale used in the study consisted of two factors. Therefore, the arithmetic means for both sub-factors were calculated and are presented in Table 1.

Table 1. Junior high-school students' perceptions of the general problem-solving process

	n	$\bar{X}$	**SD**
The perception about problem solving process	604	88.83	13.06
F1: The perception about problem solving skills	604	63.43	9.08
F2: The willingness and determination perception about the solution of a problem	604	25.40	7.09

The arithmetic mean value of the junior high-school students' perceptions of the general problem-solving process was calculated as X=88.83 (22.00-51.33: low, 51.33-80.66: medium, 80.66-110: high) and was determined to be high (Table 1). On examining the sub-scale scores, it was seen that the arithmetic mean value of students' perceptions of problem-solving skills was calculated as X=63.43 (15.00-35.00: low, 35.00-55.00: medium, 55.00-75.00: high) and that the value in question was at a high level. However, the arithmetic mean value of students' willingness and determination perceptions of the problem-solving process was calculated as X=25.40 (7.00-16.33: low, 16.33-25.66: medium, 25.66-35.00: high) and was determined to be at a medium level.

3.2 Factors Affecting Junior High-School Students' Perceptions of the Problem-Solving Process

The junior high-school students' perceptions of the problem-solving process were examined in the study in conjunction with their gender, grade and age levels and grade points with regards to science course. The study also took into consideration the sub-factors of the scale. Table 2 indicates the statistical values obtained as a result of the analysis conducted in order to examine the junior high-school students' perceptions of the problem-solving process according to their gender.

Table 2. Junior high school students' perceptions of the general problem-solving process to gender

	Gender	n	Mean Rank	Sum of Ranks	U	p
The overall scale	*Girl*	296	333.64	98756.00	36368.000	.000*
	Boy	308	272.58	83954.00		
F1:Perceptions about skills	*Girl*	296	324.39	96019.50	39104.500	.002*
	Boy	308	281.46	86690.50		
F2: Willingness and determination	*Girl*	296	331.82	98218.50	36905.500	.000*
	Boy	308	274.32	84491.50		

*p<0.01.

As can be seen in Table 2, the junior high-school students' perceptions of the problem-solving process differed significantly in terms of gender. Similarly, a variation at a meaningful level was determined between the students' perception of problem-solving skills and their willingness and determination perceptions of the problem-solving process, which are the sub-factors of the scale in terms of their gender. On examining the mean rank of the groups, it was concluded that the variations in question were in favour of the female students. According to this result, it can be stated that the female students' perceptions of problem-solving skills and their willingness and determination perceptions of the problem-solving process were more positive compared to male students.

Table 3. Junior high school students' perceptions of the general problem-solving process to grade level

	Grade Level	n	Mean Rank	X^2	df	p	The difference between groups
The overall scale	5	139	378.04	38.440	3	.000*	5-6, 5-7, 5-8, 7-8
	6	156	279.76				
	7	167	299.60				
	8	142	256.95				
F1:Perceptions about skills	5	139	381.19	40.322	3	.000*	5-6, 5-7, 5-8
	6	156	275.88				
	7	167	297.47				
	8	142	260.63				
F2:Willingness and determination	5	139	348.47	15.873	3	.001*	5-6, 5-7, 5-8
	6	156	294.68				
	7	167	301.71				
	8	142	267.02				

*p<0.01.

As can be seen in Table 3, junior high-school students' perceptions of the problem-solving process differed significantly in favour of the fifth-grade students. Taking into consideration the sub-factors of the scale, the students' perceptions of their problem-solving skills and their willingness and determination perceptions of the

problem-solving process were also determined to differ in favour of the fifth-grade students. Depending on the result in question, it can be stated that the junior high-school students at lower class levels had a higher-level perception of their problem-solving skills and they were more willing and determined to solve problems they faced than students in other grades.

Table 4. Junior high school students' perceptions of the general problem-solving process to age

	Age	n	Mean Rank	X^2	df	p	The difference between groups
The overall scale	10	57	372.81	28.518	4	.000*	10-12, 10-13, 10-14, 11-13, 11-14, 12-13, 12-14
	11	124	341.21				
	12	165	309.58				
	13	183	266.96				
	14	75	256.19				
F1:Perceptions about skills	10	57	400.02	32.945	4	.000*	10-11, 10-12, 10-13, 10-14, 11-13, 11-14
	11	124	336.07				
	12	165	297.93				
	13	183	270.13				
	14	75	261.93				
F2:Willingness and determination	10	57	316.94	17.033	4	.002*	11-13, 11-14, 12-13, 12-14
	11	124	339.49				
	12	165	320.44				
	13	183	274.27				
	14	75	259.78				

*p<0.01.

As can be seen in Table 4, junior high-school student's perceptions of the problem-solving process were also evaluated in relation to their age levels. The obtained results showed parallelism with the results of the comparison based on students' grade level. On examining the obtained analysis results, in general it was seen that the overall scale score and sub-scale score of the junior high-school students in the younger age group were higher than those in the older age group and the values in question tended to decrease with an increase in age. Depending on this result, it can be stated that junior high-school students' perceptions of their problem-solving skills and their willingness and determination perceptions of problem solving were higher than those of older students.

Table 5. Junior high school students' perceptions of the general problem-solving process to their grade points with regards to science course

	Grade Points	n	Mean Rank	X^2	df	p	The difference between groups
The overall scale	1	4	156.63	75.687	4	.000*	1-5, 2-5, 3-5, 4-5
	2	22	193.00				
	3	125	237.80				
	4	162	259.13				
	5	291	364.72				
F1:Perceptions about skills	1	4	161.38	37.447	4	.000*	1-5, 2-5, 3-5, 4-5
	2	22	204.73				
	3	125	267.34				
	4	162	270.20				
	5	291	344.92				
F2:Willingness and determination	1	4	188.00	83.429	4	.000*	1-5, 2-5, 3-5, 4-5
	2	22	202.68				
	3	125	227.04				
	4	162	259.39				
	5	291	368.03				

*p<0.01.

Table 5 indicates the obtained analysis results of junior high-school students' perceptions of the problem-solving process in relation to their grade points with regards to science course. Examining the values in question, it was determined that the academic achievement of junior high-school students was an important variable affecting their perceptions about the problem-solving process. The mean rank values for overall scale and sub-scale tended to increase in parallel with an increase in grade points. As a result of the analysis conducted in order to determine the reason for the difference in question, it was determined that this was due to the students whose science course grade point was five. Depending on this result, it can be stated that the perceptions of problem-solving skills and willingness and determination perceptions of the problem-solving process was higher in students with a high science course grade point than in those with a low science course grade point.

4. Discussion

4.1 Junior High-School Students' Perceptions of the Problem-Solving Process

Problem solving, a lifelong learning skill, is thought to be an important skill that not only influences the success and performance of individuals in their educational life but also their whole life. Individuals' personal perception of themselves frequently influences their behaviours, skills and attitudes. Therefore, in the current study, students' perceptions of the problem-solving process were researched since students' perceptions are thought to influence the use and development of problem-solving skills, which are a lifelong learning skill. The first result obtained from the study showed that students' perception of their problem-solving skills was at a high level but that their willingness and determination perception regarding the problem-solving process was at a medium level. According to the result in question, though the students had a positive and high level of personal perception related to their problem-solving skills, they may have tended to avoid problem solving and may have conducted problem solving unwillingly. According to Denton (2013), problem solving, this means the need to find solutions by thinking about and evaluating problems step-by-step, requires the ability to use knowledge, facts and data. Therefore problem solving, which involves definite stages, is a process that covers not only skills; it also requires willingness and determination within the process. Today, students face many problems in both their daily life and school life. It is thought that they tend to avoid a problem instead of solving it, causing the respective result. Beside this, since students think that their problem-solving skills will contribute to passing exams, they may have the delusion that solving real-life problems will not bring any benefit to them. Another factor that may

cause this result may be that they do not feel confident due to the fact that their problem-solving skills are not at a sufficient level.

4.2 Factors Affecting Junior High-School Students' Perceptions of the Problem-Solving Process

According to the second important result of the study, it can be stated that variables such as gender, age, grade level and science course grade points of the students affected students' perception of the problem-solving process. According to the results of the study, it was seen that the personal perceptions of the female students regarding problem-solving skills and their willingness and determination perceptions of the problem-solving process were more positive than the male students. Huang and Flores (2011) note in their study conducted with high-school students that they did not determine any difference between the problem-solving skills of the students with regards to gender but it can be assisted to understand the needs of female and male students regarding problem solving in future studies. Also, Serin and Derin (2008) determined from the results of their study that female students perceived themselves as more efficient with regards to problem solving compared to male students. In some studies conducted with university students, it was concluded that the problem-solving skills of female students were higher than those of male students (Buluç, Kuru, & Taneri, 2010; Yavuz, Arslan, & Gülten, 2010; Kuru & Karabulut, 2009). As a result, changes in study participants chose for the study influences results. However, as is the case in this study, it is thought that the perceptions of the female and male students regarding the problem-solving process were at different levels because of differences in their needs regarding the problem-solving process. It can also be stated that the result in question may be due to the fact that the interest, attention and motivational level of female students regarding learning will be high at each respective learning level and age and that they should have positive feelings and thoughts regarding learning. Cavaş (2011) concludes in her study that the motivation of female students with regards to learning science was higher than that displayed by male students. Hardré, Chen, Huang, Chiang, Jen, and Warden (2006) also determined in their study that female students thought more positively than male students and that they adapted easier to their targets and had a higher level of motivation. Similarly, Khamis, Dukmak, and Elhoweris (2008) conclude in their study that female students had a higher level of motivation regarding learning than male students. Taking these studies into consideration, it is thought that Turkish female students' perceptions of the problem-solving process are higher than those of male students, since they participate more actively in the learning process and have a high level of learning motivation and ambition.

The comparison results conducted in the study regarding age and grade level show similar features. Depending on the result in question, it can be stated that the perception level of junior high-school students at lower grades and a lower age regarding their own problem-solving skills compared with other grades and age groups was higher and that they were more willing and determined to solve the problems they face. Also, Yavuz, Arslan, and Gülten (2010) determined in their study that the problem-solving skills of university students were higher in the first grade than in the fourth grade. In general, the problems students encounter in daily life and the school environment become more complex when the age, position and environmental factors of individuals change (Yıldırım, Hacıhasanoğlu, Karakurt, & Türkleş, 2011). In particular, students are expected to learn more specific and complex subjects that need to be founded on their existing knowledge the higher the grade level during the learning process. The content of the respective subjects involves different and abstract concepts and the students may face difficulties in solving problems related to these abstract concepts. At the same time, students face more complex and more frequent problems in their daily life as they grow older. Therefore, it is thought that the result in question is due to the age and grade levels of the students.

According to the last result obtained from the study, it can be stated that students who had a high achievement level in the science course had high levels of perception of their problem-solving skills along with their willingness and determination regarding problem solving. As is known, problems in maths and science education play an important role (Gog & Kester, 2012). Students who are frequently confronted with problems during the courses in question use their problem-solving skills during the solving processes of these problems. Problem solving is a higher and more complex level of learning (Syafii & Yasin, 2013). Consequently, the students who are able to solve the problems may gain higher achievement in their respective courses. Lee (2010) concluded from the findings of his study that there was a positive relation between the solving of a problem structured in accordance with the daily life of primary education students and their conceptual changes. Greiff and Neubert (2014) emphasize in the study they conducted with high-school students that there might be a relation between academic achievement and solving complex problems. As a result, it can be stated that problem solving influences learning and is influenced by learning. Students who are successful in their courses learn new concepts and develop problem-solving skills while they are solving the problems they encounter. Similarly, since there are many problems to be encountered in course content, students able to solve the problems they meet are

more successful in their courses. It can therefore be stated that successful students in the science course had a positive perception of the problem-solving process.

5. Conclusion and Suggestions for Future Study

It was determined according to the results obtained from the study that Turkish junior high-school students' perceptions of the general problem-solving process were at a high level. Nevertheless, it was seen that the willingness and determination perceptions of the students with regards to problem solving were at a medium level. It is therefore thought that it is necessary to examine the factors that affect the willingness and determination of the students; more detailed studies need to be conducted. Beside this, setting off from the respective result, a suggestion could be to involve problems ranging from easy to difficult within the learning activities in an effort to increase the willingness of the junior high-school students during the learning process, to generate student awareness by emphasising the importance of problem solving and to ensure that students realise that problem solving is not only an important skill used in school life but also in daily life. It is thought that the use of teaching methods involving semi-structured problems attracting the interest of the student, appropriate for their level and related to daily life during the learning process, would be more effective as they would help the students increase their problem-solving skills and their learning level. It was determined in the study that gender, age, grade level and grade points were variable, statistically affecting the perceptions of the Turkish junior high-school students regarding the problem-solving process. Depending on the result in question, it can be suggested that qualitative studies could be conducted regarding the role of gender in problem solving in order to determine the needs of male students towards problem solving more clearly by studies to be performed. It was revealed in the study that the students' perceptions of their problem-solving skills tended to decrease as students' grade level increased. It is therefore thought that for the teaching of more difficult subjects it is necessary to use different teaching techniques and that teachers should enrich the learning environment with activities to help guide students to develop their problem-solving skills. Due to the positive relation between achievement and problem solving, it can be suggested that teachers should use teaching methods and techniques where semi-structured problems are used, such as concept cartoons and scenarios.

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