

Full Length Research Paper

An investigation of problem-solving skills of pre-service science teachers

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Advancements in science and technology have created problems for some people who have difficulties adapting to the new environment. Improving problem solving skills of these people is very important for them to so have the ability to cope with new problems. From the education perspective, it is believed that teachers should help students by not only giving them information on how to solve certain problems but also how to assimilate problem solving skills. Teachers should first and foremost have these problem solving skills so that they can help their students. In this context, the aim of the current work is to study pre-service science teachers' problem-solving skills and to determine the effect of science teacher training program on pre-service science teachers' problem solving skills based on their grade levels. 76 freshmen, 81 sophomores, 117 juniors and 69 seniors (that is, 343 pre-service science teachers in total) of the Department of Science Teacher Education in 2012 to 2013 academic year participated in this study. In order to measure their problem solving skills, problem solving inventory (PSI) which was developed by Heppner and Petersen and adapted into Turkish by Şahin, Şahin and Heppner was used. In the data analysis procedure, One-Way ANOVA was used to determine whether there is any statistically significant difference among grades, scores of problem solving skills, and its dimensions. According to the findings, significant differences were found between sophomores and juniors; and also between sophomores and seniors. As for the sub dimensions, there was only found a significant difference according to "impulsive style" and "avoidant style" dimensions among grades.

Key words: Problem solving skills, pre-service science teachers, teacher education.

INTRODUCTION

Recently, learning science entails solving practical problems by doing investigations. Also, there is less emphasis on the early stages of acquiring special knowledge unlike what it used to be (Peacock, 2005). Science is considered as one of the most important subjects in school. However recently, traditional teaching methods are criticized due to their inability to trigger

critical thinking, cognitive skills and a holistic learning environment for children. Rather than teaching only facts, the subjects are expected to develop science process skills where children can observe, measure, classify, process information on their own, interpret, think about solving problems, formulate conclusions, etc. (Kirtikar, 2013).

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As learning theories evolve, the understanding of the problem-solving processes also evolves. The prominent learning theories are conceptualized as behaviorism, cognitive psychology, and information-processing domains. Specifically, from behaviorists' point of view, problem solving is a process which develops through positive and negative reinforcement mechanisms. On the other hand, cognitive psychologists view it as a process which includes introspection, observation, and the development of heuristics. Finally, the information-processing consideration of problem solving is based on general problem solving skills and artificial intelligence (Hardin, 2002).

If the information-processing model of problem solving is seen as a model of social skills, it would be reduced to social and interpersonal contexts only; because, self-appraised effective problem solvers use information cognitively and engage it in an appropriate behavior in that process. If, however, the model includes more than social skills, self-appraised effective problem solvers might demonstrate abilities in recognizing and using adaptive strategies in a broader context instead of only social and interpersonal situations. For example, optimal adjustment in an academic setting requires adaptive behavior in domains rather than social skills. Moreover, in order to perform successfully, college students must have some skills such as organizing their time, studying course materials and certain requirements of the program effectively, in addition to be able to fulfill academic requirements for passing the courses successfully (Elliot et al., 1990).

Problems solving requires complex cognitive skills which characterize one of the most intelligent human activities. As from childhood, individuals actively solve various types of problems. They acquire information first, and then organize it into structures of knowledge about objects, events, people, and store them in their memories. These structures of knowledge originate in understanding mental models, convictions, and beliefs which influence people's way of putting those experiences together and solving the problems of daily life, school, and business life (Chi and Glaser, 1985). More specifically, problem solving includes some components as follows:

1. Taking time for a deep understanding of the nature and detail of the problem including its limitations (for example, time, scarce resources etc.).
2. Agreeing about a successful solution or outcome.
3. Considering different ways of dealing with the problem, rather than simply focusing on the ones in front.
4. Deciding on the best approach indicating success.
5. Making a systematic plan and implementing it with the chosen approach,
6. Evaluating whether the problem has been solved.
7. Making implications about the whole procedure in

order to improve the approach for the next problem solving experience (The Key Skills Support Programme; KSSP, 2005).

Therefore, it can be stated that problem solving is the key skill which develops students' ability to think about situations, issues and problems in new and different ways; and also to deal with them by means of using creative, systematic, and analytic strategies. So, it can be inferred that helping students to improve their problem solving skills is one of the most crucial focus points for employability and, increasingly, for education and training at all levels.

Individuals who have already acquired problem solving skills can deal with any problems (that is, either simple or complex ones). Although problem solving skills are essential for each person, they are especially important for certain areas of profession in which aiding of other humans is one of the most prominent ones. In this regard, problem solving skills should be certainly made students to acquire along with the education system. Because, only individuals who are not just taking the information, but rather using it and being able to teach themselves can cope with the rapid increase of knowledge and technology. Also, it has been stated that individuals who can criticize, query, and solve the problems creatively will be effective in societal development, as well (Güzel, 2004; Berkant and Eren, 2013).

According to Genç (2012), there are two substantial reasons for concerning about problem solving in science education. Firstly, there is a common assumption that a student who solves a science problem with the guidance of a teacher might learn the subject more effectively than others. By considering that assumption as correct, we teach many science-related subjects through problem solving; so, problem solving is a teaching method. Secondly, there is another assumption that problem solving skills can be learned and be transferred to new situations after learning. Again by considering that assumption as correct, we include problems with the aim of not only teaching the subject content, but also teaching the problem solving methods. Thereby, among the general purposes of science education, the duty of a teacher is to make students solve their problems by means of science, comprehend the cause-effect relationship of occasions and facts, acquire a consciousness of proper scientific judgment (i.e. by questioning it) related to encountered occasions, and learn to use their own minds, have the habit of studying regularly and systematically, and learn how mankind can adapt to the changes of nature (Temizyürek, 2003).

From the point of teachers, teaching science is a process of questioning, as well, in which the teachers' own ability to develop problem-solving skills matter. Thus, teachers, just like students, need training on how to use

problem solving skills before they start to use any method including the use of problem solving skills effectively. In other words, teachers in science education may have a concern about the slow development of problem-solving as a teaching method due to the fact that there is a lack of experience in teachers' training in the current issue (Andersen and Weigand, 1967).

Briscoe and Stout (1996) indicated that teacher-educators can prepare teacher candidates more likely to engage in teaching through problem-solving by means of providing various experiences in problem-solving in which the processes and content for mathematics and science are fully integrated and essential for solving the problems. Therefore, the problem-centered learning activities should allow opportunities for pre-service teachers to form and make connections between processes and outcomes of problem solving. Through this way, pre-service teachers can be trained for considering the teaching of problem solving skills as one of the most effective ways. Similarly, a method of integrating problem-solving to the class experiences is an essential factor which might lead to the preparation of more efficient elementary teachers. However, it is important to note that the future practices of prospective teachers who are able to implement problem solving strategies in their classrooms will be affected by a number of factors including the culture that they work in, the contexts of their classrooms, and the frameworks of their own beliefs about problem solving (Briscoe and Stout, 1996).

According to the literature review, pre-service teachers were investigated by many aspects and variables of problem solving skills such as age, sex, graduated high school, university, department, reasons for choosing that department, specific area they are working on (for example, social, science), grade level, parental education status and occupations, and accommodation while receiving education (Arslan, 2001; Ocak and Eđmir, 2014; Aslan and Uluđınar-Sađır, 2012; Üstündađ and Beşoluk, 2012; Çevik and Özmaden, 2013; Akpınar, 2014; Kulođlu and Arı, 2014; Karabacak et al., 2015).

According to the findings of experimental studies related to the factors affecting the perception levels of pre-service teachers regarding problem solving skills; learning based on a creative thinking in science education improves pre-service teachers' problem solving levels (Koray, 2003); science education based on a constructivist approach is more successful in developing problem solving skills in pre-service teachers compared to traditional education methods (Orhan, 2004); science education grounding on critical thinking skills is more effective in improving the problem solving skills of pre-service teachers compared to traditional education (Yıldırım and Yalçın, 2008).

Studies in the current literature demonstrate that

problem solving skills of pre-service teachers may differ with respect to some variables. Also, it has been indicated that learning environments provided to pre-service teachers might make differences in their perceptions related to their problem solving skills in a positive way. Therefore, rather than their demographic variables that cannot be made any changes on, it is important to focus on programs that are implemented in learning-teaching process, due to the fact that those programs are already proved as being effective on pre-service teachers' problem solving skills. Overall, it can be concluded that, making prospective teachers acquire problem solving skills during their own education will have an important effect on the future of a country. That is to say, it is essential to teach them acquiring their own problem solving skills in order to ensure that they will help their students in this issue (that is, by leading them to internalize that skill, above and beyond just giving the necessary information to solve problems).

The present study focuses on changing pre-service science teachers' perceptions about their own problem solving skills through a 4-year teacher education program. Examining the pre-service teachers' beliefs on this issue is expected to provide a broader definition for potential teacher education programs. It is also expected that understanding the effects of methods acting on pre-service teachers will be useful as being a model for other teacher educators. From another point of view, this study is designed to investigate the development and changes in problem solving skills of pre-service science teachers of the Primary Science Teacher Education Program (PSTEP) in Pamukkale University in Turkey over the four-semester-sequence. The following main question was presented:

Problem solving skills of pre-service science teachers make a meaningful difference in terms of class level change? (Problem Solving Skills are examined by considering the following subscales:

1. Impulsive style (IS)
2. Reflective style (RS)
3. Avoidant style (AS)
4. Monitoring (M)
5. Problem-solving confidence (PSC)
6. Planfulness (P)

METHODOLOGY

This research uses simple descriptive survey approach which is a one-shot survey for the goal of describing the characteristics of a sample at one point in time rather than the cross-sectional and longitudinal approaches of survey research (Mertens, 1998). In this research, how a four-semester-sequence teacher education program helps to change pre-service teachers' perceptions about

their problem solving skills was described.

Sample of research

Participants of the current study are pre-service science teachers of a faculty of education from a state university in one of the cities located in the west of Turkey.

Purposive sampling was used for selecting the participants. In this procedure, it is assumed that selected participants have the necessary information about the target population (Frankel and Wallen, 1996).

In total, 343 pre-service science teachers (that is, 76 freshmen, 81 sophomores, 117 juniors and 69 seniors) who study in the Department of Science Teacher Education in 2012 to 2013 academic years participated in this study. 76 first year pre-service science teachers have enrolled in basic science courses (Physics I-II, Chemistry I-II and Mathematics I-II).

At this level, they have taken the courses, namely introduction to educational science and educational psychology. 81 second year pre-service science teachers enrolled in basic science courses (Physics III-IV, Chemistry III-IV and Biology I-II) in addition to introductory courses on science teaching, namely Science-Technology Programme and Planning. It is assumed that 3rd year of this program has an essential role in science-teacher education due to the fact that this is the year in which pre-service science teachers complete the sets of basic science courses (Physics I-II-III-IV, Chemistry I-II-III-IV, Mathematics I-II and Biology I-II); and besides, they take courses on science teaching (for example, Special Methods of Science teaching I), science laboratory practices (that is, Science Teaching Laboratory Practices I-II) and nature of science (that is, Nature and History of Science).

Lastly, the 4th year of pre-service teachers in this program includes courses related to science teaching (that is, Special Methods of Science Teaching II), school experiences, teaching practices, Turkish educational system and school management.

Data collection tools

Problem solving inventory (PSI; Heppner and Petersen, 1982) was used as a measurement tool in this study. Heppner and Petersen (1982) suggested that the PSI is designed to measure some constructs; namely,

1. Amenable to change through specific skill training in problem solving
2. Unrelated to conceptualizing means to hypothetical problem situation
3. Related to subjects' general perceptions of their problem solving skills
4. Unrelated to intelligence or social desirability, and
5. Related to personality variables (most notably locus of control).

PSI was adapted into Turkish by Şahin, Şahin and Hepner (1993) (Problem Çözme Envanteri, 1993), and it consists of 35 items including both positive and negative statements. It is based on a 6-point Likert scale. Reliability analysis of the adaptation into Turkish was also conducted by Şahin et al. (1993) by means of the participation of 244 university students. As a result of that reliability study, Cronbach's alpha coefficient was found as 0.88.

In this study, Cronbach's Alpha coefficient was found as 0.86. Şahin et al. (1993) indicated that this scale consists of 6 dimensions which are Impulsive Style (items 13, 14, 15, 17, 21, 25, 26, 30, and 32), reflective style (items 18, 20, 31, 33, and 35), avoidant style (items 1, 2, 3, and 4), monitoring (items 6, 7, and 8), problem-solving confidence (items 5, 11, 23, 24, 27, 28, and 34) and planfulness (items 10, 12, 16, and 19). These approaches specifically measure the following components:

Impulsive STYLE

While solving a problem, whether an individual approaches the problem in a hasty and impulsive way, a sample item is "When confronted with a problem, I tend to do the first thing that I can think of to solve it."

Reflective style

While facing a problem, whether the individual tries to understand the situation, whether he/she reviews it, or considers all the related information to solve it. A sample item is "When making a decision, I weigh the consequences of each alternative and compare them with each other."

Avoidant style

Whether the individual broadly thinks about information gathering to solve the problem, whether he/she has suspicions about dealing with the problem in case of he/she fails or encounters some obstacles while solving it, and whether he/she thinks about problem solving procedure (that is, what worked and/or what did not work) after the problem has been solved. A sample item is "When a solution to a problem was unsuccessful, I do not examine why it didn't work."

Monitoring

While facing a problem, whether the individual presents more reasons about the problem and evaluates it from the multidimensional perspective. A sample item is "When I have a problem, I think up as many ways to handle it as I can until I can't come up with any more ideas."

Problem-solving confidence

Believing in oneself or feeling qualified to solve a problem. A sample item is "I trust my ability to solve new and difficult problems."

Planfulness

While solving a problem, whether the individual plans the solution by forming the steps of a problem, a sample item is "I make decisions and am happy with them later."

Data analysis

The collected data was analyzed by using statistical package for social sciences (SPSS) (Version 20.0). In the scoring, negative items were reversed. For the scoring of the scale, items 9, 22, and 29 were extracted from the scoring. Reverse items were 1, 2, 3, 4, 11, 13, 14, 15, 17, 21, 25, 26, 30, and 34.

Total score that can be obtained from the scale was between 32 and 192 points. In order to determine the average total point obtained from inventory and sub-dimensions, descriptive statistical methods were used. In order to determine whether data is normally distributed, Kolmogorov-Smirnov analysis was ran and analysis showed a normal distribution ($K-S(Z)=1,168$; $p > 0.05$). One-way ANOVA was performed in order to examine whether there is a significant difference between problem solving skills and grade levels.

Table 1. Findings of one way ANOVA indicating the perception of problem solving skills scores in terms of grade levels.

PSI	Grade Level	N	\bar{X}	SS	F	p	Significance (Tukey HSD)
PSI total	Freshmen	76	87.1316	18.5518	4.632	0.003*	2-3*
	Sophomore	81	89.3827	19.1250			
	Junior	117	81.4103	15.5852			
	Senior	69	81.3043	17.6304			

* $p < 0.05$.

Interpretation of data

The height of obtained points from the scale indicated that pre-service science teachers' perceptions about their own problem solving skills were "unsatisfying". In addition, perceived low points indicated positive perception about their problem solving skills, effectiveness in problem solving, and behaviors and attitudes about the successful problem solving (Şahin et al., 1993). On the other hand, in the scoring of subscales measuring problem solving approaches which are characterized as positive-desirable (that is, reflective style, problem-solving confidence, monitoring, and planfulness), low points indicated more usage of these approaches. On the contrary, the less scores on problem solving approaches which are characterized as negative-ineffective (that is, impulsive style and avoidant style) indicated the less usage of those approaches.

RESULTS

One-way ANOVA was performed in order to investigate whether there is a significant difference between problem solving inventory (PSI) scores and the grade levels of pre-service teachers who participated in this study (Table 1).

As shown in Table 1, there is a significant difference between PSI scores and grade levels of pre-service science teachers ($F = 4,632$; $p < 0.05$). In order to determine the direction of this difference based on the grade levels, the multiple comparison analysis, namely Tukey HSD analysis, was conducted.

The findings of this analysis indicated that sophomore pre-service science teachers are significantly different from both junior and senior pre-service science teachers ($p < 0.05$). While investigating the average total scores based on the grade levels, average total scores that sophomore pre-service science teachers have obtained from PSI (89,382) are lower than both junior (81,410) and senior (81,304) pre-service science teachers' average scores. When considering the fact that individuals who obtained higher scores from the inventory have insufficient problem solving skills, it can be concluded that sophomore pre-service science teachers' perceptions about their problem solving skills are lower compared to that of junior and senior pre-service science teachers. Table 2, on the other hand, indicates the

findings of One-way ANOVA which was conducted to investigate the sub-dimensions of Problem Solving Inventory based on the grade levels of pre-service science teachers.

In Table 2, there is no significant difference between the Reflective, Monitoring, Problem-Solving Confidence, and Planfulness sub-dimensions of PSI based on the grade levels of pre-service science teachers ($p > 0.05$); whereas a significant difference was detected for Avoidant and Impulsive sub-dimensions of PSI ($p < 0.05$). In order to determine the direction of this difference based on the grade levels, the Tukey HSD Post Hoc analysis was conducted. The findings of this analysis indicated that in terms of the Impulsive Style sub-dimension, sophomore pre-service science teachers are significantly different from both junior and senior pre-service science teachers. Moreover, in terms of the Avoidant Style sub-dimension, freshmen pre-service science teachers are significantly different from both junior and senior pre-service science teachers. While investigating the average sub-dimension scores based on the grade levels, in the Impulsive Style sub-dimension of PSI, sophomore pre-service science teachers (3.322) have higher average scores compared to both junior (2.987) and senior (2.989) pre-service science teachers' average scores. Thereby, it has been concluded that sophomore pre-service science teachers use impulsive approach styles more than junior and senior pre-service science teachers. On the other hand, in the Avoidant Style sub-dimension of PSI, freshmen pre-service science teachers (2,592) present more avoidant approach styles compared to junior (2.199) and senior (2.141) pre-service science teachers.

DISCUSSION

Today, with improvements in knowledge, science, and technology have posed problems to some individuals trying to adjust to the new situations. Accordingly, in order to make them cope with those problems, the issue of improving their problem solving skills becomes one of the most important purposes of education. Therefore, training the new generations who are supposed to shape

Table 2. Findings of one way ANOVA indicating the Subdimensions of problem solving inventory in terms of grade levels.

PSI Sub-dimensions	Source of variance	\bar{X}	N	SS	F	P	Significance (Tukey HSD)
Impulsive	Freshmen	76	3.161	0.703	5.240	0.002*	2-3*; 2-4*
	Sophomore	81	3.322	0.738			
	Junior	117	2.987	0.563			
	Senior	69	2.989	0.614			
Reflective	Freshmen	76	2.363	0.795	1.462	1.225	-
	Sophomore	81	2.548	0.964			
	Junior	117	2.313	0.736			
	Senior	69	2.339	0.797			
Avoidant	Freshmen	76	2.592	0.972	5.236	0.002*	1-3*; 1-4*
	Sophomore	81	2.500	0.919			
	Junior	117	2.199	0.801			
	Senior	69	2.141	0.814			
Monitoring	Freshmen	76	2.575	1.015	0.291	0.832	-
	Sophomore	81	2.543	1.025			
	Junior	117	2.516	0.766			
	Senior	69	2.387	0.890			
Problem-solving confidence	Freshmen	76	2.611	0.863	2.107	0.099	-
	Sophomore	81	2.721	0.832			
	Junior	117	2.464	0.604			
	Senior	69	2.501	0.771			
Planfulness	Freshmen	76	2.625	1.028	2.306	0.077	-
	Sophomore	81	2.515	0.916			
	Junior	117	2.344	0.690			
	Senior	69	2.330	0.788			

* $p < 0.05$.

the future as individuals having problem solving skills in both education process and daily life is an essential goal for all the education levels. So that, newly applied education programs since 2004 in Turkey have a target to develop students' problem solving skills (MEB, 2013).

Enhanced problem solving skills make students more powerful both in their educational and professional live, in addition to their private lives according to the Centre for Good Governance (CGG). Both nationally and internationally, there is a growing consciousness that problem solving skills will be much more important compared to the past if education system aspires to produce skilled thinkers and innovators in the current fast-changing global economy. To be able to solve problems in a range of learning contexts, the

development of knowledge, understanding and performance is very important. To make students engage in complicated and authentic problem solving encourages them to use content knowledge in more innovative and creative ways which in turn intensifies their deeper understanding (GIHE, 2011).

It is important to note that effective problem solving skills rarely rise spontaneously; instead, they are consciously learned and nurtured. Specifically, effective problem solving skills are conceptualized as developing creative, innovative, and practical solutions, showing independence and initiative in identifying problems and solving them, and applying different strategies to solve the problem across a range of areas (CGG, 2006).

In this study, pre-service science teachers' problem

solving skills were evaluated in terms of their problem solving skills' scores and grade levels. Also, perceptions about their own problem solving skills were investigated through the several subscales, namely Impulsive Style, Reflective Style, Avoidant Style, Monitoring, Problem-Solving Confidence, and Planfulness.

According to the findings of the current study, there is a significant difference between pre-service science teachers' problem solving skills in terms of their grade levels. Accordingly, whereas the averages of pre-service science teachers' problem solving skills ranged through the lowest to the highest for juniors, seniors, freshmen, and sophomores, respectively; it has been determined that junior pre-service science teachers have the highest, and sophomore pre-service science teachers have the lowest problem solving skill perceptions due to the fact that low scores obtained from the scale indicate high problem solving skills.

This finding can be interpreted as courses such as Scientific Research Methods and Science Laboratory in the third year of science teacher education program are effective in terms of their contents and applications towards improving students' problem solving skills. Such methods as problem solving at laboratory, which place students in the center of learning, encourage asking more questions, inquiring and researching, promote suggestion of solution methods and enable them to take the responsibility of their own learning through designing an experiment, are favorable (Güngör-Seyhan, 2014).

Also Aslan and Uluçınar (2012) concluded that pre-service science teachers' problem solving skills are better at the first and fourth grade levels compared to the second and third ones. On the other hand, Yenice (2012) determined that senior pre-service teachers are better compared to both freshmen and juniors. This finding shows that this situation originates from the difference between the sample and teaching fellows.

In the current study, the only significant difference is found between Impulsive Style and Avoidant Style based on the grade levels, when pre-service science teachers' perceptions towards their problem solving skills were investigated through the approaches of Impulsive, Reflective, Avoidant, Monitoring, Problem-Solving Confidence, and Planfulness.

As the scores obtained from the Impulsive and Avoidant subscales (which can be characterized as negative-ineffective) among the problem solving approach methods decrease, it is thought that the usage of those approach methods diminishes. Specifically, Impulsive Style reveals whether an individual approaches the problem in a hasty and impulsive way while solving a problem. It includes whether an individual goes for the first idea that comes to the mind without rethinking when faced with a problem; whether he/she considers different factors about the problem; and overlooks most things

when tackling problem. Thereby, approaching the problem impulsively may lead an individual to make mistakes in problem solving (Birel, 2012; Erdoğan, 2004).

In this context, according to the findings of this study, sophomore pre-service teachers use more impulsive approach compared to juniors and seniors; so that they tend to make a mistake on problem solving more than others. Avoidant Style, on the other hand, assesses whether an individual think about information collection related to problem solving in detail; whether he/she begins to suspect the way he/she tackles problem in case he/she fails; and whether the individual thinks about what works and what does not after the problem has been solved. The behavior of withdrawal that an individual display in solving problem is directly related not to try to solve problem. One of the reasons behind avoiding problem might be the feeling of self-incompetence (Birel, 2012; Erdoğan, 2004).

In this context, under the light of the findings of the present study, it can be stated that freshmen pre-service science teachers tend to adopt far more avoidant approach compared to juniors and seniors. Üstündağ and Beşoluk (2012) found that senior pre-service science teachers' usage of "Avoidant Style" is significantly higher than that of juniors, while investigating the relationship between the sub-dimensions of total scores that pre-service science teachers obtained from that scale and their grade levels.

The findings of this study also showed that there is no significant difference between pre-service science teachers' perceptions towards their problem solving skills in the Reflective Style, Monitoring, Problem-Solving Confidence, and Planfulness and their grade levels. In the scoring of sub-dimensions, it is evaluated that as the scores of sub-dimensions assessing problem solving approach methods which can be interpreted as positive-desirable (that is, reflective style, problem-solving confidence, monitoring, and planfulness) decrease, the usage of those approach methods increases.

Overall, no matter what pre-service science teachers' grade level is, it can be concluded that they try to understand the situation when facing a problem, review, consider all the information related to the subject, compare and contrast the consequences of different choices while trying to decide the problem solving method, and thereby struggle to reach the best result in problem solving necessarily through *thinking*. Also, they compare the solutions which are obtained after trying a certain method and the solution that they think of it, try to think about all the ways to apply in order to solve the problem. Thereby, they put forth more reasons, *evaluate* the problem from a multi-dimensional perspective, are able to reach healthier solution, and they consider themselves as sufficient for problem solving and try to

solve the problem, they *trust* themselves, plan through constructing the problem steps in order to solve the problem, and finally they reach the solution through evaluating the obtained data in a planned way.

Conflicts of Interests

The authors have not declared any conflict of interests.

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