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Relationship between Problem Solving Skills and Academic Achievement

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ABSTRACT The objective of the research is to examine the effect of the problem solving abilities of primary school students on their school success, as well as on their motivation for academic preparation for future exams. The public primary schools in the district of Nicosia constitute the target population of the paper. The inventory of problem solving was used to collect the data. The results of this paper indicate that the ability scores of the senior primary school students relating to problem solving does not create a significant difference at a statistical level, from the point of view of the intervening variable of gender. Accordingly, the subject is discussed in light of the existing literature and the result has duly been reached that, as from the senior grade of primary school and from earlier periods, development of problem solving abilities is important.

INTRODUCTION

As one of the skills, which individuals need throughout their lives and they need to gain it from young ages, problem solving has also been maintaining its significance at the present time. It is stated that the education of a problem solving skill rendered to the primary school students as from young ages, has been affecting, favorably, their problem solving skills throughout their lives (Dereli-Iman 2014; Karabulut et al. 2015; Cornoldi et al. 2015) and that it has negative effects on children's aggression and their keeping themselves away from activities (Kesicioglu 2015).

The literature studies offer the findings in the direction of the situation that, for the individuals possessing relatively higher problem solving skills, the level of their anger control and social adaptation have been relatively higher (Oztaban and Adana 2015; Yuen and Imelda 2016) and that, for the said persons, the skills such as self-confidence, being able to fight against clumsiness (Mengi 2012), being able to think independently, creativity (Abdulkadir and June 2015) and setting up social relations (Saygili 2014), have been relatively at higher levels. Apart from children, the problem solving skill also shows itself with different effects on young and adult groups. It is known that, the relationship with their children, parents affect the form of their setting up the relations (Akyuz and Sendil 2014; Cartilli and Bedel 2015). It is stated that, for the young individuals studying at universities, it has effects on their anger control and aggressively contributes to the achievement of the career education (Erkus and Bahcecik 2015), affects aggressive behaviors (Gunes et al. 2014) and has effects on critical thinking (Ozyurt and Ozyurt 2015). Literature findings, through many studies on different age groups, emphasize the significance of gaining of the problem solving skill (Kar-Tin 2014; Almeida and Bruno 2015; Duran et al. 2016). As much as the importance of possessing an effective problem solving approach, gaining of the problem solving skill is also important. In the literature there is a consensus in the direction of defining the most appropriate problem solving approach and following up a logical plan for the solution (Bjorn et al. 2016). Beside the contribution of this approach to the educational programs of the teachers at schools, supporting it also through model behaviors is deemed significant (Ogulmus and Kargi 2015). It is considered as significant that the teachers display the approaches of corrective guidance for the inappropriate behaviors, encouraging terminal behaviors, insisting on the acts that decrease the fear of failure averting problem solving, being supportive, considering individual differences, and that the teacher shows, as a model behavior, the maturity of correcting his/her own errors by noticing those faults (Kar-Tin 2014; Almeida and Bruno 2015; Ozyildirim 2015). The literature results have revealed the studies supporting the relationship of the problem solving skill with the state of being successful. Teacher's contribution on students' problem solving skills is also regarded as significant. Therefore, from the point of view of creating awareness, emphasizing the problem solving skill at the primary schools in Northern Cyprus, this paper needs to be carried out.

Objectives

The aim of this study is to examine whether problem solving abilities of senior primary school students differentiate at a significant level or not on the students' school successes and on their academic exam motivation in the future. Additionally, it is aimed at exploring whether the problem solving scores create a difference, at a significant level, on intervening variables such as gender and income.

Problem Statement

Do the problem solving scores of senior students at a primary level of education show significant differences according to school success, academic exam motivation and intervening variables such as gender and income position?

In order to explore this, an answer will be sought to this question, "Is there a difference, at a significant level, between the school success of the senior students, who have been continuing their education at primary level, and their problem solving abilities?" Secondly, a reply will be sought to this question, "Is there any significant difference between the situation of exam preparation motivation and problem solving scores?" Thirdly, a reply will be sought to the following question, "Is there a significant difference between problem solving and the intervening variables?" Finally, whether there is a significant difference between family income level and problem solving abilities will be examined.

METHODOLOGY

Research Model

This research has been realized according to the screening model. The screening models are research approaches, which describe a situation in its old or existing form (Karasar 2005).

Population and Sample

The senior students who have been continuing their education in the district of Nicosia during the education period of 2014-2015 constitute the study universe. Through a simple random sampling, 150 senior students were included in the research sample. The sample consists of 68 female students (45%) and 82 male students (55%). The sample selection model enabled an equal selection probability for each sample selection. The primary schools, the values of the universe of the senior class, their percentage ratios, and selected sample amounts are presented in Table 1.

Table 1: The sample selection information for the primary schools

Name of the school	*N*	*%*	*N*
Caglayan Republican Primary School	82	23	35
9th September Primary School	97	27	40
Martyr Ertugrul Primary School	95	26	39
Martyr Tuncer Primary School	87	24	36
Total	361	100	150

The confidence interval of the research has been taken as .05. Within this confidence interval, the 150 senior class students have been included (Buyukozturk et al. 2009). At the schools indicated in Table 1, there exist a total of 361 senior primary school students. According to the sample selection principles, from each of the schools and according to the percentage distribution of the students thereat, a sample group of 150 students was selected. Classroom lists were used to do this. Each student was equally entitled to be selected and the selection was determined by lot. At the stage of the practice, excluding teachers on sick leave, normal annual leave or those who did not volunteer for the paper, the procedure of lot has been repeated. The names of those students that came out of the lot were repeatedly included in the lot until the predetermined sample size was achieved. During the lot, the senior class students were gathered in a single hall and the procedure was completed in a timely and efficient manner.

Data Collection Tool

The problem solving scale, developed by Serin et al. (2010) for children, with a Cronbach alpha reliability coefficient of .80 was utilized. The scale is a 5-item Likert type, with 24 questions, each of which scored between 1-5. For problem solving abilities, a self-assessment scale was used to measure the sense of self. Its score-range was 24-120. In this paper, the value of the Cronbach alpha is .79.

Data Analysis

The data analysis was conducted using an independent samples t-test, arithmetic mean, stan-

dard deviation and the one-way analysis of variance. The level significance of this research has been taken as .05.

RESULTS

The answer to whether or not, statistically, there exists a difference at a significant level between the problem solving scores of the senior students continuing their education at primary level and school success, has been sought.

Whether there exists a statistically significant difference, or not, between the problem solving abilities and the level of their scores, according to their academic successes, has been tested by using the one-way analysis of variance (ANOVA). At the end of the one-way analysis of variance, it was found that the problem solving scores of the students have statistically been differentiated at a significant level, from the score variables of the school successes. With the purpose of determining whether the senior primary school students' problem solving ability scores have significantly differed, the Scheffe meaningfulness test was applied. Accordingly, the average score for problem solving ability of the students whose level of success is good, was found to be relatively higher compared to the students whose scores were at a medium level (Table 2). In other words, it could be said that greater problem solving abilities favourably affect school success.

For the second problem, regarding whether there is a significant difference between exam preparatory motivation of the students and their problem solving abilities, the t-test for an independent group of samples was applied. The independent samples t-test, as shown in Table 3, reveals that the problem solving ability scores of the students have shown differences at a significant level compared to the variable of the exam preparatory motivation [t(148)=4.17 p<0.01]. It has been shown that the average score (=96.59) of the students who have a high level of exam preparation motivation is relatively and significantly higher compared to the average score (=87.28) of those students who do not have similar levels of motivation. Therefore, it can be said that greater problem solving abilities of students favourably affects their exam preparatory motivation.

The third problem looked at whether problem solving was related to the intervening variable of gender, at a significant level. A t-test was implemented. This showed that the problem solving scores of the students, in respect to the gender variable, does not create a difference, statistically, at significant level (Table 4).

Table 2: The F-test result of the students' average problem solving scores according to their levels of school success

Variable		*N*	$\overline{X}$	*Ss*	*Sd*	*F*	*p*	*Difference*
Level of School Success	V. good (a)	65	98.56	12.65	3	5.96	.001	c-a*
	Good (b)	52	92.53	11.52	146			
	Average (c)	26	89.07	11.12	149			
	Poor (d)	7	85.85	10.94				

*Difference in favour p<0.01

Table 3: The t-test results of the average score of the problem solving scores with respect to the variable of the exam preparatory motivation.

Variable		*N*	$\overline{X}$	*Ss*	*Sd*	*t*	*p*
Exam Preparatory Motivation existence	Yes	112	96.59	11.89	148	4.17	.000*
	No	38	87.28	11.89			

*p<0.01

Table 4: The t-test results of the problem solving ability scores in respect to the variable of gender

Variable		*N*	$\overline{X}$	*Ss*	*Sd*	*t*	*p*
Gender	Female	68	94.19	13.88	148	.04	.96*
	Male	82	94.28	11.36			

*p>0.05

The final sub-question examined whether the problem solving ability scores of the senior students showed any differences with respect to the variable of family income. A one-way analysis of variance was applied. This analysis showed that the problem solving scores of the students have been differentiated at a significant level with respect to their family incomes. With the purpose of identifying in which samples this statistical difference occurred, the Scheffe meaningfulness test was applied (Table 5). The Scheffe meaningfulness test showed that the differences lie between family incomes and the upper level, and between the medium and lower levels of income. It can, therefore, be said that an increase in income level positively contributes to problem solving abilities.

DISCUSSION

At the end of the research it was observed that the scores of the problem solving skills of the students, who have been continuing their education in the second grade of primary school, do not show differences, at significant level, according to gender. In a paper they carried out on university students, Koc et al. (2015) have found out the problem solving skills of the university students as relatively higher. In this paper, the reason for the non-existence of significant difference might be originated from the fact that the childhood problems are relatively more complex compared to those of adults.

The scores of the problem solving skills of the students, whose exam preparatory motivations are relatively higher, have been found to be higher, at significant level. In a paper conducted on students, Moshirabadi et al. (2016) and Delice and Ergene (2015) stated that the students' problem solving skills have had effect both on the motivation of school success and individual relationships. Koc and Kavas (2015) have found out that the constructive problem solving skill is correlated with the communication skills of students, destructive aggression and imperishableness. For the Math courses, where the problem-oriented learning method is applied, Hatisaru (2015) mentions that there have been positive transformations in the self assessments of students in terms of the skills such as striving, conducting research and team work, for their learning. Kilic and Moralar (2015) also reported that the approach of problem oriented learning has been effective in academic achievement and in the increase of motivation. The findings of this paper have indicated that, among the reasons for the preparatory motivation for an exam being relatively higher than possessing higher problem solving skills, depending upon the problem solving skill, might be originating from the ability to develop the style of approaches in terms of being able to think logically, having proper communication and coherent approach.

It has been observed that the students, who have relatively higher school successes, have relatively higher levels of problem solving skills as well. In a paper where Aydemir and Kubanc (2014) conducted a research on the arithmetical and verbal problem solving skills of primary school students, it has been observed that, those students, who correctly answered the questions have successfully fulfilled the following, that is, being able to restate the problem, being able to analyze the data and asked points in the problem, being able to solve the problem with alternative strategies, being able to transfer a previous knowledge or experience into the question, and, most importantly, being able to control the logical righteousness of the problem. It has been observed, however, that the students, who have incorrectly answered the questions, were not able to understand the problem, determined their strategies according to unnecessary details of the problem, tried to reach the result through incidental workouts, and thus the result they reached was misleading. In a paper conducted on primary school students, Uyar and Ball (2015) have obtained the findings indicating that the

Table 5: The F-test results of the problem solving ability scores with respect to the level of family income

Income status		*N*	$\overline{X}$	*Ss*	*Sd*	*F*	*p*	*Difference*
Family Income Status	Upper (a)	42	98.19	10.67	2147149	7.22	.001	c-a*c-b*
	Medium (b)	78	94.75	13.14				
	Lower (c)	30	87.36	10.69				

*Difference in favour, $p<0.01$

increase in problem solving skills causes increase in the school success. When one evaluates the paper results, which show parallelism with literature findings, it is said that the problem solving skill might have been originating from its carrying on the characteristics of being a permanent practice.

It has been confirmed that the level of students' problem solving competence is differentiated, at a significant level, according to the parental income status. This differentiation indicates that, as the income level increases, the sufficiency in problem solving increases, in parallel. The literature findings have supported the findings in the direction of the fact that increase in the income level causes an increase in the problem solving skill (Gabriel et al. 2015). In his paper carried out on the students of prospective teachers, Gungor (2013) has not encountered a significant difference between problem solving skills and socioeconomic structure. When one evaluates the reason for this difference found in this paper, it is seen that it might be originating from the fact that the opportunity of not being able to develop the needed problem solving skill, during the childhood period, could be possible at later periods of higher income. Also, it might be the result that the grownup students have the cognitive ability needed in the direction of developing their problem solving skills.

CONCLUSION

In conclusion, the problem solving skills of the primary school students of senior grade have been examined from the point of view of the variables such as gender, income, school success and exam preparatory motivation, and the significant findings, which will create awareness, have been discussed within the framework of the literature. With this paper covering the primary school students and significance of the problem solving skill, the problem area has been introduced to or identified for the next researchers and awareness towards the requirements of the research tried to be brought in. Results of the paper indicate that primary school students have the problem solving skills with cognitive infrastructure, and they also proved that the income level is an important element in developing educational skill. It can be said that the intramural successes of primary school students depend on the increase of the exam motivation towards the future, the increase in the problem solving skill, and as an intervening variable, the contribution of the high income level.

RECOMMENDATIONS

Through setting off from the findings of the research, it can be said that, by developing problem solving programs for the senior primary school students, with the help of the intramural applications, school success and the exam preparatory motivation can be improved. When one evaluates that the increase in the level of income has created a favorable effect on the problem solving skill, it is seen that the out-of-class practices of problem solving skills towards lower income group of students, without any charge, can be increased. Finally, it is hereby proposed to the educators, who have been carrying out studies in this field, to continue their studies on descriptive researches, from the point of view of reaching causal results.

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