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Investigation of Problem-solving Skills in Children Aged 11-12 Playing Regular Educational Games Regularly

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ABSTRACT This study examined the frequency of educational games applied on problem-solving skills in children of the age group 11-12 years. The experimental and control groups consisted of 30 students each. Educational games were played for 3 days a week, for 10 weeks in the experimental group, and pretest and posttest were applied to both groups as Problem Solving Inventory for Children. Data was analyzed using the Mann Whitney Test, U Test and Wilcoxon signed ordinal numbers test. While no significant difference between the groups was found in preliminary tests, a significant difference was found as $p = 0.008 < 0.05$ in confidence sub-dimension between the posttests, and as $p = 0.016 < 0.05$ in self-control sub-dimension. In the avoidance sub-dimension, no statistically significant difference was found as $p = 0.132 > 0.05$. As a result, the conclusion was reached that the 10-week educational game practices created a significant difference in confidence and self-control that were the sub-dimensions of problem-solving skills.

INTRODUCTION

In the development of movement competence, the development of appropriate strategy and tactics and the use of skills as a third factor besides the basic movement skills and concepts has become increasingly important. The objective of these strategies and tactics here is that the students should identify the most appropriate methods and use them during the activities for themselves or their team by using problem-solving skills in order to be more effective in game activities. They are education opportunities created by children in order to improve their personal, social and thinking abilities. These are called life skills. These skills include self-knowledge, personal and social responsibility, fair play, group work, communication, surveillance, target acquisition, implementation, evaluation, reflection and other similar skills (Topkaya 2012: 6-7).

Vygotsky thinks that games have an important role in learning and cognitive development. Games are always learning activities, because they require learning, comprehending the rules, seeing that they form a system, reshaping them after being examined and becoming skilled in various exercising types (Nicolopoulou 1993/ 2004: 155-156). In parallel with body development, in order to help brain development of the children, they certainly need to play games. If a child does not play games, there would be mental and physiological deficiencies. Physical and mental discharge opinion through exercises and games is the most important game theory today (Acak 2006: 18). Piaget states that game development progresses pure individuals from innate special symbols to social games and common symbolism. Games come from the mental structure of the children and it can be explained only by this structure (Nicolopoulou 1993/2004: 142).

In short, the problem means the difficulties encountered by the individuals and the situations that are seen to be inextricable. In case of a problem, there is an uncertainty between the individual and the situation. Dewey problem has been described as anything arising suspicion and uncertainty. There is a problem where our scientific principles, techniques and devices remain insufficient. Most problems exist around us naturally and wait to be solved (Sünbül 2010: 254). Problem solving is the most important process in education programs. Today there is great need for those who are problem solvers. Problem solving itself is a way of effectively learning and developing individual skills (Bingham 2004: 11). The correlations of educational games have substantial contributions to the physical and mental development of problem-solving skills in children aged 11-12.

METHODOLOGY

In Kirsehir, 10 schools were randomly chosen. From these 10 schools, 60 students aged to 11-12 were further chosen using the random sampling method. Of these, 30 students were selected for the experimental group and 30 students for the control group. A "Pretest - Posttest – Control Group Experimental Design" was applied. Reliability results were found to be 0.84 for the 1st factor, 0.79 for the 2nd factor, 0.70 for the 3rd factor and 0.85 for the whole of the scale. The problem-solving inventory was used as a data collection tool for the children at the level of primary school (Serin and Saygili 2010).

The dependent variable in the research is the problem-solving skill and the independent variables are educational games, gender and age. In pretest practice, both groups were given descriptive information about the aim and the questions. Also, the ability to understand the questions was ensured. The students in the game group played at least five games, three days a week. The games have previously been noted to be suitable for the age group, and have the quality of developing different motor skills. Both groups continued the practice of physical education, 2 hours a week.

In the analysis of the data, the SPSS 16.00 (Statistic Packets for Social Sciences) computer packaged software was used, and the appropriateness of the data to the normal distribution was determined using the Kolmogorov-Smirnov test. Since the distribution of data at the significance level of five percent did not show compliance with the normal distribution, among nonparametric analysis methods, the Wilcoxon Signed Ordinal Numbers Test and Mann-Whitney-U test were used.

RESULTS

In this study, there is an experimental group consisting of 15 girls and 15 boys aged 11-12 and a, control group consisting of 15 girls and 15 boys aged 11-12 (Table 1)

Table 1: Gender and age distribution of the students in experimental and control groups

Group	*Girls*		*Boys*	
	Age 11	*Age 12*	*Age 11*	*Age 12*
Experimental	15	15	15	15
Control	15	15	15	15

In the comparison, the control groups' pre- and posttest results were not found to be statistically significant for the sub-categories of trust (Pre.T.X=44.67±9.05, Post.T.X=45.67±7.68, $p = 0.342 > 0.05$), self-control (Pre.T. X=25.5±4.93, Post.T.X=25.6±5.09, $p = 0.970 > 0.05$), and avoidance (Pre. T. X=21±3.57, Post.T.X=19.97±3.23, $p = 0.116 > 0.05$) (Table 2). In all sub-categories of the control group, it was seen that pretest and posttest results are close to each other and there is no statistical meaningful difference.

In the sub-categories of the experiment group's problem-solving skills the pretest and posttest results were as follows. Trust was observed as (Pre.T. X=47.90±7.35, Post.T. X=50.65± 6.91, $p = 0.042 < 0.05$), self-control was observed as (Pre.T. X=25.37±5.43, Post.T.X=28.93± 5.16 $p = 0.00^{*} \leq 0.05$), and avoidance was observed as (Pre.T. X=19.67±4.36, Post.T.X=21.10±4.23, $p = 0.121 > 0.05$) (Table 3). Accordingly, no meaningful difference was observed in the sub-category of avoidance while a meaningful difference was noticed in the sub-categories of trust and self-control.

The sub-categories of the problem solving skills of the control and the experiment groups were noted as following for trust (C.Pre. X= 44.67±9.05, E.Pre.X=47.90±7.35, $p = 0.153 > 0.05$), for self-control (C.Pre.X=25.47±4.93, E.Pre. X=25.37± 5.53 $p = 0.894 > 0.05$), and for avoid-

Table 2: The comparison of pre-test and post-test in in problem solving skill in the sub-dimensions of confidence, self-regulation and avoidance in control group

Sub-dimensions	*Test*	*X*	*SD*	*Z*	*P*
Confidence	Pre-test	44.67	9.05	0.951	0.342
	Post-test	45.67	7.68		
Self-regulation	Pre-test	25.5	4.93	0.038	0.97
	Post-test	25.6	5.09		
Avoidance	Pre-test	21	3.57	1.571	0.116
	Post-test	19.97	3.23		

Table 3:The comparison of pre-test and post-test in in problem solving skill in the sub-dimensions of confidence, self-regulation and avoidance in experimental group

Sub-dimensions	*Test*	*X*	*SD*	*Z*	*P*
Confidence	Pre-test	47.90	7.35	2.029	.042
	Post-test	50.67	6.91		
Self-regulation	Pre-test	25.37	5.43	3.539	.000
	Post-test	28.93	5.16		
Avoidance	Pre-test	19.67	4.36	1.550	0.121
	Post-test	21.10	4.23		

ance (C.Pre. $\bar{X}$=21.00±3.57, E.Pre.$\bar{X}$=19.67±4.36, p = 0.291 > 0.05) (Table 4). As it is understood from the tables and the results, there was no meaningful difference between the pretests of trust, self-control and avoidance.

The trust sub-category of the problem solving skills of the control and the experiment groups was noted as (C.Post. $\bar{X}$ = 45.67±7.68, E.Post. $\bar{X}$=50.67±6.91, p= 0.008 < 0.05), the self control sub-category was noted as (C.Post.$\bar{X}$=25.63± 5.09, E.Post.$\bar{X}$=28.93±5.16, p= 0.016 < 0.05), and the sub-category of avoidance was noted as (C.Post. $\bar{X}$=19.97±3.23, E.Post.$\bar{X}$=21.10±4.23, p= 0.132 > 0.05) (Table 5).

As understood from the tables and results, while meaningful differences were noticed in the sub-categories of trust and self-control at p<0.05 level, no meaningful differences were observed. In terms of inner comparisons between the pretests and posttests of control and experiment groups of avoidance sub-category, no meaningful difference was noticed. It is the required result according to the table that compared both groups' pre- and posttest (between groups), no meaningful difference was noticed.

DISCUSSION

The aim of this study is to examine the problem solving skills of the children aged 11-12 who play educational games. No statistically significant difference was found in the sub-dimension of problem solving skills in the control group's pretest and posttest, in confidence sub-dimension (p = 0.342 > 0.05), in self-regulation sub-dimension, (p = 0.970 > 0.05), and in avoidance sub-dimension, (p = 0.116 > 0.05). A statistically significant difference was found in the sub-dimension of problem solving skills in experimental group pretest and posttest, (p = 0.042 < 0.05) and in self-regulation (p = 0.00* < 0.05). However, although there is a numerical difference for the

Table 4: The comparison of pre-tests in the sub-dimensions of confidence, self-regulation and avoidance of control and experimental group in problem solving skills

Sub-dimensions	*Test*	*X*	*SD*	*Z*	*P*
Confidence	C-Pre Test	44.67	9.05	353.500	.153
	E-Pre Test	47.90	7.35		
Self-regulation	C-Pre Test	25.47	4.93	441.000	0.894
	E-Pre Test	25.37	5.53		
Avoidance	C-Pre Test	21.00	3.57	379.000	.291
	E-Pre Test	19.67	4.36		

Table 5: The comparison of post-tests in the sub-dimensions of confidence, self-regulation and avoidance of control and experimental group in problem solving skills

Sub-dimensions	*Test*	*X*	*SD*	*Z*	*P*
Confidence	C-Post Test	45.67	7.68	271.000	.008
	E-Post Test	50.67	6.91	271.000	.008
Self-regulation	C-Post Test	25.63	5.09	288.000	.016
	E-Post Test	28.93	5.16		
Avoidance	C-Post Test	19.97	3.23	348.000	.132
	E-Post Test	21.10	4.23		

avoidance (P = 0.121 > 0.05) sub-dimension, no statistically significant difference was found. Considering the results in both groups according to gender and age variables, no significant difference was found in the sub-dimensions of confidence, self-regulation and avoidance related to problem solving. No statistically significant difference was found in the sub-dimension of problem solving skills in the control group and experimental group related to pretest, in confidence sub-dimension (p = 0.153 > 0.05), in self-regulation, (p = 0.894 > 0.05),or in avoidance sub-dimension, (p = 0.291 > 0.05). While a statistically significant difference was seen in the in confidence (p = 0.008 < 0.05) and self-regulation (p = 0.016 < 0.05) in control and experimental group posttest results related to problem solving skills, no statistically significant difference was found in the sub-dimension of avoidance (p = 0.132 > 0.05).

As a result of their study, Anilak and Dinçer (2005) detected that pre-school education programs being implemented in pre-school educational institutions are more effective in problem solving and alternative solution thinking skills. According to the results of the opinions of primary school first level teachers about the effect of the development of games on the education of children (Demirci et al. 2006), ninety-nine percent stated that the inclusion of games in education is important, and it increased the academic success of children.

According to the results of Körmükçü and Demir's study (2010), it was concluded that educational games positively affect the social development of children in the age group of 5. It is said that educational games contribute to the development of skills like problem solving, self-confidence, decision-making, tolerance and co-operation. They have an important place in a child's growth as individuals harmonize with the society. Kavasoglu (2010) stated that game-based education is more effective in increasing mathematical success.

According to Yigiter (2012), it has been seen that recreation activities positively affect the level of the perceived problem-solving skills of the students. In Gülhan's study (2012), the effects of educational games on the social skill levels of primary school students in the age group of 10-12 were examined and an increase was detected in social skill levels of the experimental group students playing educational games compared to the control group students taking physical education lesson. In Kaya and Elgün's research (2015), the achievement points of experimental group students whose Science and Technology lesson was conducted through the teaching techniques supported by educational games are significantly higher than the achievement points of the control group students whose primary school 4th class Science and Technology lessons were conducted through teacher's guide book.

CONCLUSION

No statistically meaningful result was noticed in the sub-categories of trust, self-control and avoidance, as they have no activities other than the routine applications. Statistically, meaningful difference was found in the sub-categories of trust and self-control regarding the control group's pretest and posttest results. However, although there is a numerical difference, no statistically meaningful difference was found in the sub-category of avoidance. The meaningful difference in the categories of trust and self-control is thought to result from knowing the variables in the structure of the games played, from sensing the problems, from deciding and from solving itself. That there is no difference in the sub-category of avoidance is thought to result from age group features such as avoiding problem solving, regressing problem solving, not trying to solve the problem and feeling insufficient.

As a result, it was understood that a 10-week routine of educational games led to significant differences in trust and self-control sub-categories of problem solving skills while it did not lead to any for avoidance category.

RECOMMENDATIONS

Among the general principles related to Physical Education and Sports applications, in the first three years of the primary school, physical education lessons must be linked to the social sciences units and it must make use of the games and imitation. Game is a part of a child's life. Through this way, their physical, mental and social skills and emotions emerge. However, since the games do not cover all kinds of movement, physical exercises and sports, which have movement value and corrective practices must be included to an extent to realize the objectives of this lesson.

Games are for children. Educational and preliminary educative games must be arranged for

children. Games must take center stage, because games are educational tools that develop psychomotor, psychosocial, mental and emotional abilities. At the same time, they are important learning processes, which children enjoy very much.

This study can be applied to a larger student group, the study time can be extended, it can be worked with different age groups, and educational game activities can be applied in different lessons.

NOTE

*This study is prepared from Master's Thesis and it was accepted as a poster presentations at Erzurum University 6-7 May 2015 international games and toys convention.

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