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THE EFFECT OF ACTIVITY-BASED ALGORITHM TRAINING ON PROBLEM-SOLVING SKILLS OF 5-6 YEAR OLD CHILDREN[1]

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ABSTRACT

The aim of this study is to examine the effect of activity-based algorithm training on problem solving skills of 5-6 year old children. The study group consists of two classes in Bağışçılar Foundation Kindergarden in the city center of Bolu Province, Turkey with children of the same age group and at similar developmental stages. One class was assigned as the experimental group (16 children) and the other group was assigned as the control group (13 children). Personal Information Form prepared by the researcher and the Problem Solving Skills Scale (PSSS) for 5-6 year children developed by Oğuz and Köksal Akyol (2015) were used as data collection tools in the study. The experimental group was taught based on the activity-based algorithm training practices prepared by the researcher as well as the daily plan practices of Ministry of National Education for 3 days a week, 24 activities for 8 weeks. There was a significant difference in the pre-test and post-test scores of the children in the experimental group. Thus, it was revealed that activity-based algorithm training practices supported problem solving skills of children.

Keywords: Algorithm; problem solving skills; pre-school period; activity-based algorithm training.

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ETKİNLİK TEMELLİ ALGORİTMA EĞİTİMİNİN 5-6 YAŞ ÇOCUKLARININ PROBLEM ÇÖZME BECERİSİNE ETKİSİ

ÖZET

Bu araştırma, etkinlik temelli algoritma eğitiminin 5-6 yaş çocuklarının problem çözme becerisine etkisini incelemeyi amaçlamıştır. Bu bağlamda çalışma grubu oluşturulmasına yönelik ilk olarak; Bolu il merkezinde Bağışçılar Vakfı anaokulunda aynı yaş grubunda ve benzer gelişim dönemlerinden çocukların bulunduğu iki sınıf belirlenerek deney ve kontrol grubu (deney,16; kontrol,13) olarak atanmıştır. Araştırmada veri toplama aracı olarak Araştırmacı tarafından hazırlanan Kişisel Bilgi Formu ve Oğuz ve Köksal Akyol (2015)'un geliştirdiği 5-6 Yaş Problem Çözme Becerileri Ölçeği (PÇBÖ) kullanılmıştır. Kontrol grubu ile MEB günlük plan akışı uygulamaları devam ederken deney grubuna MEB günlük plan akışının yanında araştırmacı tarafından hazırlanan Etkinlik Temelli Algoritma Eğitimi Uygulamaları haftada 3 gün olmak üzere, 8 hafta boyunca toplam 24 etkinlik olarak, her bir oturum 30 dakika süreyle uygulanmıştır. Araştırma sonucuna göre, Etkinlik Temelli Algoritma Eğitimi Uygulamalarının çocukların problem çözme becerilerini desteklediği ortaya çıkmıştır.

Anahtar Kelimeler: Algoritma; problem çözme becerisi; okul öncesi dönem; etkinlik temelli algoritma eğitimi

INTRODUCTION

The rapid changes and developments in science and technology in the 21st century, which is called "information age", and these concepts, which are the indicators of the development levels of the century, have great effects on the functioning of social life today (Çakmak, 2008). In today's information society, these rapid developments and changes in the field of science and technology have increased the expectations and needs of the society (Bayraç, 2003). This state of development and change requires individuals to improve themselves (Demirel & Yağcı, 2017). In this context, the general goals of the countries are to raise individuals who are physically, mentally and socially developed, productive, adaptable and have problem solving skills.

Since the beginning of the 21st century, countries around the world have been defined as "developed countries, developing countries, and underdeveloped countries (Tolunay & Akyol, 2006). The studies conducted in determining these levels of development indicate that especially the economy contributes greatly to education (Economic Cooperation and Development Organization [OECD], 2017). Today, in many OECD countries, children start having education before the age of 5. In these countries, two-thirds (84%) of 4-year-old children have pre-school or primary education (OECD, 2014). In this context, it can be said that early childhood education should be given priority in order to ensure social development.

Early childhood is an important period that includes mental, physical, social skills and habits in the early stages of children's lives (Bertan, Haznedaroğlu, Koln, Yurdakök & Doğan Güçiz, 2009). Experiences gained in the early childhood requires the child to be able to find solutions to the problems, to discuss these solutions, to use analytical thinking skills, to plan and apply the solution (Aydoğan, 2012). Education in the pre-school period is significant in terms of the individual's learning and innovation skills, critical thinking skills, problem solving skills, communication and collaboration skills (Yalçın, 2018).

In Turkey, the education called pre-school education for children aged between 0-6 years covers an important part of early childhood education (Gürkan, 2009). It has been stated that, in this period, when children's social-emotional, physical, cognitive, psychomotor and language development grow faster and their curiosity and interest levels are high, computer assisted learning has a great importance (Kaçar & Doğan, 2007), and the integration and the use of technology with the pre-school education period simultaneously, the effect of using rich materials and different methods affect the social, cultural and economic development levels of the countries (Çakmak 2008; Tolunay & Akyol, 2006). In this context, considering that children should be able to use the 21st century skills effectively to support their developmental areas, to raise awareness in terms of developing solutions to the problems they encounter at an early age and to produce information technologies on online and offline platforms are significant both for the development of educational technologies and for the development of economies of the countries (MoNE, 2018a). Accordingly, Student Profile Workshop in the 21st Century organized by the MoNE in 2011, it was stated that one of the most important skills that students should have is problem solving skill (MoNE, 2011). Considering that the most appropriate age range for problem solving skill education covers the pre-school period (Aydoğan, 2012), it is important for children to be able to solve daily problems, professional and social problems by using their cognitive skills. Basic skills such as scientific and multi-directional thinking and analytical thinking, especially problem solving skill, which are among the skills that are required for the individuals during their whole life, are provided to the individual by the algorithm activities carried out in the pre-school period (Demirer & Sak, 2016). "Coding" skill, which includes logical reasoning and problem solving skills, is one of them (European Commission, 2014). Coding refers to the code sequences written in order to reach a solution by using a programming language (Şahin & Namlı, 2017). Software development is the stages of development and implementation with various command sequences to solve problems, to provide human-computer interactive communication and to implement certain tasks by computers (Fessakis, Gouli & Mavroudi, 2013). Algorithm is the logical and sequential expression of the set of rules of the process, especially computed by the computer or to be followed in other problem solving processes (Michael & Omoloye, 2014). Coding and algorithm activities are included in the curriculum from the first grade in Estonia, from the fifth grade in Australia for two years, from pre-school in France and China (Saygıner & Tüzün, 2017). On the other hand, in Turkey, coding education has been added as an elective course to the curriculum under the name of "Information Technologies and Software Course" since the 2012-2013 academic year, and it became a compulsory course for 5th and 6th grades in the 2018-2019 academic year (MoNE, 2018b).

There are various web-based platforms for pre-school aged group and older aged groups such as ToonTalk, Squeak toys, Microworlds JR, Tagecast Creator, Code.org and Scratch that contain coding and simple algorithm applications that can be applied in a computerized and non-computer environment

(Code.org, 2019; Atabay & Albayrak, 2020). When the applications on these platforms are examined, it is seen that there are content studios for children at 4-6 years of age; and the content of studios for this age group are algorithm activities that support the creativity of children and depend on solving daily life problems. Algorithms foster creativity and are supportive in teaching people to collaborate, to work together across physical and geographical boundaries, and to communicate in a universal language (Mora-Gutiérrez, Ramírez-Rodríguez, Rincón-García, Ponsich & Herrera, 2012). Algorithms help to apply the 21st century skills such as mastering today's problem solving stages, team-working and analytical thinking (Akçay, 2015). It can be stated that algorithm practices, especially in pre-school period, support skills such as working according to the rules and models, understanding, using, applying and developing algorithms of daily life, creating sequence of actions to achieve results, correcting the sequence of actions (Bers, 2019). In addition, algorithm education supports other application fields such as Mathematics, Turkish, Science, Game with rich materials. Considering that the algorithm education for pre-school children supports basic cognitive skills (Fessakis, Gouli & Mavroudi, 2013; Morgado, Cruz & Kahn, 2010; Liao & Bright, 1991), it should not be ignored that the algorithm supports problem solving skills, which is the intended use of the algorithm. Within this context, considering the learning outcomes and the indicators in the current curriculum and children's developmental characteristics, the aim of the current study is to examine the effect of Activity-Based Algorithm Training Practices on children's problem solving skills.

METHOD

Research Model

In this study, quasi-experimental design was employed to determine the effect of Activity-Based Algorithm Training on problem solving skills of 5-6 year old children. Experimental design is generally based on environment arrangement created with dependent, independent and control variables and in this design the researchers evaluate the data assumed by the evaluative criteria determined in the scientific method (Karasar, 2017; Creswell 2014). The quasi-experimental design is one of the experimental research designs. The purpose of the quasi-experimental design is the same as the experimental design. The difference between them is that in the quasi-experimental design, the control and experimental groups are not determined randomly, but based on criteria (Karasar, 2017).

Two classes of Bağışçılar Foundation Kindergarden in the city center of Bolu Province, Turkey with children of the same age group and at similar developmental stages were determined, and one class was assigned as experimental group and the other group was assigned as control group. Personal Information Form and the Problem Solving Skills Scale (PSSS) for 5-6 years of children were used as data collection tools in the study. The control group was taught according to the daily plan practices of the MoNE while the experimental group was taught based on the Activity-Based Algorithm Training Practices prepared by the researcher as well as the daily plan practices of MoNE for 3 days a week, 24 activities for 8 weeks, and each session lasted 30 minutes.

Study Group

The study group consisted of 29 children (experiment, 16; control, 13) studying at the Bolu Bağışçılar Foundation Kindergarten in the spring semester of the 2018-2019 academic year. Homogenous sampling, which is among the purposive sampling methods, was used in determining the study group. Homogenous sampling is the formation of the events in the universe related to the problem of the research from the homogenous subgroups or events (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2012).

Data Collection Tools

In the study, a personal information form prepared by the researchers was used to obtain demographic information of the children, and the "Problem-Solving Skills Scale (PSSS)" developed by Oğuz and Köksal Akyol (2015) was used to determine children's problem solving skills.

Problem-solving skills scale

The "Problem Solving Skills Scale (PSSS)" developed by Oğuz and Köksal Akyol (2015) aims to determine problem solving skills of 5-6 years old children. The scale consists of a single form to be administered to 5-6 years old children. The features of the "Problem Solving Skills Scale", which consists of 18 pictures containing real-life problem situations, the problem statements in which these pictures are described and an evaluation form, are as follows:

- Each form in the scale consists of 18 problem situations that include observable and measurable behaviours.
- The scale is administered to children individually.
- It is a five-point Likert type scale.
- It is prepared for 5-6 years old children.
- In order for the solution suggestions produced by the children to the problem situation to be scored, each solution suggestion must be different from the other suggested solution.
- The important thing in the scale is that the child can produce more than one (alternative) answer to problems.
- The higher scores in PSSS means that problem solving skills of the children are high (Oğuz & Köksal Akyol, 2015).

Data Collection Process

In the study, the Activity-Based Algorithm Training Practices for 5-6 years old pre-school children to gain problem solving skills were carried out by the researcher at the Bağışçılar Foundation Kindergarten between 04/03/2019 and 26/04/2019. The data collection process of PSSS and Activity-Based Algorithm Training Practices are presented in Table 1.

Table 1. The Data Collection Process of PSSS And Activity-Based Algorithm Training Practices

Study Groups	Evaluation	Procedure	Evaluation
Experiment	Pre-test	Activity-Based Algorithm Training Practices	Post-test
Control	Pre-test	Ministry of National Education Curriculum	Post-test

During the application of the scale consisting of 18 visuals of real-life problem situations and various expressions for the definition of these problems, the child was placed in a position to make eye contact with the researcher. The researcher said that; "Now I will tell you about the problems some children face. The problems that I will tell are similar to the problems that every child may encounter and you need to help them"; and the visual about the problem situation was shown to the child. No additions or removal were made for the problem situation. It was ensured that the child focused on the visual as much as the questions related to the problem situations were answered completely. Children were given time for each solution. The researcher noted the answers given by the child on the scoring table. In this way, the application process of the scale took approximately 20-30 minutes for each child.

Preparation and Application Process of the Activities

The activities prepared by the researcher and applied to the experimental group aimed to support the cognitive processes that are considered important in the process of applying the algorithm training in providing problem solving skills to the 5-6 aged pre-school children. According to Aydoğan (2012), these cognitive processes include understanding whether a problem exists and defining the problem, asking questions, explaining the problem situation, analyzing the reasons, reviewing the information required for the solution of the problem, predicting the results, revealing the important points about the problem situation, testing the accuracy of choosing the most appropriate solution. In line with these processes, 24 activities were prepared within the scope of Activity-Based Algorithm Training Practices to help children acquire and develop problem solving skills.

The activities were prepared as from simple to complex, from easy to the difficult, from general to the specific and in accordance with the age, gender and developmental characteristics of the children, and the aims and the learning outcomes of the problem solving skills with the aim of providing children learning opportunities that they could gain experience about their daily lives.

In addition, the learning outcomes and the indicators in the MoNE (2013) Pre-school Education Curriculum (36-72 Months), which was updated in 2013, were examined while preparing the Activity-Based Algorithm Training Practices. The curriculum includes learning outcomes and indicators of problem solving skill in the field of cognitive development:

Learning outcome 19: Children produce solutions to problem situations.

Indicators are as:

- S/he tells the problem.

- S/he offers various solutions to the problem.
- S/he selects one of the solutions.
- S/he tells the reason for the selected solution.
- S/he tries the solution that s/he has selected.
- When s/he cannot reach a solution, s/he tries a new solution.
- S/he suggests creative solutions to the problem (MEB, 2013)

After 24 activities were prepared by the researcher in accordance with the problem-solving skills, learning outcomes and indicators, they were presented to expert opinion. Regarding this, the opinions of four experts from the field, two experts in field of pre-school education, one in the field of information technologies, and one in the field of mathematics education, were taken. The level of agreement between expert opinions on the Activity-Based Algorithm Training Practices was calculated as 0.89 by the reliability formula (Reliability=Agreement/(Agreement+Disagreement) by taking the similarity of the opinions and the reliability formula created by Miles and Huberman (1994).

The researcher prepared the activities based on a Bee Arya character that created by himself in order to attract the attention of children and arouse curiosity. In all of the activities, practices were carried out with an algorithm set made of wooden blocks. During the application process, for example, the researchers asked the question of; “The Bee Arya wants to go to the flower but cannot, how can we bring her to the flower?” to describe a problem situation. Then, this problem situation discovered by the children was tried to be solved by creating an appropriate algorithm by the children in the algorithm setup on the tables. The children, who grasped the location of the Bee Arya, freely formed the flow chart using the appropriate units and brought the Bee Arya to the flower. Each child tried various algorithms that he/she created as a flow diagram on the setup and saw whether the problem was solved. Problem situations were selected from real life problems such as making cake and tying shoes.

After the pre-test application, Activity-Based Algorithm Training Practices were applied to the experimental group. In the study, a total of 24 activities were applied to the experimental group during the 8-week application period, and one activity was carried out for 3 days a week (Monday, Wednesday and Friday), and each session lasted 30 minutes. In this process, no Activity-Based Algorithm Training was applied regarding problem solving skills with the children in the control group, and the daily education practices of the Ministry of National Education Preschool Education Curriculum (for 36-72 Months Children) was applied by the classroom teacher. The Activity-Based Algorithm Training Practice was conducted in the morning classes after breakfast since the focus of children on cognitive activities were at highest level during this time of the day (Aydoğan, 2004). The explanations about the activity and the timeline for the application of one-week Activity-Based Algorithm Training Practices are shown in Table 2.

Table 2. Timeline for The Application Of One-Week Activity-Based Algorithm Training Practices

DURATION (MIN.)	Monday	Wednesday	Friday
5 minutes	Preparation of the educational environment	Preparation of the educational environment	Preparation of the educational environment
5 minutes	Introduction and description of the activity	Introduction and description of the activity	Introduction and description of the activity
15 minutes	Practising the activity	Practising the activity	Practising the activity
5 minutes	Evaluation	Evaluation	Evaluation
Total 30 minutes.			

After completing the Activity-Based Algorithm Training Practices, the PSSS was applied as post-test to the experimental and control groups individually and as face-to face in the same environment and conditions where the pre-tests were carried out by the researcher in the workshop of the related institution.

Data Analysis

The data collected through the "Problem Solving Skills Scale (PSSS)" for 5-6 years old children were analyzed using the IBM SPSS 25 package program in computer environment. In the analysis of data, firstly the distribution of descriptive statistics such as frequency, arithmetic mean and percentage were examined. For determining the appropriate data analysis, firstly it was examined whether the data were normally distributed. For this purpose, Kolmogorov-Smirnov and Shapiro-Wilk tests, which are widely used by the researchers, were employed. A significance level of 0.05 was accepted for the analysis. Since the result for this analysis was found to be less than 0.05, it was interpreted that the scores at this level of significance did not show a normal distribution. Therefore, appropriate non-parametric tests were used in the analysis of data since the data did not show normal distribution and the data were less than 30 (Büyüköztürk et al., 2012). In order to determine the equivalence of the experimental and control groups before the application, the Mann Whitney U test, which is one of the non-parametric statistical tests, was applied. The Mann Whitney U Test reveals whether the scores obtained from two unrelated samples differ significantly from each other (Büyüköztürk et al., 2012).

In order to compare the pre- and post-application scores of both groups, the pre-test and post-test scores of the non-parametric statistical tests, Wilcoxon Sign Rank test, were applied. The Wilcoxon Signed Ranks Test is used in experimental studies to determine whether there is a significant difference between pre-test and post-test scores and whether the distribution is normal (Woolson, 2007). In this context, Mann-Whitney U test was applied to evaluate the post-test conditions of the experimental and control groups.

FINDINGS

The findings of the pre-test scores of the experimental and control groups obtained from the Problem-Solving Skills Scale before starting the Activity-Based Algorithm Training Practice process prepared for 5-6 years children are given in Table 3.

Table 3. Descriptive Statistics Of The Experimental And Control Groups Regarding The PSSS Pre-Test Scores

Pre-test	N	$\bar{X}$	SS
Experimental Group	16	17,18	3,56312
Control Group	13	15,53	5,83974

As can be seen in Table 3, the mean pre-test scores obtained from the Problem-Solving Skill Scale was found to be 17,18 for the experimental group while it was obtained as 15,53 for the control group.

The Mann-Whitney U Test analysis was applied to determine whether there was a significant difference between the pre-test scores of the experimental and control groups before starting the Activity-Based Algorithm Training Practice process prepared for 5-6 year old children. The results are given in Table 4.

Table 4. Mann-Whitney U test Results Related To The Difference Between The Pre-Test Scores Of The Experimental And Control Group

Pre-test	N	Mean Rank	Sum of Ranks	z	U	p
Experimental Group	16	16,88	270,00	-1,326	74,00	0,185
Control Group	13	12,69	165,00			

p > 0,05

The analysis results in Table 4 showed that there was no statistically significant difference between the Problem Solving Skills Scale pretest scores, U = 74,00, p> 0,05. (z = -1.326; p = 0.185; p> 0.05). When the pre-test mean rank scores of the Problem Solving Skills Scale were examined, it was seen that there was no significant difference between the groups since the scores of the children who participated and did not participate in the Activity-Based Algorithm Training Practices were close to each other.

The results of the Wilcoxon Signed Ranks Test regarding whether problem solving skills of the children in the experimental group showed a significant difference before and after the Activity-Based Algorithm Training Practices are given in Table 5.

Table 5. Wilcoxon Signed Ranks Test Results Related to The Difference Between The Experimental Group PSSS Pre-Test And Post-Test Scores

Experimental Group	N	Tanks	M.R.	z	P
	0	Negative Ranks	0,00		
Pre-test	16	Positive Ranks	8,50		
Post-Test	0	Equal		-3,524	0,000
	16	Total			

p < 0,05

The analyses in Table 5 showed that there was a significant difference between the pre-test and post-test scores of the children who participated in the Activity-Based Algorithm Training Practices (z = -3.524; p = 0.00; p <0.05). Considering the mean rank of the difference scores related to the scale, it was seen that the obtained difference was in favor of the positive ranks, that is, in favor of the posttest score.

Table 6 presents the results of the Wilcoxon Signed Ranks Test regarding the difference between the pre-test and post-test scores of the children in the control group.

Table 6. Wilcoxon Signed-Ranks test results related to the difference between the control group PSSS pre-test and post-test scores

Control group	N	Ranks	M.R.	z	P
	1	Negative Ranks	3,00		
Pre-test	10	Positive Ranks	6,30		
Post-test	2	Equal		-2,697	0,007
	13	Total			

p>0,05

As a result of the analysis in Table 6, it was obtained that there was a significant difference between the post-test and pre-test scores of the children, and this difference was in favor of the post-test scores (z = -2.697; p = 0.007; p <0.05).

Table 7. Descriptive Analysis Of The PSSS Post-Test Scores Of The Experimental And Control Groups

Pre-Test	N	$\bar{X}$	SS
Experimental Group	16	50,62	4,82873
Control Group	13	18,07	5,66365

As can be seen from the post-test mean scores in Table 7, the mean score of the children in the experimental group was 50.62 while the mean score of the children in the control group was 18.07.

Table 8 presents the statistics of the Mann-Whitney U Test regarding the difference between the post-test scores of the experimental and control group.

Table 8. Mann-Whitney U Test Results Regarding The Difference Between The Post-Test Scores Of The Experimental And Control Groups

Post-test	N	Mean Ranks	Sum of Ranks	Z	U	p
Experimental Group	16	21,50	344,00	-4,570	0,000	0,000
Control Group	13	7,00	91,00			

p<0,05

As a result of the analysis in Table 8, there was a statistically significant difference between the posttest scores of the children in the experimental group who participated in the Activity-Based Algorithm Training Practices and the children in the control group who did not participate in such an practice: $U = 0.00$, $p < 0.05$. ($z = -4.570$; $p = 0.00$; $p < 0.05$). When the mean ranks of the Problem Solving Skills Scale were considered, it was seen that this difference was in favor of the children who participated in the Activity-Based Algorithm Training Practices.

RESULTS AND DISCUSSION

The findings of the study showed that there was no significant difference between the pre-test scores of the experimental and control groups in terms of problem-solving skills of children. The fact that there was no significant difference between the pre-test scores of the children in the experimental and control groups can be explained by the fact that the school that the study was conducted in is located in the city center, the children in the study group were at the same age group, the sociocultural characteristics of the families were similar, and the children had training in the morning hours of the day.

When the pre-test and post-test scores of the children in the experimental group were examined, a significant difference was obtained. Therefore, it can be concluded that the Activity-Based Algorithm Training applied improved problem solving skills of the children. The mean ranks of the PSSS scores of the children participated in Activity-Based Algorithm Training practices showed that there was a significant difference in favor of the positive ranks; that is in favor of the post-test score. It was concluded that there was a significant increase in the post-test problem solving scores depending on the training the children in the experimental group received. As a result, it can be said that activity-based algorithm training practices have a positive effect on improving problem solving skills. In a study conducted by Çetin (2016) with 28 children at 60-72 months of age, for 12 weeks, it was determined whether children can be included in the computational thinking activities in a computing-supported environment with schematic-based schematic organizers such as fishbone diagram, brainstorming and flow diagram, which are among the cognitive tools in pre-school education. In the study, the researcher concluded that the computational thinking activities prepared and applied with the support of information technologies by using cognitive tools were suitable for the use of children in the pre-school period of 60-72 months of age and that the algorithmic thinking of children was at a good level while planning the problem solving stages. In addition, as stated by Bers (2018), the type of activity is important for children to discover content specific to the field and to develop their problem solving and reasoning skills. For this reason, it is shown that the Activity-Based Algorithm Training Practices applied are effective in problem solving skills. A similar finding of this study was obtained in the study conducted by Bers, Gonzalez and Armas-Torres (2019) with 3-5 years old age pre-school children (N = 172) and 16 classroom teachers. In the study, they aimed to evaluate the experience of "coding as a playground" prepared in accordance with the Positive Technological Development (PTD) framework with the KIBO robot set designed for young children, and it was obtained that the strategies used supported communication, problem solving skills, collaboration and creativity in classroom environments. In another similar study, Akyol Altun (2018) conducted a research with 5 years-old children who have pre-school education, and examined the effect of the algorithm and basic coding training on the problem solving skills of children. They concluded that according to the pre-test and post-test scores obtained from the problem solving scale, the algorithm and basic coding training had a significant effect on problem solving skills of children. On the other hand, in another similar study conducted by Fessakis et al. (2013) with ten 5-6 year old children who get pre-school education for problem solving skill application on the smart board, using a Logo-based application under the guidance of a teacher to solve a series of problems, it was obtained that the children enjoyed practicing activities, and that they had the opportunity to develop problem solving and social skills. In this context, based on the results of this study, it can be stated that problem solving skills of children can be supported with appropriate educational practices regarding problem solving skills.

It was seen that there was a significant difference between the pre-test and post-test scores of the problem solving skill scale of the children in the control group. During the study, activities included in the daily flow plan of the MoNE Pre-school Education Program (2013) were applied to the children in the control group by their teachers. It is thought that the content supporting problem solving skills are included in the activity applications in this daily flow plan and this may be the reason for this difference. It is thought that the increase in the post-test scores of the control group may be due to the fact that there are learning outcomes for problem solving skills in the MoNE Pre-school Education Curriculum and there are activities related to the learning outcomes of this skill in the daily plans of the teachers. In addition, this increase in score may be due to the factors such as family or classrooms as social environments, the activities conducted for problem solving skills, and the interest of the family and teachers. Similarly, Aksüt (2015) investigated the effect of science activity practices on problem solving skills, and a significant increase was found in the experimental group compared to the control group, and a significant difference was obtained in the pre-test post-test scores of the children in the control group, which support the finding obtained in this study.

According to the results of the difference between the PSSS post-test scores of the children in the experimental and control groups, it was obtained that the mean scores of the children in the experimental group were higher than the mean scores of the children in the control group. It was also seen that there was a significant difference between the PSSS post-test mean scores of the children in the experimental and control groups. The significant difference was found to be in favor of the experimental group. Accordingly, it is concluded that the Activity-Based Algorithm Training Practices applied to the experimental group positively affected problem solving skills of the children. In addition, when the post-test total scores of the experimental and control groups were compared, it was concluded that the post-test total scores of the children in the experimental group were significantly higher than the post-test total scores of the children in the control group. Williams, Park and Oh (2019) conducted a study on the platform they developed for 4-7 year aged children to learn about artificial intelligence (AI) by creating, programming, training and interacting with this social robot for children, and came to the conclusion that children who used social robots considered the robot as a learning partner and created algorithms. It was seen that this platform was effective in helping young children understand the concepts of artificial intelligence. In light of these results, the fact that the Activity-Based Algorithm Practices consist of daily life problems, including steps such as identifying the problem, understanding the problem, planning the solution, applying the solution, reaching the solution in an order from simple to complex, can explain the significant difference in favor of the experimental group.

As one of the most important results of this study, it is seen that algorithm training positively affects problem solving skills of pre-school children. In this context, it can be suggested that algorithm training can be given within the scope of in-service trainings and seminars in order to use the Activity-Based Algorithm Practices prepared with the content of the MoNE pre-school curriculum in the classroom practices of pre-school teachers.

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