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Effects of the Sense-Based Science Education Program on Scientific Process Skills of Children Aged 60–66 Months

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ARTICLE INFO	ABSTRACT

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Purpose: This study aimed to examine the effects of the Sense-Based Science Education Program on 60–66 months old children's scientific process skills. **Research Methods:** In this study, which carries experimental attribute features, the pre-test/final-test/observing-test control grouped experimental pattern, and qualitative research were used. Forty children who are 60–66 months old that attended independent preschool and nursery school classes in 2013–2014 education year took part in this study. Data in the study was collected with Personal Information Forms and Scientific Process Skills Evaluation Scale for 48–66 Months Old Children (SPSES). **Findings:** The findings obtained from the research show that the SPSES final-test score averages of the experimental and control groups have a significant level of difference (p<0.05) favoring the experimental group. When the experimental group's SPSES pre-test/final-test score averages were compared, a significant level of difference (p<0.05) favoring the final-test was seen. When the control group's SPSES pre-test/final-test scores were compared, again a significant level of difference (p<0.05) was found. Also, when the experimental and control groups' SPSES final-test score averages were compared, a significant difference (p<0.05) favoring the experimental group was determined. Though no significant difference was found when the experimental group's observation test and final-test score averages were compared, when the observation test and pre-test score averages were compared a highly significant level (p<0.05) was found. **Implications for Research and Practice:** When the research results were evaluated, it was concluded that the Sense-Based Science Education Program has a positive effect on children's scientific process skills. Future studies could examine children's scientific process skills in multifaceted and diverse disciplines.

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Introduction

The most important need of a learning process is to enhance the most basic cognitive process, such as attention and perception, by supporting children's learning desires at an early period with cognitive activities that engage their attention (Shams & Seitz, 2008). Perception process is the most important element because it enables knowledge to be transferred to the memory and increases its permanence (Ayvacı &Yurt, 2016). The development of perception is possible by active and balanced stimulation of all senses (Stockdale, 2007; Robinson, 2008). When early childhood studies on perception learning are examined, it is seen that single-acting sensory learning model was focused on. (Tomchek & Dunn, 2007). However, children in the early period need to research and receive feedback from their surroundings through sensory experiences by using all their senses and performing practical experiences (Goodwin, 2008; Trundle & Sackes, 2015). Sensory inputs received from their surroundings have an important role in their brain development (Todd, 2010). Consequently, newly acquired information and skills in multible sense studies causes constant functional changes in the brain, and various synaptic links are established in the brain (Thomchek & Dunn, 2007). For this reason, using neuroscientific studies in education makes it easier to understand the brain's potential, operation, and effects of coarse sensory experiences on the development of cognitive process (Bruer, 1997; Arnold, Bourdeau & Nott, 2016; Duran & Unal, 2016). In this context, science education offers a variety of opportunities for children to work towards their interests and sensitivities and to observe and discover by using sensory materials, all of which ensure effective usage of their scientific process skills (Sackes, Trundle, Bell & O'Connell, 2011; Trundle & Sackes, 2015). Because in early childhood, children's questions arising from their curiosity and interest are related to scientific content (Inan, 2007). For this reason, what makes science an effective method is that it is a method that holds all the components, such as senses, brain development, and scientific process skills, together (Kandir et al, 2012).

Insufficiencies and problems were observed in the preparation and application of a science education program, which uses methods and techniques focusing on children's sense development and targeting scientific process skills development in the early childhood period. As a result of this, problems arising in the preparation and application of a conscious and balanced sense-supported science education program have increased the need of studies in this area. For this reason, it is extremely important that the sense-based science education program, which is actively encourages learning through the use of all five senses in the early childhood period, is planned. As a result, the perception awareness is increased and scientific activities that accelerate and support children's scientific thinking skills are included in the program.

This research was conducted to test the effects of the "Sense-Based Science Education Program" on children's scientific process skills which is based on science education targeting 60–66 months old children and was developed with the intent to help raise individuals who can think scientifically, make effective discoveries using all senses, conducts research, questions, and has problem-solving skills.

Method

Research Design

In this experimental attribute featured study, the following methods were used: pre-test/final-test/observation-test, control grouped experimental pattern, qualitative research interview, observation, and image analysis.

Research Sample

The universe of the research is composed of 60–66-month-old children enrolled in independent preschool and nursery classes connected to the National Ministry of Education during the 2013–2014 school year in the Malazgirt district of Mus province. The working group of the study is composed of 40 children who were randomly selected among 60–66-month-old children attending preschool and nursery classes. Twenty of the children who composed the working group were determined as the experimental group, whereas the other 20 were determined as the control group.

Research Instrument and Procedure

Personal Information Form. Information regarding the children was collected through a "Personal Information Form." When the personal data of the children were examined, it was determined that the children's age group breaks down as follows: 58.5% are between 60–66 months, 24.3% between 56–60 months, and 19.0% between 48–56 months old. It was further found that 53.7% of them are girls and 46.3% of them are boys, and that 58.5% of them have attended preschool education for one year, 19.5% have never attended a preschool, 14.7% of them have attended for two years, and 7.3% of them have attended for three years.

Scientific Process Skills Evaluation Scale (SPSES) for 48–66-Month-Old Children. The data studied was collected using SPSES, which was developed by researchers Tekerci and Kandır (2013). SPSES already had a validity and reliability study performed on it and consists of eight sub dimension and 79 items.

Teacher Observation Form and Teacher Interview Form. In order to evaluate the program's effectiveness, a "Teacher Observation Form" and "Teacher Interview Form" were used.

Development and Implementation of Sense-Based Science Education Program. The program that was prepared for 60–66-month-old children and aims to support their scientific process skills in the preschool period. The program activates all senses of children and is a type of science education program that includes basic science areas related to learning experiences and activities aimed at children's observation, comparison, classification, measurement, recording, communication, elicitation, and guessing skills. The program also has the features of activating children's curiosity and interest in science and supporting the problem-solving, reasoning, decision-making, and scientific thinking skills of children.

While the content planning of the program was being carried out, the basic science fields of physical science, life sciences, and earth and space sciences were taken into consideration by an examination of the related literature. Furthermore, the themes were determined to be used as a tool in the activities based on the basic science branches of biology, zoology, botany, mathematics, physics, chemistry, geology, meteorology, astronomy, oceanology, and glaciology. In the activities, scientific process skills are listed in order and scaffolded.

While the program was being prepared, many methods and techniques, such as experimentation, project studies, mind maps, and observation trips, were made use of to develop children's scientific tendencies and cognitive skills. It was elaborated that the prepared materials would support children's senses, activate scientific process skills, and were multi-purposed and durable. While creating the program, sample science education programs implemented abroad were examined and principles of the program were determined.

In the Sense-Based Science Education Program, 32 activities and one alternative activity for each week were prepared to be implemented for minimum of 20 minutes a day, three times a week for eight weeks. Image and audio of teacher implementations were recorded throughout the activity by a researcher and an observer teacher from the field. After each implementation, it was evaluated by the researcher and observer teacher using the "Teacher Observation Form" through an examination of the recorded image and audio record. SPSES was applied to children who are in the experimental and control group as pre-test/final test. In order to determine the permanence of the effects of the program, it was applied to children in the experimental group four weeks after the SPSES final-test.

Data Analysis

During the research, the SPSS 20 packet program was used to analyze the data collected through the SPSES and "Personal Information Form" The data were analyzed using Independent Samples t-Test to compare the pre-test scores obtained by the study group SPSES, ANCOVA to compare the final-test scores obtained by the dimensions that have significant differences between the pre-test results of the control and experimental groups, and ANOVA to compare the pre-test/final-test/observation-test results. As 0.05 was used as the significance level, it was specified to have a significant difference when it is $p<0.05$ and not to have a significant difference when it is $p>0.05$.

Results

The findings obtained by the study were examined in two parts.

In the following are the findings on the evaluation of the implementation process of the Sense-Based Science Education Program. Evaluation of the implementation process of the program was done by "Teacher Observation Form." According to the results, the teacher had no problem implementing almost all of the activities. The teachers' remarks on the program elements that they had applied were evaluated by the "Teacher Interview Form." Accordingly, teachers expressed that the program contributed to their professional and personal development and supported them in many ways to activate the children's scientific process skills with science education and address their multi-sensory learning process.

Findings regarding the effects of the Sense-Based Science Education Program on children's scientific process skills. Findings obtained from the research are presented in Tables 1–5.

Table 1

SPSES Sub-Dimensions Pre-Test Scores T-Test Results for the Experimental and Control Group

SPSES Sub-Dimensions	*Group*	*n*	*M*	*SD*	*df*	*t*	*p*	*Et Square*
Observation	Control	20	6.300	1.625	38	.213	.833	-
	Experiment	20	6.150	2.700				
Comparison	Control	20	3.450	1.605	38	-2.133	.039*	.097
	Experiment	20	4.950	2.704				
Classification	Control	20	4.900	1.252	38	-2.421	.020*	.134
	Experiment	20	6.700	3.080				
Measurement	Control	20	1.600	.598	38	-9.453	.000*	.701
	Experiment	20	2.950	.224				
Recording	Control	20	2.150	.813	38	-3.305	.002*	.223
	Experiment	20	.900	1.483				
Communication	Control	20	4.150	1.348	38	1.240	.223	-
	Experiment	20	4.700	1.455				
Inference	Control	20	2.000	.858	38	-9.831	.000*	.716
	Experiment	20	.050	.224				
Guessing	Control	20	3.550	1.234	38	-8.660	.000*	.663
	Experiment	20	1.000	.459				

It is seen in Table 1 that there is no significant difference ($p>0.5$) between the pre-test score averages of the observation sub-dimension and the communication sub-dimension of children in the work group, and there is a significant difference ($p<0.5$) between the pre-test averages of comparison, classification, measurement, recording, inference, and guessing. For this reason, in order to remove the effects of the pre-test scores on final-test scores, covariates were taken as a variable on all sub-dimensions. Pre-test/final-test score t-test results of the experimental group are presented in Table 2.

Table 2

SPSES Sub-Dimensions Pre-Test/Final-Test Scores t-Test Results of Experimental Group

SPSES Sub-Dimensions	Measurement	*n*	*M*	*SD*	*df*	*t*	*p*	*Et Square*
Observation	Pre-Test	20	6.150	2.700	19	-12.104	.000*	0.885
	Final-Test	20	11.900	3.042				
Comparison	Pre-Test	20	4.950	2.704				
	Final-Test	20	8.350	2.033	19	-6.354	.000*	0.679
Classification	Pre-Test	20	6.700	3.080	19	-9.087	.000*	0.812
	Final-Test	20	12.950	0.999				
	Pre-Test	20	2.950	2.236	19	-41.000	.000*	0.988
Measurement	Final-Test	20	5.000	0.000				
		20	0.900	1.483				
Recording	Pre-Test				19	-11.650	.000*	0.877
	Final-Test	20	5.900	2.149				
Communication	Pre-Test	20	4.700	1.454	19	-18.242	.000*	0.946
	Final-Test	20	8.300	1.301				
	Pre-Test	20	0.050	0.224	19	-17.971	.000*	0.944
Inference	Final-Test	20	6.500	1.638				
Guessing	Pre-Test	20	1.000	0.459	19	-10.823	.000*	0.860
	Final-Test	20	7.450	2.856				

In Table 2, it is seen that there is a significant difference between the pre-test/final test score averages of the experimental group regarding the observation sub-dimension [t(19) = -12.104, p<.02], comparison sub-dimension [t(19)= -6.354, p<.01], classification sub-dimension [t(19) = - 9.087, p<.01], measurement sub-dimension [t(19) = -41.00, p<.01], recording sub-dimension [t(19)=-11.650, p<.01], communication sub-dimension [t(19) = -18.242, p<.01], inference sub-dimension [t(19) = 17.971, p<.01], and guessing sub-dimension [t(19) = -10.823, p<.01]. Pre-test/final test score t-test results of the control group are presented in Table 3.

Table 3

SPSES Sub-Dimensions Pre-Test/Final Test Scores t-Test Results of Control Group

SPSES Sub-Dimensions	Measur-ement	n	M	SS	Sd	t	p	Et Square
Observation	Pre-Test	20	6.100	1.552	19	-8.258	.000*	0.953
	Final-Test	20	10.050	1.317				
Comparison	Pre-Test	20	3.450	1.605	19	-7.178	.000*	0.648
	Final-Test	20	7.000	1.414				
Classification	Pre-Test	20	4.900	1.252	19	-5.480	.000*	0.612
	Final-Test	20	2.972	2.972				
Measurement	Pre-Test	20	1.600	0.598	19	-7.033	.000*	0.846
	Final-Test	20	3.300	0.865				
Recording	Pre-Test	20	2.150	0.813				
	Final-Test	20	4.800	1.056	19	-11.994	.000*	0.883

Table 3 Continued

SPSES Sub-Dimensions	Measur-ement	*n*	*M*	*SD*	*df*	*t*	*p*	*Et Square*
Communication	Pre-Test	20	4.150	1.345	19	-7.025	.000*	0.722
	Final-Test	20	7.000	1.487				
Inference	Pre-Test	20	2.000	0.858	19	-4,937	.000*	0.562
	Final-Test	20	3.750	1.209				
Guessing	Pre-Test	20	3.550	1.234	19	-8.345	.000*	0.786
	Final-Test	20	7.000	1.487				

It is seen in Table 3 that the averages of the SPSES sub-dimension pre-test/final-test scores are as follows: observation sub-dimension [t(19)= - 8.258], comparison sub-dimension [t(19)= -7.178], classification sub-dimension [t(19)=-5.480], measurement sub-dimension [t(19)= - 7.033], recording sub-dimension [t(19)= -11.994], communication sub-dimension [t(19)= - 7.025], inference sub-dimension [t(19) = - 4.937], and guessing sub-dimension [t(19) = -8.345] ($p<.05$). The ANCOVA results regarding final-test scores of the experimental and control group are presented in Table 4.

Table 4

ANCOVA Results Regarding SPSES Sub-Dimensions Final-Test Scores of Experimental and Control Group

Source of Variance	*Sum of Squares*	*df*	*Average of Squares*	*f*	*p*	η^2
Pre-Measurement (Observation)	65.277	1	65.277	16.834	.000	.313
Group (Experiment/Control)	37.522	1	37.522	9.676	.004	.207
Error	143.473	37	3.878			
Pre-Measurement (Comparison)	14.033	1	14.033	5.065	.030	.120
Group (Experiment/Control)	7.892	1	7.892	2.848	.100	.071
Error	102.517	37	2.771			
Pre-Measurement (Classification)	.046	1	.046	.009	.925	.000
Group (Experiment/Control)	130.191	1	130.191	25.801	.000*	.411
Error	186.704	37	5.046			
Pre-Measurement (Measurement)	.046	1	.046	.121	.729	.003
Group (Experiment/Control)	9.716	1	9.716	25.398	.000*	.407
Error	14.154	37	.383			
Pre-Measurement (Communication)	17.146	1	17.146	11.119	.002*	.231
Group (Experiment/Control)	10.327	1	10.327	6.697	.014*	.153
Error	57.054	37	1.542			
Pre-Measurement (Inference)	.151	1	.151	.071	.792	.002
Group (Experiment/Control)	18.413	1	18.413	8.668	.006*	,190
Error	78.599	37	2.124			
Pre-Measurement (Guessing)	16,055	1	16.055	3.079	.088	.077
Group (Experiment/Control)	35,086	1	35.086	6.730	.014*	.154
Error	192,895	37	5.213			

Table 4 shows that there is a statistically significant difference between the working group final-test observation sub-dimension score averages (f= 16.834; p<.05). The calculated effect size is (η^2= .207). It is seen that there is no significant difference between the final-test comparison sub-dimension score averages (f= 2.848; p>.05). The calculated effect size is (η^2= .0,71).

It is observed that there is an important difference between the final-test classification sub-dimension score averages. The acquired et square values are (η^2=.411). Significant difference exists between the final-test measurement sub-dimension score averages (f= 8.668; p<.05). The calculated effect size is (η^2= .407). A difference between the recording sub-dimension final-test score averages (f=13.261; p<.01) is seen. The calculated effect size is (η^2=. 264).

An important difference between the communication sub-dimension final-test score averages (f= 6.697; p<.05) is seen. The calculated effect size is (η^2=.153). It is seen that there is an important difference between the inference sub-dimension score averages (f= 8.668; p<.05). The calculated effect size is (η^2=.190). An important statistical difference between the guessing sub-dimension final-test score averages (f= 6.730; p<.05) is seen. The calculated effect size is (η^2=.154). The pre-test/final test/observation-test score t-test results of the control group are presented in Table 5.

Table 5

T-Test Results Regarding SPSES Pre-Test/Final-Test/Observation-Test Scores of Experimental Group

SPSES Sub-Dimensions	*Measurement*	*n*	*M*	*SD*
Observation	Pre-Test	20	6.150	2.700
	Final-Test	20	11.900	3.042
	Permanence	20	12.000	2.596
Comparison	Pre-Test	20	4.950	2.704
	Final-Test	20	8.350	2.033
	Permanence	20	8.350	2.033
Classification	Pre-Test	20	6.700	3.080
	Final-Test	20	12.950	.999
	Permanence	20	12.950	.999
Measurement	Pre-Test	20	2.950	.224
	Final-Test	20	5.000	.000
	Permanence	20	5.000	.000
Recording	Pre-Test	20	.900	1.483
	Final-Test	20	5.900	2.150
	Permanence	20	5.850	2.277
Communication	Pre-Test	20	4.700	1.455
	Final-Test	20	8.300	1.302
	Permanence	20	8.300	1.302
Inference	Pre-Test	20	.050	.224
	Final-Test	20	6.500	1.638
	Permanence	20	6.800	1.105
Guessing	Pre-Test	20	1.000	.459
	Final-Test	20	7.450	2.856
	Permanence	20	7.500	2.800

When Table 5 is examined, no significant difference could be found between the final-test and observation test scores of any of the experimental group's sub-dimensions (p>0.05).

Discussion and Conclusions

In this study, it was determined that there is a significant difference between the SPSES sub-dimension pre-test/final-test score averages of children and that final-test scores increase compared to pre-test scores. Correspondingly, it can be said that multi-perception discoveries that occur via sense-based studies in science education increase learning and remembering. In their research, Brown et al. (2013), Schijndel (2014), and Omar, Puteh and Ikhsan (2014) mentioned that the science education programs that they implemented with different methods and techniques have an important effect on both the teacher's and the children's science performance and scientific process skills. In this respect, it can be said in order to develop scientific process skills during early childhood, science education program models and materials that use planned, programmed, and various methods and techniques that bring scientific thinking and questioning to the forefront and that provide education that supports scientific process skills have similar effectiveness. As a result of the acquired data, including scientific process skills in the learning process within the program progressively, we can conclude that using all senses actively and in balance may have a positive effect on children's scientific process skills.

During the study, when the SPSES sub-dimensions' pre-test/final test score averages of the children in the control group were compared, it was determined that the final-test scores had increased from the pre-test scores. According to the acquired results, the learning experiences that the teachers presented to the children, in accordance with acquisition and indicators that exist in MoNE's (MEB) program, had an effect on the children's scientific process skills. In this study, it was determined that the experimental group had higher SPSES observation sub-dimension scores than the control group. Observation skill forms the basis of all process skills that comes after itself due to being the base of scientific process skills and because these skills are structured progressively. As a result of an observation-based science project that they applied and observation materials that they used, Morrison (2012) and Gelman et al. (2010) indicated that systematic studies performed on observation skills increases children's noticing of details and awareness of the features to be observed. Thus, what made a significant difference in favour of the experimental group may be because of the fact that observation skills were supported as part of the "Sense-Based Science Education Program" with coarse-sense materials, and that studies aimed at children's recognizing and identifying substances and defining their features using their observation skills are included

In this research, no significant difference could be seen in regards to the acquired scores from the SPSES comparison sub-dimension. However, when the corrected averages were looked at, it was determined that the experimental group comparison sub-dimension score average is higher that the control group average. The comparison process skill is defined as finding similarities/differences inside the objects or concepts (Ocak & Tümer, 2014). Using this skill, children start matching, comparing, determining similarities and differences as a result of their natural observations (Kandır et al, 2012). Correspondingly, having involved activities that support children's comparison skills and activate various senses at the same time in the program that was applied to experimental group may have increased the comparison sub-dimension scores.

It was determined that there was a significant difference in terms of scores acquired from the SPSES classification sub-dimension. Children who can distinguish between similarities and differences during the preschool period can also do binary classification according to indicated features. In their studies, Yampinij, Princhankol, and Sudsanong (2010) found out that with science program and computer games, children in the early period significantly develop their observation and classification skills. In this respect, since each child has a different pace of actualizing their scientific process skills, providing the activities that support classification skill with the coarse-sense method in combination with various science sub-fields in the applied education program may have positively affected the children's classification skill final-test scores.

In this study, it was determined that children in the experimental group had higher scores from the SPSES measurement and recording sub-dimensions. Progression studies and cognitive theories argue that response programs and stimuli that are applied have an effect on maximizing children's developmental potentials (Sackes, 2011). Correspondingly, science and mathematics education programs developed for early childhood aim to support children's developing mathematics skills with science activities (Klein et al, 2008; Clements et al, 2011).

The recording skill refers to children's expression of the data gathered from the measurements within science and math activities using pictures, music, visual works, graphics, photos, and verbal and numerical symbols (Kandır et al, 2012; Trundle & Sackes, 2015). The activities within the Sensory-Based Science Education Program concerning the skill of recording data, such as drawing tables, taking notes, drawing a sketch, tape recording, taking photos, and reporting a conducted experiment, can account for how the children's scores regarding measuring and recording skills are higher in experimental group.

Language develops within all mental processes and supports a child's mental development (Yazici & Ilter, 2008). Communication skill is an important one that children use to explain what they acquire through these processes and their expanding knowledge of words and concepts (Zaporozhets, 2002). Applied science education programs support children's progress in science skills and their use of concepts and knowledge of content. In a study examining children's verbal communication skills, development of scientific concept, and problem solving skills, Hong and Diamond (2012) asserted that there was a positive increase in these skills of children. Reviewing the relevant literature and surveys, it has been seen that there is a positive relationship between children's development of language skills, vocabulary, knowledge of concepts, and in this respect their communicational skills and science activities.

The inference skill is defined as children's forming an opinion about the phenomena and events that they are unable to observe, based on their first observations and existing knowledge (Hanuscin & Rogers, 2008; Anagun & Yasar, 2009). That is why in science education children are allowed to make inferences using a logical reasoning process to understand the phenomena and events that they are unable to directly observe. (Morrison, 2012). When research results are analyzed, making children actively involved in trial and error with the "Sensory-Based Science Education Program" enables them to collect data using their senses and to create situations that require inference skills through engagement with unobservable themes such as gravity, balance, and slope. These may have had an influence on the inference skills of the children in the experimental group.

The SPSES predicting sub-dimension sores of children in the experimental group are specified as significantly high in the study. Prediction (making estimation in advance) involves making statements about future events or expected conditions (Hanuscin & Rogers, 2008). It requires one to make much more than a simple assumption (Mutisya, Rotich & Rotich, 2013; Ocak & Tumer, 2014). On one hand, the prediction skills of preschool children are limited because of their egocentric thinking (Kandir et al, 2012). On the other hand, when developmental differences are taken into consideration and preschool children are provided with appropriate guidance on how to reach the information, they are able to acquire prediction skills through trial and error. It is seen that the data obtained from the inference sub-dimension in the research and the study results presented above support each other.

No significant difference has been found in any of the sub-dimensions between post-test and monitoring test points in the SPSES of the children in the experimental group. The lack of significant difference indicates that the experimental processes carried out are permanent.

Conclusion

When the findings are analyzed, it is indicated that children's scientific process skills develop in parallel with cognitive processes and that behavioral development occurs as a result of cognitive processes. Hence, the study shows a parallelism in that providing education using planned science education program models in early childhood that are sensory-based and focused on process skills is efficient. These results indicate that the "Sensory-Based Science Education Program" implemented on the experimental group has a significant impact on supporting children's scientific process skills and this impact is sustained depending on the monitoring results.

Recommendations

Presented below are the suggestions in light of findings obtained by the present study: The impact of a "Sensory-Based Science Education Program" can be studied regarding different variables such as age, cognitive development, parents' educational level, socio-economic status, and attending early childhood education institutions. This program was implemented for one term. However, it can be examined in such a way to include a full one-year process. When the children involved in the program start first grade in elementary school, the effect of their scientific process skills on their future academic progress can be studied. The program is planned focusing on fundamental and intermediate process skills. Sensory-Based Science Education Program can be planned in such a way to include all scientific process skills. In accordance with the principles and features of Sensory-Based Science Education Program, various interdisciplinary studies can be carried out based on the strong relationship between brain-senses and scientific process skills and learning.

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60-66 Aylık Çocukların Bilimsel Süreç Becerilerine Duyu Temelli Bilim Eğitimi Programının Etkisi

Atıf:

Tekerci, H. & Kandir, A. (2017). 60-66 Aylık çocukların bilimsel süreç becerilerine duyu temelli bilim eğitimi programının etkisinin incelenmesi. *Eurasian Journal of Educational Research*, 68. 239-254, http://dx.doi.org/10.14689/ejer.2017.68.13

Özet

Problem Durumu: Erken dönemde çocukların öğrenme isteğini, onların ilgisini çekebilecek bilişsel etkinliklerle desteklemek öğrenme sürecinin en önemli gereksinimlerindendir. Bilim eğitimi ise; çocuklar için, onları öğrenmeye iten içsel güdüleri ile bilişsel süreçlerini harekete geçirerek yaşadıkları dünyaya karşı, sistematik bir düşünce ve anlayış geliştirme yöntemidir. Bilimsel süreç becerileri çocukların bilimle başarılı bir şekilde ilişki kurabilmeleri açısından çok önemlidir. Bu becerilerin kazanılması ve bilimsel düşünce farkındalığının oluşması için gerekli çalışmaların ve uygulamaların yapılabileceği kritik dönem ise, erken çocukluk dönemidir. Erken dönemde bilimsel süreç becerilerinin etkin kullanımı açısından çocukların tüm duyularını kullanarak, araştırmaya ve duyumsal deneyimler aracılığıyla çevreden geri dönüt almaya ihtiyaçları vardır.

Erken çocukluk döneminde çocukların duyu gelişimine yoğunlaşan ve bilimsel süreç becerilerinin gelişimini destekleyen yöntem ve tekniklerin kullanıldığı bir bilim eğitimi programının planlanmasında ve uygulanmasında eksiklikler ve sorunlar gözlenmektedir. Bu nedenle bu çalışma bilim eğitimi kapsamında duyu temelli çalışmalar aracılığı ile çocukların bilimsel süreç becerilerini güçlendirmeye odaklanmaktadır.

Araştırmanın Amacı: Bilim eğitimine yönelik yapılan çalışmalar, çocukların bilimsel süreç becerilerine ve sonraki akademik başarılarına etki ettiği yönünde çeşitli bilgiler sunmaktadır. Buna bağlı olarak, bilim eğitimi kapsamında geliştirilen duyu temelli bilim eğitimi programının, bilimle ilişkili temalar ve bilimsel kavramlar çocukların bilimsel süreç beceri kazanımlarını destekleyecektir. Bu da bilim okuryazarı ve bilimsel düşünebilen bir toplum oluşması beklentisini desteklemesi yönünden büyük önem taşımaktadır. Bu nedenle bu araştırmada, 60-66 aylık çocukların bilimsel süreç becerilerine duyu temelli bilim eğitimi programının etkisinin incelenmesi amaçlanmıştır.

Araştırmanın Yöntemi: Araştırma yöntemlerinin kullanımında geliştirilmiş etkili yöntemlerden biri de karma desenli yöntemdir ve çocukların bilimsel süreç becerilerini değerlendirmek amacıyla yapılan bu araştırmada karma desenli yöntem

kullanılmıştır. Deneysel nitelik özelliği taşıyan bu araştırmada, ön-test/son-test/izleme-testi kontrol gruplu deneysel desen ve nitel araştırma türleri kullanılmıştır. Araştırmanın evrenini, 2012-2013 eğitim-öğretim yılı Erzurum ili MEM'ne bağlı anaokulları/anasınıflarında görevli öğretmenler ve çocuklar ile 2013-2014 eğitim-öğretim yılı Muş ili MEM'ne bağlı anaokulları/anasınıflarında görevli öğretmenler ve çocuklar oluşturmaktadır. Çalışmada, bağımsız anaokulu ve anasınıfına devam eden 60-66 aylık 40 çocuk yer almıştır. Araştırmanın verileri; Tekerci ve Kandır (2013) tarafından geliştirilen; 48-66 Aylık Çocuklar İçin Bilimsel Süreç Becerilerini Değerlendirme Ölçeği (BSBÖ) ve Kişisel Bilgi Formu ile toplanmıştır. Araştırma verilerinin analizinde; deney ve kontrol gruplarının denkliğini belirlemek amacıyla BSBÖ'nden elde ettikleri puan ortalamaları arasındaki farkın anlamlılığı "Bağımsız gruplarda t Testi" analizi tekniği ile test edilmiştir. Deney ve kontrol gruplarının BSBÖ ön-test sonuçlarına göre düzeltilmiş son-test puan ortalamaları arasındaki farkın anlamlı olup olmadığı, tek faktörlü kovaryans analizi (one factor ANCOVA) ile test edilmiştir. Deney grubunun BSBÖ ön-test/son-test ve izleme testi ortalama puanları arasındaki farkı test etmek için ise; tek faktör üzerinde tekrarlı ölçümler için iki faktörlü ANOVA (repeated measures) uygulanmıştır.

Araştırmanın Bulguları: Duyu Temelli Bilim Eğitim Programı'nın uygulama sürecinin değerlendirilmesi "Öğretmen Gözlem Formu" ile yapılmıştır. Elde edilen sonuçlara göre, öğretmenin etkinliklerin tamamına yakınının uygulanmasında sorun yaşamadığı görülmüştür.

Araştırmada BSBÖ'nden elde edilen verilere göre, deney/kontrol grubunun, BSBÖ son-test puan ortalamalarında deney grubu lehine anlamlı düzeyde bir fark olduğu ($p<0.05$), deney grubunun BSBÖ ön-test/son-test puan ortalamaları karşılaştırıldığında ise son-test lehine anlamlı düzeyde fark ($p<0.05$) olduğu görülmüştür. Kontrol grubunun, BSBÖ ön-test/son-test puanları karşılaştırıldığında yine anlamlı düzeyde fark ($p<0.05$) bulunmuştur. Ayrıca deney/kontrol grubunun, BSBÖ son-test puan ortalamaları karşılaştırıldığında, deney grubu lehine anlamlı düzeyde fark ($p<0.05$) belirlenmiştir. Deney grubu izleme testi puanları ile son-test puan ortalamaları karşılaştırıldığında anlamlı düzeyde fark ($p>0.05$) bulunmazken, izleme testi ile ön-test puan ortalamaları karşılaştırıldığında ise anlamlı derecede yüksek ($p<0.05$) bulunmuştur. Buna bağlı olarak, çocukların bilimsel süreç becerilerinin gelişiminin aynı zamanda bilişsel süreçlerinde gelişimine paralel ilerlediğini ve bilişsel süreçlere bağlı olarak davranışsal gelişiminde gerçekleştiğini ön plana çıkarmaktadır. Ayrıca Duyu Temelli Bilim Eğitimi Programı'da yer alan öğrenme süreçlerinde bilimsel süreç becerilerine sıralı, aşamalı ve sistematik olarak yer verilmesi, tüm duyuların aktif ve dengeli bir şekilde kullanılması, çocukların bilimsel süreç becerileri üzerinde pozitif etki yaratmış olabilir.

Araştırmanın Sonuç ve Önerileri: Okul öncesi dönemde bilim eğitiminin temel amacı çocukların sahip oldukları bilgiden ziyade bilgiye ulaşma sürecinin nasıl işlediğidir. Bu süreç içerisinde çocukların ihtiyacı olan bilgi ve becerilerine yönelik gerçekleştirilen çoklu duyu çalışmaları, çocukların bilimsel süreç becerilerini güçlendirmekte ve maksimum düzeye çıkarmayı hedeflemektedir. Bu araştırmada