

Developing Basic Mathematical Skills of Pre-School Children by using Plasticized Clay

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Abstract

The main objective of this research was to study the development of basic mathematical skills in preschool children by using plasticized clay. A pre-test and post-test design was adopted for the study to compare the difference before and after the art activity. The experimental group of 15 preschool children of 3-4 years old, attending kindergarten 1 during the school year of 2015; were selected based on their low grade in basic mathematical skill. The assessment was done by using the measurement tool created by the researcher. The experiment was conducted by using plasticized clay in art activities for 6 weeks, 3 days per week or totaled to 18 times. The study covers all the 6 basic skills in mathematics viz. observation, categorization, comparison, classification, order arrangement and measurement, which consists of 3 activities per skill, totaled to 18 activities, as per the activity table. The same set of test has been conducted to test the basic skill in mathematics by pre-test and post-test design. To compare the difference between the points, paired sample T-Test was done. The research findings indicate that, the art activities' using plasticized clay is highly effective to develop basic mathematical skills in pre-school children. And the children in this research exhibited a higher level of development in mathematical skill after participating in the activities. Conclusion and Recommendations are also presented for further research.

Keywords: basic mathematic skills; pre-school children; art activities'; plasticized clay.

1. Introduction

Preschool children are at the beginning period of their lives from first born to 6 years old, which is considered as the most important period of a life time. All the development of growth of children of this age group happens very fast. Therefore, the children should be facilitated in all aspects of development: physical, emotion-spiritual, social and intellectual (Yaopa Dechacoop, 1999). Development for children at this age group should be the foundation of knowledge in various fields, with emphasis on the integration of important and necessary skills, such as, motion skill, language/communication skill, social skill, thinking skill and mathematics skill, together with the cultivation of ethic and morality, by letting the children be the center of learning and practice (Panida Gutkrung, 2010). Basic skill in mathematics is a necessary skill which needs to be cultivated in children of this age group, by inserting, integrating the basic skill in mathematics, in all the activities. The teacher should provide the children with opportunity of practicing the skill in mathematics which will encourage them to have reasoning in thinking, in searching for an answer by themselves. Normally, the children will learn the basic skill in mathematics from the experience of everyday, naturally (Waro Pengsawat, 1999) with reference from (Croft & Hess, 1985).

It is necessary to arrange suitable activities, educating children of preschool age, focusing on the development of abilities in early childhood, in order to motivate/stimulate the best abilities in each child. Creative art activity is one of the 6 activities the preschool children must practice every day. By this creative art activity, the children are motivated to use creative thinking and imagination. Apart from being able to use the thinking process and coordination of vision and hand motions, creative art activities will be the media for the children to exhibit their knowledge, their feelings in the creative art forms such as molding, tearing-patching, print picture, threading, crafting and other creative hand work (Kulya Tuntiplacheewa, 2004; Boonyium Jitdon 2003:46) of which the children will be able to learn by action, by observation, by classification and comparison with the real objects/things. It opens up the opportunity to find the truth, understand the concept of things (Boonprachak Wongmonkol, 1993:3), that the children will be able to understand the concept in mathematics from doing the activities, enabling them to insert and integrate in other subjects also (Croft and Hess, 1985)

The scope of mathematical skills in the preschool children has been mentioned by Nitaya Prapruetkit (1998:17-19) that, they are skills in counting, numbering, matching, classifying, comparing, ordering, shape and space, measurement, set, fraction, patterning and conversion. Kulya Tuntiplacheewa (2004) stated that the skills are of knowing the place, classifying, numbering, value reading, and reasoning. Nuttanan Kampeephat (n.d.:32) stated that the skills are of observation, categorize, comparison, grouping, ordering and measuring. Academic Department (2003:18-20) stated that the skills are of thinking upon acknowledging, observation, amount, interrelated dimension and time.

Therefore, when developing the basic skill in mathematics in preschool children, it is an important issue which could be implemented with activities. The researcher is interested to study the art activities using plasticized clay which is significant to develop basic skill in mathematics. This will be beneficial in developing the learning process, to be able to think systematically with reasoning and will be able to solve the problems effectively. Also, by using the creative art activity, which is another alternative way to help the children to develop conceptual ideas and good attitude towards learning mathematics.

2. Research Objective

- ✚ To study the effect of art activities by using plasticized clay for developing basic mathematical skills in preschool children.
- ✚ To compare the level of basic mathematical skills of preschool children, before and after the art activities using plasticized clay.

3. Research Hypothesis

The preschool children participated in the art activities exhibits a high level of mathematical skill development, when compared to before participation.

4. Scope of Research

- ✚ Target respondents of this research are preschool girls and boys of 3-4 years old from a class of 30 children, who are attending kindergarten 1, second academic year 2015, Saen Sanook Kindergarten School, A. Muang, Nakorn Rajsrima.
- ✚ Experimental group consists of 15 preschool girls and boys of 3-4 years old, attending kindergarten 1, second academic year 2015 of Saen Sanook Kindergarten school, A. Muang, Nakorn Rajsrima, who were secured low grade in basic mathematical skills. The assessment was done by using the measurement tool created by the researcher.
- ✚ The study of variables:
 - A. Independent variable is the art activities by using plasticized clay
 - B. Dependent variable is the basic skill in mathematics based on the concept of Nuttanan Kampeephat (n.d.:32), stating that the basic skills in mathematics consists of 6 skills: observation, categorize, comparison, classification, orderly, measuring.
- ✚ Duration of this experiment was 6 weeks, 3 days per week, 30 minutes/day during the second academic year in 2015.

5. Research Methodology

This is a Quasi-experimental Research consisting of only one experimental group, which has had one-group pre-test post-test Design. Before the actual test, the researcher did a pre-test with the whole class of children with the measurement tool, which the researcher has constructed (with reliability value of 0.86) on the basic skill in mathematics with 30 points. And the score was counted from lowest to highest point. Then 15 children, who scored lowest was selected to include in the model group.

The experiment with the model group was conducted in 6 weeks, 3 days per week, 30 minutes on Monday, Tuesday and Wednesday from 09.00-09.30, which is totaled to 18 times. With art activities using plasticized clay, covering all the 6 basic skills in mathematics, 3 activities per skill, totaled to 18 activities as per the activity time-table until the end of the program. After that, a post-test was conducted, using the same set of measurement tool and the test data was used to compare analysis by using paired sample-T-Test.

6. Analysis and Findings

6.1 The finding from the art activities of plasticized clay in developing mathematical skills of preschool children is shown in Table 1

Table 1 shows the findings from the art activities which has an effect in developing mathematical skills of preschool children (N-15)

Skills	Average	S.D.	Level of Development
Observation	3.866	.5164	High
Categorize	3.733	.5936	High
Comparison	3.866	.7432	High
Classification	3.466	.5164	Moderate
Order	3.533	.5164	High
Measurement	3.666	.6172	High
Overall average of all the 6 skills	3.688	.2259	High

From the Table 1, it is inferred that art activities using plasticized clay has effect in developing mathematical

skills of preschool children. The overall average of all the 6 skills is at high level (3.688). The result indicates that all skills have high effect in developing Mathematical skills; except classification skills, which is moderate at 3.466. The observation and comparison skill scores high (3.866), followed by categorization skill (3.733). The least scored skill is classification skill (3.466). Hence it is obvious that these skills have effect in developing mathematical skills of pre-school children.

6.2 Comparison of basic mathematical skills of preschool children before and after using the art activities with plasticized clay is shown in Table 2

Table 2 shows the comparison of basic skill in mathematics of preschool children before and after using the art activities with plasticized clay (N=15)

Skill	No.of Questions	Pre-test		Post-Test		T	p
		Average	S.D.	Average	S.D.		
Observation	5	1.333	.4879	3.866	.5164	19.**000	.000
Categorize	5	1.333	.4879	3.733	.5936	12.**616	.000
Comparison	5	1.400	.5070	3.866	.7432	9.**646	.000
Classification	5	1.466	.5164	3.466	.5164	10.**247	.000
Order	5	1.600	.6324	3.533	.5164	9.**374	.000
Measurement	5	1.666	.4879	3.666	.6172	10.**247	.000
Total basic skill in mathematics	30	8.800	1.1464	22.133	1.3557	26.**458	.000

*p<.05** p<.01

It is found from the Table 2 that, art activities using plasticize clay has a higher effect in the development of mathematical skills of preschool children. By comparing the basic skill in mathematics of preschool children before and after using the art activities with plasticized clay, it is found that the overall average level of basic skill in mathematics is higher than before participating in the activities with significant value at $P<.01$ and $t= 26.458$. Upon comparing the basic skill in mathematics of preschool children using the art activities with plasticized clay, it is found that all the individual skills i.e. observation, categorize, comparison, classification, order, measurement, are higher than before participating in the activities with significant value at $P<.01$ and $t= 19,000, 12.616, 9.646, 10.247, 9.374$ and 10.247 respectively. Hence there is a significant difference between pre-test and post-test with high effect in developing mathematical skills of pre-school children.

7. Discussion

The art activities using plasticized clay has an effect in the development of mathematical skills with preschool children, the result reveals that the overall average is at high level. While considering the individual skills, it is also found that all skills have high effect in the development of mathematical skills, except the classification skill at moderate level. It is in line with the theory of intellectual development by Jean Piaget, who believed that cognitive restructuring of knowledge and skills will occur simultaneously, while facing the environment. It is of a learning process of touching, for example, picking things up, touch, hold or touching numerous things or touching various sizes of things. It is a learning process from material to abstract (referred to Jean Piaget in Surang Kwotrakul, 1998; SirimaPinyo-Anantapong, 2002). Corresponding with a theory of cognitive development of Jerome Bruner of which it is believed that learning process of the children, is a social process which the learner must practice and creates the knowledge self (referred to Jerome Bruner in Surang Kwotrakul, 1998). But by using the art activities with plasticized clay for the development of skill in mathematics, the classification skill reported at moderate level, which has least influence on the development of mathematical skill. This could be due to the reason that some skills need more time to cultivate than other skills. This corresponds with Sirima Pinyo-Anantapong (2002) who stated that basic skill in mathematics is a necessary skill which needs to be cultivated continuously and consistently.

The comparison of the basic mathematical skills of preschool children before and after using the art activities with plasticized clay, it is found that, in overall the average level of basic development skill in mathematics is higher than before participation in the activities with significant value at $P<0.01$. In line with Jittanawan Duenchai (1998) who studied the basic skill in mathematics of preschool children using outdoor activity of drawing and found that the children who participated in the drawing activity have had a higher level of basic skill in mathematics than before participation in the activity with significant value at $P<0.01$. This also corresponds with Busakorn Buapud (2013) who made a study in the development of creative art from natural resources activity, in order to stimulate the basic skill in mathematics of preschool children. It is found that the children has a higher score in basic skill in mathematics, than before participation in the activity with significant value at $P<0.01$.

8. Conclusion

It is obvious from the study that the art activities' using plasticized clay has an effect in developing mathematical skill with preschool children. The each individual skill plays an important role in the development of mathematical skill. The comparison between before participation and after participation in activities also indicates that there is a greater difference. The scores are high after participation in art activities, definitely there is a high influence for the development of mathematical skills. The classification skill is at moderate level, but the valid reasons have been pointed out and proper attention must be given to improve the classification skills of pre-school children.

9. Recommendation

The researcher has conducted the research by using different colors of plasticized clay; the teachers who supervised the activities must pay careful attention that the children do not put the plasticized clay in the mouth which could be dangerous. In future, the experiment can be conducted with large sample. And also by using the art activities with plasticized clay for developing mathematical skill, it is found that classification skill is at the moderate level i.e. the least developed skill. Therefore, there should be further study, using the suitable art activities with plasticized clay which best defines the classification skill.

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