

A Mathematical Program to Develop the Skills of Thinking of Children

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Abstract

The importance of this study emerges from the importance of the points it discusses as it attempts to study the effectiveness of the suggested program of mathematics that develop the thinking skill of the children in preschool age. Accordingly, it comes from the attempt to teach the children the skill of thinking as one of the important and required skills for the children to accommodate with the surrounded environment and to help them develop and grow completely and to accommodate with themselves and their society. The purpose of this study is, thus, summarized in the answering of the following questions:

- 1- How can we create a program that uses mathematical activities and that contribute in the development of thinking skill of the preschool child?
- 2- To what extent is that program effective to develop the skills of thinking of the preschool child?

The research sample is composed of 35 children for the experimental group and the same number for the controller group from the KJ2 children.

The results of the research showed the effectiveness of the suggested program and its obvious contribution in the development of the thinking skills for the preschool children in a more effective way than the traditional methods used.

1. Introduction

The scientists of education emphasize that teaching children the skill of thinking and solving problems is one of the most important objectives of teaching mathematics. The aim of the skill of thinking is to develop the capacity to think properly, and the development of the imagination, sensory perception, and to develop the capacity to solve problems (Ruggicro, V.R., 2005).

In view of the components of the skill of thinking and look where we find that the mathematics skills play major role in its development and its multi abilities. Covington, 2006 find that the best way for the development of children's thinking and to take advantage of the expertise available, is that the senses are

trained as child windows within them the knowledge and feelings come to the mind of the child, that's on hand' on the other hand, teacher concentrated attention of in the provision of sensory experiences to help the child to develop the perception.

Feldhusen, 2007 asserts that when teachers design the development program of child thinking, it must be among the objectives of the program to provide educational positions directly through the atmosphere of freedom and flexibility, in order to stimulate the children mentally and intellectually, and raise the level of their willingness to acquire the largest possible degree of experience through the positions of positive and non-traditional teaching methods. Moreover, through the

supervision of the researcher on the students of female teachers in kindergartens, she found that thinking skills are not already one of the objectives of education, and children during the debate on how to find solutions to the problems of math, she found a clear defect and vulnerable in their ability to think and link between the conclusion and the facts.

Based on previous indicators, the researcher concerned with conducting this research program, which includes the activities of the mathematics as a major focus of the skill of thinking in order to develop this skill in children, therefore, based on the skills of mathematics activities in the areas of thinking mentioned above rely on experimentation and practice through education and non-traditional methods may contribute to giving children the skill of thinking in light of the foundations of their development and upbringing.

2. The Research Problem

In light of the above with the absence of studies and research in the field of the development thinking of the pre-school children, and as this skill is based on those several skills of mathematics, the author has to prepare a proposed program of activities using math skills in the development of thinking skills of the pre-school children,. So, this research attempts to answer the following questions:

- i - How can the preparation of a program by using mathematics activities contribute in the development of thinking skills for pre-school children?
- ii - To what extent is the effectiveness of this program in the development of thinking skills for pre-school children?

2.1 The Research Hypotheses

a - There are significant statistical differences between the pre- and post-measurement of the experimental group in the results of thinking and skill development test for the benefit of post-application due to the use of the proposed program of activities of mathematics.

b - There are significant statistical differences between the experimental and control groups in post- measurement of thinking skill development test for the benefit of the experimental group due to the use of the proposed program of activities of mathematics.

c- The proposed program of activities contributes in the development of mathematical thinking skills in a more effective use than traditional methods.

2.2 The Determinants of the Research

a- the sample used: only (35) thirty-five boys and girls from pre-school children aged between 5-6 years in Alexandria Governorate.

b - The tools used:

1 - Program for the Development of thinking skills by using the proposed activities of mathematics - by the researcher.

2 - Test of thinking development - by the researcher. Hoagland 2006, considers the importance of the development of the thinking of children through training on classification, arrangement and other math skills, which expand on the child's understanding of shapes and types and quantities, times, colors and dimensions to understand the relationships between them.

Thinking development skill is based on the development of child's ability to think properly, to develop the capacity of the imagination of children, the

development of the child's ability to perception, and the development of the child's ability to solve problems (Treffinger, D. 2006).

Bruner 2007, said that the skills of thinking is the mental activity in which the individual acquires information and help to get an idea or a sound decision or solve a problem.

Angela 2007 also conducted a study on the impact that children learn how to resolve the problems through a program to detect some problems and results about the importance of teacher training to help children solve their problems and the need to develop the steps of problem-solving skills through some of the experiences and attitudes, that's on hand, on the other hand, it has been found that the planning of thinking programs need a great deal of accuracy and attention as children in need to develop their thinking in order to increase the rate of growth, which is linked to linguistic expressions of mathematics, and thus to remember and the strength of observation and the conclusion and analysis and comparison. (Ford 2006, Mc Whorter 2006 and Wilford 2007).

In this regard, it is important to discuss the foundations of mathematics education that involved in resolving problems and finding, and suggests the allocation of direct experience, with math thinking skills include classification, measurement and preparation.

It is also essential to offer a series of proposals to help children in the age of 5-6 years for the discovery of mathematics as they use the skill of mathematical thinking all the time. In a study of wilford, 2007 on the development of mathematical thinking skills of pre-school children through the

training program aims to raise the aspects cognitive activity of children and their positive effects on the mental, social and mathematical aspects that they have. In light of the results of previous studies, most of the current research sought to develop thinking skills among pre-school children by means of mathematics as a vital and rich field and deals with the child continuously during the daily life.

2.3 Plan of the Research

- 1- Identification of the research problem and its importance and its limits.
- 2 - Identification of the procedural definition of the research terms.
- 3 - Studying the development of thinking skill and its relation to math activities theoretically.
- 4 - To examine the results of previous research in the development of thinking skills of a pre-school child by using activities of mathematics.
- 5 - Preparation of a proposed program of activities for the development of mathematical thinking skills of the pre-school children.
- 6 - Preparation of test in the development of thinking skills in accordance with the proposed program.
- 7 - Testing research sample.
- 8 - Pre application of the test.
- 9 – Application of the program on the experimental group.

10 - Application of the post test on each of the two groups of control and experimental.

11 - The statistical treatment and analysis of results.

12 -The recommendations and proposals.

2.4 Action of the Research

Firstly: preparation of the proposed program

The objectives of the program:

In light of the previous objectives of the development of thinking skills of a pre-school, mathematics activities amounted to (94) learning activity, (42) reform activity had been prepared..

The steps and procedures that used to teach the skill of thinking successfully:

- Oriented freedom & choice.
- Education through work, experience, life and activity
- Relying on internal motivation rather than external incentives and rewards.
- Relying on toys and activities.
- The importance of sensory perception that all must be matched by a dynamic expression.
- Take into account the gradient to give experience.

Secondly: test of thinking skill development (mathematical)

The Objective of the Test

The test is designed to measure thinking skills using mathematics activities, which are contained in the program, in light of the four axes of the skill of thinking that are: developing the capacity to think properly, developing the capacity to imagine, developing the capacity for perception, and developing the ability to solve problems.

The test included the following:

2.5 Test Sincerity and Comprehensiveness

The researcher introduced a test to a group of specialists in curriculum and teaching of mathematics in order to express an opinion on the validity of testing.

2.6 The Reliability of the Test

A diagnostic test was applied to calculate the stability factor by using the equation of "Spearman and Brown" the stability factor of the test was 84.0, thus it is a high stability degree.

2.7 Testing Time

The time for seeking the application of test items of the same (35) boy and a girl (outside the research sample) and the response time of each child on each of the individual test items, and then by total time to answer. It was the calculation of the average time required to perform the testing of a set time, It became the time needed to complete the test items is (40) minutes.

3. Application of the Test

3.1 The Pre Application of the Test

The test was applied on the sample of research, by monitoring and correction of the degrees, which amounted to an average of (19) degree.

3.2 Research Experiment

Is not deliberately seeking to apply the activities of the program itself, but let it to the classroom teacher, taking into account the element of familiarity between the children and classroom teacher, the researcher has provided all the means and tools of the **activity** application.

3.3 The Post Application of the Test

The post test was applied on the sample of research, in order to determine the impact of the activities of the program on the development of thinking skills in children.

4. Results of Research and Discussions

4.1 Firstly: the Presentation of the Results

To answer questions from the search, verification of the validity of hypotheses, and also to know the program and the effectiveness of the proposal, the researcher calculated the significance of the differences between the averages for each of the experimental and control group in the pre and post measurement, viz., calculating the value of "t."

4.2 Secondly: Discussion of the Results For the first hypothesis

After the presentation of the results agenda (1) it is confirmed the validity of testing this hypothesis all areas of thinking skills development, which demonstrates the superiority of the experimental group on the law in the development of thinking skills at the level of the four axes of research. The results agreed with each of the Ford 2006, Hoagland 2007, and Treffinger 2006. This refers to the effectiveness of the proposed program.

For the second hypothesis

After the presentation of the results agenda (2) it is confirmed the validity of

testing this hypothesis all areas of thinking skills development, which demonstrates the superiority of the experimental group on the law in the development of thinking skills at the level of the four axes of research. the results agreed with each of covington, whorter, rugqicro Ellen, church.

Thus, the research has achieved the first and second hypothesis and responded to the second question, which provides for "To what extent is the effectiveness of this program in the development of thinking skills for pre-school children?"

It is clear from tables 1 and 2 that there exist statistical differences in the axes of each of the areas of skill development thinking for the benefit of the experimental group.

Moreover, the percentage values of the rates of change of the pre and post measurements for the different axes of the test can be easily obtained. From these values, it is seen that the percentage values for the post test are greater than the corresponding ones for the pre test for the groups (experimental - control), for the different axes of the test in the research variables associated with the axes of thinking development.

Table-1 Arithmetic mean, standard deviation and the value of “t”, and the significance of the pre and post measurement of each of the experimental and control group in the research variables associated with the axes of thinking skills development.

Thinking skills development axes	Experimental Group		Control Group		Difference between The two means	Standard Error	t -value	Significance Level
	μ	σ	μ	σ				
Developing the ability of thinking properly	2.486	1.795	1.771	1.532	2.285	0.369	6.191	0.005
Developing the ability of imagination	2.429	1.678	5.143	1.959	2.714	0.442	6.135	0.005
Developing the ability of perception	3.029	1.424	4.800	1.802	1.771	0.394	4.498	0.005
Developing the ability of problem solving	2.914	1.519	3.886	1.582	0.972	0.376	2.583	0.005

Table-2 Arithmetic mean, standard deviation and the value of “t”, and the significance of the post measurement of the experimental group in the research variables associated with the axes of thinking development.

Thinking skills development axes	Experimental Group		Control Group		Difference between the two means	Standard Error	t -Value	Significance Level
	μ	σ	μ	σ				
Developing the ability of thinking properly	4.771	1.532	3.857	1.552	0.914	0.374	2.444	0.01
Developing the ability of imagination	5.143	1.959	4.286	1.965	0.857	0.476	1.802	0.05
Developing the ability of perception	4.800	1.802	3.571	1.517	1.229	0.404	3.042	0.005
Developing the ability of problem solving	3.886	1.582	3.400	1.418	0.486	0.364	0.133	0.10

References

- 1- Angela, S.(2007): Interpersonal Problem-Solving: An Intervention Program for Preschool Children. Journal of Applied Developmental Psychology, Vol (3), P.177-90.
- 2- Bruner, W. (2007): Cognitive Creativity: A Tool for Creative Teaching. U.S.A., Texas, P.20-4.
- 3- Covington, M.V. (2006): The Productive Thinking Program. Columbus, OH: Charles E. Merrill.
- 4- Feldhusen, D. (2007): Teaching Creative Thinking, Elementary School Journal, Vol. (70) P.81 – 4.

- 5- Ford, L.S. (2006): Gender Comparisons of Preschool Behavior and Resource Utilization in Group Problem Solving. *Child Development* Vol. (58), P.193.
- 6- Hoagland, D. (2007): Supporting Math Thinking. *Early - Childhood – Education – Journal*. Vol. (32), Winter, P.81- 4.
- 7- Mc Whorter, K.T. (2006): *Study and Thinking Skills in Early Learning*. London. Harper & Row Publishers.
- 8- Ruggicro, V. R. (2005): *Teaching Thinking Across Curriculum*. Harper & Row Publishers, New York..
- 9- Treffinger, D. (2006): Teaching Thinking Skills. *Elementary School Journal*, Vol. (70) P.101 – 14.
- 10- Wilford, S. (2007): Think Math. *Child – Education* V. (10) Apr. P.30 – 37.