

**COMPARISON OF THE ATTITUDES OF ACQUIRING NUMBER CONCEPT
OF THE CHILDREN EXPOSED TO TRADITIONAL AND MONTESSORI
METHODS IN PRESCHOOL EDUCATIONAL INSTITUTIONS¹**

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Abstract

For decades, researchers and teachers have investigated the most effective teaching methods in educating children at every levels. This study aims to compare the effectiveness of Montessori and Traditional Teaching Methods to make the preschoolers acquire mathematical concept. Therefore, the preschoolers attending Ihsan Dogramaci Practicing Preschool under the title of Faculty of Vocational Education of Selcuk University are taught “Mathematical Concept” via Montessori and Traditional Teaching Methods to investigate the effectiveness of them.

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The study is planned as an experimental one. The sample is 20 for 4 years old (10 for experimental and 10 for control groups) and 20 for 5 years old ((10 for experimental and 10 for control groups), totally 40.

At the beginning of the research, 40 preschoolers are given pre-test to display the groups are equal to each other. Following pre-test, the experimental group is taught by Montessori while the control group is taught by Traditional Teaching Methods.

Mann-Whitney U test Statistical under the title of Programming for Social Sciences SPSS 15.0 version is practiced to analyze the data. At the end of the training, both of the groups are given post test to analyze the outcomes of the methods.

At the end of the research, it shows that there is significant differences between experimental and control groups for experimental one.

Keywords: Preschool, Montessori Method, Number Concept, Traditional Method

Introduction

Preschool period is the period when the child actively acquires basic concepts and the development is the fastest. By means of the concepts, information is grouped and organized. When we observe children in natural environments, it is possible to see how the concepts are structured and how situations requiring problem solving are implemented. The beginning of scientific studies is based on problem solving. For this, math skills are needed (Ari, 1993).

In the curriculum about teaching mathematics in preschool period, grouping, matching, sorting, counting, numbers (between 0-20), ordinal numbers, basic shapes, location and dimensions in space are included (Güven, 2000).

One of the concepts that should be given in mathematics activities in this period is number concept. Different opinions, different teaching methods and different techniques have been used on the gain of number concept so far.

Fidan (1985) and Aydın (1997) defined the teaching method as a way of teaching, which includes all of the observation, experiment, planning studies application and

study techniques that are aimed at providing students with knowledge, skills and attitudes by creating an integrity of the techniques, subject to be covered, tools and resources in order to reach the goals in teaching. Bilen (1989) and Aydın (1997) stated that teaching technique is a special way followed to organize the equipment and teaching activities to be used to convey a certain content to students.

According to Piaget, for number concept to be developed, the child must be able to perform one-to-one correspondence function and conserve the numbers. Contrary to Piaget, Gelman and Gallistel (1978) suggested that the skills related to the number concept can be gained by providing guidance in preschool period.

Maria Montessori who said *"I started this job like a farmer who had a good quality seed and a fertile field that he would only plant as he wanted. But when I touched the soil, I found gold instead of grain. This land hid a valuable treasure. That showed me that I was not a farmer as I thought: I was like Alladdin, who opened the doors of hidden treasures and held the magic lamp in his hands"* initially gave importance to the education of the senses in her work she started without knowing what she would find and based her observation on the method she developed (Wilbrandt et al., 2008).

This observation is the one where the child is free in his activities and where it is made under natural conditions (Cited Aydoğın Akuyşal, 2007). Emphasizing that movement is of great importance in the development of living things, Montessori provided an arrangement that would allow children to use the material freely in accordance with their own development in the training program she prepared. What matters to Her is the natural movements of the child. Thus, the interaction of the child with his environment reveals his physical and mental unity (Çağlak, 2005). Working with the sensory materials developed by Montessori helps the child to grasp what he sees, hears and touches. These materials sensitize the child's impression of hearing, seeing, tasting, touching and smelling. The child does important mental exercises not only by sensitizing his emotions but also by means of recognizing, matching and grading emotions. While in the mathematics system taught by traditional methods, by introducing "numbers and zero" to the child, the child is expected to perform operations with them, the concepts of mathematics are grasped by the child through embodiment with the materials developed by Montessori, one of which constitutes the infrastructure of another (Wilbrandt et al., 2008).

1.1. Problem

Is there any difference between Montessori teaching method and Traditional teaching methods in the gain of number concept in children attending preschool education institutions?

1.1.1. Sub Problems

1. Is there any difference between Montessori teaching method and Traditional teaching methods in the gain of number concept in 4 years old children attending preschool education institutions?

2. Is there any difference between Montessori teaching method and Traditional teaching methods in the gain of number concept in 5 years old children attending preschool education institutions?

1.2. Purpose and Importance of the Research

This study aims to compare the effectiveness of Montessori and Traditional methods in making the 4-5 years old children attending preschool education institution acquire number concept.

Years ago, Galileo said, "*Science is written in that magnificent book called the "universe", which is open to our eyes. However, we cannot read this book without learning the language and abc (alphabet) in which it is written. This language is math; without this language it is impossible to understand a single word of the book*". (Cited Ersoy, 2002) Mathematics education was given great importance in every age, and there was a need to reform from time to time. Despite this, problems in the mathematics education process have never been few, and mathematics has become a difficult, feared subject for most people. Although this difficulty is somewhat due to the abstract and symbolic character of mathematics, the problem is largely due to the insufficiency of teachers, the

presence of loaded and routinized programs and the lack of guidance service in schools (Çepoğlu, 1994). Skills related to number concept, which is one of the concepts of mathematics and accepted as the basis of arithmetic, are important in preschool and primary school years. In a period between the ages of 2 and 8, children become ready to use them in their daily lives by developing these concepts and skills.

The famous pedagogue Maria Montessori (1870-1957), the first female medical doctor of Italy, who maintained that preschool years cover sensitive periods that should not be wasted, proved by her method that mathematics can be taught to the child with due regard and through endearment. Montessori observed that a child would develop many mathematical abilities in an entertaining way in the case of working with mathematics materials at an early age and developed various materials for mathematics education (Lewis, 1977). This research is important in terms of better recognition of the Montessori method, the interest of the child in mathematics before school, learning by understanding and loving instead of memorization.

METHOD

3.1. Model of the Research

This research is an experimental study that tries to examine whether there is a difference between the groups on whom Montessori teaching method and Traditional teaching methods were implemented in the development of the concepts related to numbers in 4-5 years old children attending preschool education institution. Independent variables of this research are concept education program prepared in accordance with Montessori and Traditional method. Dependent variable is the level of development of number concept. In this study, trial model with pretest-posttest control group was used.

The following criteria are taken into consideration in the equalization of the experimental and control groups.

1. Information obtained from the personal information form of the students
2. Scores from the test

3.2. Personal Information Form

Information about the children was obtained from the student files available in their schools. This information was recorded on the information form created by the researcher. In this form, there are questions about children's name, gender, age, job status of parents, whether they are natural or alive, how many years of preschool education the child received, the education status of parents, their ages, income, number of siblings, and what order they come among siblings in the family. In terms of these features, two equivalent classes in the same school were included in the scope of the research. From the collected data, it was determined that the parents of all children received university education and that the children received education for minimum one year and maximum two years.

3.3. Participants

The population of the research is 4-5 years old children in İhsan Doğramacı Practice Kindergarten, affiliated with Selcuk University Vocational Education Faculty Child Development and Home Management Education Department. Twenty children from 40 children included in the research sample formed the control group by random element sampling method and 20 children from the children enrolled in the Montessori class formed the experimental group by random element sampling method. The children who made up the experimental and control groups were also divided into two groups of 10 as 4 years old and 5 years old, among themselves.

3.4. Data Collection Tools

In order to collect data in accordance with the purposes of this study, 17 items aimed at the number concepts in the gain assessment form were applied.

3.4.1. Assessment Form

The Pre-School Education Program for 2006 (for 36-72 months old children) consists of objectives and gain that take into account development areas. Accordingly, the development areas are as follows:

1. Psychomotor Area (PA)
2. Social-Emotional Area (SEA)
3. Language Area (LA)
4. Cognitive Area (CA)
5. Self Care Skills (SCS)

This program was prepared as a single preschool education program for all 36-72 months old children. For the children in the teacher's group, the teacher himself must choose the appropriate gain and objectives. In the program, objectives and gain were grouped according to their development areas. It was emphasized that these objectives and gain should be chosen from simple to complex (Ministry of National Education, 2006). Some forms were included in the 2006 program so that teachers can easily evaluate the child's development. One of these is the acquisition evaluation form. In this form, goals and gains are divided according to the development areas. According to this;

There are a total of 5 goals, 46 gains from P(A),

a total of 15 goals and 57 gains from SE(A),

a total of 8 goals, 37 gains from L(A),

a total of 21 goals and 97 gains from C(A) (Ministry of National Education, 2006).

And the number concepts in preschool period were in the area of cognitive development. In this study, a table was created by listing 17 items of the gain assessment form aimed at number concept. This table was used as a data collection tool in accordance with the purposes of the research. Instead of evaluating the responses received from the child as successful or unsuccessful for each item in the table, a rating and scoring method was made based on the principle of “the amount of error decreases as the unit gets smaller” (Yılmaz and Sümbül, 2004). In line with this principle, for the 17 items in the

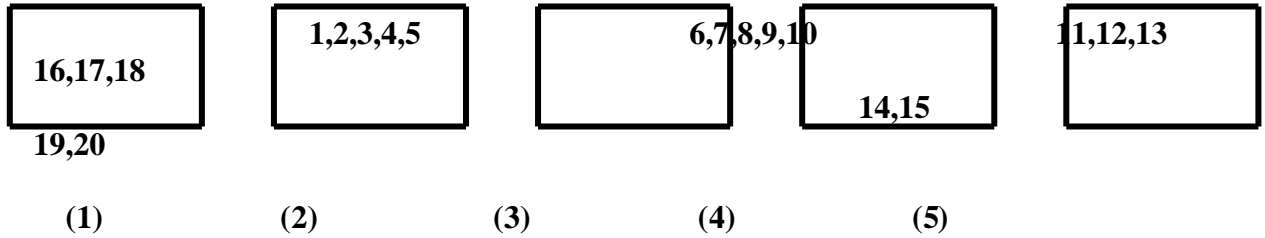
created table, the answers expected from the child were grouped in a certain number range, and each group was scored as (1), (2), (3), (4), (5).

In this scoring;

the numbers represent the statements:

- (1) -----> Not at all developed
- (2) -----> Developed below average
- (3) -----> Moderately developed
- (4) -----> Developed above average
- (5) -----> Highly developed

For example, the expression “counts one forward rhythmically within the 20” in Table 1 (see Annex: 6) was grouped and scored as follows:



Other items were also grouped according to their content and scored as (1), (2), (3), (4), (5).

Except for the first two items of the table regarding the number concept, materials were prepared by the educator for all other items. In the validity and reliability study of the prepared materials and the created table, a logical approach was followed and expert opinion was consulted. In the logical validity and reliability study, 5 child development specialists, 5 preschool education specialists and 10 kindergarten teachers presented their opinions.

.3.5. Collection of Data

In this study, the collection of the data was carried out as follows.

3.5.1. Collection of Pre-test Data

In the experimental and control group children who constitute the sample of this research, 17 items were applied as a pre-test for the number concept taken from the 2006 Preschool Education Program's acquisition assessment form.

The necessary explanations were made to the children before pretesting, and then a total of 40 children were pretested individually. An average of 20 minutes was used for each child.

3.5.2. Collection of Post-test Data

After the end of the experimental study conducted by the researcher who received the 112-hour “Montessori Education Model Theory and Practice Seminar”, 17 items related to the number concept of the 2006 Preschool Education Program were applied as a post-test to the experimental and control group.

Findings and Discussion

After collecting the data related to the research, statistical operations were made by creating a database on the computer using the "S.P.S.S. for Windows 15.0" package statistics program. In order to examine the effects of Montessori teaching method and traditional teaching method on number concept development, the level of initial number concept skills of the experimental and control groups was examined. For this, mean and standard deviations of the pretest scores of the experimental and control groups were calculated, and Mann Whitney U Test was conducted to determine whether the difference between averages of both groups was significant. The results of this analysis are given in Table 1 and Table 2.

When the number concept pre-test mean scores of the 4-years-old experimental and control groups in Table 1 was analyzed, it is seen that the mean score of the experimental group is 10.15 and the mean score of the control group is 10.85.

Table 1. Number Concept Pre-test Results of 4-Years-Old Experimental and Control Group

Group Age	N	Mean of Numbers	Sum of Numbers		Mean
Test Group 4 years old	10	10,15	101,50	Mann-Whitney U Wilcoxon W Z Asymp. Sig. (2-tailed) Exact Sig. [2*(1-tailed Sig.)]	46,500
Control Group 4 years old	10	10,85	108,50		101,500
Sum	20				-266
					,790
					,796

P > 0,05

When the Mann-Whitney U Test was carried out to reveal whether the difference between the means of both groups is important, It is determined that the value of Asymp.Sig. (2-tailed) is (, 790).When the significance value was analyzed, it is seen that $p > 796$ result is insignificant.

According to this result, it can be said that the number concept pre-test scores of the 4-years-old experimental and control groups at the beginning of experimental process are very close to each other. (Asymp.sig.(2-tailed: ,790)

When the number concept pre-test mean scores of the 5-year-old experimental and control groups in Table 1.2 are analyzed, it is seen that the mean score of the experimental group is (10.80) and the mean score of the control group is (10.20).

In order to determine the significance value of these results, Mann-Whitney U test was carried out and it is determined that the value of Asymp.Sig (2-tailed) is (820).

According to the significance value $p >$, 820 result, there was no significant difference between the pre-test scores in the two groups. At the end of the 6-week application after the determination of the baseline levels, the post-test was applied to the experimental and control groups. For this, the mean and standard deviations of the post-test scores of the experimental and control groups were calculated, and Mann Whitney U Test was performed to determine whether the difference between averages of both groups is significant. Results relating to this analysis are given in Table 3 and Table 4.

Tablo 2. Number Concept Pre-test Results of 5-Years-Old Experimental and Control Group

Group Age	N	Mean of Numbers	Sum of Numbers		Mean
Test Group 5 years old	10	10,80	108,00	Mann-Whitney U Wilcoxon W Z Asymp.Sig. (2-tailed) Exact Sig. [2*(1-tailed Sig.)]	47,000
Control Group 5 years old	10	10,20	102,00		102,000
Sum	20				-,227 ,820 ,853

$P > 0,05$

When the number concept post-test mean scores of 4-year-old children in the experimental and control groups are examined in Table 3, it is seen that the mean score of the experimental group is (14,30) and the mean score of the control group is (6,70).

When Asymp. Sig. (2-tailed) value of Mann-Whitney U test which is performed to determine whether the difference between means is significant is analyzed, it is seen that the result is (,0004) and this result is $p < 0.005$.

According to this result, the difference between the two groups is in favor of the experimental group. According to these results, it is concluded that the Montessori method is more effective in gaining the number concept compared to the Traditional method.

Table 3. Number Concept Post-test Results of 4-Years-Old Experimental and Control Group

Group Age	N	Mean of Numbers	Sum of Numbers		Mean
Test Group 4 years old	10	14,30	143,00	Mann-Whitney U Wilcoxon W Z Asymp.Sig. (2-tailed) Exact Sig. [2*(1-tailed Sig.)]	12,000
Control Group 4 years old	10	6,70	67,000		67,000
Sum	20				-2,876 ,004 ,003

$P < 0,05$

Jacqueline, Stewen and Edward (2004) compared Traditional nursery children and Montessori nursery children in terms of wittiness, classification and conservation. 4 years-old 40 children from both schools were sampled and Piagetian problem wittiness,

classification, conservation were applied to each child. According to the results, there was no significant difference in conservation between Montessori nursery children and traditional nursery children. It was determined that Montessori nursery children are more interested and can concentrate more easily about wittiness and classification. (Akt. Erben, 2006). This result is important for supporting the research.

When the mean scores of 5-years-old children in the experimental and control groups in terms of number concept gain in Table 4 are analyzed , it is seen that the mean score of the experimental group is (15.40) and the mean score of the control group is (5.60).

When the Asymp.sig. (2-tailed) value of the Mann-Whitney U Test is examined to determine whether the difference between means is significant, it is seen that the result is (, 000). In the significance test, the value (, 000) is significant compared to $p < 0.05$.

Akuysal (2007), in her research titled “The effect of the concept education program in the development of the geometric shape and number concepts of 6-year-old children”, examined the effect of the concept education program prepared by Piaget and Montessori in accordance with his method In this research

Table 4. Number Concept Post-test Results of 5-Years-Old Experimental and Control Group

Group Age	N	Mean of Numbers	Sum of Numbers		Mean
Test Group 5 years old	10	15,40	154,00	Mann-Whitney U Wilcoxon W Z Asymp.Sig. (2-tailed) Exact Sig. [2*(1-tailed Sig.)]	1,000
Control Group 5 years old	10	5,60	56,000		56,000
Sum	20				

$P < 0,05$

, while the “concept education program” prepared in accordance with the management of Piaget and Montessori was applied to the children of the experimental group, the existing program was applied in the control group. As a result, it was observed that there was a significant improvement in the behavior of matching two sets

with the same number of elements related to numbers, recognizing and matching symbolic models of numbers, counting objects, writing symbolic models of numbers according to the children in the experimental group. Asfuroğlu (1990) conducted a study entitled “Gaining Triangle, Circle and Square Concepts to 5–6 Years Old Children Attending Kindergarten”. In this study which he carried out with the aim of gaining the concepts of triangle, circle and square to the children of 5-6 years of age who attend kindergarten, 36 children are divided into two groups who receive education with material and without material. Before education program was applied, pre-test was carried out to the experimental and control groups. Both groups were applied a post-test at the end of the education program and a retention test four weeks later. The same educational activities were applied to the groups with and without materials for 16 days. Only children in the material group were allowed to work in class with the materials developed by Montessori. As a result, there is a significant difference between the pre-test, post-test and retention test results of the children who received education with and without materials. Considering the results of these studies, it can be said that the Montessori method is more effective in gaining the number concepts compared to the Traditional method.

Result and Suggestions

The aim of this research is to compare Montessori and Traditional Teaching Methods in gaining number concept to 4-5 years old children attending preschool education institution. After training of the number concepts given to 40 children from İhsan Doğramacı Practice Kindergarten, “17 items of the Gain Evaluation Form for number concepts” were applied. The findings were evaluated statistically.

When the obtained data was evaluated statistically, it was found that there was a significant difference between the number concept acquisition levels of the groups using Montessori Teaching Method and Traditional Teaching Methods ($p < 0,05$). It was determined that 4 years old students using Montessori Teaching Method were more successful in gaining the number concepts than 4 years old students receiving Traditional Education. (Table 1.3). In addition, it was determined that 5-years-old students who

used Montessori Teaching Method were more successful than 5-years-old students who received Traditional Education. (Table 1.4). A strong framework should be created in order to increase the developmental characteristics and natural mathematical abilities of children in preschool period.

Today, many children see mathematics as a set of rules or facts to remember, and they cannot establish a relationship between mathematics and their own lives. The reason for this outcome is that mathematics is usually taught in a non-content way. (Whitin, 1994). The quality of the stimuli which is chosen is important to be successful for the child. The basis for the mathematical concepts required for the higher mathematical skills that the child will need in later school life should be established and appropriate educational experiences about this subject should be provided. (Bilir, Metin, Bal, Şahin, 1992). One of the best ways to achieve this in the classroom is to prepare the Montessori educational environment. Montessori Tools are introduced to children once by their teachers or other children. Thus, the child learns the way of working which is suitable for the purpose of the vehicle. Each study is designed to take a child to a higher cognitive level. Tools follow each other, and the previous tool is less complex and easy in level than the next one. The fact that the tools follow each other during the study ensures that the child's knowledge always moves on a foundation. This is a complementary process, such as construction of a wall.

Learning does not occur without repetition, but Traditional education presents the subject to be learned within the time which it determines and it starts to deal with another subject after this period. But every child's learning style and need for repetition are different. In the Montessori Method, the child adjusts her/his working speed and becomes the manager of her own learning experience. This is a very important feature which must be gained for a person. Children working with Montessori tools start with learning by using concrete objects and senses, develop their abstract thinking skills, progress in writing, reading, mathematics and science, and become individuals who love to study and learn.

Educational philosophy of Montessori is very different from Traditional understanding in terms of the view of the child. According to Montessori, children learn, think and perceive in a completely different way than adults. Therefore, giving educa-

tion by trying to see the child as an incomplete example of the adult does not mean anything other than maintaining an error that has been done for thousands of years. Children have their own needs and rights. The only thing an adult can do in the child's development process is to remove the obstacles to the child and meet her/his needs. Education is to enrich the experiences that the child may have during this period of self-construction and to present experiences in the direction of progress.

While the traditional method measures the child's development with notes, tests and scorecards, the Montessori Method rejects this measurement fundamentally. Obviously, trying to measure development in this way puts the child's goal in a negative context that reduces it to a only test result, whereas the main goal is to learn and progress.

In the Montessori Method, evaluation is determined as a result of sensitive observations which are made during the child's work with the tools. In particular, it is known that traditional assessment cannot be made to the child in the first six years of age, and tests which are thought to measure development give very limited and highly generalized information about children. Therefore ; Observations collected during the child's work include not only observations about the work done with the tools, but also the movements he/she made during physical education and the conversations he had with his friends while playing games. These observations collected about the child are evaluated both according to the principles and measures of Montessori and the data of developmental psychology. The Montessori Method evaluates works done by the child with regular follow-up by teachers and observers and experts rather than a report that evaluates the development of the child by numbers. The success, strengths and weaknesses of the child are also mentioned in these reports and suggestions are made. (<http://www.sihirlibahce.com.tr>).

Suggestions

The findings of the research show that “Montessori Teaching Method provides a positive change in children's behaviors regarding the number concept.

Following suggestions have been developed in accordance with the findings of the research.

1-Current preschool programs should be supported with the Montessori teaching Method by taking the opinions of teachers.

2- In order to put the views on mathematics on a better basis, especially in the preschool period, seminars and practices to spread the Montessori method should be organized.

3- Access to Montessori materials should be facilitated.

4- Similar studies should be conducted with sample groups from different populations in order to make a generalization from the results obtained from this research. The effects of the “Montessori Teaching Method” on the other development of children can be explored by subjecting to other studies.

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