Hacettepe Üniversitesi Eğitim Fakültesi Dergisi 18 : 17 - 25 [2000]

HELPING SIX YEAR OLD KINDERGARTEN CHILDREN TO ACQUIRE THE CONCEPT OF CONSERVATION THROUGH TRAINING

Meziyet ARI*, Servet BAL**, Belma TUĞRUL***, Selay UZMEN**** and Sema AYDOĞAN*****

ABSTRACT : This study aimed to find out the level of knowledge of conservation possessed by six year old kindergarten children and study the effect of the training program employed on their knowledge of conservation. The subjects consisted of a total of 49 six year old children attending Hacettepe University's Gülveren Kindergarten. As an experimental one, this study involved the following sequence of events: pre-test - supportive training - post- test. The children in both the experiment and control groups were first administered the pre-test, in which adjustments had been made to include tasks dealing with conservation of number, length, material, quantity and weight. Following this, the children in the experiment group were administered a training-through-play program to reinforce their knowledge of conservation. This program was applied five days a week for two months for each area of conservation. Following the training period, the same tasks used in pre-test to test the children's knowledge of conservation, were administered to the children in both the experiment and control groups as the post or final test. In the statistical analysis of the data the Ki-Square test (for dependent samples) (Mc Nemar Test) was used and the number and percentage of children successful in each area of conservation in the pre-and post-tests were given. The difference was found to be significant between the scores achieved by the children in the experiment group in the pre- and post-tests. On the other hand, the difference between the scores achieved by the children in the control group in the pre- and post- tests was not significant. However, there was some increase in the level of knowledge of conservation possessed by the children in this group. Care should be taken that educational programs designed for early childhood should give room to educational activities which will help children to acquire the concepts of conservation.

KEY WORDS : *Conservation, Preschool Child, Piaget, Cognitive Development*

ÖZET : Bu araştırma, anaokuluna devam eden altı yaş grubundaki çocukların korunumla ilgili bilgi düzeylerini belirlemek ve verilen eğitim programının çocukların korunuma ait bilgi düzeylerine etkisini incelemek amacıyla yapılmıştır. Araştırma, Hacettepe Üniversitesi Gülveren Anaokuluna devam eden altı yaş grubundaki toplam 49 çocuk ile sürdürülmüştür. Araştırma ön test-destekleyici eğitim-son test şeklinde yürütülmüş deneysel bir çalışmadır. Her iki gruptaki çocuklara sayı, uzunluk, madde, miktar, ağırlık korunumu ile ilgili uygun düzenlemelerin yapıldığı ön test uygulandıktan sonra, deney grubundaki çocuklara korunum bilgisini destekleyici, oyunla eğitim programı verilmiştir. Bu program, her korunum alanıyla ilgili olarak, iki ay süreyle, haftada beş gün uygulanmıştır. Eğitim programı sonucunda, ön testte verilen korunum alanlarıyla ilgili düzenlemeler, deney ve kontrol grubu çocuklarına son test amacıyla tekrar verilmiştir. Verilerin istatistiksel analizinde Bağımlı Örneklerde Ki-Kare Testi (Mc Nemar Testi) uygulanmış ve her korunum bilgisi için ön test ve son testte başarılı olan toplam çocuk sayısı yüzdeleri verilmiştir. Oyunla eğitim yöntemlerinin kullanıldığı, destekleyici eğitim programları sonucunda deney grubundaki çocukların ön ve son test sonuçları arasındaki fark anlamlı bulunmuştur. Kontrol grubundaki çocukların ön ve son test sonuçları arasında fark anlamsız bulunmuştur. Ancak bu gruptaki çocukların korunumla ilgili bilgi düzeylerinde artış olduğu gözlenmiştir. Erken çocukluk dönemi eğitim programlarında korunumla ilgili kavramların kazanılmasını destekleyecek eğitsel yaşantıların yer almasına özen gösterilmelidir.

ANAHTAR SÖZCÜKLER : *Korunum, Okulöncesi Çocuğu, Piaget, Zihinsel Gelişim.*

1. INTRODUCTION

Mental structures develop through interaction between the individual and the environment. These structures appear during early childhood and begin to develop as soon as the child begins to gain environmental experiences. His research on mental development from birth until adulthood led Piaget to conclude that this process is divided into four different but consecutive basic stages [1]. According to Piaget, children begin

*Prof. Dr., Hacettepe University, Child Development and Education Department, Samanpazarı, ANKARA
** Assoc. Prof. Dr., Hacettepe University, Child Development and Education Department, Samanpazarı, ANKARA
*** Assoc. Prof. Dr., Hacettepe University, Faculty of Education Department of Preschool Education, Beytepe, ANKARA
****Res. Assist., Hacettepe University, Child Development and Education Department, Samanpazarı, ANKARA
*****Specialist, Hacettepe University, Gülveren Kindergarten, Gülveren, ANKARA

to think and use primitive reasoning about size, number, quantity, time, volume, weight and space when they reach the concrete operations stage (7-11 years of age). During this stage, they achieve greater mastery of the concept of conservation that is, they learn that certain quantitative aspects of objects remain unchanged despite some changes in the appearance of objects [2]. Piaget maintained that the concepts of conservation (of number, length, material, quantity, weight, area, volume) are acquired gradually and different forms of conservation emerge at different periods in the life of a child [1].

Conservation is the recognition that any physical changes occurring in an object or a group of objects do not effect a change in the quantitative aspect of those objects [3]. There are different views as to whether the process of the acquisition of the concept of conservation can be accelerated by giving children some special training [4].

In the studies made in this area, some specialists argued that the concept of conservation can be acquired through training. Some researchers pointed out the benefits of employing different methods of education to encourage the children to acquire the concept of conservation [5, 6] and carried out relevant studies, which concluded that training can help the acquisition of the concept of conservation [5, 7, 8, 9, 10].

Both the theory of maturationism and the interactional theory, stress the importance of being at the right age for the acquisition of the skills of conservation. Gesell (1954), Thompson (1954) and Hunt (1964) believe that some characteristics of the age based conceptual level and limitations in neurological maturation might cause children to resist the training to be given [11].

Pasnak (1987), stated in a study that the cognitive development of children of kindergarten age can be accelerated through development of new programs of instruction [12].

Turh (1980), Gelman and Gallis (1978), expressed the view that the acquisition of the concept of conservation can be accelerated if the educational programs are detailed and systematic [13].

Sinha and Carabine (1981), agreed that conservation activities are an important tool through which children can develop competence in establishing communication conservation. Activities can also contribute positively to children's development [13].

Golomb and Boren (1981), stressed in their study that early childhood educational programs should include activities designed to support children's knowledge of conservation. Early childhood educational programs should also include educational experiences to support the acquisition of the concepts of conservation and the development of the relevant skills [14].

2. THE AIM OF THE STUDY

This study aimed to determine the level of knowledge of conservation possessed by 6-year-old kindergarten children and to assess the effects of the training program employed on their knowledge of conservation.

3. METHOD

The subjects consisted of a total 49 children in the six year old age group (ranging from 5 years 7 months to 6 years 6 months) attending Hacettepe University's Gülveren Kindergarten.

The 49 children comprising the subjects were divided into two groups as the experiment group and the control group. The study was designed to consist of the following stages: Pretest - supportive training - post-test.

The researcher familiarized the subjects with the materials to be used before starting to work with them.

For each task, a pair of objects were placed on the table before the subjects, who were then asked whether or not the pair of objects in question were quantitatively equal in terms of num-

ber, length, substance, quantity or weight, depending on the task. When the subjects did not agree that the pair of objects were quantitatively equal, some modifications were made in the objects or in their positions. It was only after the children accepted the quantitative equality of the objects that one of the objects was deformed into another shape or its position was changed. And the other object was left intact. Thus, the changes made had to do with either the shape of the object or its position in relation to the other element of the pair. However, there were no quantitative changes [15].

The same approach was employed in the administration of the pre-and post-tests to both the experiment and control groups. Pre-and post-tests were administered individually outside the classroom in a room checked for stimulative effects. Only the subjects in the experiment group went through the training stage of the study in a special room in the kindergarten. The activities and the educational program were implemented by only one of the researchers involved in this study. The subjects in the experiment group received special supportive training in each area of conservation for two months, five days a week. During the implementation of this training program, matters such as interaction between the objects and children, manipulation, raising awareness about relations and characteristics and drawing attention to causal aspects were emphasized. The subjects took an active part in the play activities included in the training program. Art, physical education and study of nature were chosen as activities to be included in the training-through play program [16]. The children in the control group were allowed to take part only in those activities included in the training program implemented by the kindergarten. This way, it was believed, the potential variables which might result from the involvement of different teachers could be taken under control.

For the statistical analysis of the data, the Ki-Square (Mc Nemar) test was used for Dependent Samples and for each area of conservation the total number and percentage of the children successful in the pre-and post-training tests were given [17].

4. FINDINGS

Tables 1-5 and Figure 1-5 show the distribution of the subjects successful in skills related to conservation of number, length, substance, quantity and weight according to the experiment and control groups.

Table 1: Distribution of the Subjects Successful in Skills Related to Conservation of NUMBER According to the Experiment and Control Groups

GROUPS	THE EXPERIMENT GROUP							n : 27	THE CONTROL GROUP							n : 22
PRE-TEST	+		I	−		II	X^2	P	+		I	−		II	X^2	P
POST-TEST	+	−		+	−				+	−		+	−			
	7	0	25.9	17	3	88.9	17	P<0.05	1	0	4.5	8	13	40.9	8	p>0.05

I : Number/Percent of children successful in the pre-test.
II : Number/Percent of children successful in the post-test.

Table 2: Distribution of the Subjects Successful in Skills Related to Conservation of LENGTH According to the Experiment and Control Groups

GROUPS	THE EXPERIMENT GROUP n : 27							THE CONTROL GROUP n : 22							
PRE-TEST	+		I	−		II	X^2	P	+		I	−		II	X^2	P
POST-TEST	+	−		+	−				+	−		+	−			
	3	0	11.1	19	5	81.5	19	P<0.05	3	0	13.6	0	19	13.6	0	p>0.05

I : Number/Percent of children successful in the pre-test.
II : Number/Percent of children successful in the post-test.

Table 3: Distribution of the Subjects Successful in Skills Related to Conservation of SUBSTANCE According to the Experiment and Control Groups

GROUPS	THE EXPERIMENT GROUP n : 27							THE CONTROL GROUP n : 22							
PRE-TEST	+		I	−		II	X^2	P	+		I	−		II	X^2	P
POST-TEST	+	−		+	−				+	−		+	−			
	3	0	11.1	21	3	88.9	21	P<0.05	2	0	9.0	1	19	13.5	0	p>0.05

I : Number/Percent of children successful in the pre-test.
II : Number/Percent of children successful in the post-test.

Table 4: Distribution of the Subjects Successful in Skills Related to Conservation of QUANTITY According to the Experiment and Control Groups

GROUPS	THE EXPERIMENT GROUP n : 27							THE CONTROL GROUP n : 22							
PRE-TEST	+		I	−		II	X^2	P	+		I	−		II	X^2	P
POST-TEST	+	−		+	−				+	−		+	−			
	3	0	11.1	21	3	88.9	21	P<0.05	2	0	13.6	1	18	18.1	1	p>0.05

I : Number/Percent of children successful in the pre-test.
II : Number/Percent of children successful in the post-test.

Table 5: Distribution of the Subjects Successful in Skills Related to Conservation of WEIGHT According to the Experiment and Control Groups

GROUPS	THE EXPERIMENT GROUP n : 27							THE CONTROL GROUP n : 22							
PRE-TEST	+		I	−		II	X^2	P	+		I	−		II	X^2	P
POST-TEST	+	−		+	−				+	−		+	−			
	4	0	14.8	21	2	92.6	21	P<0.05	0	0	0.0	1	21	4.5	1	p>0.05

I : Number/Percent of children successful in the pre-test.
II : Number/Percent of children successful in the post-test.

Figure 1: Distribution of the Subjects Successful in Skills Related to Conservation of NUMBER According to the Experiment and Control Groups

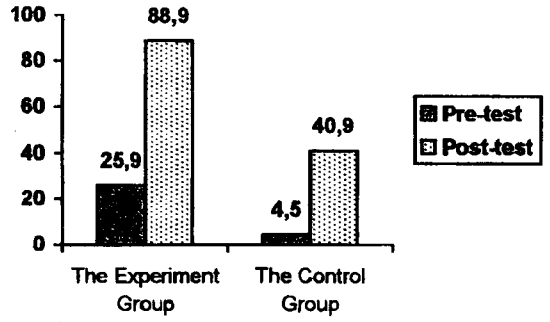


Figure 2: Distribution of the Subjects Successful in Skills Related to Conservation of LENGTH According to the Experiment and Control Groups

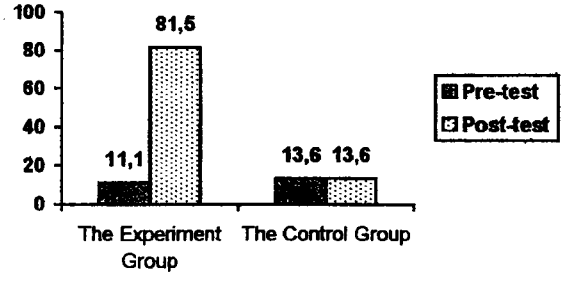


Figure 3: Distribution of the Subjects Successful in Skills Related to Conservation of SUBSTANCE According to the Experiment and Control Groups

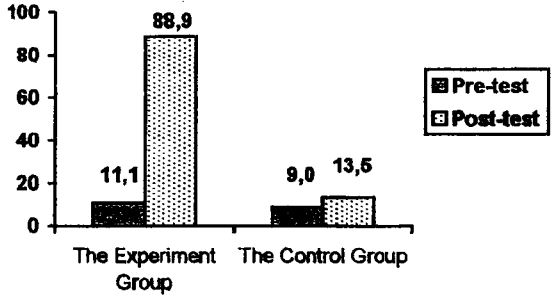


Figure 4: Distribution of the Subjects Successful in Skills Related to Conservation of QUANTITY According to the Experiment and Control Groups

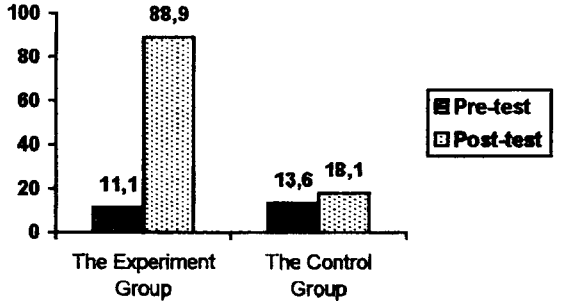
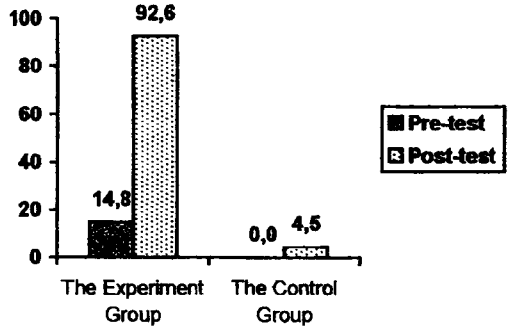


Figure 5: Distribution of the Subjects Successful in Skills Related to Conservation of WEIGHT According to the Experiment and Control Groups



5. RESULTS AND DISCUSSION

This study was designed to find out the level of knowledge of conservation possessed by six year old kindergarten children and examine the effect of the training program on their level of knowledge of conservation. The study tried to determine the pre-and-post levels of knowledge of conservation of number, length, substance, quantity and weight possessed by the children in the experiment and control groups.

When the distribution of the subjects successful in skills related to conservation of number according to the experiment and control groups (Table 1, Figure I) was studied, the difference between the pre-and post-tests was found to be significant in the experiment group ($x2 = 17$, $p<0.05$), but insignificant in the control group ($x2= 8$, $p>0.05$). The percentage of children successful in the conservation of number in the pre-test was 25.9. However, in the post-test, this figure rose to 88.9 %. This indicates that 63.0 % of the children were positively influenced by the training provided in the conservation of number ($P<0.05$). On the other hand, in the control group, the percentage of the children successful in the pre-test was 4.5 % whereas in the post-test, it rose to 40.9 %. This result was not found to be statistically significant ($P>0.05$). The fact that the success rate achieved by the children in the control group rose in the post-test although they had received no supportive training led us to believe that this was due to the fact that the aims related to number training had greater weight in the kindergarten educational program. This was not observed in other areas of conservation.

A number of experiments carried out by Haldford, et al (1985) on conservation of number led them to conclude that children in the 3-4 year age group knew nothing about the conservation of number. Halford's theory assumed that understanding conservation had to do with the concept of number and the quantity expressed by the numbers. According to the researcher, children cannot grasp these two overlapping concepts until they are 4.5-5 years of age [18].

Piaget attributed young children's failure in conservation of number to their lack of understanding of the related concepts [19].

Çelen (1992), in a study, applied a symbolic "play program" to sixty children between the ages of 4-6 years in addition to the regular kindergarten curriculum. He stressed that this program had a cognitive effect on the children's acquisition of number [20].

Siegler and Liebert (1972), in a study, were able to accelerate the acquisition of the conservation of number [21].

The findings presented in Table 2 and Figure 2 indicate that the children's performance in the conservation of length was statistically significant for the experiment group ($x2= 19$, $P<0,05$). In the experiment group, 11.1 % of the children performed successfully in the conservation of length in the pre-test. This figure however, rose to 81.5 % in the post-test. Training, thus, brought about 70.4 % more success in the conservation of length in the post-test. In the control group, however, there was no difference between the results achieved in the pre-post-tests. Only 13.6 % of the children were successful in both the pre-and post-tests.

Gelman (1982) provided training in the conservation of number and length for children who had already acquired the concept of conservation. Gelman, in his training program emphasized the concepts dealing with the same number and length. The study found significant changes, compared to the pre-test results, in the performance of the children in the post-test, administered immediately after training in conservation tasks related to number and length. The same performance level was also achieved in the final test administered three weeks later [7].

Piaget observed that young children thought two identical sticks placed side by side to be of equal length because their ends matched. However, they thought the sticks were not of the same length when one of them was moved sideways [11].

The distribution of the subjects successful in skills related to conservation of substance accor-

ding to experiment and control groups (Table 3 and Figure 3) indicates that the difference between the pre-and post-test results achieved by the subjects in the experiment group was significant ($x2 = 21$, $p<0.05$) where as it was found to be insignificant in the control group ($x2= 1$, $p>0.05$). 11.1 % of the children in the experiment group performed successfully in the pre-test. This rate rose by 11.1 % to 88.9 % in the final test. In the control group, this rate was 9.0 % in the pre-test while it was 13.5 % in the final test.

The training program applied to the children in the experiment group created ample opportunity for the children to interact with materials such as ceramics, and clay, which are used in art activities. Children's achievement of a rate of success of 88.9 % in the final test, from the 11.1 % in the pre-test may be considered to have resulted from the opportunities provided for children in the training program.

Chang et al (1987) carried out a study to investigate the conservation skills of Singaporean preschool children in areas of number, length and quantity. Over 200 hundred children ranging in age from 3-6 years were included in the study. The findings showed that over half of the 5.5-year-olds were successful in the conservation of number and less than 15 percent in the conservation of length and quantity. The study further found that the children in private schools acquired the concept of conservation at an earlier age than their peers in public kindergartens. Researchers emphasize the importance of conservation activities in the acquisition of the concept of conservation [6].

Onyehalu carried out a study in Nigeria in 1985, in which he applied Piaget's experiments on the conservation of substance to 247, 6.5-7.5 year old children. The study revealed that the children with previous kindergarten experience acquired conservation skills earlier than those with no kindergarten experience. The study further revealed that the children with no previous kindergarten experience had not seen clay or ceramics before the study [11].

Price, et al (1969), in a study applied Piaget's conservation experiments related to number, substance, weight and volume to two groups of Mexican boys. They observed that the group of children doing pottery work were particularly successful in conservation of substance while the group of boys with no work experience were unsuccessful [22].

The findings presented in Table 4 and Figure 4 indicate that the difference between the rates of success achieved by the subjects in the experiment group in conservation of quantity in the pre-and post-tests was significant ($x2= 21$, $p<0.05$). In the control group, although there was a rise in the level of success in the final test compared to that in the preliminary test, this rise was not statistically significant ($x2= 1$, $p>0.05$). In the experiment group, the rate of success in conservation of quantity rose from 11.1 % in the preliminary test to 88.9 % in the final test. In the control group, however the same rate rose from 13.6 % to 18.1 in the final test.

The children's failure to give a correct answer to the question about conservation of quantity in the pre-test may be ascribed to the possibility that they confused the meanings of such words as "more", "fewer", "less" and "equal". During the administration of the supportive training program, the children were allowed to be engaged in activities in which they had a chance to grasp the meanings of these words through concrete experiences. In addition, since their ability to give correct answers to conservation problems was related to their ability to distinguish the differences between the physical characteristics of the environment and those of the objects with which they interacted the children were given ample opportunity during their training period to engage in activities involving the acts of filling, emptying, carrying and dividing, which gave them a chance to compare various dimensions, forms and quantities of the objects used [16].

In a study by May and Norton (1981), the level of acquisition of the conservation of number, length, substance and quantity attained by 5-6 year old children was found out. Then the children

were subjected to conservation training. The findings indicated that both the children who had not acquired the concept of conservation at all and those who had partially done so before training were more successful in various conceptual relations, and they could transfer what they had learned to other areas of conservation [8].

In a study by Sinha and Carabine (1981), 3-6 year old children were shown two toy animals: a small dog and a big horse. The animals were supposed to drink water out of similar containers. The bigger animal had a big container and the smaller a small one. After the first trial, the containers were changed and water was poured into them (The water in the small container was put into a thin tall glass, and that in the big container into a wide glass). Young children (3-4 year olds) gave the water in the wide glass, which they thought was little, to the dog. This was because they were at a level of perception which led them to use as a hint in their decision-making only an easily noticeable characteristic of the container rather than the act of emptying from one container to another [13].

The findings presented in Table 5 and Figure 5 indicate that following training, the children in the experiment group had greater knowledge of conservation of weight. The increase in the experiment group was found to be statistically important ($x2= 21$, $p<0.05$) while that in the control group was found to be statistically insignificant ($x2= 1$, $p<0.05$). While 14.8 % of the children in the experiment group was found to have acquired conservation of weight in the pre-test, in the post-test, this percentage rose by 14.8 % to 92.6 %. None of the children in the control group, however, was successful (0.0 %) in the pre-test. The success rate in final test, on the other hand, was only 4.5%.

Miller and Lipps (1973), claimed that as children grew older, the rate of error-making in their skills of conservation of weight grew lower. This observation was in conflict with Piaget's view that children have stronger functional belief systems and thus they will not change their beliefs even when they are taught [11].

Lawton and Reddy (1984) studied the effect of highly organized knowledge on the acquisition of the concept of conservation by 3-4 year old children. To the experiment group, the researchers applied a training program based on Ausubel's theory of learning, designed to draw children's attention to special properties of objects and high levels of rules needed to solve the conservation problems related to learning activities. The children in the control group, on the other hand, were trained through regular explanations within the framework of the traditional kindergarten program, which is not based on any particular theory of development or learning. The children in the experiment group, achieved top performance levels in conservation whereas those in the control group performed at lower levels in pre-and post tests [23].

Wheatley (1970) found, that there was a relationship between the acquisition of conservation skills and the age, socio-economic level and experiences of a child. He also found that the children from families which provided rich stimulants and suitable materials were able to understand the concept of conservation at an early age. His findings, furthermore, revealed that specially provided materials and chances such as blocks, legos, construction materials, and playing games with water and sand contributed to children's grasp of the concept of conservation [24].

Golomb and Boren (1981) in their study, provided the subjects who failed to understand the problems related to conservation with training through symbolic play, then repeated the same conservation problems. The researchers claimed that the children acquired enough cognitive gains from their training to generalize their knowledge of conservation to cover those areas of conservation in which they had not received any training [14].

The findings of this study indicated that there was an increase in the level of knowledge of conservation possessed by children supported by a training-through-play program. Thus, the training program used for this study can be said to have been useful to the subjects in the experiment group.

The educational programs designed for children in the early childhood period should give room to educational experiences that will support the acquisition of the concepts related to conservation. Active participation in learning will positively affect children's lives and educational gains. When they find and opportunity to touch the objects in their learning environment, they will have achieved learning at a conceptual level. Training through play provides a significant opportunity which allows active participation by children and enriches children's learning through trial and error practices. Therefore, instead of traditional approaches, those which will allow children to manipulate objects should be preferred.

REFERENCES

1. Hughes, F.P., Noppe, LD., Noppe, I.C. "**Child Development**". U.S.A.: West Publishing Company. (1988).
2. Ausubel, D., Novak, J., Hanesian, H. "**Educational Psychology A Cognitive View" (2nd Ed)** New York: Holt, Rinehart and Winston. (1978).
3. Charles, C. "**Öğretmenler İçin Piaget İlkeleri".** Çeviren: Gülten Ülgen, Ankara: Lazer Ofset Matbacılık Ltd. Şti. (1992).
4. Jersild, A. "**Çocuk Psikolojisi".** Çeviren: Gülseren Günce. 3. Baskı. A.Ü. Eğitim Fak. Yay. No: 79. Ankara: A.Ü. Basımevi. (1979).
5. Field, D. "A Review of Preschool Conservation Training: An Analysis of Analysis". **Developmental Review**. 7, 210-251. (1987).
6. Chang, A. and others. "**Are there as Many Do Ils in This Row as That Row?".** Ed 305, 134. (1987).
7. Gelman, R. "Assessing One to One Correspondence: Still Another Paper about Conservation". **British Journal of Psychology.** 73, 209-220. (1982).
8. May, R., Norton, J. "Training Task Orders and Transfer in Conservation". **Child Development**. 52, 904-913. (1981).
9. Onyehalu, A.S. "**Feedback and Performance of Piagetian Conservation Task in a Developing Country".** 90(1) 65-73. (1983).
10. Parsonson, B.S., Naughton, K.A. "Training Generalized Conservation in 5 Year Old Children". **Journal Of Experimental Child Psychology.** 40, 372-390. (1988).
11. Haktanır, G. "7-10 Yaşlarındaki Çocuklarda Sayı, Madde, Uzunluk, Miktar, Ağırlık, Alan ve Hacim Korunumu İlkesinin İncelenmesi". **Yayınlanmamış Doktora Tezi.** Ankara Üniv. Fen Bilimleri Enst. Ev Ekonomisi Anabilim Dalı. (1994).
12. Pasnak, R. "Acceleration of Cognitive Development of Kindergartners". **Psychology in the Schools.** 24, 358-363. (1987).
13. Moore, C., and others. "Precocious Conservation in Context: The Solution of Quantity Tasks by Non Quantitative Strategies". **Journal of Experimental Child Psychology.** 38, 1-6. (1984).
14. Golomb, C., Boren, S. "Playing Game of Make Believe: The Effectiveness of Symbolic Play Training With Children Who Failed to Benefit From Early Conservation Training". **Genetic Psychology Monographs.** 104: 137-159. (1981).
15. Dworetzky, J. "**Cognitive Development. I. The Theory of Jean Piaget. Introduction to Child Development".** Minnesota: West Publishing. Co. (1981).
16. Tuğrul, B. Hacettepe Üniversitesi Anaokulu Oyunla Eğitim Uygulama Örnekleri. (1994).
17. Saunders, D., Trapp, R. "**Basic and Clinical Biostatistics".** Int. Edt. USA Appleton. Lange. (1990).
18. Haldford, G., Boyle, F. "Do Young Children Understand Conservation of Number?". **Child Development.** 56, 165-175. (1985).
19. Gold, R. "Performance on Donaldson and Mc Garrigle's "Cars and Garages" Task as Evidence About the Reasons for Failure on Piaget's Number Conservation Task". **The Journal of Genetic Psychology.** 147 (2) 151-165. (1984)20. Çelen, N. "4-6 Yaş Çocuklarının Sayı Korunumunu Kazanmasinda Sembolik Oyunun Işlevi". **VII. Ulusal Psikolojisi Kongresi. Serbest Bildiri Özetleri.** Ankara: 64-65. (1992).
21. Lefrançois, G.R. "**Of Children: An Introduction to Child Development".** (8th edition) USA: Wadsworth Pub. Comp. (1995).
22. Price, W., Gordon, W., Ramirez, M. "Skills and Conservation: A Study of Pottery Making Children". **Developmental Psychology,** 1.769. (1969).
23. Lawton, J., Reddy, P. "Effects of High-Order Rule Instruction on Preschool Children's Understanding of Conservation". ED 300. 127. (1984).
24. Wheatley, G. "**Conservation Cardination and Counting As Factors In Mathematics Achievement".** In: Athey, J.J. and Rubadeau, P.O. (Eds.). Educational Implications of Piaget's Theory. Toronto. (1970).