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An Examination of Two Different Approaches to Learning in Nursery School

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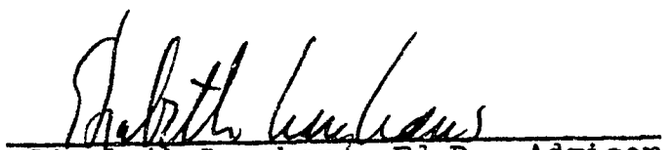

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ABSTRACT

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Statement of the Problem

The primary purpose of this study was to explore teacher guidance - does it help promote learning? The sub problems are to explore and assess the value of academic training in nursery school versus a straight child development program, and to explore and assess the value of play as a teaching method.

The Population

This study included sixty, four year old children who were enrolled in nursery school for the first time. They were divided into six equal groups of ten each according to sex and I. Q.

Control Groups I and II - pupils who participated in a five month child development theory nursery school program.

Experimental Groups III and IV - pupils who participated in a five month child development theory nursery school program with added experiences in mathematical concepts under a self-directed learning program.

Experimental Groups V and VI - pupils who participated in a five month child development theory nursery school program with added experiences in mathematical concepts under a teacher guided learning program.

Method of Conducting the Study

Instruments used to gather basic data were: Wechsler Preschool and Primary Scale of Intelligence and the CTB/McGraw-Hill Test of Basic Experiences - Mathematics.

The data was statistically described by an analysis of variance and the Scheffe Multiple Comparison Test.

Findings

Main Hypothesis: Children working under a teacher guided program learn more mathematical concepts than children working under a self-directed program in mathematical concepts.

The main hypothesis was accepted as those children involved in the teacher guided program had significantly higher scores than those obtained by the children under the self-directed program.

Sub Hypothesis A: Play and the use of play materials are valuable as teaching methods.

The sub-hypothesis that play and the use of play materials are valuable as teaching methods was accepted when their use included initial teacher guidance.

Sub Hypothesis B: Children working under a program of planned instruction will learn more mathematical

concepts than children in a straight child development theory of education.

The sub-hypothesis was accepted that children involved in a child development theory nursery school benefited from planned mathematical instruction provided the instruction is teacher guided.

Conclusions

This study revealed that children gain more mathematical concepts through guided experiences and training in nursery school if there is teacher guided learning.

A formal program with preschool children can enhance acquisition of mathematical concepts. The program has different consequences for children of average or above average intelligence than for superior intelligent children. Nevertheless, each of these groups show gains particular to their knowledge and experiential base.

The value of play as a teaching method has been demonstrated in this study. Children in the experimental groups who were using the select mathematical materials in a play situation demonstrated an increased learning over the control groups involved in a straight child development program.

Children involved in a program of planned instruction (the experimental groups) learned more mathematical concepts than those in the control groups. This would indicate that

planned instruction is more beneficial than the emergent planning advocated by the Child Development Theory of preschool education.

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CHAPTER I

INTRODUCTION

A. Importance of the Study

There is a growing question in education today concerning preschool children and how they should be taught. What part does planned instruction play in programs for young children? Is a highly structured approach or less directive role more appropriate?

Research by Bloom and Hunt indicates that the most formative years are those from birth to five, and it is at this point in time that the mental development and its relationship to environment has its plus and minus effects.[1] Since learning, both positive and negative, takes place all around us, we must pay more attention to the nature of learning. We must take a look at the role of early childhood education.

Research in human development suggests that perhaps the present emphasis on social and emotional development of contemporary preschool education is misplaced, and that the

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[1]Benjamin S. Bloom, Stability and Change in Human Characteristics (New York: Wiley, 1964) pp. 69-70; J. McVicker Hunt, Intelligence and Experience (New York: Ronald Press Company, 1961) p. 27.

years from birth to six may well be the most important to a child's intellectual growth, as well as to his social and emotional development.[2]

Dr. John Fisher of Columbia Teachers' College summarized the case for a more academic early childhood education in the annual report to President Johnson from the National Advisory Council on the Education of Disadvantaged Children:

> There is substantial evidence that the level of intellectual capability young people will achieve at seventeen is already half determined by the age of four, and that another thirty percent is predictable at seven years. This is no ground for believing that a child's academic fate is sealed by his seventh birthday, but it means that a community that seriously wants to improve its children's opportunities will start them to school early.[3]

Though this statement focuses on the importance of early childhood education of culturally deprived children, the remarks about the early predictability of intellectual capacity should hold true for all youngsters.

The success of any effort to develop this potential requires a carefully elaborated theory of human development. A theory has been developed in our time by the Swiss psychologist, Jean Piaget.

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[2]John Paul Scott, Experience and the Organization of Behavior (Belmont, California: Wadsworth, 1968) p. 79; H. W. Stevenson, E. E. Hess, and Harriet L. Rheingold (Eds.) Early Behavior (New York: Wiley, 1967) pp. 251-254.

[3]John Fisher, Annual Report 1967, National Advisory Council on the Education of Disadvantaged Children (Washington, D. C.: Government Printing Office, 1968) p. 7.

The "Child Development" tradition of preschool education interprets Piaget as part of a maturational theory including Freud (Kessen), Gesell, and Isaacs.[4] His ideas in this theory are viewed with the notion that preschool education should let cognitive abilities (which are usually considered by educators as a set of intellectual skills) simply grow and that preschool education should emphasize helping the child adjust socially and develop emotionally.

On the other hand, Kohlberg cites Flavell and Hooper and interprets Piaget by stating that the cognitive abilities emerge through a process of development which is neither direct biological maturation nor direct learning in the usual sense. It is a reorganization of the mind resulting from organic environment interaction.[5]

Piaget writes of situations in which a child's mind reacts to its environment and is itself altered as it tries to make sense of that environment -- as it develops new muscles to cope with the information entering through its eyes, ears, and other senses. Provided this information

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[4]William Kessen (Ed.) The Child (New York: Wiley, 1965) pp. 268-274.; Arnold L. Gesell, "The Ontogenesis of Infant Behavior," in L. Carmichael (Ed.) Manual of Child Psychology (New York: Wiley, 1954) pp. 367-370.; Susan Isaacs, Social Development in Young Children (London: Routledge, 1933) p. 54.

[5]Lawrence Kohlberg, "Early Education, A Cognitive Developmental View," Child Development XXXIX (December, 1968) pp. 1013-1014.; John Flavell, The Developmental Psychology of Jean Piaget (New York: VanNostrand Company, Inc. 1963) pp. 41-44.; Frank Hooper, "Piagetian Research and Education," in I. Sigel and F. Hooper (Eds.) Logical Thinking in Children: Research Based on Piaget's Theory (New York: Holt, Rhinehart and Winston, 1968) pp. 423-425.

is not too much for the child's intellectual muscles to deal with, this process not only produces an act of learning, but actually generates a positive appetite for more learning.[6]

Cannot the child development theory practiced in Nursery Schools be refined by incorporating this Kohlberg interpretation of Piaget?

The social and emotional development presently fostered by play, art and social experiences in the child development tradition are recognized by Piaget as having large cognitive structual components and contributing to cognitive development. Rather than just allowing cognitive abilities to grow, preschool programs could be expanded to provide more experiences necessary for organic environment interaction.

Basic to Piaget's conception concerning these experiences is the theory of the "proper discrepancy." The child's mind might be considered at any point to be ready to step forward -- to learn something new. The length of this step is crucial to success or failure in the learning process. If a child's mind at a given moment is capable of making one step forward, and the experience offered in the learning situation requires precisely one step (the proper discrepancy) the child will enjoy both the challenge and the experience of learning. But, should the challenge from the experience require more than one step when the mind is

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[6]Jean Piaget, The Psychology of Intelligence (Totowa, New Jersey: Littlefield, Adams and Company, 1968) pp. 7-8.

capable of one only, he is likely to become frustrated or upset, and draw back from trying to learn any more.

Dr. J. McVicker Hunt calls this matter of finding the proper discrepancy the problem of finding the "match" between a new learning problem and one the child already has developed.[7]

This should be another consideration in the possible refinement of the child development theory of preschool education. How does one know when a child is ready to make his next mental move forward? Finding the proper match between a child's present abilities and a new learning unit is an individual process.

The development of early childhood programs could be based in part on the research of Dr. Benjamin Bloom. He indicates that there is an ideal time for a human to acquire any new skill and that if this ideal time is not found, a youngster will not only never learn the skill as readily at a later age, but may never learn it as well as he would have at the "readiness" stage. It becomes more difficult as time goes on because greater changes are required to bring about a given amount of change in a child's intelligence, if it can be produced at all.[8]

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[7]J. McVicker Hunt, Intelligence and Experience (New York: Ronald Press Company, 1961) pp. 268-270.

[8]Benjamin S. Bloom, Stability and Change in Human Characteristics (New York: Wiley, 1964) p. 71.

A second implication follows from the concept of the "match". If the discrepancy between what the child knows and what the environment offers him is just large enough the result is pleasure. If the discrepancy is too large, the result is distress. It follows then that if there is no discrepancy at all -- if the environment offers a child no possibility for learning, the result is likely to be boredom.[9]

If preschool programs are to include more planned instruction, the education system may have to be revised upwards from the bottom, building the work of the primary grades upon that of early childhood education. As matters stand now, preschool education is forced to work backwards; rather than trying to find out what four year olds are capable of learning, it looks ahead to what they will learn in kindergarten and first grade, and the preschool curricular content is kept at a level which assures that it remains easier than the lessons to come.

There is evidence that children's ability is being wasted through failure to teach them when they are most capable of learning and eager to do it. David Elkind has reviewed these arguments for the criticalness of early childhood intellectual stimulation and found none of them entirely satisfactory. He does not, however, deny the

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[9]Hunt, Intelligence and Experience, pp. 278-279.

importance of the early childhood period for intellectual growth. The preschool period is important, even critical, not because growth is most rapid at this time or because there is evidence to show the lastingness of early instruction. The preschool period is important for another reason. Mental growth is cumulative and depends upon what has gone before.[10]

When speaking of Piagetian stages, there is a cumulative learning aspect. What the child learns in the preschool period can adequately prepare him for what he is to learn later.

Because of the cumulative nature of a child's development, new learning comes from previous learning, and earlier learning affects that which follows. The idea of cumulative learning is inevitable, and therefore the utilization of the educational potential of early childhood years is self-evident.

The early childhood years are the first years in concept formation, according to Hunt:

> It now looks as though early experience may be even more important for the perceptual, cognitive, and intellectual functions than it is for the emotional and temperamental functions.[11]

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[10]David Elkind, "The Case for the Academic Preschool: Fact or Fiction?" Young Children (January, 1970) pp. 137-138.

[11]J. McVicker Hunt, "The Psychological Basis for Using Preschool Enrichment as an Antidote for Cultural Deprivation," Merrill-Palmer Quarterly, X (July, 1964) p. 3.

These are the years when curiosity impels a child to reach out into his environment; to touch, squeeze, taste, ask "why", to try to know. His primary method for intellectual growth is active, manipulative and sensory. He actively utilizes material to build his conceptual scheme of the world.

A single experience, no matter how successful, is not enough to build a reliable concept. A child should make many approaches from many angles over a period of time before a concept has some measure of stability. The work of Piaget, Bruner, Jersild and others supports the proposition that children cannot move ahead toward abstract structure and reasoning without a broad base of direct encounters from which to generalize.

Early childhood programs need to be rich and diversified in concrete manipulative and sensory learning experiences. In such a setting, children can gradually develop a way to sort relevant data which leads them to refine previous concepts and make them more precise. The way in which conceptual growth takes place, building on previous experience, underscores the necessity for a cumulative learning framework.

What very young children should be taught and how, continues to be a growing question now that the solution to other major problems of education such as school failure, dropouts, and functional illiteracy seems to lie in the years before a child normally enters the first grade.

Maya Pines advocates placing more emphasis in the preschool curricula on specific intellectual activities, such as language training and early exposure to letters and numbers. She believes that for the child to know that he really has the skills necessary for success in school will do wonders for his self-image and go a long way toward preventing school failure.[12]

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[12]Maya Pines, "How and What to Teach the Very Young Child," NEA Journal (February, 1968) p. 43.

B. Scheme of the Study

The purpose of this study was to explore two approaches to learning used in Nursery School and to determine how these approaches affected the learning process.

This was accomplished by exposing children to a number of different mathematical materials in order to make known and to measure the amount of mathematical learning which took place during the course of the study. The materials were especially designed to develop an understanding of mathematical concepts and in themselves stimulate the interest of their users.

The mathematical concept area was selected for use in this study because of its relative freedom from cultural bias.

Four groups of preschool children, matched according to age, sex, I. Q. and socioeconomic family background, took part in this study. The children, aged four, were in attendance in a private nursery school.

Two groups were simply exposed to these materials during their free activity work period, encouraged to play with them as their interest stimulated them and left to their own devices as to the materials' use. The children could choose to independently explore the materials which were available.

The other two groups were introduced to the materials and provided with planned teacher-group sessions during

which the teacher demonstrated the use of the materials and assured that each child understood the object of the materials' use.

Two control groups were also established in order to compare study subjects with children enrolled in the child development theory of preschool education.

The children were contrasted in their performance on the same pre-tests and post-tests. These tests measured the children's ability in mathematical concepts.

The four groups involved in the study engaged in full nursery school programs during the intervening period. Experiences not associated with the study were not considered in the testing.

C. Assumptions Basic to the Study

In these formative years, children need opportunities to develop concepts about their world and to share in activities with children of about the same age.

The nursery school, through qualified teachers, proper equipment and materials, and an environment planned around the needs of the rapidly growing young child, can supplement and expand the experiences offered the child in his home. Its program can provide for appropriate continuity of learning and development.

Piaget conducted an immense number of investigations into the ways in which children learn, and decided that in the early stages, learning takes place in a sensory-motor field. Children must see, hear, feel, smell or taste things in order to learn what they are. They cannot yet learn by being told. They cannot form abstract or imaginary concepts. They learn too, by their own movement.

There are two points about a learning experience which should be emphasized. First, it needs exercising. Children are learning about the world they live in and they must be allowed to do things over and over again and thus reassure themselves that what they have learned is true, that patterns do repeat themselves, that things are constant.

The other point about a learning experience is that exercising it should be pleasurable. Piaget has collected a great deal of evidence to this effect, and common observation confirms it. At this age, there is a tendency on

the part of adults to associate pleasure with play and as the child grows older, play is contrasted with something different called work.

Educators recognize the value of play in the learning process. Children's play is observed closely and systematically, and it is recognized that play is much more than the release of surplus energy. It is something undertaken with great seriousness and concentration and is important to the child.

Various theories of play have been proposed. Early thoughts on play were mainly essays on the reasons for play. Groos felt that the child plays because it is a form of "pre-exercise," meaning that the child does certain acts as forecasts of more mature forms of behavior.[13] Patrick postulated that play was a form of relaxation, that it is a way of obtaining relief from other excitements.[14]

Britt and Janus reviewed some of these earlier theories of play. Most of these theorists did not account for the various types of play or attempt to make a distinction between play and work in the child's behavior.[15]

More recent theorists have attempted to explain various aspects of play. The Cognitive Theory presents a detailed

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[13]Karl Groos, Play of Man (Translated by E. L. Baldwin) (New York: D. Appleton and Company, 1901) p. 101

[14]George Thomas Patrick, "The Psychology of Play," (Paper presented at the Pedagogical Seminary, 1914). p. 482-484.

[15]Steward H. Britt, Sidney Q. Janus, "Toward a Social Psychology of Human Play," Journal of Social Psychology (1941) pp. 355-357.

theory of play. Piaget believes that play is mainly assimilation. By this he means that the child is concerned with working within already existing experiences and that the use of these experiences is no longer a matter of adapting the child's cognition to reality, but rather adapting reality to already existing cognitions. Piaget suggested that there is a tendency on the part of the child to repeat experiences which already exist for their own sake and for no other end than the functional pleasure of use.[16]

Through countless kinds of play, children discover the nature of materials and begin to form concepts of weight size, texture, softness, hardness, plasticity, transparency, and so on. In playing with materials, children begin also to discover the possibilities and limitations of their own powers. They unconsciously explore the physical world and discover how that world is related to their own inner feelings.

The child gains knowledge through his play. The process of learning develops gradually, and play continues to be of the greatest importance as a means of understanding and learning. If play is eliminated, the delight and pleasure of learning may go with it. Indeed, play is valuable in all work throughout life.

Play and learning ɐn do not appear to be mucually exclusive. Children can absorb a wealth of facts, concepts

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[16]Jean Piaget, Play, Dreams and Imitation in Childhood (New York: W. W. Norton, 1962) pp. 87-89.

and relationships in nursery school groups involved in a play situation.

At the start of grade school, the children who are best in traditional subjects are not necessarily those who have had considerable previous drilling in number work, spelling and so on; they are the ones who have a rich background of general information based on encounters in the world of nature, things, and people. Concrete experiences which give meaning to the concepts of size, shape, distance and time are basic to understanding arithmetic.

Nursery schools should have such experiences as part of their daily programs. This could be accomplished through planning, by using current interests and questions of the children, and by applying the knowledge gained from research and experience.

The goals of preschool education and the means of reaching them go far beyond keeping children busy, happy and safe. Four year olds should be stimulated, not pressured, to ask questions, think for themselves and try out new ideas.

D. Objectives of the Study

The main objective of this study is to determine whether nursery school children involved in a program of planned mathematical instruction using a structured approach learns more mathematical concepts or if they learn more in a similar program under a less directive teacher role situation.

Previously cited studies indicate that educators and psychologists believe that the first six years of life are crucially important formative years. During that time, the shaping of a child's personality begins, and his chances for healthy mental growth are determined. He may learn more in those years than he will during any later period of his life.

In order to fulfill this prediction, the child needs a feeling of competence. He needs plenty of opportunity to show his initiative and satisfy his curiosity.

His feelings of competence will grow as he freely manipulates the equipment that has been built to his own size and as he discovers that it is possible for him to have a wonderful time without running into a constant succession of don'ts.

The child needs to understand himself and the surrounding world. At nursery school there is time to explain and there is also plenty of time to foster the child's curiosity about the world at large.

A child of four wants to know the answers to a question. What am I capable of doing? There is a need to learn, to do, and to feel adequate.

A child is not a passive recipient. He is an active seeker after information.

Children have been observed to spend hours building a tower of blocks, watching it fall, building it again, fall, and rebuilding again. The children are involved in what seems to adults mere repetitive play. What they are doing is learning to master and be competent. What looks to adults like play is serious business to the children.

It seems a long way from block play to adult notions of competence in today's world, but recent research by Wattenberg and Combs clearly indicates a connection. Pre-schoolers' estimate of their own competence is an effective forecast of their success in later schooling.[17]

The development of competence, in terms of exploring and getting answers, trying out firsthand one's impact on people and things, and judging one's ability is an objective of the nursery school program.

There are other needs; the need to sort out, to structure and organize what one is experiencing, to make sense out of events and type them together. These are all a part of cognitive development.

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[17]William Wattenberg, Mantal Hygiene in Teaching (New York: Harcourt Brace, 1959) pp. 542-546.; Arthur Combs, Ira Gordon, "The Learner, Self and Perception" Review of Educational Research XXVIII (1958) pp. 433-444.

The term cognition basically refers to adaptive actions upon objects. Cognition is defined by Kohlberg as a mode of action or as a faculty or ability. The encouragement of cognitive development then is the provision of opportunities for activities of an organized or equilibrated form.[18]

In seeking to fulfill these other needs, the nursery school program should make this provision and have as one of its objectives, the encouragement of cognitive development.

How can a nursery school help children acquire these objectives? How can its program help to build competence and confidence, and enhance cognitive development?

Nursery schools should utilize individuality and drive for competence by providing different types and levels of experiences.

Nursery school teachers should accept and utilize a child's already developed individuality. They should provide a variety of experiences and tasks that proceed simultaneously instead of requiring all children to do the same thing at the same time. The teacher should accept the child's own timetable of growth.

Much informal play can be used to foster cognitive development. Enrichment of experience is vital. In helping children see for themselves, teachers can make use of the new knowledge about the processes of discovery in

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[18]Kohlberg, "A Cognitive-Developmental View," p. 1015.

children. They can design experiences to help a child discover events and learn how to make bridges between them.

The teacher can help make the difference. The stated purposes of nursery school programs should give primary emphasis to the physical, social, emotional and intellectual development of young children. How effectively these purposes are realized depends in part upon the teacher.

When a teacher is instructing, in a directive sense he is either involved in getting a child or children "launched" or in helping a child consolidate or digest what he has lately been learning. For self-directed exploration, the teacher adopts a much less directive, but supporting role.

The objective of this study is to show how the role of the teacher influences the children's exposure to the materials used in the learning experience. Does intellectual challenge involve external stimulation? Is the teacher a part of providing this stimulation?

CHAPTER II

BACKGROUND OF THE STUDY

A. Review of the Related Literature and Generalization of the Findings

Formal preschool education is nearly two hundred years old, established in France in the later 1700s to protect children from the influences of the streets. For the next century and a half, early childhood education continued to be conceived in social welfare terms as a way of shielding children from harmful influences and enabling mothers to work in war plants.

The greatest concentration in preschool education was from the middle twenties of the twentieth century to the beginning of the forties. At this time the stress was on intellectual development. During this period, the focus was whether preschool attendance would accelerate mental growth. From the early forties to the late fifties, this focus was absent.[1]

Recently psychologists interested in learning and cognition have recognized that a child's experience in the years before he is six influence not only his attitudes toward intellectual ideas, but his actual abilities for grasping them.

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[1]"Early Childhood Education," The Encyclopedia of Education, 1971, III, pp. 137-140.

In his studies, Piaget explored the growth of intelligence. Although Language and Thought of the Child was published in English in 1926, it was not until the early 1960s that Piaget's ideas made any significant impact in the United States. Professor Jerome S. Bruner of Harvard is probably responsible for the current awareness which can be traced to his books, The Process of Education and Toward a Theory of Instruction. Bruner states that Piaget has written the logical theory on which the child proceeds in dealing with intellectual tasks and describes him as the most impressive figure in the field of cognitive development.[2]

In his spirial curricula theory, Jerome Bruner advocates preschool academic education. He claims that any subject can be taught to anybody at any age in some form that is honest.[3] In On Knowing, Essays for the Left Hand, he elaborates on this theory when he comments that readiness is a function not so much of maturation as it is of intention and skill at translating ideas into the language and concepts of the age level being taught.[4]

Are the ages at which Piaget's stages appear definite or is there variation in this respect? The results of different researchers differ greatly. According to Piaget

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[2]Jerome S. Bruner, The Process of Education (Cambridge: Harvard University Press, 1960) p. 34.

[3]Ibid., p. 12.

[4]Jerome S. Bruner, On Knowing, Essays for the Left Hand (Cambridge: Harvard University Press, 1966) pp. 105-108.

the ability to think rationally and abstractly appears between the ages of eight and twelve, while Smedslund and Kooistra have reported it at younger ages. Kooistra, working with gifted children at City and Country School, where children had an I.Q. of 130 and higher, finds it as early as the age of four in a small number of children.[5] This fact in itself is important for the program planning of nursery schools because these children can perhaps understand material that might previously have been considered beyond their scope.

Kohlberg finds that the interactional conception of stages (the Kohlberg interpretation of Piaget) differs from a maturational one (the child development theory) in that it assumes that experience is necessary for the stages to take the shape they do as well as assuming that generally more or richer stimulation will lead to faster advances.[6]

Can children be trained in these thinking tasks or is it merely a matter of maturation which cannot be influenced by education? The general consensus is that the training of children to think is very difficult and for

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[5]William H. Kooistra, "Developmental Trends in the Attainment of conservation, Transitivity and Relativism in the Thinking of Children - A Replication and Extension of Piaget's Ontogenetic Formulations," Unpublished Ed.D. dissertation, Wayne State University, 1963. pp. 230-231.

[6]Lawrence Kohlberg, "Early Education, A Cognitive-Developmental View," Child Development, XXXIX (December, 1968) p. 1024.

the most part results in failure.[7] (Studies conducted by Wohlwill, Beilen and Franklin.)

Kohlberg argues that specific types of preschool academic training are unlikely to have long run general beneficial effects and that programs directed toward raising general psychometric intelligence are unlikely to have marked success.

However, he states that a Piagetian conception of methods of accelerating intellectual development which employ cognitive conflict, match, and sequential ordering of experiences might generate somewhat more general and long range cognitive effects than would other approaches.[8]

Research by Piaget and follow up studies by Sigel, Roeper and Hooper points to the following conclusions. The development of logic in all young children proceeds according to definite stages. The ability to think rationally and abstractly may appear as early as the age of four in children who have not been exposed to any systematic training. In the preoperational stage, some kind of primitive sequential thought processes appear that may lead the child to either wrong or correct conclusions, depending on what criterion he happens to use. It is important

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[7]John G. Wohlwill and Robert C. Lowe, "Experimental Analysis of the Development of the Conservation of Numbers," Child Development, XXXIII (1062). p. 163.: Harry Beilin, Irene C. Franklin, "Logical Operations in Area and Length Measurement, Age and Training Effects." Child Development XXXIII (1962). pp. 617-618.

[8]Lawrence Kohlberg, "A Cognitive-Developmental View," p. 1056.

to realize that at no stage is the child's mind inactive. He attempts mastery at any level and if his tools are too simple, his conclusions may also be too simple.

Training built on whatever stage the child actually functions in, also facilitates growth toward the ability to think. The child may be taught to comprehend some of these concepts in specific instances, even though he may not have reached this particular stage in his general development.[9]

For the purpose of this study, the writer found the following two important concepts of value. First, children's ability to think logically and abstractly develops according to definite stages. Secondly, the ability to think can be reached through the process of growth, but could be facilitated by carefully planned educational experiences. What can these facts mean in terms of early childhood education?

Curiosity and assimilatory action are aroused by the new or novel in the context of the familiar. In a planned instructional program in order to stimulate interest, too much effort may be made of stressing what is new or novel and the importance of familiarity neglected.

There should be stress on the role of action on the part of the learner. Children do not learn new ways of

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[9]Irving E. Sigel, Annemarie Roeper and Frank H. Hooper, "A Training of Procedure Acquisition of Piaget's Conservation of Quantity" in I. Sigel and F. Hooper (Eds.) Logical Thinking in Children, Research Based on Piaget's Theory (New York: Holt, Rhinehart and Winston, 1968) pp. 305-306.

thinking through passive absorption of events. Psychologists stress the central role of active exploration. Nursery school children are continually on the go. Of course, some of this activity can be rather aimless, but most of it in normal settings is activity with purpose. Piaget states, "Knowledge is not a copy of reality. To know an object, to know an event, is not simply to look at it and make a mental copy or image of it. To know an object is to act on it."[10]

Not only is action an important part, but it appears to be an action of a somewhat repetitious sort. The observant teacher can give many illustrations of what appear to be repetitious behaviors associated with cognitive development.

This is a gradual process and the child's actions upon the environment are repeated again and again with slight modifications each time. The young child who begins to differentiate the properties of size and weight has learned to do so on the basis of many liftings and pushings of objects, and only several years later will the distinction between the two be formally recognized.

It seems that Piaget differs on this point from Bruner in that Piaget depicts the child as somewhat slower and methodical, somewhat more systematic in acquisition of new ideas, while Bruner tends to depict moments of discovery and cognitive leaps.

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[10]Jean Piaget in R. E. Ripple and V. N. Rockcastle (Eds.) Piaget Rediscovered: A Report of the Conference on Cognitive Studies and Curriculum Development (School of Education, Cornell University, 1968) p. 8.

Review of the literature concerning early childhood education would tend more to the Piaget theory. Size and weight concepts come not only from experiences with styrofoam blocks, but they stem from experiences in all kinds of situations with all kinds of objects. Basic abilities to handle quantity and number come not just from manipulating counting cubes, but from a variety of interactions which range from block construction to handing out cookies, one to a child. Modification requires a variety of experiences as well as repetition and time.

The young child is most eager for learning. Every experience becomes a learning situation. Early childhood education has realized the child's great potential for learning by himself and is using this realization in the development of its educational methods and materials.

Sigel points out, however, that this type of learning can be unselective in the case of the child who functions on a preoperational level. He is not yet equipped to make a choice between different categories of facts and unable, therefore, to build his judgement on relevant information. In consequence, he is likely to develop misconceptions. These misconceptions may become deeply embedded in the child's thinking and stand in the way of further concept formation.[11]

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[11]Annemarie Roeper and Irving Sigel, "Finding the Clue to Children's Thought Processes," Young Children (September, 1966) pp. 347-348.

In other words, the young child is deeply motivated toward understanding the world, but is not yet mentally equipped for it. The only solution for the child's problem would appear to be adult guidance.

The conclusion drawn from the review of the literature is that the young child should be helped toward proper concept formation through an organized goal-directed approach.

B. Development of Nursery School Methods in the United States

The initial development of preschool education was Basically a private effort in the United States. The real start toward development of a sound educational program at the preschool level began in the twenties. The trend toward a more scientific approach to child development accounts for the improvement of educational goals and objectives. It is during this decade that such research centers as the Institute of Child Welfare at the University of Minnesota and Toronto and the Fels Institute at Antioch College were started. At the same time, growth studies at Stanford, Harvard, Chicago and Michigan contributed to the scientific evaluation of the growth and development of young people.

The child development point of view was the dominating influence in preschool education during the 1930s. The research of this period concerned itself chiefly with the motivation and needs of the children.

Modern nursery education has its philosophical beginning in the child study movement which as Brody states:

> ..Began in this country at the turn of the century with the work of G. Stanley Hall. Hall had been deeply influenced by the findings of Freud and Darwin. Another great stream of thinking came in the 1920s from the child guidance clinics which had themselves emerged out of the larger, nation wide mental hygiene movement.[12]

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[12]Sylvia Brody, Theory and Research in Child Development read at the Conference of Early Childhood Education Council, Brooklyn, New York, April 26, 1958. p. 3.

These different influences in education, psychology and child study culminated in the establishment of laboratory nursery schools where these new theories could be tested on a broad scale. These schools were founded in various colleges throughout the country and were supported by funds from the Rockefeller Foundation.

The primary objectives of laboratory schools, as stated in the Twenty-Eighth Yearbook of the National Society for the Study of Education were:

> To provide opportunity for controlled research .. to furnish facilities for training preschool teachers, to provide for the cultural and general training of college women, to train teachers of home economics, to demonstrate the best methods of child care, to permit parents to participate in the group care of children and to train junior and senior high school students.[13]

A review of the research indicates that the first nursery schools were established for every purpose except the one of educating the children.

In addition to children of faculty members, enrollment in the laboratory schools was intended, as Hymes states, for the intellectually advanced, the only child of a wealthy family, the youngsters in the select urban center.[14]

Gans, Stendler and Almy comment:

> The nursery school in its early years ... was unique among educational institutions. It was

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[13]National Society for the Study of Education, Twenty-Eighth Yearbook (Albany: The Society, 1928) p. 43.

[14]James L. Hymes, Jr., "The Beginnings of Education," in Gruenberg, Sidonie, Matsner, and the Child Study Staff, Our Children Today (New York: The Viking Press, 1952) p. 71.

> concerned not so much with what could be taught children as with what could be learned from them.[15]

In the early twenties the behaviorist theories of John Watson permeated the child development field, and according to Gans, Stendler, and Almy, stressed teaching methods which placed more emphasis on the ways and means of promoting repetition of desirable behavior ... rather than on the feelings and emotions that might motivate the child.[16]

Stanton describes the effects of this ideology thus:

> Nursery schools went through a period of devotion to the acquisition of skills ... buttoning and unbuttoning, washing and dressing and sleeping.[17]

There was a marked change in the philosophy and goals of nursery education when the theories of Freud began to influence the child development field in the early thirties. The nursery school now provided a setting where according to Stanton:

> Children have the opportunity for being their complete selves, their most effective selves, under the guidance of teachers who understand the needs of young children.[18]

Toward the end of the thirties nursery school philosophy had incorporated many influences and was being

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[15]Roma Gans, Celia Burns Stendler and Millie Almy, Teaching Young Children (Yonkers, New York: World Book Company, 1952) p. 62.

[16]Ibid., p. 76.

[17]Jessie Stanton, "What is Education for the Child Before He is Six," Progressive Education (Reprint)

[18]Ibid.

affected by teaching goals and methods which focused on the following aspects, as set forth in the writings of such authorities as Read and Murphy.[19]

Promoting socialization through group experiences

Providing opportunities for creative expression

Providing opportunities for expression through dramatic play

Meeting the needs of the individual child

Affording suitable equipment made to the size and need of the young child

During the depression years of the thirties, the federal government established hundreds of schools for young children in order to meet the work needs of unemployed teachers. The years from 1941 to 1945 saw the beginning of child care centers sponsored by the government in order to permit the mothers of young children to go to work.

Educational and sociological changes occurred as the result of these programs. Some, according to Anna Freud and Catherine Landreth were:[20]

Emphasis on group organization

Mother-substitute experiences

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[19]Katherine H. Read, The Nursery School (Philadelphia: W. B. Saunders Company, 1955) pp. 21-25; Lois Murphy, "The Nursery School Contributes to Emotional Development," Childhood Education (May, 1940) pp. 6-10.

[20]Anna Freud, Nursery School Education - Its Uses and Dangers (New York: Child Study Association of America, 1949) p. 49; Catherine Landreth, Gladys Gardner, Bettie Eckhardt, and Ann E. Prugh, "Teacher-Child Contacts in Nursery School," Journal of Experimental Education, XII (1943) pp. 65-91.

Emphasis on discipline

More structured environment

The following statement is significant in evaluating the experiences of the emergency schools.

> Although the shortcomings of the emergency schools were many, inadequately prepared teachers, insufficient supervision and lowering of equipment standards, being the more apparent ... the importance of the endeavor in ushering in a new era for the child under five or six can hardly be over-estimated.[21]

A major sociological change occured as a result of the government subsidized programs because, as the same report states, "before this time, the advantages of good nursery schools were available only to the well-to-do and the under privileged ...[22]

The years of mass nursery education did stimulate and expand the number of nursery schools and broaden the segments of population who were involved in such schools. Beer points out that, "Today the half day or short day nursery exists primarily for children of non-working mothers who are interested in the educational and social values of nursery schools.[23]

The basic philosophy and teaching goals referred to by Beer are rooted in the philosophical concepts of nursery education. Taylor states that these concepts are, "Founded

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[21]National Society for the Study of Education, "Early Childhood Education," Forty-Sixth Yearbook, Part II (Nelson B. Henry, ed.) (Chicago: The University of Chicago Press, 1948) p. 259.

[22]Ibid.

[23]Ethel S. Beer, Working Mothers and the Day Nursery (New York: Whiteside, Inc., and William Morrow and Company, 1957) pp. 20-26.

on the fundamental principle that each child must be encouraged, respected and taught so that he may become the most that he is capable of becoming."[24]

The role of the nursery school teacher in implementing the goals of education has been complex and difficult to interpret to laymen and professionals outside the nursery school and related fields. As Moustakis and Berson point out, "Many educators feel that nursery schools do not educate and that teachers in nursery schools do not teach.[25]

A substantial body of literature on the role of nursery school teachers has been written by child development specialists, psychologists, and nursery school educators. Most of these research studies, however, are directed toward gaining knowledge on behavior and needs of the child in the nursery school setting rather than on gathering data about teachers.

There are many dissenting views of the role of the teacher. The reason for this may be found in the evolvement of nursery school philosophy.

At first the teacher's role was primarily that of an interested observer and recorder. Gans, Stendler, and Almy point out that during the early period the emphasis

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[24]Harold Taylor, "Role of Education in Contemporary Life," Childhood Education (November, 1959) p. 104.

[25]Clark E. Moustakis and Minnie P. Berson, The Nursery School and Child Care Center (New York: Whiteside, Inc. and William Morrow and Company, 1956) p. 17.

was on maintaining an environment in which adult direction was kept to a minimum and which was practically the same for each child.[26]

This approach was scientifically devised and rigorously adhered to in the early nursery schools.

The next phase in nursery education cast off this rigid teaching approach and emphasized the education of the whole child. Beyer comments that, "The teacher now focused on the child's social and emotional needs and utilized raw materials as creative media for stimulating the child's self expression."[27]

The role of the teacher was not "child-centered." In discussing the teacher's attitudes in such a setting, Biber says:

> She was expected to maintain a strict balance between guiding the children's play when necessary and retiring into the background before repressing the child's creativity. Interest centered in the child as an individual and the teacher was expected to help him develop his individual potential.[28]

A further move took place in the forties and was strongly influenced by the experiences in the emergency schools. This development was termed the democratic approach.

A survey of teaching practices conducted by Sigel in 1957 reveals that each of these roles is practiced by teachers

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[26]Gans, Stendler and Almy, Teaching Young Children, p. 56.

[27]Evelyn Beyer, The Teacher Sets the Stage (Chicago: National Association for Nursery Education, 1951) p. 2.

[28]Barbra Biber, Play as a Growth Process (New York: 69 Bank Street Publications (no date) p. 4.

in different nursery schools, depending on "The philosophy of the school leadership or upon the emotional needs of individual teachers."[29]

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[29]Irving Sigel, "How Does a Research Point of View Contribute to the Nursery School Teacher?" The Journal of Nursery Education, XIII (Fall, 1957) p. 109.

CHAPTER III

STATEMENT OF THE PROBLEM

A. Purpose of the Study

The main purpose of this study was to investigate the effect of two different nursery school approaches to learning on the development of mathematical concepts, and to determine from a review of the findings the implications for enriching early childhood curriculum.

How effective are various methods and materials used in nursery school and how do they effect preschool children's ability to learn? The trend in early childhood education appears to be fostering a teacher "hands off" policy. Materials are being set out where the children can use them and discover the objective for themselves.

At this level should all material, even that claiming to be self-instructive, be handled without some method of teacher instruction? The primary purpose of this study is to explore the effect of teacher guided instruction on learning outcome.

As a secondary purpose, this study investigates the effectiveness of play and play materials as teaching methods.

Two sub-problems will be considered:

1. To explore and assess the value of play as a teaching method of number concepts.
2. To explore and assess the value of academic training in nursery school in the specific areas of mathematics.

B. Development of the Problem and Hypotheses

In Chapter One, it was noted that there are two trends of thinking in early childhood education. One is concerned primarily with children's emotional and social development and the other which emphasizes intellectual growth.

The first group believes in educating the whole child. One should not try to teach specific skills in any organized sequence, but let the child learn from experiences that involve all aspects of his life: his emotions, relations to other children, surroundings, actions. As an example, children are supposed to learn most number concepts by simply playing with blocks. These are the traditional child development theorists.

The second group, the cognitive group, is concerned with how children learn to think and how the curriculum can be structured in order to promote this learning. They would take the most advantage of the sensitive period of children's earliest years.

As pointed out in Chapter Two, the cognitive group bases their ideas on the work of Jean Piaget, who describes how children construct their changing image of the world out of the ingredients supplied by their environment.

Until the early 1960s, the motto of early childhood educators was "don't push" young children intellectually. Intelligence was supposed to be fixed at birth. Only emotional factors could tamper with its development.

The cognitive psychologists, on the other hand, emphasize the eagerness with which children teach themselves skills when the environment is favorable. They believe a child who is given maximum opportunities to grow intellectually will also grow emotionally and socially and thus has no need for particular experiences in these areas.

This study is an attempt to find out if the theory advocated by the first group can be refined and added to by the theory of the second group. Development of the whole child is vital, and the traditional child development nursery school has always sought to individualize instruction and allow each child to do his thing. Discovery learning is built into many preschool activities and by providing a range of materials and allowing the child to engage in those which interest him at the moment, the traditional preschool capitalizes upon intrinsic motivation to learn in the best sense of that term.

Is it valuable to add to this program by including planned instruction for intellectual stimulation and training? Should the program attempt to further stimulate and enrich a child's environment?

As indicated in Chapter Two, Piaget's stages can serve as clues to the kind of experiences a child will find most challenging. A good match produces so much motivation and pleasure that it will become unnecessary to worry about pushing children.

It was also noted in Chapter One that in order to be effective, learning experiences must be pleasurable and repetitive. Children gain knowledge through play and they need rich backgrounds of concepts in all subject areas to further later learning.

Having decided upon the value of informal play to achieve cognitive development, it would be significant in this study to find out if children learn from informal play with teacher instruction of materials especially designed to develop concepts or if left to the discovery of the concept from non-guided use of the same materials.

The following experimental hypotheses were developed to guide the planning of this study:

Main Hypothesis:

> Children who are introduced, guided and instructed in the use of mathematical materials will obtain significantly higher scores on the CTB/McGraw-Hill Test of Basic Experiences - Mathematics. This will indicate a greater learning has taken place than that experienced by children who have not received this guidance and were exposed to the same materials and left to discover the concept through their own devices.

It is predicted that the two groups of children provided with planned teacher group sessions in order to be introduced to and instructed in the intended use of the material,

will attain greater success in acquiring certain number concepts than the two groups simply exposed to these materials during their free activity work period and left to discover the concepts from interest stimulated by the materials themselves.

Sub-Hypotheses:

a. The children in the four experimental groups involved in this study will show a significant gain in scores on the CTB/McGraw-Hill Test of Basic Experiences - Mathematics from the pre-test to the post-test which will indicate that the use of play and play materials are valuable as teaching methods.

b. The children in the four experimental groups will show significant gain scores on the CTB/McGraw-Hill Test of Basic Experiences - Mathematics from pre-test to post-test when compared with the children in the control groups who are involved in a child development program without special mathematical experiences.

This study focuses on mathematical concept development as a means of testing the value of intellectual training in nursery school because of the relative freedom of mathematics from cultural bias and its greater feasibility in testing on the preschool level in nursery school.

There is an increasing awareness of the importance of early mathematical experiences in building toward more

complicated concepts. Young children need ample opportunity to explore numerous concept materials that will lead to later abstractions. The child at this age is beginning to see certain relationships which are basic to the understanding of all types of reasoning. Specifically concerning mathematical reasoning, before the child can solve problems of distance, volume, and time, he must see that there is a difference between here and there, up and down, big and small, full and empty, few and many, early and late, summer and winter, and day and night. Before a child can grasp the concepts behind arithmetical problems, he needs to understand the ideas of more than, less than, larger than, smaller than, just the same as putting together, taking away from and similar relationships among objects.

If he is unable to see these contrasts, he will see no problem to be solved, for they will look the same and be unintelligible to him. All number experiences are preparing the preschooler for the formal learning of mathematics.

The nursery school curriculum therefore should offer experiences which are designed to stimulate cognitive development in all areas of formal learning.

CHAPTER IV

DATA COLLECTION

Introduction

Planning this study required the following steps:

A. Locating an instrument designed to evaluate the intelligence quotient of basically non reading four year olds and an instrument that could effectively evaluate the response of preschool children in the specific area of mathematics.

B. Selecting the mathematic materials to be used in the study.

C. Selecting a school and securing the cooperation of the teachers and parents of the children attending the preschool to be used in the study.

D. Selecting the population and equating the groups to be included in the study.

E. Formulating plans for administrating the testing program, for conducting the study, for scoring the responses and for interpreting the results.

F. Evaluating the results and formulating conclusions.

Each of the above steps will be dealt with in greater detail on the following pages.

A. Locating and Selecting Testing Materials

Instruments were selected that would measure the specific variables of the study. Test instruments used in the study were the Wechsler Preschool and Primary Scale of Intelligence and the CTB/MCGraw-Hill Test of Basic Experiences-Mathematics.

The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) consists of a battery of sub-tests, each of which when treated separately may be considered as measuring a different ability and when combined into a composite score, as a measure of overall intellectual capacity. The test battery is divided into verbal and performance test groups because the separation has proven diagnostically useful.

The test of Basic Experiences (TOBE) Mathematics by CTB/McGraw-Hill, attempts to determine a child's mastery of fundamental mathematical concepts, the terms associated with them, and his ability to see relationships between objects and quantitive terms such as the biggest piece of cake, the oldest boy, the most marbles and the number of eyes people have. This type of information is a prerequisite to much of the primary mathematics curriculum.

The pre-testing was started and completed during the month of August, 1971. The WPPSI was used to obtain the I.Q. of each child selected for participation in the study.

The CTB/McGraw-Hill TOBE Mathematics Test was used to evaluate each participant's knowledge of mathematical concepts.

Post testing was carried out during the month of February, 1972. All participants were tested again using the CTB/McGraw-Hill TOBE Mathematics Test to determine the gain scored in mathematical concepts.

All testing was done on an individual basis in a special room. The testing was accomplished by the research investigator who is trained in administering individual tests. The scoring was accomplished by the research investigator prior to and during the study. The evaluation of the scoring was made at the conclusion of the study.

B. Selecting Math Materials

Materials to be used in this study were selected based on the following criteria: study subjects needed materials in wide variety to give scope to their drive to experiment and investigate; the materials must fit children's natural activities in the area of mathematics and be designed primarily to foster the development of mathematical concepts.

There were numerous commercial and manufactured mathematical materials to be found and researcher designed materials were also utilized.

Abacus: A number frame made of hardwood containing ten rows of beads, one half inch in diameter with ten beads on each rod. One half of the beads on each rod are yellow and the other half blue.

Number Puzzle: Cards six inches by three inches containing numeral and corresponding number of objects - self correcting for matching numerals with objects.

Jumbo Color Dominoes: Hard maple blocks with bright color dots, three and three-quarters inches, double blanks to double sixes.

Geometric Shapes: Blocks of polypropylene, three inches high by one-fourth inches thick, in three colors.

Graded Cylinders - Sets with Knobs: Two and three-quarter inches by eighteen inches by three inches, each contains ten insert cylinders graded in height and diameter.

Graded Circles, Squares, Triangles: Raised form board in slide top wood storage box, eleven inches by twelve inches by one and one-half to three inches, in three colors, promotes bigger than, smaller than.

Counting Stairway: Ten pieces graduated in length from one inch to ten inches and scored at inch intervals, fitted onto a dowel to form a stairway - self correcting apparatus for learning sequence of numbers concept.

Number Sorter: Fifteen one-half inch wood dowels - arranged in sequence from a single dowel to five dowels are imbedded in a sixteen inch long board - fifteen two and one-half inch brightly colored rubber squares fit over the dowels from one square to fit over single dowel up to five squares with five holes for the five dowel grouping.

Peg Numbers: Ten five inch high rubber numbers of different colors are bored with holes into which are fitted colored pegs - the number of holes in each corresponds to the figure and allows for matching with number symbols.

Aluminum Liquid Measures Set: Five spun aluminum measures for experiments with sand and water - includes gill, half-pint, pint, quart, and gallon.

Ring Equalizer: Forty-four inches long by ten inches high, hardwood balance - challenges children to match one and three-eighths inch washers (as weights) on either side of the center of the balance. Children discover distance from center and quantity have an equation relation. Can also have meaningful addition and multiplication implications.

A Box of Things to Count: Bottle caps, stones, buttons, toothpicks, straws, and macaroni.

A Box of Pairs of Things: A pair of socks, a pair of shoes, a pair of mittens.

A Box of Objects of Different Sizes: Cans, bottles, boxes, spoons.

A Box of Objects of Different Weights: Paper, books, rocks, pencils.

An Oil Cloth: Eleven feet long to put on the floor and mark off from zero to ten to be used as steps, the children can walk from one number to the next.

C. Selecting the School and Teachers in the Study

The study encompassed the period of approximately two-thirds of the 1971-1972 school year, beginning on September 6, 1971 and ending February 6, 1972.

During the early spring of 1971, a nursery school in Plainfield, New Jersey was selected for participation in the study. The school was carefully screened before selection to insure staff, program and environment were of satisfactory quality. The school was well established, having a program that allows children to develop and explore within the limits of its child development philosophy, but open and cooperative to the employment of varied methods and materials.

This program consisted of well balanced, meaningful activity which gave children the opportunity to develop new skills, abilities and physical coordination and to learn self-reliance. The experimental school's developmental theory of education listed the goals of their program to help each child:

Develop increased awareness and appreciation of self.

Grow in understanding the world around him and his place in it.

Learn to speak, listen and use words creatively and correctly.

Develop basic perceptual skills needed to translate from gross play activity to scholastic training.

Find effective ways to work and play with other children and adults.

Build a strong, healthy body.

Another criterion for selection of the school for the study was the teaching staff. There were wide differences in the level of training, experience and philosophy among the number of teachers in existing nursery schools in the area. Factors such as the number of years of teaching, training, and public school and nursery school credentials were considered.

The staff of the school selected for this study had comparable training and experience, and held regular elementary school teaching credentials with experience at the primary level. The two teachers of the groups involved in the study were in their third year of teaching in this nursery school and were interested in the study.

As each child was registered for the school year, 1971-1972, a form requesting permission for the child's participation in the study was issued to the parents. Upon the signing of this form, a child's name was placed on a list for screening.

A negligible factor was that only two parents refused permission for their children's participation in the study.

D. Matching of the Groups in the Study

The children included in the study were four years old. To ensure that no over age children were included in the study, the subjects must have been born on or before November 1, 1967. These children would be eligible for enrollment in Kindergarten in the fall of 1972.

The number of children in the four experimental groups was forty, twenty boys and twenty girls. Two control groups were also formed, consisting of ten boys and ten girls. Each group of ten contained five girls and five boys. The children were from economically middle class homes and had parents who were education conscious. The school, because of tuition costs, enrolls children of middle income families.

All the children used in this study were those who had no prior nursery school experience.

Groups were matched according to chronological age, I.Q. scores from the WPPSI, sex and socioeconomic family background. The following measures were made in obtaining the data for these dependent variables of this study.

sex - school records

birthdate - school records

prior experience in nursery school - school records

reasons why the child was in nursery school - school records and conversation with school director and teacher and parents

socioeconomic status - father's occupation

I.Q. - score obtained on the Wechsler Preschool and Primary Scale of Intelligence

E. Collection of the Data

During the month of August, 1971, the sixty children selected for this study were individually tested with the Wechsler Preschool and Primary Scale of Intelligence and divided into six groups based on the results.

Each child was then tested with the CTB/McGraw-Hill Test of Basic Experiences - Mathematics in order to determine his level of knowledge of mathematics concepts.

The groups were assigned to teachers A and B. Three groups were scheduled to attend school on Mondays and Tuesdays and the other three groups would attend on Thursdays and Fridays.

The existing nursery school program continued on unaffected by the study. No changes or alterations were suggested by the researcher. The two control groups participated in this program.

During each day's session, two experimental groups were involved in a forty-five minute period using the mathematical materials. This period took place during their normal free play period.

The self-directed experimental group was brought by the teacher into the section of the room where the materials were displayed and encouraged to play with them. The teacher assigned then withdrew and merely observed from the sidelines. The children moved freely from table to table using the materials as they desired. No instruction was provided.

The teacher guided experimental group was taken by the teacher into the section of the room prepared with the mathematics materials and instructed in the use of the materials. The children were not simply informed of a concept, but were guided to discover it themselves through observation and teacher directed discussion. Games were played with the teacher who demonstrated the procedure to be used in order to derive the most learning from the situation and the accomplishment of the objective of the game.

These periods were conducted from September 6, 1971 through February 6, 1972. The sessions were scheduled so that each group received thirty-five periods.

Upon the conclusion of the allotted sessions, each child was again individually tested with the CTB/McGraw-Hill Test of Basic Experiences - Mathematics in order to determine the gain score in mathematical concepts during the study period. (See Table No. 1)

TABLE NO. 1

CTB/MC GRAW-HILL TOBE - MATHEMATICS - STANDARD SCORES

TEACHER A	CONTROL GROUP NO. 1			SELF-DIRECTED GROUP NO. 3			TEACHER GUIDED GROUP NO. 5		
	Pre Test	Post Test	Gain	Pre Test	Post Test	Gain	Pre Test	Post Test	Gain
	45	46	1	43	46	3	40	45	5
	43	45	2	45	49	4	37	48	11
	45	45	0	37	42	5	45	56	11
	56	56	0	48	49	1	48	56	8
	41	43	2	48	53	5	31	37	6
	37	38	1	48	51	3	37	48	11
	45	46	1	45	45	0	41	48	7
	45	45	0	45	49	4	48	56	8
	37	41	4	41	45	4	46	61	15
	49	51	2	56	56	0	56	56	0
TOTALS			13			29			82

TEACHER B	CONTROL GROUP NO. 2			SELF-DIRECTED GROUP NO. 4			TEACHER GUIDED GROUP NO. 6		
	Pre Test	Post Test	Gain	Pre Test	Post Test	Gain	Pre Test	Post Test	Gain
	53	53	0	45	48	3	43	46	3
	40	43	3	41	43	2	38	46	8
	37	38	1	45	49	4	56	61	5
	41	43	2	37	41	4	43	58	15
	48	49	1	45	49	4	33	38	5
	45	45	0	37	41	4	41	50	9
	45	49	4	53	56	3	48	56	8
	37	37	0	41	43	2	49	56	7
	40	43	3	40	43	3	56	60	4
	37	40	3	51	56	5	37	43	6
TOTALS			17			34			70

F. Analysis of the Data

The analysis of variance involves certain assumptions which have to be made in order to derive the table of significant values for the test. The values required for significance at the five percent level apply when these assumptions are satisfied.

1. The population from which the groups in the experiment were drawn is normally distributed.
2. There is homogenity of variance.
3. The subjects of the experiment have been randomly and independently drawn from their respective populations.

If it is known that these assumptions have been met, one can accept the conclusions based on the analysis of variance at face value. However, the practical usefulness of the analysis of variance procedure may be nearly as great when two of these assumptions are fulfilled as when all are satisfied.[1]

The subjects of this study meet the randomization requirement as they were selected at random from the applicants for the 1971-1972 session.

The assumptions of normality and homogenity of variance are not as easily made. Since the groups involved

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[1]Benton J. Underwood, Carl P. Duncan, Janet A. Spence, and John W. Cotton, Elementary Statistics in Education and Psychology (New York: Appleton-Century-Crofts, Inc. 1968) pp. 162-163.

in the study are small, there are not enough scores to indicate the shape of the distribution for each population. Cochran's test of the homogenity of variance was conducted.[2]

Cochran's C equals .1284 and is not significant at the .05 level. This homogenity of variance can be assumed as tenable for the data.

Analysis of variance was used in this study for testing the null hypothesis that there is no significant difference in methods of instruction. The research investigator wanted to find out whether the six groups' different scores were significant when compared by the measure of variability between groups with the measure of variability within groups. This permits the researcher to determine how large a value of the ratio of these two variabilities is required to indicate that the groups' gain scores differ more than would be expected if the null hypothesis were true.[3]

Table No. 2 presents a summary of the results of analysis of variance: significance was obtained at the .01 level. The null hypothesis that the population for the six groups learn equally under the two different approaches to learning is rejected.

Through analysis of variance, a significant F between groups was obtained to reject the fact that all the groups

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[2]Jerome L. Meyer, Fundamentals of Experimental Design (Boston: Allyn and Bacon, 1966) p. 73.

[3]Underwood, Elementary Statistics in Educational Psychology, p. 159.

TABLE NO. 2

SUMMARY OF THE ANALYSIS OF VARIANCE
OF THE EXPERIMENT ON EFFECTS OF TWO DIFFERENT
APPROACHES TO LEARNING IN NURSERY SCHOOL

Source of Variation	SS	df	MS	F	P
Between Groups	407.48	5	81.49	7.43	.01
Within Groups	592.104	54	10.965		
Total	999.584	59			

learned equally, but since more than two groups are being compared, a significant F does not imply that each group's scores necessarily differ significantly from every other group's scores. Thus, the researcher was interested in determining more exactly where the differences lie. Scheffe's Multiple Comparison Test was used to determine what groups and methods were causing significance in the analysis of variance.[4]

The results of the initial statistical computations involved in the Scheffe Test as applied to the data are summarized in Table No. 3.

On the basis of the data collected, the null form of the main hypothesis was rejected and the experimental hypothesis was accepted. It was concluded that the teacher directed program developed significantly higher scores on the CTB/McGraw-Hill Test of Basic Experiences - Mathematics than those obtained under the self-directed program. As indicated on Table No. 3, the difference between the teacher guided groups when compared with the self-directed groups is highly significant.

Based on the findings, the control groups who did not have the use of the mathematical materials in a play-learning situation, either self-directed or teacher instructed, did not obtain significant scores when compared with the self-directed groups, but the difference when compared with the

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[4]Allen L. Edwards, Experimental Design in Psychological Research (New York: Holt, Rhinehart and Winston, 1965) pp. 150-153

teacher-guided groups was significant. Thus in considering Sub-Hypothesis A, the null hypothesis was accepted in the case of control group versus self-directed group and rejected when comparing control group to teacher-guided group. It was concluded therefore that play and the use of play materials are valuable as teaching methods when their use includes teacher guidance.

A similar conclusion was made concerning Sub-Hypothesis B. The null form of the hypothesis was rejected in comparing the control groups with the self-directed groups as no significant difference in means was obtained. (see Table No. 3, Groups 1 and 2 versus 3 and 4). However, when comparing the control groups with the teacher guided groups a highly significant difference in scores calls for the acceptance of the experimental hypothesis. (see Table No. 3, Groups 1 and 2 versus 5 and 6). The conclusion was made that children involved in a child development nursery school program do benefit from planned mathematical instruction, provided this instruction is teacher guided.

As indicated on Table No. 3, comparing the means with Scheffe's Test, no significant differences were found between the two control groups, the two self-directed groups or the two teacher guided groups. (Groups 1 versus 2, 3 versus 4 or 5 versus 6). No significant differences were expected in these areas.

While the comparison of all the children receiving instruction with all the children on a self-directed program

TABLE NO. 3

SCHEFFE MULTIPLE COMPARISON TEST

Groups Compared	D	A	F'	Significance
1 vs 2	-4	.8	.072	NS
1 vs 3	-16	12.8	1.17	NS
1 vs 4	-21	22.05	2.01	NS
1 vs 5	-69	238.05	21.7	.05
1 vs 6	-57	162.45	14.9	.05
2 vs 3	-12	7.2	.81	NS
2 vs 4	-17	14.45	1.31	NS
2 vs 5	-65	211.25	19.2	.05
2 vs 6	-53	140.45	16.33	.05
3 vs 4	-5	1.25	.14	NS
3 vs 5	-53	140.45	16.33	.05
3 vs 6	-41	84.05	9.77	NS
4 vs 5	+48	115.2	13.38	.05
4 vs 6	-36	64.8	7.53	NS
5 vs 6	+12	7.2	.81	NS
1+2 vs 3+4	-33	54.45	4.9	NS
1+2 vs 5+6	-122	744.2	67.8	.05
3+4 vs 5+6	-89	396.05	46.05	.05

F' .05 = 11.85

results in a significantly higher score for the instructed groups, it is interesting to note that in the sub-comparison of Groups 3 versus 6 and 4 versus 6, the teacher guided group did not score significantly higher than the self-directed groups. The gain scores show a positive, though not significant trend in favor of the instructed group. In studying the data, the difference in these groups' scores seemed to be evident, but the size of the variance made it impossible to obtain an F value of sufficient size to be significant.

It is interesting to speculate what factors led to this one teacher guided group not scoring as high as the other teacher guided group. As explained previously, the four groups were set up based on an average I.Q. score. The random sampling allowed four children with high I.Q.s to be involved in the study. The pre-tests indicate that these children already had, at the beginning of the study period, a good understanding of many of the concepts to be developed. Those children scoring very high on the pre-test, scored high again on the post-test, and as a result did not achieve a significant gain.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. Summary of the Findings

Two questions are asked in this study: (a) What part does planned instruction play in preschool education, and (b) is a highly structured or less directive situation of more benefit to children's learning?

In an effort to develop the potential of children's early years, Piaget's theory of learning should be put to more use. The child development theory currently followed in many nursery schools emphasizes social and emotional growth - the intellect simply grows with maturation. Kohlberg's interpretation of Piaget's theory states that cognitive abilities grow through a process of organic environment interaction. Can the child development theory be enhanced by adding those experiences which Kohlberg says would encourage cognitive development?

There are many ideas concerning the importance of early childhood education. One of these is that early childhood education is critically important because of education's cumulative nature.

Data previously sited indicate that preschool education should offer experiences which are repetitive, use

concrete manipulative materials, and are pleasurable. The value of play as a teaching method at this level is therefore important as it appears to meet these criteria.

Research seems to indicate that the development of competence and the encouragement of cognitive development should be the objectives of a nursery school program. A teacher can help realize these objectives.

A review of the related literature reveals that ability to think can be reached through growth process, but is facilitated by planned educational experiences. A child can be helped toward proper concept formation through an organized goal directed approach.

The primary purpose of this study was to explore the effect of teacher-guided instruction on learning outcome. The sub-problems are to explore and assess the value of academic training in nursery school versus a strict child development program, and to explore and assess the value of play as a teaching method.

The hypotheses formulated in order to conduct this study are:

1. Children working under a teacher guided program learn more mathematical concepts than children working under a self-directed program in mathematical concepts.
2. Play and the use of play materials are valuable as teaching methods.

3. Children working under a program of planned instruction will learn more mathematical concepts than children in a straight child development theory of education program.

After an analysis of the data collected, the main hypothesis was accepted as those children involved in the teacher guided program had significantly higher scores than those obtained by the children under the self-directed program.

The sub-hypothesis that play and the use of play materials are valuable as teaching methods was accepted when use of play materials included initial teacher guidance.

The sub-hypothesis was accepted that children involved in a child development theory school benefited from planned mathematical instruction provided the instruction is teacher guided.

B. Conclusions

This program of research revealed that children gain more mathematical concepts through guided experiences and training in nursery school when there is teacher guided learning.

This program of research has also revealed that children of average and above average intelligence profit from planned experiences which are teacher guided while children of superior intelligence have a more limited growth under a teacher guided program. This may be the result of the more intelligent children having previously obtained these concepts from an outside source environment.

This program of research has demonstrated that a formal program with preschool children can enhance acquisition of mathematical concepts. The program has different consequences for children of superior intelligence. Nevertheless, each of these groups show gains particular to their knowledge and experiential base.

Practically, this means that educators interested in developing such programs should take into account the intelligence of the children in the group. The contribution such programs make to children's cognitive development resides in the degree to which they become involved with their environment.

The value of play as a teaching method has also been demonstrated in the study. Even the children under the self-directed program who were using the select mathematical materials in a play situation demonstrated an increased learning over the control groups involved in a straight child development program.

The children involved in a program of planned instruction, all those in the experimental groups, learned more mathematical concepts than those in the control groups. This would indicate that planned instruction is more beneficial than the emergent planning advocated by the child development theory of preschool education.

C. Recommendations - Curriculum

The new math encourages children to explore, to search for and discover quantitative values and interrelationships. Efforts are currently being made by mathematical curriculum developers to extend the use of the mathematical approach to the preschool level.

Kindergarten programs list the following topics: sets, recognizing geometric figures, comparison of sizes and shapes, comparison of sets, subset of a set, joining and removing, ordering, using geometric figures for directions and games, and using numbers with sets. Although this curriculum is not the only definite way of introducing mathematics at this early level, it is a good example of the kind of improved curriculum being developed today.[1]

Programs of preschool experiences in mathematics should emphasize exploration, discovery and comprehension of basic mathematical relationships and properties. Comprehension comes before computation or memorization of arithmetic facts.[2]

This program of research reveals the value of discovery in early childhood curriculum; children finding out or

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[1]Bernard Spodek, "Sources of Early Childhood Curriculum" Young Children, XXVI (October, 1970) pp. 47-49.

[2]Jean H. Orost, Mathematical Skills, Threshold Program for Early Learning, Vol. II (New York: MacMillian Company, 1970) pp. 9-10.

discovering new ideas or new relationships for themselves. This is the essence of Piaget theory - the child comes to an understanding of the world through his own efforts. While he may accommodate his thought to the ideas of others, it is only as he tries those ideas out within the context of the ideas he has previously acquired that he makes them his own.3

But there is no reason to believe that a discovery is more meaningful if the child has to flounder aimlessly for a time before making the discovery. The essence of Piaget's method is the assessment of the child's readiness to make a particular discovery, and the pacing of his educational experience to that readiness so that he will have both the intellectual content and the cognitive abilities needed to make it. There is nothing in either the theory or the method to imply that there is no place for the giving of direct instruction.

Piaget's materials, unlike many of those currently being prepared for the education of young children, are not intended to circumvent the teacher's attempts to intervene in the child's learning. Rather, they should render that intervention more appropriate and more effective.

Five cognitive areas have been derived from Piaget's research with children: classification, number, causality,

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3Millie Almy, Edward Chittenden, Paula Miller, Young Children's Thinking, Studies of Some Aspects of Piaget's Theory (New York; Teachers' College Press, 1966) pp. 136-137.

time, and space. These areas should be presented in the curriculum as a carefully sequenced set of goals that enables the teacher to focus on the development in children of specific kinds of thought processes essential to all mental growth.

The materials selected for the program should provide for the creative involvement of the children in the learning process rather than offer him success by mastering a set of correct answers.

The curriculum should be designed to help children not only to develop basic mathematical concepts, but to become better thinkers in any area of mental activity. The children learn by doing, experimenting, exploring and talking about what they are doing.

To enhance these learning experiences, there may be required a number of changes in the traditional child development classroom and teaching arrangements. Instruction should be conducted with individuals and small groups rather than a total class. Children should be actively engaged with learning materials rather than passively listening to explanations. Discussions should be designed to encourage speculation and ideas rather than factual answers, and verbal interaction among children should be encouraged.

These experiences should be introduced into the day's work as it is related to what the children are doing and

talking about. The value of these experiences lies in its related interest to the everyday living of the child.

D. Recommendations - Teacher's Role

The role of the teacher of preschool children in a curriculum which encourages cognitive development is active and creative. The material gathered in this study suggested a number of ways in which the teacher might function.

Children are continually seeking information and attempting to organize it into some kind of conceptual framework. Supporting and extending children's efforts in these directions becomes a responsibility of the teacher's role. There are many ways in which the teacher can meet this responsibility. One step is to give greater attention to answering satisfactorily the questions children ask.

There are many ways in which these questions can be answered. There is the simple, straightforward answer contributing a bit of information or confirmation of a fact the child already has. Concepts are built a little at a time and a little information at a time is all children really want or need.

The importance of play to the learning of children has been pointed out. Finding ways to guide this play so that it extends children's understanding and challenges their intellectual capacities is a part of the responsibility of contributing to children's cognitive development.

This study has emphasized the importance of the teacher's role in selecting and planning experiences that satisfy the intellectual needs of children.

In selecting and planning experiences, it is not proposed that a series of ready-made or preplanned experiences be provided every year for groups of children. This is not practical because of the fundamental idea of individual differences. Some of the children are ready for certain experiences at a certain time and others are not. The teacher should base the selection of specific experiences on observation of the children and assessment of their readiness.

The goals of the program, however, should be set up on a long range basis. One of the advantages of setting goals in terms of basic concepts and understandings is that these understandings can be achieved through any number of different kinds of experiences. This means there is a great flexibility in choosing the specific experiences for teaching certain concepts to children.

Concepts are built bit by bit over a period of time. Children need time to experience and assimilate new learning a little at a time. Experiences should be developed to contribute new information or understandings to a growing concept. Children should be provided with information and

then given time to assimilate it before more related information is supplied.[4]

A nursery school program depends on a well trained teacher. It is the teacher, skilled in knowing children and in knowing how to take their qualities and needs into account, who sets the tone for the nursery school program. The teacher's understanding, therefore, should go beyond a knowledge of children in general to each child in particular as individuals.

It is for this reason that contact should be person to person, or in a very small group. A nursery school teacher should not gather children together in a large group often because a child must relate to a few before he can relate to many. He has not yet mastered the give and take of group situations. There are, therefore, fewer times when the teacher brings them together in large groups for directed instruction.

The teacher should act on the basis that the most effective learning is that which proceeds from the child's own motivation and provide the child with choices; help him to consolidate his understanding through involvement, through play, through exploration of materials; and

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[4]Bernard Spodek, "Developing Social Studies Concepts in the Kindergarten" (unpublished doctoral dissertation, Teachers College, Columbia University, 1962) p. 97.

interact with him as resource and reinforcer to validate his choices and discoveries.[5]

A teacher should assume responsibility for assessing children's growth and learning, and decide when a child needs a concentration or broadening of the stimuli in his learning environment.

It is apparent from this research that providing the kind of experience needed involves some changes in the concept of the role of the teacher of preschool children. The basic concept of this role has been that of providing an environment rich in manipulative materials which challenges the children to explore, create, and solve problems which come from the use of these materials. The teacher's function has been to guide this process by improving the quality of problem solving. It has been a background role. The changes this research suggest are an extension of this role. Teaching which will contribute to children's cognitive development involves the guiding and supporting of thinking and reasoning.

The teaching technique involves the distribution of material, talking about each item to establish vocabulary, and giving the child time to play freely with the equipment. The technique then requires the posing of a problem, the solution to which is to be found using the equipment,

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[5]John Holt, How Children Learn (New York: Pittman Publishing Company, 1967) p. 153.

listening to the children's responses and asking the children to explain their answers. The children are not told they are wrong, nor are they given the right solution. Their attention is called to certain elements they have not noticed or they are directed to a gradual transformation. They may also be given other cures that will help them discover the solution for themselves.[6]

To accept the idea that the period from age three to age six is crucial to children's cognitive development because of learning's continuous nature is to accept that children make efforts to reason, to see cause and effect relationships. The teacher must recognize the need to help in all these processes which are part of cognitive development.

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[6]Ceilia Stendler Lavatelli, Knowledge Tree Films (Little Neck, New York: University of Illinois, 1971)

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