DOCUMENT RESUME

ED 300 126 PS 017 611

AUTHOR	Wakefield, Alice P.; Richards, Herbert C.
TITLE	To Play or Not To Play: The Case for Free Play in Kindergarten.
PUB DATE	88
NOTE	19p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Classroom Research; *Cognitive Development; Educational Practices; *Hypothesis Testing; *Kindergarten Children; Learning Centers (Classroom); Novelty (Stimulus Dimension); *Piagetian Theory; *Play; Pretests Posttests; Primary Education; *Selection; Serial Ordering
IDENTIFIERS	Decalage

ABSTRACT

Key elements in the construction of an operation were an integral part of an empirical study designed to test practical, pedagogical implications of the Piagetian model of cognitive growth. A total of 49 kindergarten children were pretested to determine their levels of seriation and classification operations. Pretests were conducted with a battery of Piagetian tasks that had been refined in a pilot study involving 50 additional children. Subjects were observed in a classroom where a learning center was equipped with a manipulative number board designed to foster seriation and classification skills. The number board was available in a free-choice format during a "free-play" activity hour, 4 days a week for a total of 15 days. Children were then posttested. It was predicted that children in transitional phases of constructing logical operations would freely choose to use the board more than children would who had already constructed these operations or were not close to constructing them. Decalage, which was based on how much variability existed among test sores measuring the same operation, was used as an index to determine which children were experiencing internal cognitive conflict. As predicted, children with the highest decalage scores used the manipulative number board significantly more often and with greater variety than did their low decalage counterparts. Board use was found to be significantly associated with gain in seriation scores. (RH)

To Play or Not to Play:

The Case for Free Play in Kindergarten

by

Alice P. Wakefield
College of Charleston
Education Department
Charleston, SC 29424

and

Herbert C. Richards
University of Virginia
Educational Studies
Charlottesville, VA
22903

For Additional Information
Write the Senior Author
or Call
(803) 792-8058

RESEARCH ABSTRACT

This study is based on Piaget's equilibration model which implies that internal cognitive conflict (i.e., disequilibrium) motivates a child to investigate the external environment in hopes of resolving his or her internal conflict. The result of this conflict, investigation and resolution is cognitive growth . It was predicted that children in this study who were in transitional phases of constructing logical operations (i.e., seriation, classification and conservation) would freely choose to use a manipulative number board offering seriation, classification and conservation experiences more than children who had already constructed these operations or were not close to constructing them. Decalage, based on how much variability existed among test scores measuring the same operation, was used as an index to determine which children were experiencing internal cognitive conflict. As predicted, those children with the highest decalage scores used the manipulative number board significantly more often and with greater variety than their low decalage counterparts. As a corollary to the main research question, a positive relationship between board use and pre-to-posttest change was predicted. Board use was found to be significantly associated with gain in seriation scores.

The question, what is learning and how can it be promoted, has been pondered by people for centuries. Since Jean Piaget's theory of cognitive development first became known in this country, psychologists, educators and parents have enthusiastically sought to make it the answer to that question. The relationship of structured experience to the construction of logical operations described by Piaget (e.g., seriation, classification and number conservation) is continually investigated. By examining the transitional phase between not having and having constructed these operations, researchers may discover ways to facilitate learning. For example, research by Siegler (1981) indicates children pass through several phases of understanding as they construct the concept of number conservation. Siegler found that children use up to three strategies (i.e., counting, one-to-one correspondence and analysis of the transformation) to perform number conservation tasks. Strategy preferences are presumed to be related to the quality of the child's thinking. As teachers of young children learn about this gradual, multiple-step process, they are more likely to offer their students number activities based on transitional stages rather than on any ultimate objective. Counting activities would occur less often as a rote exercise if a teacher were sensitive to the many levels of a child's thinking that precede the simultaneous coordination of cardination and ordination involved in counting to 10. Research that examines transitional thought processes could reveal an optimum time or phase when a logical operation would most likely be constructed by the child. Information such as this would be especially useful to educators.

Piaget's theory (1936/1952) implies that internal cognitive conflict (i.e., disequilibrium) motivates children to ponder, to consider, to examine (i.e., to think). This internal conflict remains until some kind of resolution is reached and the internal cognitive conflict resolved (i.e., equilibrium is restored). The resolution can be logical or illogical by adult standards. However, if it is acceptable to the child, the internal conflict eases, albeit temporarily if that resolution is not logical. The most powerful pedagogical point to be drawn from Piaget's theory of equilibration is that a child in a transitional phase, before an intellectual structure is formed, is capable of incredible intellectual breakthroughs. For example, a child who imperfectly performs a logical operation (mismatching pairs of dinosaurs) when confronted with evidence of his/her error (the last two dinosaurs do not match) may vigorously seek out objects in the environment that will help him construct a higher level of coordination (recheck other dinosaur pairs). If proper objects are found, the result is a better coordination of the partially constructed relationship. In this manner, cognitive growth ensues.

Research on conservation training has been carried out by investigators who seek crucial experiences that could nudge non-conservers into conservation. An early study by Wohlwill and Lowe (1962) examined the effects of reinforced practice, of biasing perceptual cues and of addition and subtraction on the acquisition of conservation. A more recent review of inducing success on concrete-operational tasks by Gelman and Baillargeon (1983), examines the effects of trainer modeling of more mature problem-solving behavior, adult instruction in which contradictions in the child's logic is pointed out and a correct explanation is offered, repeated experiences in counting and matching, and memory training which helps the child remember the component parts of the problem. They argue that "to the extent that preschoolers can be shown to benefit from training on some concrete-operational task, then to the same extent they can be assumed to possess (at least part of the) structural capacities relevant to this task" (p. 175). Piaget (1964), in commenting specifically on Wolhwill's research, acknowledged that Wolhwill was able "to obtain a certain learning effect" (p. 17). Piaget explained this by saying that learning was made possible by basing more complex structures on simpler structures, "that is, when there is a natural relationship and development of structures and not simply an external reinforcement" (p. 17). Piaget stressed that learning is subordinate to development. He was skeptical of research done in which the investigators have claimed success in the teaching of operational structures. He believed that the internal process of equilibration cannot be manipulated externally. Piaget, 1964, asked three questions of investigators purporting to have developed a successful conservation training procedure: (a) is this learning lasting? (b) how much generalization is possible? and (c) are the appropriate simple structures, upon which the more complex structures are based, a part of the child's cognitive functioning level? Gelman and Baillargeon assume if children are receptive to training of complex structures then the necessary simple, underlying structures are present by definition. Piaget's other two questions are rarely addressed in operational task training experiments.

If, as Piaget believed, the internal process of equilibration cannot be manipulated externally, then researchers who conduct empirical studies on the training of Piagetian tasks must be cautious in their claims if they have failed to consider that internal process in their research design. The very nature of an experiment on training logical operational abilities places the child (i.e., subject) in a situation that s/he has not freely chosen. If the internal process of equilibration is to function, it will . t be because an experimenter wishes it so. It will be because the child freely experiences internal conflict and seeks to resolve it. A random selection of young children (i.e., subjects) may include some children who are experiencing internal conflict related to the operation in question, but many, and perhaps most, would not. There are several other elements that are often lacking in operational task training experiments. Piaget and others have noted that the child is more attracted to moderately novel objects and situations than to familiar ones. This attraction has been noted in infants as young as several days, through all the stages of early childhood and into later childhood (Berlyne, 1960; Kagan, 1970; Piaget, 1972). Human learning takes place best when it is somehow related to what the child already knows, yet is novel enough to create interest and disequilibrium. Once that internal mechanism starts to function, the child will wrestle with the incongruities until they are resolved and equilibrium is established. Again, what is both novel and related to what is already known for one child (i.e, subject) may not be for the next. Without consideration of the individual subject's past experiences, internal cognitive conflict can not reasonably be predicted to occur. The construction of an operation occurs slowly. It takes time. It does not "happen" in a one-shot training session. Many experiences, repeated again and again, contribute to the construction of multiple phases prerequisite to the construction of the operation. In addition to time, there must be repeated opportunities to apply a newly mastered concept before moving on to more advanced levels (David Elkind, 1974, uses the term "horizonal elaboration" to refer to this process).

Key to the construction of a logical operation, yet lacking in most training experiments are these four basic elements: (a) free-choice of the child to follow his/her internal schedule of construction through the process of equilibration, (b) experiences and/or materials that are moderately novel to the child, (c) time for the child to test and retest the operation to see if it is indeed a logical structure, and (d) experimental opportunities that promote horizontal elaboration rather than vertical push.

If, as Piaget believes, a youngster experiencing disequilibrium will wrestle with the conflict until it is resolved and equilibrium is reestablished, then it should follow that youngsters in conflict (caused by disequilibrium) will seek out experiences and/or materials which offer them an opportunity for conflict resolution. If this is true, then specific learning opportunitites would be especially attractive to particular youngsters and of little interest to others. What is termed disequilibrium by Piaget could be considered each child's most "teachable moment," that optimum time when a logical operation would most likely be constructed by the child.

To test practical, pedagogical implications of the Piagetian model of cognitive growth, an empirical study was designed in which the elements key to the construction of an operation (i.e., free-choice, novelty, ample time, and horizonal elaboration) were an intrical part of the research design. Ninty-nine kindergarten children participated in this research. Fifty of these youngsters provided pilot data that was used to refine and scale a battery of Piagetian tasks (see note 1). Following this pilot research, the remaining 49 children were pretested to determine their levels of seriation (three scales) and classification (three scales) operations with the refined instrument battery. The children were then observed in a classroom setting in which a learning center was equipped with a manipulative number board designed to foster seriation and classification skills (Figure 1). This manipulative number board, which was the product of several years of development, provided opportunities for children to place a variety of objects (e.g., marbles, golf tees, washers and cylinders) into various relationships (e.g., order, class, 1:1). The board was available to all the children for 45 to 60 minutes per day. It was offered in a free-choice format four days a week for a total of 15 days. Children were neither encouraged to use nor were they instructed in how to use the manipulative number board. One board was placed in each of two kindergarten classrooms and was available, along with other kindergarten materials, during the "free-play" activity time. The duration and variety of board use for children judged to be in "cognitive transition" was compared to board use of other children. Finally, everyone was posttested on the Piagetian battery.

It was reasoned that children who were in cognitive transition would display high decalage (i.e., high variability) across scales designed to measure a common operation. Accordingly, each child was assigned a decalage score for seriation operations on the basis of his or her variance across the three seriation scales administered in the pre-test. Similar decalage scores were assigned for classification.

The children were then grouped into three categories: (Group A) those children who displayed little or no decalage (variability) for either seriation or classification operations (see note 2); (Group B) those children who displayed high decalage for one, but not the other, of these operations (see note 3); (Group C) those children who displayed high decalage for both operations (see note 4). It was predicted that children who were in cognitive transition (i.e., those in the highest decalage group) would freely choose to use the number board more frequently, for longer time periods and with more varie_ than their peers who were not in transition.

The results were in accord with the predictions. Although very few youngsters (there were four) were found who exhibited high decalage in both seriation and classification simultaneously, children of this kind (i.e., those in Group C) clocked, on the average, 56.9 minutes each on the number board; their low decalage counterparts (i.e., those in Group A) only clocked 20.3 minutes each. (See Table 1.) While these results were significant (decalage tends to affect board use, $p < .01$), it may be most useful to discuss what practical, general purpose this knowledge serves.

The fact that so few children were in the high decalage group (four out of 49) indicates that teacher-directed lessons and/or like assignments for the entire kindergarten class would be an inappropriate use of time (see note 5). Too few children may be in a receptive period for any one "lesson" to warrant requiring the attention of the whole group. Yet, while seeking a kindergarten setting for this research, the senior researcher encountered resistance from a school administrator who was afraid that the "free-play" period required for the research would deprive children of valuable instruction time. One of the two kindergarten teachers expressed concern about giving up classtime which she felt was needed to teach the required reading and math readiness skills. Because of these concerns, the free-play period permitted (none was regularly scheduled previous to this request) for the research was reduced from the requested 60 minutes to 45 minutes per day, and from five days per week to four. Piaget (1964) showed that concept development cannot be directed externally. Children are not passive recipients of information. There must be internal challenge before the external environment is investigated and lasting learning occurs. The best teacher can not _give_ her students this internal challenge. However, the teacher can create an appropriate setting for each student to use the cognitive conflict s/he is experiencing in the most productive way. By allowing the key elements of free-choice, novelty, ample time and horizonal elaboration to function in the kindergarten environment, the teacher is best able to enhance the development of the child.

In this study the major research question was the relationship between decalage and the use of a manipulative number board. While a significant positive relationship was found (children experiencing ·alage tended to make use of the manipulative number board), the corollary research question is of particular interest to advocates of free-play for young children. Children who freely chose to use the number board showed significant gains on their posttest, seriation scores when compared wih those who did not make use of the board (see note 6 and Table 2). Children experiencing disequilibrium seek conflict resolution by acting upon the materials they find in their environment. In this study, they gravitated toward the manipulative number board. This was in keeping with the research prediction and reaffirms the Piagetian model of cognitive growth. Seriation, pre-posttest, gain scores indicate that gain is significantly ($p < .05$) associated with board use. Not only do children initiate conflict resolution by actively seeking out and interacting with materials in their environment, but measureable, cognitive growth is likely to result from this interaction. Certainly these findings make a strong case for providing young children with regular periods of free-choice during which they are free to interact and experiment with materials as they explore, invent and construct their own knowledge.

NOTES

1 Three Piagetian tasks for each of the operations were scaled using a Guttman Scalogram Analysis. A copy of the test battery may be obtained by writing the senior author.

2. Group A children had consistently high scores or consistently low scores for both operations. There was no evidence of decalage which was used to indicate the possibility of cognitive conflict. Thus, Group A children showed no evidence of being in a period of cognitive conflict in either seriation or classification.

3. Group B children had scores that were inconsistent on one of the two operations. The responses of children in this group indicate that thinking was logical some but not all of the time on one of the operations. The inconsistency indicates horizonal decalage on either seriation or classification and is associated with cognitive conflict in that one operation.

4. Group C children had scores that were inconsistent on both of the operations indicating that these children were experiencing high cognitive conflict. Thus, Group C children were in a period of cognitive transition for both seriation and classification operations.

5. The other 45 children were likely experiencing varying degrees of cognitive conflict as they constructed other operations and sought other materials to explore (e.g., blocks, house-keeping, puzzles, etc.) and which were available during the free-choice activity period.

The point is that children are busy thinking about and acting upon what is of interest to them.

6. There were no significant gains on classification posttest scores. This may indicate that the children were not seeking the board for classification opportunities or it may indicate that the classification scales were not difficult enough to register potentially higher posttest scores. Testing for decalage scores requires a different instrument from the ususal pre-posttest instrument.

TABLE 1

Means, Standard Deviations, F-ratios, and a-priori comparison t-ratios for Board Use, Board Use Adjusted for Attendance, and Variety as a Function of Decalage Group Membership (See Notes)

Variable	Decalage			F-ratio	t-ratio
	Group C (N= 4)	Group B (N= 15)	Group A (N= 30)		
Board Use	49.50 (25.17)	18.93 (20.08)	18.93 (18.65)	4.48*	2.93**
Board Use Adjusted for Attendance	56.90 (29.72)	21.96 (25.41)	20.26 (20.02)	4.74*	3.06**
Variety	2.53 (1.20)	1.17 (1.25)	1.15 (1.12)	2.55	2.22*

*$p < .05$

**$p < .01$

Note 1. Group A included all subjects who displayed little or no decalage for either seriation or classification operations; Group B included those who displayed high decalage for one, but not the other, of these operations; Group C included those who displayed high decalage for both operations.

Note 2. Board use scores represent the cumulative number of minutes child attended to the manipulative number board;

TABLE 2

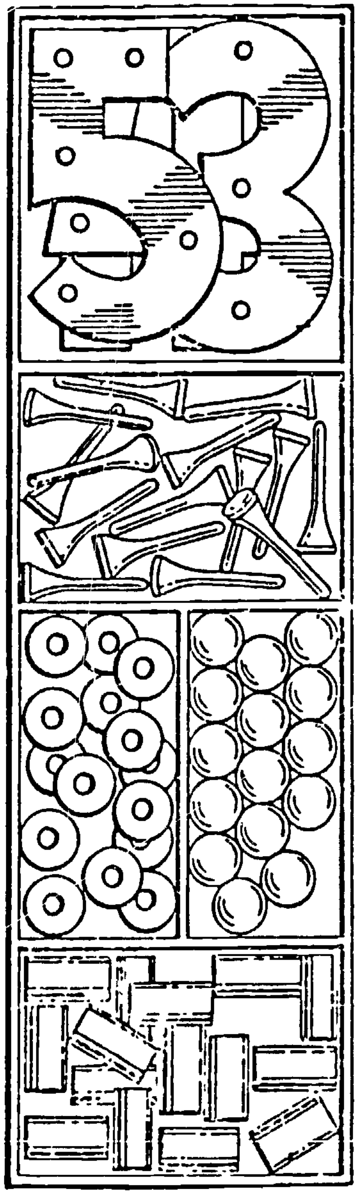
Mean Pre- Posttest Gains on Seriation, Classification, and Conservation, and Correlations of Gain Scores with Board Use (BU), Board Use Adjusted for Attendance (BUADJ), and Variety (V)

Variable	Mean Gain (Standard Deviation)	Correlation		
		BU	BUADJ	V
Seriation	.68 (1.00)	.26*	.23*	.31*
Classification	.81 (1.25)	-.10	-.09	-.06
Conservation	1.08 (1.74)	-.06	.03	.00

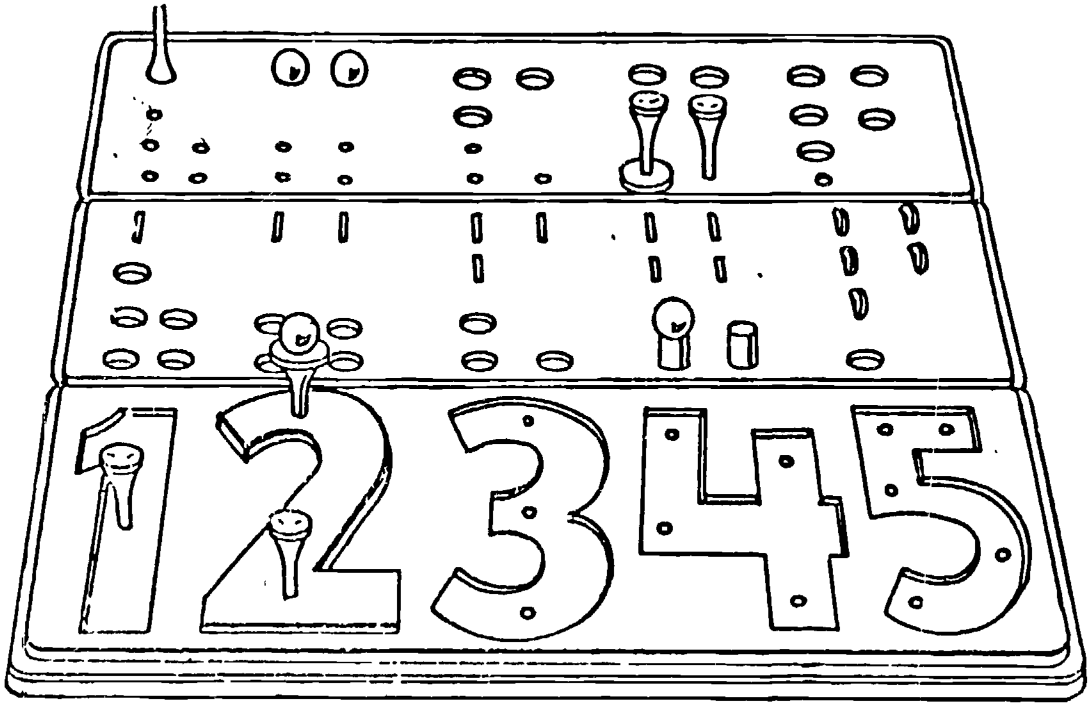
*p < .05

Note 1. Board use scores represent the cumulative number of minutes a child attended to the manipulative number board; variety scores represent the number of ways a child used the board.

Figure 1



Materials Box



Manipulative Number Board

References

Berlyne, D.E. (1960). Conflict, arousal and curiosity. New York: McGraw-Hill.

Elkind, D. (1974). Children and adolescents: Interpretive essays on Jean Piaget. New York: Oxford University Press.

Gelman, R., & Baillargeon, R. (1983). A review of some Piagetian concepts. In P.H. Mussen (Ed.), Handbook of child psychology (Vol. III). New York: John Wiley & Sons.

Kagan, J. (1970). Attention and psychological change in the young child. Science, 170, 826-832.

Piaget, J. (1952). The origins of intelligence in children. (M. Cook, trans.). New York: International University Press. (Originally published, 1936.)

Piaget, J. (1964). Development and learning. In R.E. Ripples & V. N. Rockcastle (Eds.) Piaget rediscovered: A report on the conference on cognitive studies and curriculum development, March 1964. Cornell, N.Y.: Cornell University Press.

Piaget, J. (1972). The principles of genetic epistemology. (W. Mays, trans.). New York: Basic Books, Inc.

Siegler, R.S. (1981). Developmental sequence between and within concepts. Monographs of Society for Research in Child Development, 46 (2, Serial No. 189).

Wohlwill, J.F., & Lowe, R.C. (1962). Experimental analysis of the development of the conservation of number. Child Development, 33, 153-167.