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ABSTRACT

A twenty-four item inventory was constructed and standardized in order to develop an instrument which measures the degree to which a preschool teacher adheres to Piaget's epistemological belief system. Using two criterion groups of teachers and graduate students--one Piagetian and one behaviorist--the inventory exhibited the ability to discriminate between Piagetians and non-Piagetians. Furthermore, a high degree of internal consistency was evidenced. The rating scale, entitled the Pre-School Teachers' Beliefs Inventory, is appended. (RD)

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STANDARDIZATION OF A PIAGET-BASED PRE-SCHOOL TEACHERS' BELIEFS INVENTORY

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INTRODUCTION

The essence of Piaget's theory is primarily epistemological in nature. Piaget's singular concern is with the development of the relationship between the knower and the known. Genetic epistemology is directed toward the understanding of the nature of human knowing through a study of the development of knowledge during childhood. It is Piaget's belief that the different intellectual stages of childhood are characterized by different conceptions of the world, and therefore different qualitative levels of knowledge.

Central to Piaget's theory is the adherence to a constructivist epistemology. This means that knowledge must be viewed as an individualized construction. Individuals adapt their cognitive structures to unique perceptual data. All knowledge is relative to individual actions and permeated by subjectivity. The constructivist epistemology carries with it the notion that knowledge originates neither from the individual nor from the external environment, but rather the genesis of knowledge is the result of a mutual interaction of subject and object. Piaget views the acquisition of knowledge as a biological adaptation, in the sense that the development of logical structures is looked upon to be a natural sequential process. This is not to say that intellectual growth cannot be either retarded or facilitated by environmental conditions.

Recently, the developmental theory of Piaget has come to the forefront of early childhood education (Evans, 1975). A number of attempts have been made to implement Piaget's theory in the classroom (Hooper, 1974), but most of these attempts merely draw from Piaget's psychology, and tend to overlook the importance of his underlying epistemological concerns (Kaufman, 1975).

Implementation of a truly Piaget-based program must be accompanied by a strong belief in Piaget's constructivist epistemology.

The psychological perspective is sometimes sufficient for psychologists who use parts of Piaget's theory to study children. For educators, however, this view is too limited and can result in misapplications of the theory. Educators must understand Piaget's basic ideas about the nature of knowledge and the mechanisms of its development. (Kamii and DeVries, 1973)

It is with this notion in mind that an attempt to standardize an instrument that measures the degree to which one adheres to Piaget's epistemological belief system was undertaken.

Review of the Literature

An early attempt at measuring a teacher's belief system was the "This I Believe" Test (TIB). Its purpose was to assess the degree to which a teacher's belief system was either concrete or abstract (Harvey, 1965, 1968). The TIB required the subjects to write answers to items such as "This I believe about religion" and "This I believe about friendship". These answers were then analyzed as to the relative abstractness or concreteness of their content. In addition to the TIB, Harvey constructed an objective measure of beliefs, the Conceptual Systems Test (CST). The CST was developed through factor analysis, and factors were found which were consistent with the major characteristics of the different levels of abstractness as measured by the TIB.

The Personal Beliefs Inventory was developed to determine the extent to which an individual's beliefs reflect Deweyian Experimentalism (Brown, 1968). Brown gathered approximately 1200 statements that were representative of Dewey's experimentalist-philosophy. Through the process of categorizing, gaining the acceptance of expert judges, and calculating effects on reliability, the number of statements was reduced to create a presentable instrument.

A previous attempt at measuring Piagetian beliefs, the Teacher Belief Rating Scale, was undertaken by Verma and Peters (1975). Beginning with ten theoretical assumptions about the nature of children, development, and learning, Verma and Peters proceeded to choose five of these assumptions, and subsequently constructed six Likert-type items matched to each of them, three being consistent with Piagetian beliefs and three being consistent with operant beliefs. The final form contained twenty-four items, and two scores

per subject were obtained by summing the Piagetian and operant items separately. Verma and Peters' measure of Piagetian beliefs does have some problems, as their calculations of internal consistency reliabilities are relatively low (.56 and .66 for the Piagetian and Operant scales respectively, N=38). Also their methodology used for validation is weak, as their three criterion groups total eleven subjects (Piagetian N=3, Operant N=3, and Other N=5). Clearly this measure of Piagetian beliefs could be improved upon.

Instrument Construction

Initially, Piaget's major texts were gleaned in an attempt to ascertain clear cut statements of Piaget's constructivist epistemology. Direct quotations from Piaget's writings were paraphrased to form an initial pool of items. Each of the ninety-seven statements generated in this manner were then placed into one of four categories: (1) the nature of knowledge, (2) the nature of knowing, (3) the nature of representation and memory, and (4) the nature of development. This group of statements was then submitted to a panel of "Piagetian experts", composed of five professors and one pre-school project director; all strong proponents of Piaget's theory. The seventy statements which received approval from at least five of the six judges were retained in the pool and examined as a possibility for the preliminary form. After discarding grossly repetitive items, half of the remaining statements were modified to be directly contradictory to Piagetian epistemology so as to guard against response bias. The preliminary test form included sixty-two statements to be rated on a six point Likert Scale ranging from Strongly Agree to Strongly Disagree.

This preliminary form was then administered to a sample of 45 graduate and undergraduate students at Washington University, all of whom had clinical experience in early childhood education. After an examination of item-total correlations, and reliabilities of different sets of items, the final form of the PTBI containing twenty-four items was arrived upon. To insure that the content of this final form was representative of the entire construct, each of the four categories were represented by six items, three consistent with and three contrary to Piaget's epistemology. Test scores were obtained

by summing the item scores, which ranged from one to six. For items 1, 2, 4, 6, 9, 11, 12, 16, 19, 21, 22 and 24 a Strongly Agree was counted as six, while for the remaining items a Strongly Disagree was counted as six. High scores indicate strong adherence to Piagetian beliefs.

The completed form of the PTBI was then sent to two criterion groups, one Piagetian (N=16) and one Behaviorist (N=16). The Piagetians consisted of teachers from a Piaget Pre-School Education Program. The Behaviorists consisted of graduate students in a behavioral analysis program.

Results

Reliability. From the sample of Washington University students (N=45), a measure of the internal consistency reliability of the PTBI was calculated using coefficient alpha (Cronbach, 1951), and found to be .81. A second determination of internal consistency reliability was based upon the sample composed of the two criterion groups (N=32). In this case, coefficient alpha was computed to be .98. Using the total sample (N=77), a third estimate of internal consistency reliability was found to be .95.

Predictive Validity. A point-biserial correlation was employed in order to assess the extent to which the PTBI could differentiate between Piagetians (N=16) and Behaviorists (N=16). This correlation was determined to be .851 ($t=8.892$, $p < .001$). Difference in the means of the two groups was substantial (118.2 and 58.5 for the Piagetian and Behaviorist means respectively). Moreover, there was no overlap between the two groups, as Piagetian scores ranged from 98 to 138, which Behaviorist scores all fell between 37 and 95.

Factor Analysis. An investigation into the factorial composition of the PTBI was undertaken using the total sample (N=77). Using the principal axes method with iterations, the initial extraction of twenty-four factors produced four factors with eigenvalues greater than 1.00 (Table 1).

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Insert Table 1
about here.
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Table 1

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	11.91327	49.6	49.6
2	2.22654	9.3	58.9
3	1.29893	5.4	64.3
4	1.08711	4.5	68.9
5	0.88162	3.7	72.5
6	0.75238	3.1	75.7
7	0.62886	2.6	78.3
8	0.61072	2.6	80.8
9	0.56749	2.4	83.2
10	0.54112	2.3	85.5
11	0.46952	2.0	87.4
12	0.45765	1.9	89.3
13	0.39906	1.7	91.0
14	0.36875	1.5	92.5
15	0.33181	1.4	93.9
16	0.24038	1.0	94.9
17	0.23403	1.0	95.9
18	0.22081	0.9	96.8
19	0.20601	0.9	97.7
20	0.16603	0.7	98.3
21	0.12709	0.5	98.9
22	0.12077	0.5	99.4
23	0.08763	0.4	99.7
24	0.06242	0.3	100.0

Again using principal components factoring with iterations, but restricting the number of factors to four, only two of the factors possessed eigenvalues greater than 1.00. Subsequently, two orthogonal factors were rotated using the varimax method, in order to obtain a more interpretable factor matrix. This matrix was analyzed to determine the possibility of the existence of two factors. Minimal evidence was found for the presence of a second factor composed of four to six items which reflect a strong behaviorist orientation. But subsequent analysis of a factor matrix containing only loadings on a single factor led to the more stable conclusion that the PTBI is a relatively pure measure of a single factor (Table 2).

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Table 2

ITEM	FACTOR 1
1	0.75712
2	0.83495
3.	0.34941
4	0.77795
5	0.67947
6	0.75853
7	0.57966
8	0.69145
9	0.68129
10	0.47271
11	0.68655
12	0.76989
13	0.60020
14	0.61950
15	0.52017
16	0.85083
17	0.75761
18	0.86135
19	0.64564
20	0.71424
21	0.79536
22	0.55911
23	0.57956
24	0.75988

Discussion

The PTBI clearly possesses a high degree of reliability, while also exhibiting an excellent ability to discriminate between Piagetians and non-Piagetians. The potential usefulness of an instrument of this kind is unlimited, as it could enable teachers and schools to recognize their beliefs concerning the epistemological issues that Piaget addresses. With Piaget's theory having become quite influential in American early childhood education, and with the notion that an adherence to Piaget's constructivist epistemology is necessary for successful pedagogical implementations of his theory, an instrument which is able to ascertain the degree to which an individual possesses Piaget's epistemological ideas has strong implications.

The PTBI could be used to determine what is fertile ground for implementations of Piaget-based educational programs. Evidently, the PTBI could enable the matching of an individual's belief system to a classroom style which is reflective of that belief system, which is a necessary step towards the unification of epistemological beliefs and educational practices.

Furthermore, comparing the measures of internal consistency of the two sample groups has appreciable suggestions. The sample composed of the two criterion groups, which is characterized by specific belief training, differs substantially from the group of Washington University students who lack systematic guidance concerning belief systems. This implies that training with respect to epistemological beliefs might lead to a more consistent, and therefore more meaningful, set of beliefs.

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PRE-SCHOOL TEACHERS' BELIEFS INVENTORY

This is a study of what people believe about the nature of knowledge, the acquisition of knowledge, and the representation of knowledge. Each statement below describes a particular belief a person may hold relative to the nature, acquisition, and representation of knowledge. A number of different and contrasting beliefs are presented. THERE ARE NO "RIGHT" OR "WRONG" ANSWERS TO ANY OF THE BELIEF STATEMENTS. These are statements upon which individuals have different opinions and points of view. As you read these statements, you will find yourself agreeing with some, disagreeing with some, and uncertain about others. The best response to each statement is your personal belief or opinion.

Answer every item by checking (✓) either Strongly Agree, Moderately Agree, Slightly Agree, Strongly Disagree, Moderately Disagree, Slightly Disagree: depending on how you feel in each case. Please answer every item.

1. Play and imitation are acts of knowing for the young child.

/	/	/	/	/	/
STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE

2. As the individual develops, he becomes increasingly more aware of the existence of himself as a thinking being.

/	/	/	/	/	/
STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE

3. Knowing an object means knowing its physical characteristics.

/	/	/	/	/	/
STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE

4. The individual progressively learns that his own viewpoint is relative.

/	/	/	/	/	/
STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE

5. Only quantitative changes in memory occur throughout development.

/	/	/	/	/	/
STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE

6. The acquisition of knowledge is one's personal integration of experience.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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7. An individual's ideas are a product of environmental impressions.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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8. Learning under the conditions of external reinforcement produces changes in logical thought structures.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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9. Both the external world and the individual exert a strong influence on each other.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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10. Knowledge can be gained directly from sensory experience.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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11. Knowledge originates as a coordination of physical and mental actions.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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12. Knowledge evolves toward a higher level of organization.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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13. Knowledge involves a summation of discrete pieces of information.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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14. The development of intelligence can be looked upon as the gaining of larger quantities of knowledge.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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15. The attachment of a specific memory to a past experience does not involve logical thinking.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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16. Representation is an integral part of logical thought.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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17. During the course of development, an individual's capacity to represent information remains constant.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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18. Each period of development is independent of its successor.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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19. Something is remembered through its incorporation into more general patterns of thinking.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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20. Teaching can change the sequential order of development.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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21. Throughout an individual's life, he constantly reorganizes his memories, preserving material, but constantly adding new elements which serve to change its significance.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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22. In order to understand an idea, the individual must invent it for himself.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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23. The development of logical thinking consists of responses of individuals to specific environmental stimuli and reinforcement.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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24. Through the course of development, new thinking patterns are formed which are qualitatively different from the old patterns.

STRONGLY AGREE	MODERATELY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	MODERATELY DISAGREE	STRONGLY DISAGREE
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