DOCUMENT RESUME

ED 041 727 SE 008 119

AUTHOR Buell, Robert R.
TITLE Piagetian Studies: Effect of Sub-Cultural Pressure in Quantification Upon Task Performance.
INSTITUTION Toledo Univ., Ohio.
PUB DATE Mar 70
NOTE 10p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (43rd, Minneapolis, Minn., March 5-8, 1970)

EDRS PRICE EDRS Price MF-$0.25 HC-$0.60
DESCRIPTORS *Cognitive Development, *Conservation (Concept), *Economically Disadvantaged, Learning Processes, Middle Class Culture, Rural Youth, *Socioeconomic Status, Suburban Youth

ABSTRACT

This paper examines recent research for differences on rate of conservation achievement between the subcultures: (1) rural vs. urban-suburban, (2) white vs. black, (3) subculture of poverty vs. middle class WASP, and (4) lower vs. middle socioeconomic status. The author concluded from his examination of research that: (1) among middle-class whites there appears to be no significant difference between urban-suburban and rural children of ages 6, 7, and 8 on conservation of weight and substance; (2) indicators of the effect of combination of low socioeconomic status and subculture on ability to conserve suggest a need for deeper study throughout a school system (Headstart to Grade 12); (3) the low pressure to quantify which exists in black communities must be sought for more extensively and intensively in the Grade 1 through 8 sequence; (4) grade-placement volume and falling ball disjunction) are necessary for readiness, will need to differ by the time Grade 8 is reached if the low pressure for quantification is not corrected. (BR)

NARST Convention Minneapolis, Minn. March 5-8, 1970

PIAGETIAN STUDIES: EFFECT OF SUB-CULTURAL PRESSURE IN QUANTIFICATION UPON TASK PERFORMANCE

Robert R. Buell
The University of Toledo
43606

Lesser (1963), using a non-Piagetian instrument to assess four cognitive abilities (verbal, reasoning, numerical, spatial) showed differences between Jewish, Chinese, Negro and Puerto Rican primary children in New York from these subcultural groups. Fort, Watts and Lesser (1969) replicated the results in Boston with Jewish and Negro children. The rank order between subcultural groups of these qualitites varied significantly, but within group (over both lower and middle class socio-economic status (SES) samples) order remained the same. Whereas Jewish children at both SES levels excelled in verbal and numerical skills, the Negro children ranked lowest in numerical skills, from which it is deduced that there are between these two subcultures, values of greater and less degree.

Pressures to attain some of these skills are greater in some subcultural groups than in others. By Lesser's data, pressure to quantify is less for Black subculture than for the Jewish, Chinese and Puerto Rican subcultures (though Puerto Ricans are also low).

Since 1966, a series of publications has compared, on Piagetian tasks, primitive and non-Western subcultures with those of Swiss, British and United States white, middle-class children's conservations. Prince (1968) in Papua-New Guinea, Poole (1968) in Nigeria, and Greenfield (1966) in Senegal have shown differences between rural, semi-urban and urban children in developing countries. The effect of one Western-subculture parent or grandparent among the Australian aborigenes was shown by deLemos (1966-1969) to produce differences in conservation tasks;

residual Stage II (nonconservers) in both samples may reflect the group (mentioned by both Prince and deLemos) who do not, and probably never will, conserve; evidence that they come chiefly from low SES and non-WASP is by inspection. This preliminary study indicates that a more exact method of SES - and subcultural - differentiation needs to be made.

2. Grade-placement of curriculum items for which the two conservations used (occupied volume and falling ball disjunction) are necessary for readiness, will need to differ by the time Grade 8 is reached if the Lesser effect of low subcultural pressure for quantification among blacks is not corrected by Grade 8. (It appears in Kerr's and Ludgate's samples not to have been done.) Other studies have shown that this difference in SES/culture between lower and middle class whites and blacks exists in Head Start and Grade 1, and subsequently throughout the elementary school period.

3. Among middle-class whites there appears to be no significant difference between urban-suburban and rural children of ages 6, 7 and 8, on conservation of weight and substance. More remote rural children, inner-city urban children and other such groups should also be tested on this matter, both by SES and by subcultural group.

4. Enough indicators of the effect of combination of (low SES/culture of poverty) on ability to conserve suggest deeper study all through a school system (Head start to Grade 12). If this proves longitudinal significant differences (as it presumably will), school bussing will not be a solution; remediation by using Sigel's training procedures (seriation, multiplicative classification, etc.) and other techniques should be extended beyond his limits (Head Start to Grade 2) as far as Grade 9.

5. The low pressure to quantify which Lesser shows exists in Puerto Rican

from CA 6 to CA 8, shown in many preceding studies, is noted. Hence the null hypothesis was accepted. The rural children in a village 40 miles from Toledo (population 90) appear to be as advanced in these two tasks as those selected from a middle-class suburb of that city. More evidence is needed, however, contrasting more remote villages with urban-suburban subculture. As in all reported studies herein, the first action was to be sure the children understood what was being done, then to ask for a prediction, followed by a justification ("Why do you think so?") to determine whether or not conservation was present.

SES-Black vs. White. Two studies of Grade 8 children using the classic Piagetian task for occupied volume ("build a house as big as this house") allow us to compare, in preliminary fashion, task performance by lower SES blacks with a mixed group on color and SES (but predominantly white, middle-class). Kerr (1967) worked with a sample (mean CA 14.5, mean IQ 89) selected from an all-black, lower SES slum area school (rural). Ludgate's sample (1968) was chosen from a school which draws from widely variant SES levels, and from white, black and Mexican-American subcultures. The results are compared in Table 3. Ludgate's sample (mean CA 13.7, mean IQ 99) is a year younger and 10 IQ points higher than Kerr's (whose sample is already reduced by a 55% dropout rate at her school.)

Both Kerr and Ludgate show a correlation corefficient (Piagetian stage X IQ) significant at the 1% level. There is, however, a widely different percentage at the upper Piagetian stages (Stage II is about identical).

	Non-conservers Stage II	Intermediate Stage III	Conservers Stage IV	Mean CA
Kerr	33.3	41.7	25	14.5
Ludgate	31.5	21.2	47.3	13.7

If we select the 80% conservation level as the optimum time to grade-place problems dealing with occupied volume (to insure that 80% are ready), then Ludgate's sample

will approach this by Grade 9.5, whereas Kerr's sample will not do so until after Grade 10.5.

Where both Kerr and Ludgate used only Grade 8 samples, Reamsnyder (1968) used the Piagetian disjunctive task for propositional thinking through examination of 3 levels, Grades 7, 9 and 12, the first two groups of which were chosen from the same school as Ludgate used, but selected to show markedly the two ends of the SES spectrum. Estimates of "academic ability" (A) were obtained for each student from his accumulated grade point average (in the dichotomy "high, low"). Using school level (grade), ability and SES group (high,low) Reamsnyder was able to prepare an analysis of variance (ANOVA) for between - and within - group variance and for four interactions, all of which are shown in Table 4.

Differences significant at the 1% level were found for "conservation X grade" and for "conservation X ability". The interaction "conservation X 3 effects" was significant at 10%, but for "conservation X SES" alone only at the 25% level, as was "conservation X ability-SES".

The growth of disjunction is thus shown to be progressive (1% significance level) over the grade levels 7, 9, 12, and is highly related (1% level) to school achievement ability (which correlates highly with mental age). The latter bears out the significance of correlation (1%) found by both Kerr and Ludgate between "conservation X IQ" (known to correlate highly with school marks among middle-class white children.)

Conclusions

1. Real differences were found in occupied-volume conservation by comparing Kerr's low SES/black population with Ludgate low-middle SES/mixed population. The

residual Stage II (nonconservers) in both samples may reflect the group (mentioned by both Prince and deLemos) who do not, and probably never will, conserve; evidence that they come chiefly from low SES and non-WASP is by inspection. This preliminary study indicates that a more exact method of SES - and subcultural - differentiation needs to be made.

2. Grade-placement of curriculum items for which the two conservations used (occupied volume and falling ball disjunction) are necessary for readiness, will need to differ by the time Grade 8 is reached if the Lesser effect of low subcultural pressure for quantification among blacks is not corrected by Grade 8. (It appears in Kerr's and Ludgate's samples not to have been done.) Other studies have shown that this difference in SES/culture between lower and middle class whites and blacks exists in Head Start and Grade 1, and subsequently throughout the elementary school period.

3. Among middle-class whites there appears to be no significant difference between urban-suburban and rural children of ages 6, 7 and 8, on conservation of weight and substance. More remote rural children, inner-city urban children and other such groups should also be tested on this matter, both by SES and by subcultural group.

4. Enough indicators of the effect of combination of (low SES/culture of poverty) on ability to conserve suggest deeper study all through a school system (Head start to Grade 12). If this proves longitudinal significant differences (as it presumably will), school bussing will not be a solution; remediation by using Sigel's training procedures (seriation, multiplicative classification, etc.) and other techniques should be extended beyond his limits (Head Start to Grade 2) as far as Grade 9.

5. The low pressure to quantify which Lesser shows exists in Puerto Rican

and black communities must be sought for more extensively and intensively in the Grades 1 through 8 sequence, since there is some evidence of it reported here. Like Basil Bernstein's "restricted language", it may be subculture-related as a shibboleth.

Bibliography

deLemos, M. M. (1966) "The development of the concept of conservation in Australian aborigines children". Unpub. Ph.D. thesis, Australian National University, Canberra.

-----, (1969) "Conceptual development in aborigines children". in S. S. Dunn and C. M. Tatz (eds.), Aborigines and Education. Melbourne: Sun Press

Fort, J. G., J. C. Watts and G. S. Lesser, (1969), "Cultural background and learning in young children." Phi Delta Kappan (Mch 1969) 386 ff.

Greenfield, Patricia (1966) Ch. 2 in Jerome Bruner et al., Studies in Cognitive Growth. New York: Wiley

Kerr, Barbara Ann (1967) "A Piagetian study with disadvantaged students" Unpub. M. S. & Ed. thesis, University of Toledo

Lepper, Robert (1968), "A cross-cultural investigation of the development of selected Piagetian science concepts, social status and reading readiness." J Res Sci Tchg 5:324-337

Lesser, G. S. et al. (1963) "Mental abilities of children from different social classes and cultural groups". Monog Soc Res Child Development XXX No.4

Ludgate, John Ryerson (1968) "A Piagetian study of volume with eighth grade students." Unpub. M. S. & Ed. thesis, University of Toledo.

Mignerey, Richard E. (1967), "A study of the ages, within two subcultures, at which children attain the conservation of selected science concepts." M. Ed. thesis, University of Toledo.

Poole, H. E. (1968), "The effect of urbanization upon scientific concept attainment among Hausa children in northern Nigeria." Brit J Educ Psychol 38:57-63

Prince, John R. (1968) "The effect of Western education on science conceptualization in New Guinea." Brit J Educ Psychol 38:64-69

Reamsnyder, Bryan H. (1968), "A cultural study of Piaget's disjunction operation of falling bodies on an inclined plane." M. Ed. thesis, University of Toledo.

Sigel, I. E., L. M. Anderson, and H. Shapira (1968) "Categorization behavior of lower and middle class children: differences in dealing with representation of familiar objects." Merrill - Palmer research paper. (Bibliography therein).

Table I

Percentage conserving Responses on Substance (Piaget) with Chi-Square Values computed by age, subculture group (Mignerey 1967)

Age	Rural Sample N		Suburban Sample N		Chi-Square Value	Chi-Square needed at .01 df = 1	Level of Significance
6	10	54%	10	50%	.067	6.64	.80
7	10	67	10	70	.077	6.64	.80
8	10	73	10	80	.377	6.64	.55
Total	30		30		.098	6.64	.75

Table 2

Percentage Conserving Responses on Weight (Piaget) with Chi-Square Values computed by age, subculture group (Mignerey 1967)

Age	Rural Sample N		Suburban Sample N		Chi-Square Value	Chi-Square needed at .01 df = 1	Level of Significance
6	10	40%	10	40%	.000	6.64	---
7	10	47	10	50	.067	6.64	.80
8	10	50	10	60	.606	6.64	.45
Total	30		30		.356	6.64	.55

Table 3

Comparison of Kerr's data with lower SES Blacks and Ludgate's data with mixed lower-middle SES Blacks and Whites-Grade 8 Students

Description of Stage Attained	Kerr's data (Blacks) No. Conserving	% Conserving	Ludgate's data (Mixed) No. Conserving	% Conserving
IIA No conservation;inconsistent operations	4	11.1	7	18.4
IIB No conservation; trial-error successes but no generalization	8	22.2	5	13.1
III Operational conserv'n; fails to make differences compensatory; always tries same oper'n	15	41.7	8	21.2
IVA. Multiplicative relation between length & area understood	4	11.1	4	10.5
IVB Complete understanding with accurate mathematics	5	13.9	14	36.8
Mean age of sample	14.5		13.7	
Mean IQ of sample	89.1		98.7	
Correlation Coefficient Stage x IQ	.58**		.83**	

** Significant at .01 level

Table 4

Analysis of Variance: Disjunction Operation with "Falling Ball in Inclined Plane" (Reamsnyder, 1968)

Factors:	Sum Sq.	d.f.	Mean Square	F Ratio	Significance
Grade (G)	15.723	2	7.8615	25.73	.01
Ability (A)	7.111	1	7.111	23.29	.01
Socio-Econ. Group (S)	.444	1	.444	1.45	.25
Interactions					
G x A	.722	2	.361	1.18	n.s
G x S	.056	2	.028	.09	n.s
A x S	.445	1	.445	1.46	.25
A x S x G	1.722	2	.861	2.62	.10
Within Groups	7.333	24	.3055		