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C. CROSS-CULTURAL RESEARCH AND PIAGETIAN THEORY:
PARADOX AND PROGRESS

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Approaching the methodology of cross-cultural Piagetian research from the perspective of Piagetian theory, I was struck by a series of paradoxical contradictions between the rich potential of the major theoretical constructs and their realization in empirical methods. The three paradoxes upon which my paper will focus are the paradox of the clinical method, the paradox of a developmental endpoint, and the paradox of adaptation and constructionism. For my examples, I will stick to tasks from the period of concrete operations, for this is where the largest and most varied body of research is to be found.

The paradox of the 'clinical method'. The 'clinical method' is a key theoretical element in Piaget's methodology. Applicable to Piaget's entire range of experimental techniques, it consists at base of individualized in-depth exploration of a given child's performance in such a way as to reveal underlying competence in the conceptual area being studied. Instead of a standardized procedure, later stimuli in an experimental session are based on the child's earlier responses (Flavell 1963). In Piaget's early applications of the method, it was heavily dependent on verbal interchange; in 1929 Piaget compared the clinical method to the psychiatric interview. The paradox is that while the original procedures were poorly suited to cross-cultural research, the theory of the clinical method offered some valuable concepts. The tension of this paradox led in turn to a change of emphasis in the clinical method itself.

The original procedures were poorly adapted to cross-cultural research because they often involved verbal explanation of one's own thought processes as well as hypothetical reasoning about the concrete task at hand. For instance, in a conservation of liquid situation, a child is first asked if the amount of liquid changes when it is poured from a container of one shape into a container of another shape. But 'true' conservation as defined by Piaget was diagnosed in terms of an ability to give reasons for the quantity judgment. Although it is possible to modify procedures to make the request for reasons more understandable in a non-Western culture (e.g., Greenfield 1966), nonetheless, the requisite ability to ver-

balize about one's own thought processes is extremely variable from culture to culture; this ability appears relatively lacking in traditional cultures, where informal learning is the dominant mode of education. Scribner and Cole (1972) summarize the findings by saying that the observational character of informal learning does not promote verbal formulation on the part of the learner anymore than it does on the part of the teacher. To base a diagnosis of conservation or other concepts on the ability to give reasons for one's judgment is thus to allow a general mental characteristic quite independent of specific concepts to overwhelm one's assessment of particular conceptual domains.

Furthermore, if the conservation subject correctly answers that the amount has not changed as a result of its transformation in appearance, then a 'counter-suggestion' is often given to probe for underlying conceptual structure: 'Last week a little boy told me that it is not still the same amount to drink; it's more because we poured the water into a taller glass. Is he right?' The validity of this hypothetical probe in many cultural settings is affected by the fact that skill in comprehending verbal material in the absence of a concrete referential context varies from culture to culture and, in fact, may be tied to the presence of a written language (Greenfield 1972) or more generally to formal school education. Experimental study in our own culture indicates that supportive nonverbal context is particularly important at the early stages of learning (Greenfield 1971) when concepts are unfamiliar. Thus, it may well be that hypothetical reasoning, in which one must imagine a context, so to speak, is particularly difficult when the material is unfamiliar, as Scribner and Cole (1972) suggest. A conservation experiment would of course constitute an unfamiliar and therefore hard to imagine context in many cultures; hence the difficulty in responding appropriately to the hypothetical probe of the Piagetian 'counter-suggestion', independent of one's understanding of the concept of quantity.

Thus defined, the irony of the clinical method applied cross-culturally is that the 'deeper' the experimenter tries to go in probing the foreign child's mental structures, the more superficial the level he is likely to tap.

Although the procedures are too self-conscious and hypothetical for meaningful cross-cultural translation, the theory of the clinical method is, at a more abstract level, a valid guideline for cross-cultural research. In fact, it shows a surprising congruence with the methodological principles proposed by Michael Cole and his colleagues (Cole, Gay, Glick and Sharp 1972; Cole and Bruner 1973). This group takes the view that

because universal human cognitive competencies may be manifest in very different situations from culture to culture, the same underlying competency should be assessed in a wide variety of concrete situations or experimental tasks. Just like Piaget, they recommend variations around a theme in order to extract a picture of competence from a multitude of performances. In a sense this conception actualizes the 'clinical method' as a cross-cultural tool, for it involves designing a different range of testing situations from culture to culture, just as Piaget presents a different range from individual to individual within the same culture.

Dasen (1972) says that the 'clinical method' is attractive to cross-cultural research because it may be adapted to each cultural situation, but he fails to note the problems inherent in certain types of verbal questioning. More recently, however, Berry and Dasen (1974) state a need for nonverbal methods, but the work of Heron and his colleagues with purely nonverbal conservation tests in Zambia and Papua demonstrates (Heron and Simonsson 1969; Heron and Dowell 1973) that this is not the solution either in theory or practice.

In Papua, direct comparison of the nonverbal with the 'clinical method' indicated that maximum elimination of verbal discourse does not increase the chances of correctly solving the problem of weight conservation (Heron and Dowell 1973). In the Zambian study, extensive training in the nonverbal method and use of minimal verbal cues were necessary (Heron and Simonsson 1969). Thus the elimination of verbal instructions and responses seems neither to have made the conservation problems easy to administer nor easy to solve.

The problem of out-of-context communication involved in Piaget's clinical method may however be solved by presenting the necessary nonverbal referential context in the experimental situation itself. The use of demonstrations accompanying verbal instructions, as in Greenfield and Childs' (1973) pattern representation study among the Zinacantecos, is one way of doing this. A redundant perceptual-action context seems to be an important part of the earliest verbal interaction in language acquisition; and this fact ought to make a useful addition to the cross-cultural methodology for designing the most communicative experimental procedures. On the other hand, the complete elimination of language for symbolic-relational tasks, which language is specialized to handle, must add ambiguity rather than clarity.

The paradox of a developmental endpoint. One major criticism of Piaget's

theory of development for cross-cultural research is that his notion of development is really the development of a Western scientist.¹ Gardner (1972) in comparing two major structuralists, Piaget and Levi-Strauss, points out that 'Western scientific thought, however crucial it may seem today, does not represent with any fidelity or comprehensiveness, the forms of thought valued in other cultures or during other periods' (p. 202). While Piaget himself (1966) recognized the need for studies to describe the final adult stages of cognitive development in other cultures, his concern was restricted to the operational level of these groups, in other words, to the development of Western scientific thinking. The paradox of the developmental endpoint has been that cross-cultural researchers failed to follow Piaget's own demonstration that, to study development, one must first understand the endstate toward which the developmental process is veering. An implication of Piaget's example for cross-cultural research is to ascertain the characteristics of an ideal type in a non-Western culture. Ideally, development in non-Western societies should be studied by members of the society itself. That way, the ideal type is a living reality rather than merely a theoretical abstraction, just as the model of the Western scientist is a living reality for Piaget, informing all his work. This ideal will become more and more realizable as scientific training becomes increasingly available in Third World countries. A second best approach is for a foreign social scientist to ascertain the ideal type through empirical research – interviews and the like. Wober (1974) has made just such an analysis of the Kiganda concept of intelligence in Uganda. Following such an analysis, the scientist is in a position to find out the developmental steps by which an infant grows up to this culturally defined endstate: what, to take the example of Kiganda intelligence, is the developmental process like by which the child achieves a measured, unhurried approach to affairs, one of the hallmarks of Kiganda intelligence? This principle of defining the developmental endstate, intrinsic to Piaget's own work, would paradoxically, lead away from Piagetian procedures.

Childs and I applied this methodological principle in studying cognitive development among the Zinacantecos, a Mayan group in Southern Mexico. Ethnographic study revealed that one of the hallmarks of the mature Zinacanteco woman is her skill in weaving. What we did was to

1. John Gabriel (1972) arrives at this same conclusion, although I have strong doubts about the particular line of argument that leads him there.

make videotapes of the weaving process carried out by young adults, acknowledged by other members of the community to be skilled weavers. At the same time we made tapes of girls at various definable stages in the process of learning to weave, starting with girls weaving their very first piece of cloth. We hope to put together this data to get a picture of the cognitive steps by which this highly valued Zinacanteco skill is attained and the nature of the instructional process by which it is accomplished.

Gay and Cole's (1967) work on quantitative concepts among the Kpelle provides another interesting example of the same principle. They looked at Kpelle skills in using quantitative concepts indigenous to the Kpelle culture – rice measures and so forth. Although this work was developed outside the Piagetian developmental tradition, it actually accomplishes for Kpelleland what Piaget accomplished for Switzerland in carrying out conservation experiments: the study of indigenous quantity concepts. In this sense, some non-Piagetian cross-cultural research comes paradoxically closer to the Piagetian spirit than most overtly Piagetian studies.

The paradox of adaptation and constructionism. No concept is more basic in Piagetian theory than adaptation. Adaptation occurs whenever an organism-environment encounter modifies the organism in such a way that further interchanges, favorable to its preservation, are enhanced (Flavell 1963). Adaptation as a psychological concept includes interpreting the outside world in terms of preexisting mental organization (assimilation) as well as making changes in that organization in response to particular properties of the world (accommodation). Piaget believes, furthermore, that cognitive development is not a given but rather a process of construction taking place through continuous interaction of organism with environment and always involving components of both assimilation and accommodation (Piaget 1970). The notions of adaptation and constructionism would seem to make cross-cultural research a natural for Piagetians. The study of environment-organism interactions under different conditions and their effects on the constructive process would seem an obvious method for studying the processes of adaptation so critical to cognitive development in Piaget's own scheme. The paradox is that this approach has been extremely rare in cross-cultural Piagetian research. A landmark study in this regard is that by Price-Williams, Gordon, and Ramirez (1967) in which early conservation of clay substance was shown to be an adaptation to the pottery-making process. These researchers demonstrate that, without the cultural environmental

stimulus of learning to pot, conservation of clay occurs at a much later chronological age. So, the interactive process with clay whereby the potter transforms the shape of a constant quantity stimulates the construction of the conservation concept.

Why did this type of study occur so late, if adaptation and organism-environment interaction are such central concepts in Piaget's theory? The paradoxical reason is that although the role of organism-environment interaction is central to his constructionistic theory, Piaget has never specified the nature of these interactive processes nor has he himself made them the object of empirical study (even though all his experiments are in fact dynamic interactive situations, as specified by the clinical method). The study of Price-Williams and his colleagues contributed our first hint of naturally occurring organism-environment interactions through which Piagetian concepts are constructed by the child. For this reason, it makes a large contribution to Piagetian theory, as well as to the general field of cross-cultural psychology.

Recently, Durojaye (1972) has demonstrated a connection between other types of naturally occurring organism-environment interaction and order and rate of acquisition of various concrete operational concepts in six African cultures. For instance Durojaye finds that bead stringing hastens the development of conservation of number. Dasen (1973, 1974) has extended the study of the relation between Piagetian concepts and environmental adaptation to Australian Aborigines and Alaskan Eskimos. These studies integrate Piagetian tasks into the framework of ecological functionalism first conceived by Berry (1966). Although Piaget has a concept of horizontal *décalage* to describe time differences in the acquisition of various manifestations of concrete operational thought, he has dealt not at all with the problem of how time differential or *décalage* varies as a function of environment. Cross-cultural studies like the ones under discussion ought to contribute greatly to the solution of this problem within Piagetian theory.

A final step in actualizing Piaget's concept of constructive development through interaction is to analyze these interactive experiences themselves in addition to assessing their results. An important step has been taken in a thesis by Fitzgerald (1970) at Berkeley. She analyzed teaching-learning interactions between mothers and their children in three Ga subcultures in Ghana and correlated the interactive patterns with performance on several concrete operational tasks. Although subcultural membership was correlated with performance on the Piagetian tasks, a number of

features of maternal teaching style showed an even stronger relation to Piagetian task performance. Fitzgerald concludes that the effect of subculture on test performance is mediated through mother-child interactions. The results of this study are an important step toward analyzing gross cultural variables into the interactive components by which they achieve their effects.

The paradox of the clinical method resolved. Cole (1973) points out that my research on the development of conservation of liquid quantity in Senegal is an early example of situational variation involving a Piagetian task. Looking at my study from this point of view modifies the interpretation of my findings in a Piagetian direction. Among the Wolof of Senegal, only about half the unschooled children manifested conservation of liquid quantity between eleven and thirteen years of age in two standard testing situations, (a) where the experimenter poured the liquid from one glass to a longer, thinner glass, and (b) where the experimenter poured the liquid from the same initial glass into six smaller glasses. In my original interpretation I stressed the fact that a large proportion of the oldest (11–13 years of age) unschooled Wolofs failed to attain conservation in both these situations, thus challenging the universality of Piaget's theory. While this remains an interesting and important fact, equally interesting is the fact that many 'nonconserving' children of a certain age did manifest conservation in two situations, (a) the first part of the 'standard' test involving the longer, thinner glass, or (b) both parts of the procedure where they transferred the water themselves. This could be considered an example of Cole's situational variation or Piaget's clinical method. In either case, my interpretation of cultural differences would be moderated to emphasize similar underlying competence² of all groups tested. Both aspects of the results – similarity and difference – are equally important to a valid and fair interpretation, just as Goodnow (1969) and Cole and Bruner (1971) have suggested in recent years.

But Piaget's own concept of the clinical method was not a static one. In his review of the book (Bruner, Olver, Greenfield *et al.* 1966) in which my Senegalese results appeared, Piaget (1967) began to stress the importance of testing concepts in a variety of action contexts, implicitly reducing the emphasis on the child's verbal analysis of his own thought processes.

2. A paper by Allean Keniston (1973) was very helpful to me in applying the competence-performance distinction to my conservation results in Senegal.

In the case of conservation of liquid, one of Piaget's suggested action variations was to ask the child to put equal amounts of liquid in two containers differing in shape. Would the child try to equalize levels, indicating a lack of conservation, or would he compensate for the lesser width of a container by pouring the liquid to a greater height, thus manifesting through his action at least one component of the conservation concept? The shift in emphasis exemplified by this procedure made a lot of sense in terms of Piaget's own theory, for action, not language, is seen as the basic mode of knowing in Piaget's system. Thus, the emphasis in the clinical method changed from diagnosis through verbal variation to diagnosis through action variation. Note, though, that Piaget makes no attempt to eliminate language, unlike Heron and Simonsson's (1969) approach. Rather language sticks close to the action context at hand instead of delving beneath it in a verbal explanation of thinking or going beyond it in creating an imaginary transformation of the present situation.

The inclusion of action variation in some cross-cultural research later carried out in Algeria by Bovet (1968), a member of Piaget's own team, confirmed my results and led to the first recognition of a culturally specific stage in a foreign culture by a Genevan researcher. This was the stage of pseudo-conservation. Unschooled five- and six-year-old Algerians were similar to the youngest unschooled Wolof group both in the absence of conservation judgments and in the attention to the experimenter's pouring action reflected in their reasons; seven- and eight-year-olds, in contrast, gave conservation judgments when water was poured from one container to another of a different shape. These same children, however, could not deal with the action variations such as the one just described where the child tries to equalize amounts in glasses of two different shapes. These children were called 'pseudo-conservers'.

Although I did not find such a stage among the Wolofs, this seems due to a procedural difference rather than to an actual difference in results. As mentioned earlier, I used a second Piagetian test of liquid quantity conservation not present in Bovet's study: The water was poured from a single glass into six shorter, narrower glasses. As I mentioned in my original article, this task was more difficult than the transfer to a single narrower glass, probably because it involved inequality in the sphere of action as well as perception. To be called a conserver in my study it was necessary to judge the amounts equal in both parts of the conservation test. In fact, most members of the middle (eight and nine) and oldest

(11 through 13) age groups classified as nonconservers made conservation judgments in the first part of the procedure where there was but a single pouring action; these children would have been classified as pseudo-conservers by Bovet. While this result thus parallels that of Bovet, an important difference remains. With increasing age, the pseudo-conservation pattern in Algeria gives way, first to nonconservation responses and then, by age eleven, to conservation – these latter two stages are a somewhat delayed version of the familiar pattern first observed in Switzerland (Piaget and Inhelder 1941). Among the unschooled Senegalese children in contrast, this 'pseudo-conservation' pattern persists among the eleven through thirteen-year-olds, a group even older than Bovet's Algerian conservers.

If my analysis is correct, then there is greater, although not complete, compatibility between Bovet's results in Algeria and my results in Senegal than she has noted. The exaggeration of the discrepancy points up, however, the necessity of situational variation. One more situational variant in Bovet's study and separate presentation of the data for the two different conservation situations in my own article would have eliminated the confusion and made the interpretation of both studies more accurate. In terms of the evolution of Genevan research and theory, it is interesting that a member of Piaget's own team has acknowledged the need for action variations in the cross-cultural context, thus completing the circle and bringing the clinical method into harmony with Cole's principle of situational variation. The lacunae in each study, my own and Bovet's, point up the need for even more systematic situational variation in cross-cultural Piagetian research (Cole 1973).

In a more recent article Bovet (1974) also recognizes that Piaget's earlier emphasis on verbally describing one's own reasoning is undesirable in comparative research; hence her analysis of the strengths and weaknesses of the clinical method, totally in harmony with my own, indicates that it has become a valuable tool for Genevan researchers, abroad as well as at home.

The paradox of the developmental endpoint resolved. Again, with respect to the developmental endpoint, Piaget shows himself far from static, his own major revisionist as he has said (1970). In a 1972 article on 'Intellectual evolution from adolescence to adulthood' Piaget talks about the diversification of development with age. The import of such diversification is that different individuals have different endpoints of cognitive

development according to differences in aptitude and experience, especially occupational training. The Western scientist is in theory no longer the only possibility. Piaget leaves it as an open question whether this developmental diversification means that formal operational thinking, the highest stage in his developmental theory, will appear in different domains for different people, according to occupational role (e.g., law students will reason at the formal level about juridical but not physical concepts) or 'whether there will appear new and special structures that still remain to be discovered and studied' (p. 11). The latter alternative supports, by extension, a position of extreme cultural relativism, something very new in Piagetian theory. Piaget's question concerning the possibility of cognitive structures still to be discovered poses an important challenge for comparative study both within and between cultures.

Bovet's recent article also takes a large step toward resolving the second paradox of the developmental endpoint within the context of a Piagetian framework, for she tests Algerian adults from the same milieu as her younger subjects and relates their performance on various tasks (tests of quantity, weight, length, and time) to the skills required of male and female adults in this particular sociocultural milieu. For instance, adult male subjects showed immediate conservation of length while female subjects gradually reached the correct responses by a process of trial and error. (To give an example of how one tests for conservation of length, one task involved recognizing that changing the position of one of two equal lines does not destroy their equal length.) This sex difference corresponds to a difference in adult roles: Women are very much tied to their homes, while men spend much time away from home and frequently walk considerable distances. In another example, a particular way of comparing weights by weighing quantities in one's two hands, a method used by Algerian women in daily life, appears in response to a conservation of weight test. Thus, definition of cultural differences in the endstate of development and the relation of these differences to cognitive skills has been recognized in Geneva as a principle of cross-cultural research, thus bridging the gap between Piaget's definition of development in terms of the Western scientist and the varied application of Piagetian theory to other cultures (or subcultures) having different ideal types.

The paradox of adaptation and constructionism resolved. Finally, Bovet (1974) explicitly recognizes that Piaget's principles of interaction and construction, as well as his biological leanings (closely related to the

notion of adaptation) 'provide a fitting framework for cross-cultural research' (p. 313). She adopts training procedures as a necessary aspect of cross-cultural research. Although she recognizes training procedures as situational variants that help in diagnosing the competence of people in very different cultures, she gives almost no recognition to these procedures as tools to discover what kinds of interactions with the environment are required for the construction of operational Piagetian concepts in the course of development. Perhaps this is why she fails to recognize the contribution of my pouring procedure to the conservation of quantity in unschooled Wolof subjects. As mentioned earlier, when these children did the pouring themselves – both to a single taller, thinner beaker and to six smaller beakers, they typically realized that the quantities were still the same; and their justifications referred back to the initial equalizing operation. Bovey implies that this was probably pseudo-conservation because the equalizing operation, being difficult, has done nothing more than capture their attention. This fact cannot, however, explain our results because the matched group in the standard procedure also equalized the water in the two identical glasses at the beginning of the procedure, although the experimenter carried out the subsequent transfer of liquid from one container to another. Yet that group did not show conservation in both parts of the test.

Bovey also does not account for the fact that older (eight-through thirteen-year-old) unschooled Wolof subjects who had the experience of transferring liquid from container to container also manifest conservation on two subsequent posttests where the experimenter once again did all the pouring. The phenomenon seems in fact very similar to Bovey's own account of conservation of weight in Algerian adults for whom weight concepts are used in daily life:

'For some of the nonconserving subjects, all that was required for them to grasp the notion of conservation, was to weigh the two pieces of clay once on a pair of scales in front of them. They then accompanied their judgments by logical justifications and, what is more, generalized their conservation responses to various changes in shape.

'It has been noted that in the case of children, a single demonstration is not sufficient to elicit a more advanced judgment (Smedslund, 1961). We conclude therefore that in these adult subjects an underlying logical way of apprehending the problem coexists with an intuitive approach' (p. 325).

Another interpretation may be more revealing: The weighing experience

is the organism-environment interaction which allows the construction of the operational concept out of intuitive knowledge, just as the pouring experience is the crucial environmental interaction for the Wolof children. Amount is important in the daily life of Wolof children, just as weight is for the Algerian adults. Bovey's results suggest that such practical usage is an important factor in the successful effect of a one-time 'training' experience.

My original interpretation of the training effect stressed the change in thinking that seemed to result from the experience. Equally important to a balanced interpretation is another set of facts. The first fact is that the inferred change resulted from a single brief experience, indicating a preexisting competence on the part of the subjects. This competence consisted partly of maturational readiness, for the magnitude of the training effect was proportional to age. It may also have resulted from interactions concerning quantity in everyday life, for Bovey found that short-term experience with concepts irrelevant to everyday Algerian life – such as speed and time – did not have such an effect on operational thinking. Thus, Bovey may have contributed to a specification of the interactive processes by which concepts are constructed by making this distinction between the effects of operational training in adults with and without related practical experience. Bovey's study (1974) thus makes a large contribution to the analysis of environmental interaction required for the construction of an operational concept. Because this interactive process of construction is theoretically central to Piaget, Bovey's Algerian study exemplifies the enormous value of cross-cultural research to Piagetian theory.

In conclusion, if Piaget has, in the past, led the cross-cultural enterprise astray, it is because researchers have followed his procedures rather than his theory. Deviations from the procedures, past and present, have, on the other hand, enhanced the theory, especially contributing to the concept of development as a constructive process occurring through interaction with the environment. While Piaget's writings do not suggest the new techniques necessary for further advance, it is hard to imagine future cross-cultural research that will fail to harmonize with and further actualize Piaget's basic notion of development as a constructive process involving the adaptive interaction of a biological organism with its environment.