Responsiveness of Nigerian Students to Pictorial Depth Cues

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Because research has indicated that many students in the developing countries find it hard to understand depth portrayal in Western pictures, the authors tested three groups of Nigerian high school and college students for response to four pictorial depth cues. Their tests, which used ball-and-rod models originally devised for teaching chemistry, showed no one cue to be effective with all students. The students had more difficulty with cues concerning the relative size of objects and the foreshortening of straight lines than with cues involving overlap of lines and distortion of the angles between lines.

Pictorial and diagrammatic representation is very important in scientific and technical education. There are, therefore, serious implications to be drawn from a review by Miller (1973), who reports a number of investigations concluding that many people in developing countries have difficulty understanding the portrayal of depth in Western-style pictures. Research has indicated that Africans often see the spatial relationships pictured as two- rather than three-dimensional (e.g., Deregowski, 1968, 1969, 1971; Hudson, 1960, 1962a, 1962b; Mundy-Castle, 1966). While most of these studies involved primary school children or adults having little or no formal education, Nicholson and Seddon (1977) recently demonstrated that from 20 to 60% of very able children in Nigerian secondary schools had difficulty understanding diagrams similar to those used in textbooks to represent the spatial arrangement of atoms and molecules in crystals.

Figure 1 illustrates the use of four types of cues used to portray depth—an overlap cue, a relative-size cue, and two position cues (foreshortening of lines and distortion of angles between lines). Failure to understand the portrayal of depth implies difficulty with some or all of the cues. For example, a student may not understand the conventional significance of the cues or may not perceive that the cues are in operation. In either case it is important to determine which cue or cues are creating difficulty.

In 1963, Winter found that the overlap and relative-size cues used in accident-
prevention posters were not interpreted correctly by Bantu industrial workers. Hudson (1962a) found that illiterate black laborers had more difficulty than white primary school children in South Africa in understanding foreshortening effects in pictures of everyday scenes, whereas Holmes (1963) and Duncan, Gourlay, and Hudson (1973) found that educated Kenyan adults and Bantu primary school children, respectively, had no such difficulty. In the latter case, however, the authors admit that their testing procedure failed to indicate clearly what the pictures meant to the children (p. 176).

Duncan et al. (1973) also compared the ability of European, Zulu, and Tsongan primary school children to understand different combinations of depth cues. For one set of pictures (Series A), which incorporated relative-size, position, and tone cues, they found that the proportion of Bantu children who correctly understood the spatial relationships portrayed was always greater than the corresponding proportion of European children. In the two cases in which statistical analyses were reported, the difference was significant at the .01 level. However, in another set of pictures (Series B) that contained overlap as well as relative-size, position, and tone cues, the European children performed significantly better than the Tsongan children. Duncan et al. rationalize the apparent contradiction in the two sets of results in terms of the unsuitability of the pictures in Series A. For example, in retrospect they consider the Series A pictures atypical of those normally found in educational textbooks (p. 177). Kennedy (1977) is very critical of the manner in which Duncan et al. scored the responses given by the Tsongan children to the questions in Series B. In particular, he considers that the responses interpreted by Duncan et al. as showing a lack of pictorial depth perception are actually the result of too much pictorial depth perception.

The results of all these studies provide very little clear or generalizable evidence on which to plan remedial instruction at secondary level and above. Hence the present experiment attempted to determine which of the cues create difficulties for students of different educational levels in at least one African country, Nigeria. The cues of particular interest to the study were the overlap, relative-size, and position cues illustrated in Figure 1. Because the position cue affects two essentially different pictorial features—the foreshortening of lines and the representation of angles—both these features were investigated separately.

**METHOD**

We planned to construct four tests, one for each of the four pictorial cues, so as to determine which cue was creating difficulty.

**Subjects**

We studied subjects from three different student populations in Lagos, Nigeria. One sample comprised 85 first-year students of an average age of 23, most of whom were male, from the Faculty of Science at the University of Lagos. The other two samples comprised fourth-year stu-