

GEOGRAPHY ACHIEVEMENT LEVEL AND THE COGNITIVE STYLES OF NIGERIAN PUPILS

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One hundred and sixty high and low geography achievers, selected by stratified random sampling from Forms 2, 4 and Lower 6 (Grades 8, 10 and 12) of a male and a female high school in Nigeria participated in this study. All the subjects were given a cognitive preference test. The results showed a significant relationship between geography achievement level and cognitive styles for boys but not for girls. Male high geography achievers differ significantly from male low geography achievers in their cognitive styles. The paper highlights the educational implications of these findings for curriculum development in geography.

Cognitive style is concerned primarily with the manner in which an individual perceives and analyses a complex stimulus configuration. Kagan and Moss(1) defined cognitive style as "a term that refers to stable individual preferences in mode of perceptual organisation and conceptual categorisation of the external environment". They then suggested that among individuals of adequate intelligence, there are splitters, those who "characteristically analyse and differentiate the stimulus field applying labels to sub-elements of the whole", and lumpers, those who "tend to categorise a relatively undifferentiated stimulus". Hence, they postulated that three cognitive styles are recognizable in adults and children. These are: analytic-descriptive, inferential-categorical and relational.

Analytic-descriptive style: In this type of cognitive style, a subject differentiates and selects elements of similarity shared by two or more stimuli. The criterion for classifying is a particular characteristic that can be found in each of the stimuli grouped together e.g. grouping two pictures together because "both have six buttons each". The most common analytic concept to the watch-man-ruler item is "the watch and ruler have numbers". This concept is called analytic because the numbers differentiate components of the total stimulus.

Inferential-Categorical style: A subject demonstrating this style groups together, on the basis of some inference about the stimuli, without overtly differentiating the elements within each stimulus. The criterion for classifying is a super-ordinate concept and each whole stimulus is an independent exemplar of that concept e.g. grouping two pictures together because "they are living things".

(1) Jerome Kagan and H.A. Moss, "Psychological significance of Styles of Conceptualization". In: J.E. Wright and J. Kagan (Eds.) Basic Cognitive Processes in Children, Monograph of the Society for Research in Child Development, 28, 2, 73-112, 1963.

Relational style: In the demonstration of this style, a subject groups stimuli together because of the functional relationship between the grouped stimuli. None of the grouped stimuli is an independent exemplar of the criterion used for classifying. On the contrary, the concept (criterion) is only meaningful when the grouped stimuli are considered together. Often, the criterion tells some sort of story about the relationship between the grouped stimuli e.g. grouping two pictures together in the watch-man-ruler items because "the man can wear the wrist-watch" or in the chimney-match-pipe item because "the match is used to light the pipe".

Kagan and Moss claimed that the relational style pays the least attention to details of the stimulus array before categorizing while the analytic-descriptive style pays the most attention to details of the stimulus array. The analytic-descriptive style was therefore ranked highest while the relational style was ranked lowest in terms of cognitive functioning. But Gardner(2) argued that the inferential-categorical style is equally as analytic as the analytic-descriptive style and in addition "represents a considerable higher level of abstraction". A critical appraisal makes Gardner's contention seem more tenable and would lead to a re-ranking of the styles with the inferential-categorical style ranking first and the analytic-descriptive style second in cognitive hierarchy. This could suggest that high achievers in geography might exhibit more of the inferential-categorical style in their categorization of stimuli.

METHODOLOGY

The present investigation was designed to test the validity of the suggestion. There were two hypotheses tested:

1. Among high and low geography achievers, there would be no significant difference in the distribution of cognitive styles they exhibit when presented with categorization tasks.
2. There would be no significant difference between instances of inferential-categorical style shown by high and low geography achievers.

SUBJECTS

One hundred and sixty subjects participated in the present study. They were selected by stratified random sampling in Forms 2, 4 and (Lower) 6 (Grades 8, 10 and 12) of a male and a female school, Government College, Ibadan and Queen's School, Ibadan in Nigeria. The subjects consisted of equal numbers of high and low geography achievers as defined by their ranking in the first and fourth quarterlies respectively in their most recent school examination in geography.

(2) R.W. Gardner, "Discussions on Psychological Significance of Styles of Conceptualization". In: J.E. Wright and J. Kagan (Eds.) Basic Cognitive Processes in Children, 28, 2, 112f, 1963.

EXPERIMENTAL MATERIALS

The experimental material for the investigation was the cognitive preference inventory developed and refined by Kagan and Moss. The inventory consisted of nineteen pages of pictorial drawings. Each page contained a set of three drawings of common objects such as animals and plants.

ADMINISTRATION OF EXPERIMENTAL MATERIAL

The inventory was administered to all subjects in each school at a group sitting. The instruction to each subject was standardized on the cover of each inventory booklet. The subject was asked to select two out of the three pictures on a page that were alike in some way and to state the reasons for his grouping as briefly as possible. Subjects were told that there was no wrong or right answer. Each subject worked at his own pace.

SCORING

Each of the nineteen items of the experimental material was scored and tallied according to the cognitive style reflected in each subject's response. The tallying was across all subjects under each achievement level. Any response that could not be placed unequivocally under one of the three styles was omitted. The score in each style was the total number of tallies under that style. The same trained scorer scored all the responses, thus avoiding inter-scorer inconsistencies.

RESULTS

Tables 1-5 summarize the results. Tables 1 and 2 indicate that, among the boys, high geography achievers differ significantly in cognitive styles from low geography achievers. The data for the girls as shown in Tables 3 and 4,

Table 1

Distribution of Cognitive Style Scores for Boys

Class	Geography Achievement Level	Analytic-Descriptive	Inferential-Categorical	Relational
Form 2	High	133	120	30
	Low	139	100	46
Form 4	High	129	122	33
	Low	138	97	50
Form 6	High	100	70	19
	Low	133	41	16

Table 2
Chi-Square Analysis: Cognitive Styles for Boys

Class	No. of Subjects	χ^2	d.f	p
Form 2	30	5.32	2	< .10
Form 4	30	6.64	2	< .05
Form 6	20	12.52	2	< .01
Across Classes	80	17.57	2	< .001

did not indicate a consistent distinction in cognitive styles between high and low geography achievers. Therefore, the first null hypothesis for this study is rejected for boys and supported for the girls.

Table 3
Distribution of Cognitive Style Scores for Girls

Class	Geography Achievement Level	Analytic-Descriptive	Inferential-Categorical	Relational
Form 2	High	213	37	32
	Low	252	12	16
Form 4	High	120	122	70
	Low	100	97	41
Form 6	High	135	33	14
	Low	150	26	8

Table 4
Chi-Square Analysis: Cognitive Styles for Girls

Class	No. of Subjects	χ^2	d.f	p
Form 2	30	21.34	2	< .001
Form 4	30	2.79	2	ns
Form 6	20	3.26	2	ns
Across Classes	80	21.86	2	< .001

Tables 1 and 5 also show that male high geography achievers were more inferential-categorical and less analytic-descriptive than male low geography achievers. This difference between the male high and low

Table 5
Chi-Square Analysis of Inferential-Categorical Style Scores

Sex	No. of Subjects	X ²	d.f	p
Boys	80	5.99	2	< .05
Girls	80	1.96	2	ns

geography achievers on the inferential-categorical and analytic-descriptive was highest at the sixth form (twelfth grade) and lowest in the second form (eighth grade). The male high and low geography achievers did not differ on a consistent basis as regards the educational style.

FINDINGS

The findings of the present investigation indicate that there is a significant relationship between geography achievement level and cognitive styles for boys but not for girls. Furthermore, the male high geography achievers were found to differ significantly from the male low geography achievers in their cognitive styles.

The inferential-categorical style involves more than analytic description of details or relating of two or more ideas. It involves the arrangement of assumptions, premises, and conclusions in a way to develop logical deductions. It would seem therefore from the results of the present study that the male low geography achievers tended to operate at the lower levels of cognition while the male high geography achievers tended to operate more at the higher levels of cognition. This finding did not seem to hold for female high and low geography achievers. A possible reason for this might be that the two sexes adopted differing approaches to intellectual tasks. Indeed, Davis(3) has already shown that males and females adopt different strategies or operations in functioning intellectually.

It would appear from this study that cognitive styles are an important aspect of intellectual functioning and they do influence how the child learns and what kinds of strengths and weaknesses he will display. Children with differing styles will learn different things with individual facility. It is therefore not sufficient to know how bright a child is, one must also know what kind of cognitive dimensions his intelligence operates in.

IMPLICATIONS FOR GEOGRAPHY TEACHING

Studies like the one reported here appear to have implications for curriculum improvement in geography. The term, 'curriculum' is being used here in a more comprehensive sense - all the learning experiences provided the students under the auspices of the school.

(3) J.K. Davis, Concept Identification as a Function of Cognitive Style, Complexity, and Training Procedures. Wisconsin Research and Development Center for Cognitive Learning, University of Wisconsin, Madison, 1967.

New geography courses which are currently being instituted in high schools are stressing the understanding of principles, concepts, and processes rather than rote knowledge of bodies of facts. In higher grades of high schools, for instance, the testing in the field of theories that explain and predict the spatial patterns of various characteristics of the earth's surface is being encouraged. It would seem from this study that the success of an individual learner in such new approaches to geography could well be a function of his cognitive style or his ability to analyse complex stimulus configurations (geographic materials). An assessment of the cognitive styles of students by geography teachers could therefore be valuable. For instance, for geography teachers to promote the new understanding and skills demanded in geography it might be valuable, as a point of departure, to diagnose the range of potential cognitive styles of learners. The diagnosis would certainly involve knowing not merely the test scores or the intelligent quotients of geography students but also to a great deal about their 'style of intelligence', what cognitive operations cause pupils difficulty and also which ones they operate facily. The teachers' knowledge of such antecedent conditions of geography students could enable them to provide a variety of learning experiences capable of fostering geographic understanding and skills.

An assessment of the cognitive styles of students by geography teachers has implications for curriculum provisions in the classroom. On the basis of students' cognitive styles, programmed instruction materials in geography could be used as enrichment materials with students who want to learn more about specific topics. Furthermore, the geography teacher could make use of such assessment to differentiate instruction. Thus, pupils do not merely engage in group activities but the activity is differentiated, as possible, so that the student's unique learning potential is considered.

The assessment of the cognitive styles of students by teachers could go a long way in increasing teachers concern about the continued development of students' intellectual abilities. What kind of thinking do the students engage in? How resourceful are they? Can they direct their own goals and initiate their own learning? Are they learning to give thoughtful explanations of things they see, hear, and do? Do they consider their ideas important? Do they relate similar experiences together to draw conclusions? Teachers can use these questions as a guide in helping students develop their potentialities.

If the existing cognitive structure of the student is suitably organised, it facilitates the learning of new subject matter. If it is disorganised it inhibits learning. Hence it is largely by strengthening relevant aspects of cognitive structure that new learning can be facilitated. And when we deliberately attempt to influence cognitive structure so as to maximise meaningful learning, we come to the heart of the educative process.