

CURRICULUM DEVELOPMENT

AT THE TURN OF THE CENTURY

The Nigerian Experience

Edited By:

Abdul Mansaray

and

Israel Olu Osokoya

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EDITED BY:

**ABDUL MANSARAY
and
ISRAEL OLU OSOKOYA**

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The Role Of Intelligence In Mastery Learning

E. Adenike Emeke

Introduction

The role of intelligence in Mastery Learning becomes glaring if intelligence can be explicitly defined and the major variables in Mastery Learning examined in the light of the functions of intelligence in education. Thus, this topic will be examined under the following sections.

- Definition of intelligence
- Definition and Concept of Mastery Learning
- The functions of Intelligence in Education
- The role of Intelligence in Mastery learning
- Conclusion

Definition of Intelligence

According to the new Encyclopaedia Britannica, the word intelligence "is an hypothetical construct used to describe individual differences in an assumed latent variable that is, by any direct means, unobservable and immeasurable. In popular usage,

the concept refers to ability to learn, to function in society and to behave according to contemporary social expectation."

Pyle (1979) referred to intelligence as a word "with many meanings", "a situation-specific word." This means that the word is used in various situations and this takes various meanings depending upon the particular situation.

The Encyclopaedia of Educational Evaluation described intelligence as "an abstract construct relating to abilities to reason and comprehend." Like other constructs, intelligence cannot be directly measured. However, the manifestations of intelligence are obvious in everyday life in which they are considered as taking the form of superior or inferior behaviour, depending on whether the person concerned has high or low intelligence.

Intelligence may be taken to mean ability—"what a person can do at this moment". (Dockrell, 1970). Here, the person is observed, in certain situations, and a decision is made as to his level of intelligence. Vernon (1977) stressed a simple and nonspecific definition such as "an all round thinking capacity" or "mental efficiency". However, Berry and Dason (1974) and Vernon (1969) argued strongly that any definition of intelligence must take into cognisance the culture in which the individual is reared, for intelligence is inextricably interwoven with the beliefs, values, language, concepts and orientations of a particular group or race of people. On the other hand, Cole and Bruner (1971) warned that this is often not the case. They clearly stated the problem in inferring certain psychological processes from apparent cultural differences. The two camps represent the nature/nurture debate about intelligence. Vernon and others lean towards the nurture while Cole and Bruner took sides with nature.

After several years of controversy on the nature of intelligence, many psychologists now accept Wechsler's (1974) view that intelligence tests measure the extent to which the individual's innate potential has been modified by his or her environment. Thus, intelligence should be seen more as a set of process and less as an entity. It should be regarded more as an abstraction.

Binet (1968) referred to intelligence as the "ability to judge, to understand and to reason well." To be rated as being intelligent, the exhibited behaviour must not only be rational and purposeful, it must not only have meaning but it must also have value, it must be esteemed by the rater.

The varying conceptions of the nature of intelligence have contributed to the development of a wide diversity of tasks for testing it. Intelligence tests usually include a diversity of tasks, although the particular combinations vary, depending on the developer's definition of intelligence.

Definition and Concept of Mastery Learning

Bloom (1971), a foremost exponent of mastery learning, asserted that "there is nothing sacred about the normal curve. It is the distribution most appropriate to chance and random activity. Education is a purposive activity and we seek to make students learn what we have to teach them. If we are effective in our instruction, the distribution of achievement should be very different from the normal curve."

The basic assumption of Bloom's model of mastery learning is that: All, or almost all students can learn well if:

1. Instruction is systematically approached;
2. Students are provided with adequate help when and where they have learning difficulties;
3. They are given sufficient time to achieve mastery; and
4. There is some clear criterion of what constitutes mastery.

Block (1980) defined Mastery Learning as two things. In one, he called it an optimistic theory about teaching and learning. Essentially, the theory asserts that any teacher can help virtually all the students to learn excellently. The teacher can help 'dull' learners to learn like 'smart' students, 'slow' students like the 'fast' students, 'retarded' students to learn like the 'gifted' students. Such teaching, not only improves many students' chances for long term social and personal prosperity, but many teachers' chances

as well. The students, in particular, acquire those basic intellectual, manual and emotional competencies which ensure that they can and want to undertake life-long learning. And the teachers acquire some basic pedagogical skills and career rewards which ensure that they can and want to keep teaching.

It need be stated that the inherent message in mastery learning is at variance with the beliefs of most educators because they have become 'conditioned' to the normal distribution. The pattern of grading students follow the normal distribution and administrators gets angry if the grading of any teacher deviates from the normal distribution. The administrators are constantly at alert to control teachers who are "too cheap" or "too hard" in their grading.

Bloom (1973) remarked that over the years, educators have been made to believe that only a few of the students (between 20% and 30%) can learn to a great extent what the schools have to teach. Psychological theories have contributed to the past and even the present belief of the educator in the normal distribution grading policy. One of such theories is the projective theory, which assumed that individual behaviour is based on certain predetermined patterns, which are activated by environmental stimuli. That while environmental forces may affect behavioural forms in general, behaviour is controlled by drives that are "genetically established and bound" (Asian and Maudaus, 1972). The theory thus emphasizes the intractability and permanence of early characteristics implying that no amount of effort can improve performance.

This theory could said to have been rejected in its entirety by Adler (1957) when he described (the projective view) as one of the principal causes of poor learning inferiority. He explained that pupil's failure is taken for granted, and so neither teacher nor child is required to exert the effort that might prevent failure. Brunner (1962) gave the theory a great shock when he hypothesized as follows:

"Any subject can be taught effectively in some intellectually honest form to any child at any stage of development."

Block (1983) pointed out that one of the most ancient criticisms of mastery learning has been a variant of the "Robbing Peter to pay Paul" argument. By making time and not learning the variable in school teaching, critics contend that mastery learning simply exchanges the normal curve in student learning for normal curve in student learning rates. Cronbach (1972) was therefore, of the view that mastery programmes must either extend the education of slow learners "until they are oldsters or hold back fast learners until the slow ones catch up."

Mueller (1976) also argued that the fixed time unit cannot be used to maximise learning for all students because students learn at different rate except the objective to be mastered is directed at the ability of the slowest learners and the time liberalized. The models tend to prevent the faster students from being free to learn more through motivation.

These arguments had been laid to rest in such writings as those of Block (1974), Block and Anderson (1975), Bloom (1976), Block and Burns (1977). They addressed the two critical assumptions upon which the criticism rests and found them wanting. One of the assumptions was that there are wide natural individual differences in students' learning rate. Their work suggested that most individual differences in students' learning rate are unnatural and remain artefacts of their instruction. The other assumption was that mastery learning approaches cannot do much to eradicate these differences. But researches had indicated that mastery instruction could press individual differences in student learning rate to a vanishing point i.e. to help the 'slow' learners learn as fast as the fast ones. Moreover, the vanishing point seemed to be reached not by dragging down 'fast' students to the rate of the 'slow' but the dragging up of 'slow' students to the rate of the 'fast' ones.

In his reaction against the existing model of teaching and learning, Caroll (1963) used a conceptualized model based on five variables – aptitude for particular kinds or learning, quality of instruction, ability to understand instruction, perseverance and opportunity. He defined each of the variables in terms of time, a physical measurement with well-known properties. He asserted

that a learner would succeed in learning a given task, if he spends the amount of time he needs to learn the task. The success in learning the task according to him, is a function of the five variables.

His definition of the variables are as follows:-

Learner's aptitude

Instead of defining aptitude as the capacity of an individual to learn a given task, Carroll's conception of aptitude is simply the time required by an individual to attain mastery level of a given learning task to a given criterion level under ideal instructional condition. If every student is given the right time, he will be able to reach the desired goal. However, if the student was not allowed enough time, then the degree to which he would be expected to learn will be a function of the ratio of the time actually spent in learning to the time needed.

$$\text{Degree of Learning} = \frac{\text{f(Time actually Spent)}}{\text{Time needed}}$$

Quality of Instruction

The quality of instruction is governed by presentation, explanation and ordering. The teacher should determine in advance how best to present a given task so that both the fast and slow learners in the class gain from it optimally, even though they learn at different rates. The quality of instruction can affect both student's learning rate and achievement level.

Ability to understand Instruction

The ability to understand instruction is the learner's capacity to understand the nature of task he is required to learn and the procedure he is to follow in learning it. Student's ability to interact

with the instructional materials and the instructor's style of teaching are based on verbal ability and reading comprehension.

Perseverance

This is the time the learner is willing to spend in learning a given task. The time spent and the time needed are influenced by characteristics of the learner and the quality of instruction. It is a function of the time the student is willing to spend on active learning.

Bloom (1968) suggested that learning should not be made so difficult that only a small proportion of students can persevere to mastery.

If all learners experience much more success than failure in learning tasks administered then there will be more perseverance. Small failures can be instructive, but largely, enduring failure psychologically lead only to frustration and withdrawal from learning.

Time allowed for learning

In a learning situation, definite periods of time are allocated for each particular learning task. Whatever the amount of time allowed, it is likely to be too much for some students and not enough for others. For Carroll, the time spent on learning is the key to mastery. If instruction and student's use of time become more effective, it is likely that most students will need less time to master a subject.

Bloom (1971) argued that it is not the sheer amount of time spent in learning (either in or out of school) that accounts for level of learning but the time the student needs which is likely to be affected by his aptitude, his verbal ability, the quality of instruction and the quality of help he receives in class and out of class.

The time needed by the student was determined by student's aptitude in the subject, the quality of instruction (including instructional materials) and his ability to understand this

instruction. If the quality of instruction was high, then the student would readily understand it and would need little time to learn the subject beyond that required by his aptitude. But if the quality of instruction is too low, then the student would need more time.

The Functions of Intelligence in Education

The obvious fact that some people learn more, and learn more easily than others has led some educators to assume that they must have been born brighter. It has led some to believe that if one is not born bright there is not much he can do about it. However one of the school's major tasks is to identify, as early as possible, those who have been gifted with the potential for educational development. As a result, it has led to the widespread use of intelligence tests to identify the gifted as well as those less favourably endowed.

The nurture group which is the alternative view to the nature group described above emphasizes that mental ability is a developed ability. Wechsler's view makes it clear beyond any reasonable doubt that inheritance plays an important role in determining a person's characteristics.

The biological basis for learning—the sense organ, nervous system, and the brain—are physical characteristics too. It is reasonable to believe that heredity has something to do in their development, and that as a result, one person develops better capability for learning than another. These differences could make a difference in how easily or how much a person learns. But except in a few cases of extreme mental deficiency, there is no clear notion of what these differences are.

In contrast, there is good evidence that mental ability does develop. There are no mental operations that a person was born knowing how to do, none that were not learned. In the learning of some of them, "fortunate accidents" play important roles. Not all learnings are learned equally soon or equally well by all developing persons. Because each of us has unique opportunities and experiences and makes unique efforts, each of us develops a unique personality made up of a special pattern of abilities, habits,

interests, attitudes and ideals. No two human beings, not even identical twins growing up in the same household, have identical experiences. Each develops his own individuality.

Psychoanalysts are even of the view that human personality is very sensitive to specific incidents or accidents. Small causes in experience can have great consequences in developing personality.

It is a statement of fact that no new knowledge can be added to a person's store unless some knowledge previously gained is on hand to give it meaning and value. It follows that the foundations of learning, established in the early learning years are of utmost importance. Another is that deficiencies in early learning are likely to constitute continuing handicaps. The potential of most human beings for educational development is in principle, virtually unlimited. That the potential is seldom realized is more a fault of ourselves than our cells.

Few people work hard to learn all they possibly could. Most people, probably for good reasons of health, happiness or social participation develop only a fraction of the mental capacity they possess. We are sometimes like automobiles moving at various speeds along the highway. What determines each car's speed is not usually the maximum speed it could attain, it is rather the purposes and the habits of the driver. It is therefore reasonable to believe on the evidence now available that limitations on natural ability do not seriously limit any man's potential for developing wisdom or goodness, for serving society. What is needed is education to develop man's almost unlimited potential. The function of teachers is to foster that development.

The role of intelligence In Mastery Learning

The exponents of mastery learning do not dispute the fact that there are "individual differences" in learners but they are against using the notion to shape learning standard and achievement. They are of the opinion that the basic task in education is to find strategies, which will take individual differences into consideration and promote the fullest development of the individual.

Carroll (1963) makes it clear that if students are normally distributed with respect to aptitude for some subjects and all the students are provided with exactly the same instruction (same in terms of amount and quantity of instruction and time available for learning), the end result will be a normal distribution on an appropriate measure of achievement. It was even noted that the relationship between aptitude and achievement will be fairly high (a correlation of, .70 or 0.7 or higher is to be expected if the aptitude and achievement are valid and reliable). The implication of the message here is that achievement is a function of student's aptitude or intelligence if all students are provided with exactly the same instruction as defined above.

However, if students are normally distributed with respect to aptitude but the kind and quality of instruction and the amount of time available for learning are made appropriate to the characteristics and need of each learner, the majority of the students may be expected to achieve mastery of the subject. And the relations between aptitude and achievement are expected to approach zero, that is, achievement will not be a function of intelligence or aptitude. As a result, Carroll does not view aptitude as a synonym of intelligence; instead aptitude is defined by him as 'the amount of time required by the learner to attain mastery of a learning task'. Even with this definition of aptitude the time required by the learner will be a function of intelligence because some students will achieve the mastery of each learning task sooner than do others. But the time required for mastery may not follow the normal curve if the quality of instruction takes due cognisance of "individual differences" in learners.

Carroll (1963) defined the quality of instruction in terms of the degree to which the presentation, explanation and ordering of elements of the task to be learned approach the optimum for a given learner. Some students will need more concrete illustration, explanation, examples to get an idea than others. Some will need more approval and reinforcement than others and some may need to have several repetitions of the explanation while others may be able to get it the first time. All these show that "intelligence" or

individual difference" is an independent variable of the impact of the quality of the instructions on the learners.

The ability to understand instruction defined as the ability of the learner to understand the nature of the task he is to learn and the procedures he is to follow in learning of the task is obviously a function of intelligence.

Caroll defined perseverance as the time the learner is willing to spend in learning. Obviously if a student needs a certain amount of time to master a particular task and he spends less than this amount in active learning, he is not likely to learn the task to the level of mastery. Perseverance does appear to be related to attitude and interest in learning. There is no doubt that students vary in the amount of perseverance they bring to a specific learning task. If a student finds the effort rewarding, he is likely to spend more time on a particular learning task. If on the other hand, he is frustrated in his learning, he must in self-defence reduce the amount of time he devotes to it. Though the frustration level of students may vary, the belief is that all must sooner or later give up the task if it is too painful for them. Frequency of reward and evidence of success in learning which can increase student's perseverance in learning situation can also be influenced by intelligence. Hence perseverance is indirectly a function of intelligence.

For Caroll, the time spent on learning is the key to mastery. His basic assumption is that aptitude determines the rate of learning and that most, if not all students can achieve mastery if they devote the amount of time needed to the learning. This implies that a student must be allowed enough time for the learning to take place. There seems to be little doubt that students with high levels of intelligence are likely to be more efficient in their learning and to require less time for it than those with lower levels of aptitude or intelligence.

Conclusion

Mastery learning strategy came up as a result of some people's belief that every student can achieve mastery in learning, if given

necessary help. The proponents believe that intelligence to a large extent has a role to play but they are optimistic that the role of intelligence in learning can be de-emphasized. To them almost all students will obtain the desired objective of learning at their own time if given necessary assistance.

It has been noted in this write-up that intelligence has a very important role to play in mastery learning. Though the proponents want to hold intelligence constant, this is not possible as students come into class with varying aptitudes and levels of perseverance. It is noted also that for every variable of mastery learning strategy, intelligence has a role to play. The slow student has to be helped in accordance to his level of intelligence.

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