Achieving Sustainable Teaching and Learning in Nigerian Secondary Schools Through the use of Programmed Instruction Method

Owuamanam, Catherine Nkechinyere (Ph.D)
Faculty of Education, National Institute for Nigerian Languages (NINLAN), Aba-Abia State, Nigeria | E-mail: nyerekate@yahoo.com

Abstract: *With the increase in class population, there is a deduction in frequency with which any member of the class can interact with the teacher. This often leads to reduction in learning opportunities and an increase in the number of distracting events affecting the learning rate. In view of the above ideas, this paper attempts to examine how programmed instruction method can help to provide sustainable teaching and learning in Nigerian Secondary Schools. The paper therefore, looks at the concepts of teaching and learning, secondary education in Nigeria and its purpose, the programmed instruction method as a powerful method in teaching and learning process, the role of the classroom teacher in programmed instruction, problems hindering the use of programmed instruction in Nigeria and finally, makes suggestions for the implementation of programmed instruction in Nigerian secondary schools.*

Key words*: Secondary education, teaching, learning, programmed instruction, classroom teacher*

Introduction

Education is the process of imparting knowledge, attitudes and skills to the learner. It is the greatest power ever known to man for his improvements. Secondary Education is the education children receive after primary education and before the tertiary stage (FRN, 2004, P. 18). The realization of the educational objectives depends entirely on the quality and availability of teaching manpower. Teaching occupies a key position in all educational activities. Most other educational issues or matters are geared towards supporting and promoting teaching and learning. It is also common knowledge that teaching in its multiform is one of the most important conditions that encourage and stimulate learning.

The strategic position or focal role of the teacher stems from the central position of teaching in the education process. For the teacher, the main function and task in the educative process is instruction through which curriculum objectives and in fact all other objectives of education are achieved (Owuamanam, 2016). Therefore, teaching involves, arranging, manipulating, adapting or adjusting and managing the learning environment so that any person with appropriate entry behaviour placed in that environment may learn and exhibit the desired learning outcomes (Onwuka, 1996).

With the increase in class population, there is a deduction in frequency with which any member of the class can interact with the teacher. This often leads to reduction in learning opportunities and an increase in the number of distracting events affecting the learning rate (Abimbade, 1999, p.126). Programmed Instruction method with its powerful functions in education can help combat this problem.

Programmed instruction is a self-instructional approach to teaching. It is a kind of teaching that follows a sequence. This means that the learning material is presented in an ordered and structured programmed which has been prepared before the learner begins his tasks. Through programmed instruction, teaching is individualized. It is more or less having individual tutors for each student. This takes care of the issue of individual differences in learning. Also, programmed instruction helps learners participate actively in the learning process at all times (FME, 2007, pp. 140-141). The objective of this study is to examine how the programmed instruction method could help to achieve sustainable teaching and learning in Nigerian Secondary Schools.

Concept of Teaching and Learning
Teaching is an attempt to help someone to acquire or change an attitude, knowledge, idea, skill or appreciation. Essentially, teaching consists of setting the stage so that someone can learn (Onwuka, 1996, p. 314). The setting of the stage involves the teacher in influencing desirable changes in behaviour on the part of learners. Teaching is the creating or providing of opportunities from which learners can gain such experiences that will enable them acquire the knowledge, skill, attitude and appreciation that will serve as tools in life.

Teaching is a closed system of social interaction which exist wherever teachers and students meet for the purpose of given and receiving instructions (Owuamanam, 2016, p. 86). Teaching involves arranging, manipulating, adapting or adjusting and managing the learning environment so that any person with appropriate entry behaviour placed in that environment may learn and exhibit the desired learning outcomes. No wonder then (Imogie, 1988, p. 43) summarized the knowledge and skills required in teaching as follows:

The mediocre teacher tells
The good teacher explains
The superior teacher demonstrates
The great teacher inspires

Finally, teaching involves the determination of worthwhile objectives, the selection and arrangement of learning experiences, guidance, motivation as well as testing and correcting with a view to ensuring and improving upon learning (Onwuka, 1996, p.314). The purpose of teaching is to change behaviour in a specifiable and desirable way both in the classroom and outside it.

Learning
Learning refers either a process which produces progressive series of changes in behaviour and experience or the sum total of all such changes. As a process, learning involves the acquiring of new knowledge, skills, values and experiences which enable the individual to modify or alter his action or to realize his goals.

According to Onwuka (1996, p. 310), learning is the permanent acquisition and habitual utilization of the newly acquired knowledge or experience. Learning can be seen as the process by which we acquire and retain attitudes, knowledge, understanding, skills and capabilities that cannot be attributed to inherited behaviour patterns or physical growth (Owuamanam, 2016). Learning is basically a process of adapting to and improving the environment. What is learned can be measured either by those things that we observe in the behaviour of the individual or those that can be inferred.

Secondary Education in Nigeria and its purpose

Secondary education in Nigeria is the education children receive after primary education and before the tertiary stage (NPE 2004, p. 18). In specific term, secondary education shall:

a) Provide all primary school learners with the opportunity for education of a higher level, irrespective of sex, social status, religious or ethnic background;

b) Offer diversified curriculum to cater for the differences in talents, opportunities and future roles;

c) Provide trained manpower in the applied science, technology and commerce at sub-professional grades;

d) Develop and promote Nigerian languages, art and culture in the context of world's cultural heritage;

e) Inspire students with a desire for self-improvement and achievement of excellence;

f) Foster National unity with an emphasis on the common ties that unite us in our diversity;

g) Raise a generation of people who can think for themselves, respect the views and feelings of others, respect the dignity of labour, appreciate those values specified under our broad national goals and live as good citizens;

h) Provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.

To achieve the stated goals, secondary education shall be of six years duration, given in two stages: - a junior secondary school stage and a senior secondary school stage; each shall be of three years duration (NPN, 2004, p. 19).

Programmed Instruction as a powerful method in teaching and learning process.

Programmed instruction was developed as a result of the perceived needs of the learners which arose as a result of the increase in the number of students in a classroom. With the increase in class population, there is a deduction in frequency with which any number of the class can interact with the teacher. This often leads to reduction in the number of distracting stimuli affecting the learning rate (Abimbade, 1999, p. 126). New strategies evolved to combat this problem; among them is Programmed Instruction technique.

Programmed instruction is a self-instructional approach to teaching. It is a kind of teaching that follows a sequence (FME, 2007, p. 140). This means that the learning material is presented in an ordered, structured programmed which has been prepared before the learner begins his task. It is characterized by breaking up of the learning content into small bits that lead a learner from what he knows to new and more complex knowledge and principles. The small bits of information are presented in an orderly manner in steps. Simple problems are also given in each step. The learner responds at each step. When his response is correct, reinforcement is given by the immediate confirmation of the right answer or a correction of the wrong answers. The idea is for the first concepts of skills to be mastered first before new ones are introduced. The learner going through the material is aided by suggestions and hints. Also, there are frequent repetition of key terms and concepts.

Both the instruction presented to the learner, learners' response and feedback make up

what is called step/frame. The learning cycle of programmed instruction consists of the provision of bit of instructional message (Stimulus/ content), a question, student, response and feedback (knowledge of result) (Onyejemezi, 1990, p. 164). Diagrammatically, this can be represented thus;

| Instruction And Questions (Stimulus) | + | Learners Responds | + | Feedback (Knowledge of Result) | = | Frame/Step |
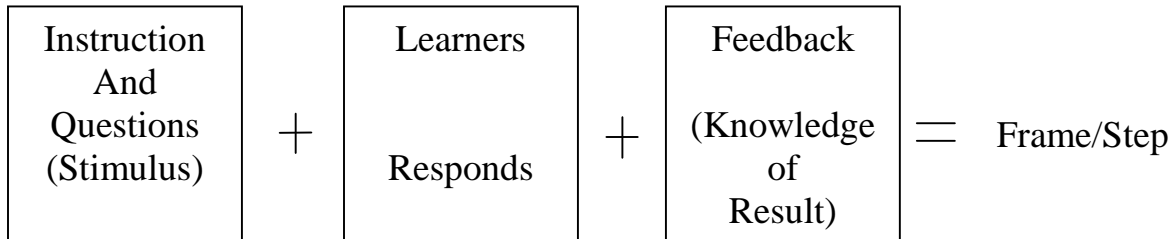
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Computers, textbooks and teaching materials are used to present the materials. The medium presents the materials in a logical and tested sequence (Wikipedia, 2016).

Programmed instruction is based on skinners' "operant condition", a behaviourist theory stating that learning is a change in behaviour. That is, the individual's response to events (stimuli-to read, think, touch, feel, smell, or observe something). Behaviour can be conditioned by rewarding the right stimulus-response patterns. According to Skinner, behaviour that is positively reinforced will reoccur producing secondary conditioning, intermitted reinforcement is particularly effective, information should be presented in small amounts so that responses can be reinforced and reinforcements will generalize across similar stimuli (edutecwikipedia, 2016).

According to (Nwafor, 1996, pp.26-27), Programmed Instruction method has the following principles:

- Specification of objectives: This principle suggests that the objectives of a programmed instruction must be specified in behavioural and measurable terms which indicate knowledge, skills and attitudes which are intended to be achieved.
- Sequencing: The material to be learned should be organized in progressive steps in the form of frame. For linear, it is one frame at a time.
- Responding: The demand of this principle is that the learner should be active in the learning process. The rational is that learning is achieved through experience and what a learner does is what he learns, it therefore requires that the learner should be actively involved.
- Immediate feedback: The learner is immediately given a feedback or reinforcement which shows whether or not the response is correct. This is immediate knowledge of the result (IKOR). That is students learn from the consequences of their responding, not from making the response per se.

- Self-pacing: learners work through the programmed text at their own pace-self pacing, rate of progression under the control of the learner.
- Entry behaviour: the principle demands that each student should be introduced to new materials at a level of difficulty commensurate with his/her previous experiences and attainments pre-requisite to the new material to be learned.

Programmed Instruction can be linear (straight-line) programming or branching programming. The man who popularized the idea of programmed instruction is B.F. Skinner. He is also the advocate of linear programming. Linear programming demands that all the frames be arranged in an orderly manner starting with the simplest to the most complex. The learner starts off with the first frame but cannot proceed to the next frame without showing mastery of this first frame. After responding to the activity in a frame, if the response is correct, the learner moves to the next frame and so continues until he fully masters that frame. All learners work through the same sequence (Fretzin, 2001). Example of a linear frame:

FRAME (I): In English Language, words are divided into classes. We call the largest class nouns.

Question (Stimulus): Nouns are a class of ——————————————

Response (Answer to frame): ——————————————

words (feedback).

FRAME I1: In English Language, words are divided into classes. We call the largest class nouns.

Question (Stimulus): In English Language, the class of words called nouns is larger than all the other----------- of words combined.

Response (Answer to the frame): —————

Classes (feedback) (Sullivan, 2016).

Thus, all students progress from the first frame to the second and so on to the end, following the same sequence regardless of what type of response they give. This is why the mode is described as linear.

Branching programming is also known as intrinsic programming. The man who became famous with this type of programming is Norman A. Crowder. Under branching programming the learner is presented with a piece of instruction usually in large steps followed by multiple choice questions, rapid progression and little repetition. The number of options must be more than two to minimize choosing correctly by chance. The learner chooses one of these options and the choice determines the next frame. If the learner's answer is correct, the learner is provided with additional information and another question. If the learner's answer is wrong, he is provided

with complete knowledge of result. That is the learner is told why he failed and with reasons (Abimbade, 1999, p.138).

Analysis may reveal that the learner's failure is caused by lack of understanding of basic concepts. So the learner is redirected to a new unit where he reads up these basic concepts. At other time, the learner may only be provided with additional explanation to enable him proceed. It can be seen therefore, that depending on the learner's initial response, the learner can be directed to many branches hence the name branching programming (Onyejemezi, 1990, p.168). Example of a Branching Frame:

FRAME I:
Learning material; in the law of Indices, when numbers with powers are multiplied then we add their powers algebraically and the whole numbers are multiplied.
$(2x10^3)$ x $(3x10^5)$ x $(4x10^6)$

$= 2x3x4x10^3x10^5x10^6$

$= 24x10^{3+5+6}$

$=24x10^{14}$

Question: Multiple these numbers and select the answer from options A, B, C and D.

$(6x10^2)$ x $(2x10^6)$ x $(3x10^3)$

Options A: $36x10^9$

B: $36x10^{10}$

C: $36x10^{-3}$

D: $36x10^{11}$

Response1A = your response was (c) $36x10^{-3}$ = sorry

(Branching frame): you must have changed the signs. Re-read frame I and make another selection.

Response1B = your response was (D) $36x10^{11.}$ Congratulation! Proceed to the next frame on the next page.

Special forms of this model are called Drill and Practice Programmes where learners are supposed to develop basic stills like arithmetic and keyboard operations by repetitions. The Programmed Instruction method has the following advantages:

- Programmed instruction provides the learner with immediate feedback and this motivates the learner to go further. Students' attention and interest are captured, making for more meaningful learning and increased retention rate. Learning is faster and more content coverage is met.
- It keeps records of learner's responses and this makes it easier to identify areas of weaknesses for remedial instruction.
- It is possible to provide for both the fast and slow learners at the same time, without one accelerating or retarding the growth of the other. Programmed instruction allows each learner to proceed at his/her own rate.
- Programmed instruction is a big step towards individualization of instruction. It makes possible the one teacher one pupil relationship. Each pupil engages on a programme and requests for the teachers' attention as often as he needs it.
- Programmed instruction is very flexible. It is adaptable to different instructional contents and tools and to develop any kind of behaviour including creativity. It is used at any learning stage-primary, secondary, tertiary and even at homes.
- When every child in the class is engaged in programmed learning, the emotional and social problems associated with the classroom will be reduced.
- The judicious use of teachers' time when students are engaged on programmed materials. Teachers are left with time to engage on other useful activities, such as marking of students scripts, recording, writing programmes, attending meetings and so on.
- The use of well illustrated programmed material can be motivating. It can help keep pupils on the learning activities for a long time. It arguments the laxity of poor trained teachers (Nwafor, 1996, p. 35).

The role of the classroom teacher in programmed instruction
It is true that this is a self instructional technique of learning. This does not make the classroom teacher useless; instead, he is fully occupied as he has to play four major roles. He is expected to direct, analyze, teach and advice.

As a director, the teacher directs the learning experiences of the students as a specialist in education. As an analyst, he continually analyzes and evaluates the progress of the students on the basis of the results from their daily work and frequent testing. As a tutor, he monitors and personally teaches students during their study when occasions demands for it. An occasional lecture to introduce a new topic or sum up a section of the source or a unit completed by some members of the class is recommended.

The class teachers also serve as consultant in many discussion periods which may come up between the teacher and a student. The discussion may also be between the teacher and the students or among the students to clarify more difficult part of the programme (FME, 2007, p.140).

Problems hindering the use of Programmed Instruction method in Nigeria
Efforts to introduce Programmed Instruction method to Nigeria was made early enough by

United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO Sponsored Workshops on Programmed Instruction in Nigeria in 1963. These workshops saw the establishment of programmed learning at the Institute of Education of the University of Ibadan. Nigerian researchers like Balogun , Okorontifa and Akinyemi did attempt programmed instruction in Sciences and Mathematics (Akinyemi, 1988).

There were also attempts to adopt foreign programmed materials into Nigerian education system. This trend neither encouraged the use of programmed materials nor augured well for Nigerian learners (Nwafor, 1996, p. 33). Till today, no drastic move is made to use the original programmed instruction or its new versions in our schools. The problems hindering its use are as follows:

- Lack of well trained programmers to prepare good materials,
- Many teachers in Nigeria have no practical training, if any at all, in programmed instruction and as such can find it difficult to use programmed materials since they were not brought up in it.
- There is inadequate production of programmed instructional books, electrical and electronic machines in the country due to high cost of production.
- The usual poor discrimination, assimilation and resistance to educational innovations in Nigeria,
- Poor survey field-trial with small number of possible users, leaving the available materials widely unknown and restricted only to the immediate users,
- Nigerians researchers are yet to get acquainted with the demands of programmed materials development such as appropriate statistics to define the qualities of criterion-referenced tests,
- Lack of interest on the part of publishing companies to publish programmed texts (Nwafor, 1996, p.34)
- Education is examination oriented in Nigeria. The concern of the teachers and the students is to cover the syllabus. Thus individualized instruction may not be easily accommodated (FME, 2007, p.139).

Suggestions for the Implementation of Programmed Instruction method in Nigerian Secondary Schools
The following suggestions are made:

- Efforts must be made by the government to introduce programmed instruction in Nigerian schools as this would help solve the problems of high cost of production, large classes, mass failures, high school drop-outs and lack of qualified teachers.
- Efforts should be made at all levels of preparation of the teachers at the Colleges of Education and Faculties of Education in the Universities to expose student teachers to the importance, use and preparation of programmed instruction materials.

- Federal Government as a matter of necessity should provide enough money for the training of programmers in Nigeria.
- Free and constructive communication should be encourage between the teacher and the students and among students'
- The teacher should respect each learner's opinion as much as possible. Conformity and uniformity of opinion should not be enforced.
- Students should be given assignments regularly. They should be encouraged to do it on their own.

Conclusion

Education is a process of imparting knowledge, attitude and skills to the learner. It is the greatest power ever known to man for his improvements. Secondary Education is the education children receive after primary education and before the tertiary stage. The realization of the educational objectives depends entirely on the quality and availability of teaching manpower. Teaching is a closed system of social interaction which exist whenever teachers and students meet for the purpose of given and receiving instructions.

With the increase in class population, there is a deduction in frequency with which any member of the class can interact with the teacher. This often leads to reduction in learning opportunities and an increase in the number of distracting events affecting the learning rate. In view of the above ideas, this paper examined how Programmed Instruction method can help to provide sustainable teaching and learning in the Nigerian Secondary Schools. The paper therefore, looked at the concepts of teaching and learning, Secondary Education in Nigeria and its purpose, the Programmed Instruction method as a powerful method in teaching and learning process, the role of the classroom teacher in programmed instruction, problems hindering the use of programmed instruction method in Nigeria and finally made some suggestions on how Programmed Instruction can effectively be implemented in Nigerian Secondary Schools.

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