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## The Delivery System in Teacher Education

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### **Introduction**

Teacher education occupies a strategic place in most African countries' National Policy on Education. For example, Section 9 of the Nigerian National Policy on Education document highlights the importance of teacher education as the basis for other forms of education. This is because, just as no nation can rise above the quality of its educational system, 'no education system can also rise above the quality of its teachers'.

The purposes of Teacher Education, as highlighted in the National Policy on Education (2004), are:

- a. to produce highly motivated, conscientious and efficient classroom teachers for all levels of our education system;
- b. to encourage further the spirit of enquiry and creativity in teachers;
- c. to help teachers to fit into the social life of the community and society at large and to enhance their commitment to national objectives;
- d. to provide teachers with the intellectual and professional background adequate for their assignment and to make them adaptable to any changing situation, not only in the life of their country but also in the wider world;
- e. to enhance teachers' commitment to the teaching profession.

It is desirable that all teachers in Nigeria's educational institutions, from pre-primary to university levels, are professionally trained. Teacher education is currently being structured to equip teachers with a relevant and appropriate delivery system for the effective performance of their duties. The following institutions are expected to give the required professional training to teachers:

- i. Colleges of Education;

- ii. Faculties/Institutes of Education;
- iii. The National Teachers' Institute;
- iv. Teachers Centres.

Since teaching, like other professions, is now legally and publicly recognized as a profession, especially with the establishment of the Teachers' Registration Council of Nigeria (TRCN), all teachers are expected to be trained in the 'art' and 'science' of teaching. Towards achieving this goal, this chapter is designed to have a look at modern trends in teacher education delivery system, with a view to producing a new crop of teachers that are not only competent and knowledgeable in their subject-matter, but are also capable of holding their heads above water, especially in this age of technology and globalization.

### **Practical Issues in the Delivery System**

It is instructive to note at the onset that the delivery system is closely associated with the teaching-learning process which is quite fundamental in teacher education. According to Oyedeji (1998), some questions are germane to the concept of teaching. These questions are: What is teaching? What makes an effective teacher? Are there certain identifiable skills that make one teacher more effective than another? Answers to all these questions will certainly provide direction for discussion on delivery system in teacher education.

### **Defining Teaching**

Teaching can be defined as the action of a person cultivating skills, imparting knowledge or giving instruction to someone else. It can also be defined as the job of a person who teaches. Teaching may be defined as an attempt to bring about desirable changes in human learning, abilities and behaviours. Teaching intends to influence the learners to acquire behaviours that contribute to better living (Olaitan and Agusiobo 1982). Similarly, Dalen and Brittel (1959) define teaching as the guidance of pupils through planned activities so that they may acquire the richest learning possible from their experiences. They also add that learning is as a result of experiencing and requests the active participation of the learner.

Teaching, simply put, is that art of helping others to learn effectively. The word 'effectively' is crucial in the sense that pupils can learn with or without a teacher. But a teacher, through the use of appropriate strategies and techniques to facilitate learning, can improve the quality and quantity of learning to a level that can justify the term 'effective learning' (Obanya 1985).

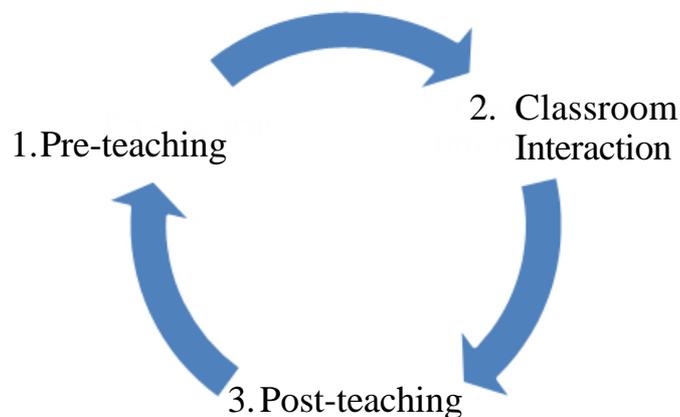
Another way one can look at the word 'teaching' is that there is no single activity which in itself constitutes teaching. Instead, teaching consists of a number of inter-related activities. These activities can be seen in the multiple roles of the teacher in the classroom.

### The Teaching Process

According to Oyedeji (1998), teaching is a challenge that requires long hours of work and preparation. It is a continuous, cyclic process involving three main phases, as can be seen from Figure 7.1, viz:

- i. Pre-teaching – during which the teacher plans what to teach and prepares (and/or collects) the materials to be used for teaching;
  - ii. Classroom interaction – during which there should be purposeful interaction between the materials, the subject-matter, the learner and the teacher; and
  - iii. Post-teaching – during which the teacher reflects on the task just completed and feeds back his observation into the planning of the next lesson. This process continues *ad infinitum*.
- (1) Pre-teaching;
  - (2) Classroom Interaction;
  - (3) Post-teaching.

**Figure 7.1:** The Cyclic Nature of Teaching



**Source:** Adapted from Oyedeji (1998) Teaching for Innovation

### Teaching Outcomes and Teaching Effectiveness

Every teaching is carried out for a purpose which is mainly to produce learning in the students in order to produce an educated person. However, it should be noted here that not every teaching brings about learning (Oyedeji 1998). There is therefore the need to look at the relationship between teaching and education.

At the end of a study commissioned by UNESCO on education and productive work in Africa, attempts were made to provide answers to the question of what education really is. Old school teachers' major objective of inculcating the three Rs (Reading, 'Riting, 'Rithmetic) were replaced with that of cultivating the three Hs, namely:

- i. the HEAD, or the faculties for thinking and reasoning in their highest forms;
- ii. the HEART, or the faculties for the development of feeling, emotions, values, attitudes and psycho-social adjustment to life situations; and
- iii. the HANDS, or the faculties for the neuro-physical coordination, physical agility and physical culture (Obanya 1980). Education, which teaching is set to promote, should therefore aim at the harmonious all-round development of an individual, by adequately cultivating the three Hs.

According to Obanya (1982), two main differences exist between the three Rs and the three Hs. First, the three Rs emphasize 'inculcation', i.e. providing the stimulation for the various desirable traits of the individuals to develop to their fullest capacity. Second, the three Rs deal with specific subject-matter, while the three Hs transcend the teaching and learning of specific subject-matter to everything that is done to nurture the individual learner. Teaching is seen as that conglomeration of complex but scientifically guided activities which aim at producing educated persons by cultivating their three Hs. Any approach or strategy which does not reflect any of the Hs will not produce educated persons and so will not amount to teaching. So, for any teacher to be effective, there are conditions his/her teaching must meet.

The essence of being an effective teacher lies in knowing what to do to foster pupils' learning and being able to do it. Effective teaching is primarily concerned with setting up a learning activity for each pupil, which is successful in bringing about the type of learning the teacher intends (Oyedeji 1998). The art of successful teaching is crucially bound up with developing both decision-making skills and action skills. Developing teaching skills is as much about developing and extending the type of decisions one makes about one's teaching as it is about the successful execution of those decisions.

There are some basic types of knowledge about the teaching profession that an effective teacher must possess. This knowledge base, according to Oyedeji (1998), includes:

- Knowledge about content;
- Knowledge about broad principles and strategies of classroom management and organization;
- Knowledge about curriculum materials and programmes;

- Knowledge about the teaching of particular content topics;
- Knowledge about pupils;
- Knowledge about educational contexts, ranging from the classroom group to the aspects of the community;
- Knowledge about educational aims and values.

The awareness of this basic knowledge of teaching by the teachers will equip them and make them perform effectively the various roles of an effective teacher.

### **Theoretical Explanation of the Delivery System in Teacher Education**

Teacher education programme is usually structured to equip pre-service teachers with skills for effective performance of their duties. Thus, developing and inculcating these skills is highly desirable in teacher education.

#### ***Teaching Skills***

Teaching skills can be defined as discrete and coherent activities by teachers which foster student learning. According to Calderhead (1986), it is useful to define teaching skills in terms of a number of features:

- i. They are intended to achieve a particular goal;
- ii. They take account of the particular context;
- iii. They require precision and fine-tuning;
- iv. They are performed smoothly;
- v. They are acquired through training practice.

In the words of Adesina (1985), skills and skill development deal with bringing up the child to acquire ability and practical knowledge in various forms of learning activities. Such skills can be developed in the pupils during teaching-learning activities. Teaching skills refer to specific teacher behaviour (such as lecturing, questioning, and discussing), using instructional aids designed to help the classroom instruction become more effective. The teaching skill approach is based on the assumption that the complex teaching act can be broken down into more easily trained skills and that the teacher can gradually acquire a repertoire that allows him or her to become flexible and versatile, since he or she has more teaching techniques at his or her command (UNICEF/UNESCO Innovation in Education Programme 1988).

Teaching skill can further be defined as a set of teacher behaviours which are specifically effective in bringing about desired changes in pupils.

In the light of this consideration, three important elements of teaching skills are discernable:

- i. *Knowledge*: comprising the teachers' knowledge about the subject, students' curriculum, teaching methods, the influence on teaching and learning of other factors and knowledge about one's own teaching skills;
- ii. *Decision-making*: comprising the thinking and decision-making which occurs before, during and after a lesson, concerning how best to achieve the educational outcomes intended;
- iii. *Evaluation*: comprising the various activities of the teacher to assess the effectiveness of the teaching (Oyedepi 1998).

### Importance of Teaching Skills

Teaching skills are very important to both teachers and learners in many ways. For example, teaching skills enable the teacher to choose appropriate objectives for the lesson. An appropriate skill enables the learner to understand and digest easily the concept being taught by the teacher. Since skills involve the breakdown of complex teaching act into more easily taught concepts, an appropriate skill therefore makes teaching and learning more effective. It removes monotony from teaching and learning because variety of skills can be applied in the course of a lesson; thus making a lesson more lively and interesting.

Appropriate teaching skills enable the teacher to choose appropriate teaching aids for the lesson, thereby encouraging pupils' understanding of the lesson. It encourages a pupil-centred lesson rather than the chalk-and-talk method, and helps in eliminating boredom on the part of the pupils. Teachers who have knowledge of adequate and appropriate teaching skills become more resourceful, versatile and flexible in their approach to teaching. The teacher is then able to influence and control pupils' behaviour and better manage his class.

### Types of Skills and their Application in Teaching

Teaching skills that can be applied to many subjects at different levels have been identified, isolated, collected and classified from a range of sources. Research studies, classroom interactions, analysis, observation of classrooms and various theories of teaching have helped in identifying these skills. The Austrian Advisory Committee on Research and Development in Education has analyzed teaching into 140 skills (Ajayi 1995).

Allen and Ryan of Stanford University (1984) have suggested 14 skills which are representatives of general teaching skills:

1. Writing instructional objective;
2. Stimulus variation;
3. Skills in questioning;
4. Skills in explaining;

5. Skills in using blackboard;
6. Initiating a lesson;
7. Skills in communication;
8. Lecturing;
9. Silence and non-verbal cues;
10. Closure;
11. Fluency in asking questions;
12. Planned repetition;
13. Illustrations and use of examples;
14. Recognizing attending behaviour (Sampath et al 1984).

Here, it is necessary to discuss some of the skills which are deemed crucial for effective teaching in the classroom.

### ***Skills in Writing Lesson Objectives***

Skills in writing objectives are given priority here because many teachers take their faulting steps from here. Once the objective of the lesson is wrongly written or chosen, that is the beginning of a lousy lesson. The objective can mar or bring the beauty in a lesson out. Some skills in writing an objective or choosing an appropriate objective include the following:

- a. An objective must be precise;
- b. It must be derived from the subject matter;
- c. It must be achievable within a given period;
- d. The age and mental ability of the learner must be considered in choosing an objective;
- e. The classroom and general environment of the pupils must be considered also;
- f. Pupils' previous experiences have a role to play in choosing an objective;

Once the teacher takes pains in following the ideas above, he would not have serious problems in achieving the objective for the lesson (Mc Farland 1973).

### ***Skills of Stimulus Variation***

Boredom is often a major problem in the classroom, but many teachers in their teaching styles ignore this problem. Many teachers remain glued to their sitting or standing position while teaching the pupils. Worse still, they talk in a monotonous voice throughout the lesson.

Stimulus variation is geared towards using various attention-compelling behaviours to maintain pupils' attention. These behaviours include:

- a. *Movement*: A teacher's movement from one section of the class to another facilitates useful shifts for attention. The movement must be purposeful. Such movement can be towards the chalkboard to illustrate a point or it can be going round to mark pupils' work.
- b. *Gesture*: This involves movement of the head, hands and body for more expressive and dynamic presentation. The teacher can use his hand to explain shapes, sizes, etc. The head can be used by the teacher to register agreement or disagreement to pupil's answer.
- c. *Changes in Speech Pattern*: The teacher can effectively sustain pupils' attention by sudden or radical change in tone, volume or speed of the teacher's speech, modulation of voice and so on.
- d. *Focusing*: This involves verbal gestures or verbal-gestured focusing, calling attention to specific materials as 'listen to this', 'look at this', etc.
- e. *Change in Interaction Styles*: Instead of teacher monologue, the teacher is encouraged to use three patterns of interaction, viz: Teacher-Group (Teacher making a dialogue with the entire class); Teacher-Student (A student is asked probing questions by the teacher); Student-Student (One student's response is re-addressed to another student for comment on clarification).
- f. *Pausing*: Short deliberate intervals of silence can be used while conveying information, lecturing or explaining.

### ***Skill of Questioning***

Asking questions constitutes a major part of teachers' activities. Meredith D. Gall (1970) reports that about sixty per cent of teachers' questions require students to recall facts; about twenty per cent require students to think and the remaining 20 per cent require procedural responses usually associated with classroom management. The essence of emphasizing skill of questioning is to encourage teachers to avoid questions requiring recall of facts and to concentrate instead on asking questions that will encourage thinking and analysis. For the practice of this skill, questions are categorized into low-order-questions, middle-order-questions and high-order-questions. Low-order questions are those asking for knowledge; middle-order-questions are those asking for comprehension or application, while high-order-questions are those asking for analysis, synthesis or evaluation. For simplicity, teachers should try as much as possible to use more of high-order questions and minimize the use of low-order questions.

When a teacher asks pupils a question and the correct answer is not given, the teacher should not punish the pupils; rather, he should lead the pupils to the correct answers by asking probing questions which will eventually lead them to the correct answer. The skill of probing questions comprises the following:

- a. *Prompting*: Questions where there is a hint for the pupils to help them in reaching the expected response.
- b. *Seeking Further Information*: Questions where more information is sought, asking how and why of correct or wrong part of the partially-correct answer.
- c. *Refocusing Question*: Question which makes the pupils compare a phenomenon with another phenomenon for similarity or contrast or for any other relationship.
- d. *Redirected Question*: Questions which are directed to more than one pupil for response.

### ***Skill of Explaining***

Explanation is a set of inter-related statements made by the teacher. Teachers, in their teaching, make use of explanation most of the time. Explanation is necessary in order to increase pupils' understanding of the lesson. To be able to explain well, the teacher has to develop certain desirable behaviours like using beginning and concluding statements lacking in continuity; and vocabulary, lacking in fluency and using vague words and phrases. The teacher should try as much as possible to be patient when explaining concepts or ideas to the pupils. Pupils should be allowed to ask questions during or after the period of explanation.

### ***Skill of Using the Chalkboard***

The chalkboard is one of the most widely-used visual aids. Many teachers usually forget the availability of a versatile tool close at hand. The components of the skill of using the chalkboard are:

- a. Teachers should make sure that their writing on the board is legible. The writing on the board should be with letters bold enough for pupils at the back of the class to read. There should be space in-between letters and words;
- b. The chalkboard must be neat at all times. This can be achieved by retaining only the relevant matter under focus and by seeing that there is no over-writing;
- c. Appropriateness of written work, in respect of meaning, brevity, simplicity and continuity in the points being presented, underlining important words using coloured chalk, developing the necessary and proportionate diagrams along with the lesson.

### ***Skill of Reinforcement***

Pupils need approval of their behaviour. Pupils' participation in the class increases when they are appreciated by the teacher for answering questions correctly. This is the result of positive reinforcement. On the other hand, negative reinforcement

results in pupils being passive if they happen to be discouraged by the teacher's behaviour. Positive and negative reinforcement are either verbal or non-verbal and have the following components:

- a. Using verbal reinforcers;
- b. Repeating and re-phrasing pupils' answers;
- c. Writing pupils' answers on the chalkboard;
- d. Using extra verbal cues like "um" and "aha" to encourage pupils while answering.

These are positive reinforcers. A teacher should avoid using negative verbal and non-verbal reinforcers so that the pupils are encouraged to participate to the maximum. Duthie (1980) gives more examples of positive reinforcers such as: teacher praises; teacher uses pupils' contribution; teacher relates pupils' contribution; teacher writes pupils' contribution on the board. These are reinforcers that can increase pupils' participation in the lesson.

### ***Specific Teaching Skills***

Joyce and Weil (1980) suggest that there are many kinds of effective teachers. They further suggest that different teachers are effective under different circumstances. For example, a teacher might be quite effective at the elementary level but quite ineffective at the secondary level or vice versa. Elementary teachers tend to be required to teach all areas of the curriculum, whereas secondary teachers usually teach in only one or two curriculum areas. Thus, different specific skills are required to be able to teach effectively at either the elementary or secondary level.

Major development differences between elementary and secondary level students help differentiate the skills needed by teachers at different grade levels. At the secondary level, adolescents are going through puberty, accompanied by all the physical body changes and emotional adjustments. Thus, students at this level need teachers who can help them acquire complex physical, social, emotional and cognitive skills. In contrast, pupils at the elementary level are still quite dependent and need teachers who can display and provide affection and act as surrogate parents. As a result of these developmental differences, vastly different skills are needed to work effectively with elementary level pupils and secondary level students.

### ***Generic Teaching Skills***

There are also certain teaching skills that are essential for effective teaching in all grades and in all curriculum areas. These generic skills can be classified as pre-instructional, instructional or post-instructional (Moore 1992).

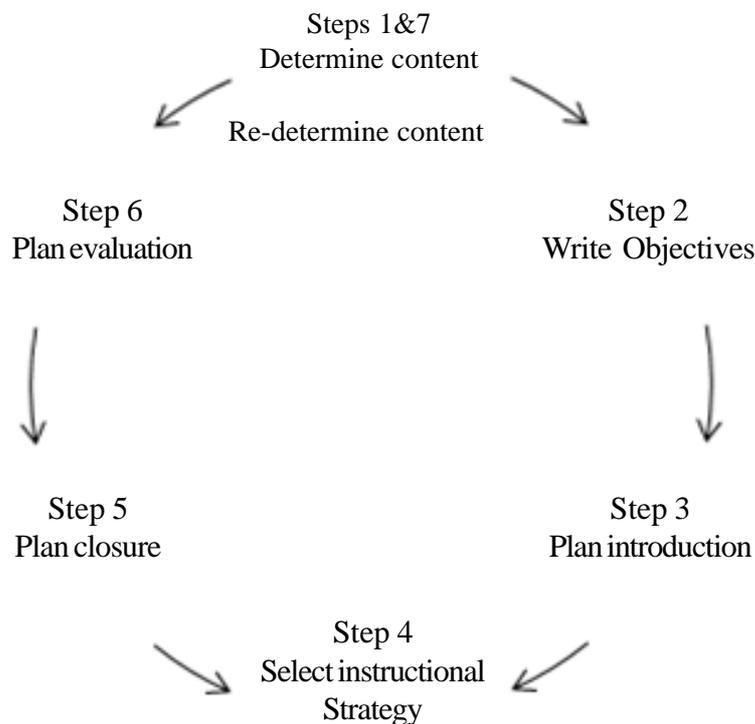
*Pre-Instructional Skills:* The key to effective teaching is planning. The teacher must plan well to teach well. Oyedeki (1998) identifies and discusses briefly the

skills one needs to plan well. According to him, answers must be provided sequentially to the following questions:

1. What content should be taught?
2. What are the desired learner outcomes?
3. What teaching materials will be needed?
4. What is the best way to introduce the subject?
5. What is the best instructional strategy for the intended learning?
6. How should the lesson be closed?
7. How should the students be evaluated?

This sequential planning process is illustrated in Figure 7.2. Step 1 involves identifying the content; Step 2, writing objectives; Step 3, introducing the lesson; Step 4, selecting an instructional strategy; Step 5, closing the lesson; Step 6, evaluating the lesson; and Step 7, identifying new content to be taught.

**Figure 7.2:** Basic Seven-Step Planning Process



Source: Adapted from Oyedeji (1998) Teaching for Innovation

The planning process, as presented in Figure 7.2, represents a major undertaking that is essential to effective teaching.

A thorough examination of and reflection on the pre-instructional and planning process reveals that it is a major undertaking that requires a number of skills. Specifically, a teacher must be able to:

1. Make accurate observations;
2. Write objectives;
3. Select appropriate closure;
4. Plan appropriate cognitive sets (sets induction);
5. Select appropriate teaching strategies;
6. Determine and develop appropriate evaluations. Whether a student-teacher (future teacher) or an experienced one, one needs to develop and refine these pre-instructional skills. The results will be more effective planning and increased student learning (Oyededeji 1998).

### ***Instructional Skills***

Once a lesson is planned, it has to be implemented. Implementing a lesson in order to ensure that maximum learning takes place is another difficult and tedious task that requires special skills essential to all teachers.

One of the most central tasks of instruction is the ability of the teacher to communicate effectively with the students. One cannot communicate effectively without gaining students' attention and arousing and maintaining their interest. This requires skill in the use of stimulus variation, questions and reinforcement.

Management of the learning environment is also a skill that all effective teachers must master. The teacher must be able to get students' cooperation, arouse and maintain their interest and involvement in learning tasks, and conduct the business of the classroom smoothly and efficiently.

Successful implementation of a well-planned lesson requires a number of special skills. Specifically, a teacher must be able to:

1. Establish cognitive sets (set induction);
2. Communicate;
3. Use stimulus variation;
4. Use reinforcement effectively;
5. Use questioning techniques;
6. Manage a classroom;
7. Establish lesson closure;
8. Evaluate objectives (Oyededeji 1998).

Although, the development and refinement of these instructional skills does not guarantee success, according to Moore (1992), they should greatly increase teachers' potential for success.

### ***Post-Instructional Skills***

Teaching involves well-planned and organized evaluation. Evaluation information needs to be collected and analyzed with respect to teachers' objectives, and judgements must be made regarding the level of student achievement. The two skills here include:

1. Ability to analyse evaluative information, and
2. Ability to make judgements regarding evaluative information.

The development and refinement of pre-instructional, instructional and post-instructional teaching skills is important to all professional educators. Without these, teachers can never maximize their teaching effectiveness.

### ***Skills in Classroom Management***

Classroom management, most of the time, is taken for granted by many experienced teachers, whereas it is necessary for effective teaching and learning processes. Classroom management often takes a big proportion of the teacher's time because it involves a lot of activities. Such activities include keeping school records, reports, requisition for equipment and supplies or the necessary routine of classroom control and discipline. Improper classroom management can lead to disorder and other disciplinary problems in the classroom. Consequently, effective classroom learning can be jeopardized. Poor classroom management can also lead to an indifferent or negative attitude on the part of the pupils. The following are required for effective classroom management:

- a. The teacher should give pupils sufficient activity to keep them busy;
- b. Noise in the classroom should be at a reasonable level. Pupils should not be left idle or alone; otherwise the class will become very noisy. Argument among pupils must be discouraged as this can lead to fighting;
- c. The teacher's authority is necessary as it is through authority that the teacher can control and discipline the pupils;
- d. Honesty is important on the teacher's part since pupils do watch and judge a teacher's behaviour. If a teacher is honest, pupils will surely emulate him;
- e. Firmness by the teacher will go a long way to foster discipline in the class (Farrant 1976).

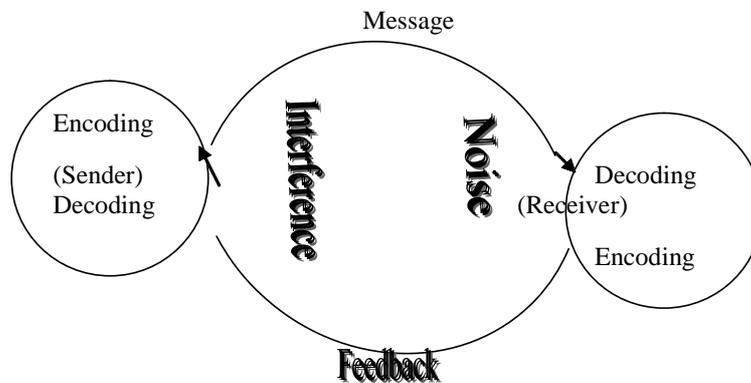
### Communication and Instruction in the Classroom

Furthermore, since teachers are by design, orientation and accreditation professionals in the dissemination of knowledge, it is necessary to discuss the major attributes of communication and instruction which form the core of teacher education. Teacher education programmes enriched with communication and instruction, serve a dual purpose. First, they should increase the efficiency and effectiveness of the instructional and educational process in the programme. Secondly, and more crucial, a programme for educating teachers should itself be a model for teaching, embodying the most effective and innovative procedures and concepts of communication technology (UNESCO 1974:224).

Without communication, teaching and learning cannot occur. Of course, Omoniyi (2005) describes communication as a *sine-qua non* to effective teaching and learning. At the heart of the relationship between teacher and students is the teacher's ability to communicate. Effective communication skills are not only the prerequisite for successful work in the classroom; they also contribute to making the classroom environment lively and enjoyable to students (Oyedeji 1998).

Teaching has been described as a communications process with the teacher as the 'sender' and the student the 'receiver'. Teachers continually send messages to students and receive messages from them. This is illustrated in Figure 7.3 below.

**Figure 7.3:** The Communication Process



**Source:** Adapted from Teaching for Innovation (Oyedeji 1998)

The sender first encodes (composes) a message into a form which will be understood by the receiver and then transmits this message. The transmitted message is received and decoded by a receiver, who then encodes some form of reaction to the message. The reaction is often non-verbal and is used to communicate whether the message was understood or not. The receiver sends

the encoded reaction back to the sender, who then decodes and reacts to the feedback. The sender's reaction to the feedback may be to continue with new information, to clarify the original message or to repeat.

Messages may be sent or received through verbal, physical or situational stimuli. Teachers must be skilled at sending and receiving messages through all these modes. Improving the quality and delivery of teaching is a system-wide problem in Africa's educational institutions. Impactful research requires appropriate infrastructure and communication facilities. These communication facilities are generally referred to as 'educational media'.

Educational media are generally defined as the devices available to teachers for use in aiding teaching and learning in a more efficient and stimulating manner than the use of only the teacher's voice. According to Omoniyi (2005), they are the media born of the communication revolution which can be used for instructional purposes alongside the teacher. The media are technologies that are capable of delivering information and experiences widely and quickly. They serve very different specific aims: explanation, illustration, systematic instruction, preservation, practice, etc. The general argument in favour of using educational media in schools is that they promote efficiency and bring about innovation because they help students get away from the traditional rote-memory learning. Omoniyi (2005) in Hoban (1991) reported that when effectively used, the media can achieve the following:

- i. Supply concrete basis for conceptual thinking and reduce meaningless word responses of pupils;
- ii. Make learning more permanent. Learners are able to retain and recall information with ease;
- iii. Offer a reality of experience which stimulates self-activity on the part of learners;
- iv. Provide high degree of interest for learners;
- v. Develop continuity of thought, especially motion pictures;
- vi. Contribute to growths of meaning and, through that, enhance vocabulary development;
- vii. Provide experiences not easily obtained through other materials, thus contributing to the efficiency, depth and variety of learning.

### Cybernetics

Cybernetics is the science of communications and automatic control systems in both machines and living things. The term itself originated from a Greek work *kubernotos-steerman* in 1947, to describe a concept that invokes the rich interaction of goals, predictions (objectives), actions (process), feedback and response in

communication systems of all kinds (Wiener 1948). Early applications in the control of physical systems were not limited to communication. It included the designing of electronic circuits and manoeuvring of robots. Principles of cybernetics are applicable in the design of software and hardware or social, managerial and other interpersonal systems.

Cybernetics, in this age of information and communication technology (ICT), is the study of computer control systems and the relationship between these artificial systems and biological systems, i.e. man-machine relationship. Cybernetics is simply about the development of feedback-control mechanism in communication. ICTs have significantly improved the feedback control in communication. It is now possible to have synchronous communication in man-machine interactions.

### ***Cyberspace and Virtual Events as Aids to the Delivery System***

Virtual event or reality is a computer-generated environment that allows the user to experience various aspects of life through online transactions. Cyberspace, which is connected when one logs on to the online service, is the environment in which electronic communication or e-learning occurs, and it offers many possibilities in distance learning. The possibilities, which are available on the internet, include (1) online tutorials; (2) virtual library; (3) virtual classrooms, where classes are taught entirely on line, as against the online tutorial, which is individualistic; (4) correspondence courses, where instructional materials are sent to individual students and returned via the internet rather than by mail.

Virtual events offer great promise because of the capabilities of the world wide web (www) to support multiple media channels – text, graphics, audio and video, all in digital form. Initially, synchronous communication via the internet was limited to text-based applications, such as Internet Relay Chat (IRC) and Multi-User Domains (MUDs). With the advancement in the world wide web, it is possible to transmit information via audio and video in addition to text, images – both still and animated – and interactive features such as forms, questionnaires and bulletin board discussion (McLellan 1998).

Galbreath (1999) highlights 17 key computer technologies/applications that can help in imparting the skills required by teachers of this modern age. These are:

1. Computers/network computers;
2. E-mail;
3. Video production equipment;
4. Database software (e.g. Microsoft Access, Informix);
5. Internet/worldwide web;

6. Project management software (e.g. MS project);
7. Knowledge management (e.g. Inference);
8. Decision support software (e.g. Cognos);
9. Presentation software (e.g. PowerPoint);
10. Graphic software (e.g. Adobe Illustrator);
11. Data visualization (e.g. Visual insights);
12. Desktop publishing (e.g. Aldus PageMaker);
13. Word processing software (e.g. Word, Word Perfect);
14. Spreadsheet software (e.g. Excel);
15. Video conferencing (e.g. Picture Tel);
16. Group ware (e.g. Lotus notes);
17. Remote collaboration software (e.g. Net meeting).

The technologies enhance and develop essential skills of communication, problem solving, information access and management, collaboration and teaming, visual production, graphic production and advertisement, e-commerce and e-banking. Some of the modern-day teaching materials that can be used for effective delivery system in teacher education include the following:

- *Audio Media:* This refers to the teaching and learning devices that appeal to the sense of hearing only. They include audio recordings (tape and disc), broadcast radio and telephone.
- *Audio-Visuals:* These are instructional materials that appeal to the senses of hearing and sight simultaneously. They include television, video recording and sound film.
- *Educational Boards:* These are the boards that are used for teaching and learning purposes. They include chalkboard, flip board, white board, flannel board, bulletin board, etc.
- *Flash Cards:* These are small, compact cards which are flashed before a fairly large audience to explain an idea or convey information.
- *Format:* This refers to the style or arrangement of design elements or the surface on which designs are made.
- *Graphics:* These are the two-dimensional visuals used to facilitate communication. They include posters, graphs, charts, maps, etc.
- *Hardware:* These comprise machines or equipment used to access information stored in certain materials. They include projectors, computers, television receiver, tape/disc player, etc.

- *Models*: These are recognizable three-dimensional representation of real things, whether animate or inanimate. Models can be produced using clay, *papier mache*, plastine, cement, sawdust, etc. They could be very effective if students can see and examine the materials from various angles.
- *Non-projected Materials*: These are materials that need no projection or accessibility through hardware. Such include realia, maps, specimens, posters and charts.
- *Plasticine*: This refers to synthetic clay, a type of plastic substance used for modelling.
- *Projected Materials*: These are materials containing information which can be projected on screens through the aid of hardware. They include transparencies, slides and films.
- *Projectors*: These are equipment or machines for projecting software. They include slide, overhead, opaque and multimedia projectors.
- *Realia*: These are real things or objects. They include currency notes, artifacts and plants.
- *Software*: They are carriers of information which are relayed through the hardware. They include tapes, discs, transparencies, slides and films.
- *Specimens*: Specimens are small pieces, segments or samples of real objects or materials.
- *Still Pictures*: These are prints and motionless pictures. They include photographs, illustrations, cartoons and drawings from printed materials.
- *Texture*: This refers to the actual perceived roughness and smoothness of a surface.
- *Templates*: These are outlines of shapes cut out from some fairly thick materials such as cardboard, hardboard, plastic or metal sheet.
- *Three-dimensional Objects*: These are teaching and learning materials with length, breath and depth. They include models and real objects.
- *Two-dimensional Objects*: These are prints or flat educational materials done on formats with length and breadth only. They include photographs, charts, posters and cartoons.
- *Visuals*: These consist of materials that appeal to sight only, e.g. poster, drawings, model, specimen, charts and educational boards.

### Audio Aids

These are teaching and learning devices that mostly appeal to the sense of hearing. They include records, instructional radio, audio recordings and telephone signals.

### ***Instructional Radio***

Radio audience receives electronic signals that are broadcast or transmitted through the air, over regular AM or FM radio frequencies. Broadcast radio can be adapted for educational use, especially where there is a shortage of competent, specialist teachers.

*Audio Teleconference:* This is simply an extension of telephone call. Advances in telephone now allow individuals or groups of people at different locations to hear and be heard clearly and easily. Audio teleconference is a two-way conversation which involves the use of the telephone (mobile or static) to connect people from different locations.

### **Visual Aids**

These are teaching and learning devices that appeal to sense of sight only. They include pictures, charts, three-dimensional objects and models.

*Charts:* Consists mainly of symbols and lines. They are symbolic and abstract; hence, they need to be explained to students. Examples are line chart (graph), bar-chart, organizational chart, pie-chart, flow-chart, pictorial, life chart and flip chart. Good charts should be simple, with accurate content, and the lettering must be bold and conspicuous. Content should stand out against the background and appropriate colours should be used.

*Print Media:* These include books, magazines, journals, handouts and newspapers. They are readily accessible, useful for formal and non-formal education. They have wide audience and long range. As transmitters of ideas, they help to improve the skills of teachers.

### **Projectors and Projected Visuals**

There are many types of projectors. They include overhead, opaque, slide, filmstrip and film projectors. Most of them are visual aids, as they can only project materials that appeal to sight. Their use depends on several inter-related factors such as size of class, level, physical environment, availability, cost and effectiveness.

*Slide Projector:* This is an example of diascopic projection equipment as it requires light to function. Most modern slide projectors are fitted with lamp as the source of light to enable them function effectively in semi-darkened room. The slide is a frame of picture bound by self-adhesive card mounts. They offer a wide coverage of subject matter. Suitable materials are available in the market for students of all levels: from primary to university level, particularly in science. Resourceful teachers can produce slides, specifically to illustrate their lessons, using ball-point pen to work on clear acetate sheet or tracing paper. One value of slide projector lies in the ease with which the teacher can operate the machine. This

makes it possible to switch the method of teaching from oral to visual illustration and back, so providing an invaluable mental change of activity on the part of the students.

*The Overhead Projector:* It is designed to project an image from a transparency placed on a horizontal stage (Fresnel lens) and project it upward into a lens-mirror combination and then over the operator's shoulder to a nearby screen. The projected pictures may be diagrams prepared on acetate roll or sheet. They could be drawn with scribe or liquid colour e.g. radiographic ink and miracle markers. Writing could also be done using chinagraph pencils, marlumo colour pencils or by applying lateral set. Apart from acetate sheets, old x-ray films from which silver emulsion has been removed are good for making transparencies. Any clear transparent material will serve the same purpose. All these colouring and writing materials can be cleaned off if no longer needed. Those containing colours dissolved in spirit are removed with methylated spirit or kerosene. Others containing water-based colour can be cleaned off with damp cloth.

*The Opaque Projector:* This projects images directly from printed materials in books, magazines, photographs, maps and other materials without any processing. It could also project small three-dimensional objects such as small tools, coins and specimens, colours and textures reproduced well on the machine. The projector can be used to enlarge small-scale pictures for class viewing during a lesson, or it can be used for drawing attention to certain aspects of a lesson from a book. Opaque projector is very effective in teaching subjects like science, social studies, languages and disciplines that require visual illustrations.

*The Multi-Media Projector:* This projector is a versatile digital projector which can project still and motion images. Many refer to it as computer projector. However, it must be noted that the projector does not only project images generated on the computer, it can also be used directly with a video player. A video player can be connected to the projector for the images recorded on video tape or disc to be displayed on the screen, particularly for a large class. Images that would have otherwise been projected with overhead, slide or opaque projector can also be generated on the computer and projected accordingly.

### **Audio-Visuals**

The term refers to those instructional materials that appeal to the senses of hearing and sight simultaneously. The television and sound movies are examples.

### **Instructional Television**

Undoubtedly, television has profoundly affected the way we present and process information. It is therefore expected that television, as a form of technology, should also have had a significant impact in the realm of education. There can be no argument that it exposes everyone to a great deal of information, much of

which is retained and absorbed. More importantly, television presents information in a highly dynamic and multimedia form. It relies on quickly changing images, drama, sound and music, comedy and various other devices not often found in traditional materials.

### **The Internet**

The internet certainly has great potential for educational use and especially for the delivery system in teacher education. It is therefore necessary to know more about it. To have a good picture of the net, let us imagine a room filled with many spiders, each spinning its own web. The webs are so interconnected that the spiders can move freely within this maze. That is a simplified view of the internet – a collection of many different computers and computer networks globally, that are linked together. The internet enables a person to sit at his computer and exchange information with other computers and computer users in other parts of the world.

### **The World Wide Web (WWW)**

The web is a part of the internet. It supports the storage and retrieval or playing of photographs, graphics, animations, videos and sounds. By using a web browser, one can easily and quickly view information and colourful graphics that may be stored in computer in many different countries. The ability to move nimbly back and forth from one web site to another is commonly called ‘surfing the net’.

### **Electronic Mail (E-mail)**

Electronic mail is used to send individual or group messages. It functions like the conventional postal system, except that it is faster and more efficient. In learning, the e-mail functions as personal messaging in which learners and teachers can work one-on-one. It allows for individuality in learning. A learner can also exchange information with other learners. E-mail is an effective tool to facilitate learning activities by providing feedback from the teacher or other learners.

### **Compact Disc-Read Only Memory (CD-ROM)**

The CD-ROM is characterized by a large storage capacity for video, audio, animation and interactive multimedia. CD-ROMs offer media formats, such as text, image, graphics, sound and animation. Learners can study the context only through their own computers, not through online environment. Therefore, a CD-ROM provides learners, particularly those learning at distance, an effective tool for the purpose of individual learning. Learners can also access courses at any time, at their own pace, without the necessity of an online connection.

### ***Interactive Video***

The system typically consists of a micro-computer and a video source (either videotape or videodisc) with the ability to present both computer text and video scenes within the same lesson. A computer interface connects each of these parts into a single presentation medium to be used by the student. Interactive video is widely used in the delivery of distance education. Discs are reported to have advantages over cassettes: freeze-frame, a rapid and accurate search, large single frame, storage capacity, slow and sped-up motion and lower machine cost.

### ***Tele-Video Instruction***

Telecommunication devices such as telephone (mobile or static) can also be combined with instructional video for distance learning. The telephone will allow for two-way communication between the facilitator and the distance learners at their different locations or study centres. Learners can also interact and exchange information using the telephone. The device allows for individualized instruction and self-study (Omoniyi 2005).

### **Conclusion**

Delivery system in teacher education in Africa today, and most especially Nigeria, should not be seen as 'business as usual' with the use of traditional or orthodox methods of teaching which are at variance with contemporary trends and practices worldwide. There is the urgent need to take delivery system in teacher education, especially in this digital era, more seriously since it is the only way of achieving meaningful results in the present era of globalization.

It should always be borne in mind that, just as no nation can rise above the quality of its educational system, no educational system can equally rise above the quality of its teaching force. Hence, concerted efforts must always be made to ensure that the nation's teaching force, especially at the primary and secondary levels, is well equipped with modern methods of delivering knowledge such that the product of the classroom interaction can be better improved upon and the seemingly fallen standard of education and poor results being witnessed year in year out can become a thing of the past.

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