

## **INTEGRATING TECHNOLOGY WITH TEACHER PREPARATION IN NIGERIA FOR GOOD GOVERNANCE AND SUSTAINABLE ECONOMY**

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### **Abstract**

*New societal goals for education, recommendation from current educational research findings, and theories from cognitive and social psychology challenge a number of traditional beliefs about school learning: beliefs about how students learn, beliefs about who should learn (or is capable of learning), and beliefs about what is important to learn. Changing their instructional methods to conform to educational reform recommendations creates challenges for many teachers, but it places special demands on beginning teachers, whose framework for interpreting what goes on in a classroom is heavily influenced by their own school experience. We take the position that teachers who are expected to redefine their ideas about teaching and learning must have opportunities to examine instructional methods in light of reform recommendations and current information about learning. But such examination, analysis, and reflection are often difficult or impossible in the complex, fast-moving environment of real classrooms. Therefore, the purpose of this paper is to explore ways, videodisc and integrated media technologies can be used in teacher education programmes to help teachers in Nigeria rethink traditional instruction. We believe that certain types of technologically based materials can provide an environment that is more conducive to examination, reflection, and analysis than the real classroom. A few examples of teacher education projects that are developing and using technology to provide such environment in which pre service teachers can learn about reforms in teaching and learning for good governance and sustainable economy are discussed.*

**Keywords:** Teacher preparation; Integrating; Technology; Sustainable economy; Nigeria

### **Introduction**

Much of the attention that has been given to restructuring Nigeria schools has been devoted to issues of school organization and governance (Olaitan, 2013). Restructuring discussions and guidelines have included such themes as school based management, teacher empowerment, and parental choice (Mankilik, 2020). However, in recent publications, policy makers and researchers have suggested that initiatives in these areas alone are unlikely to produce the changes desired in educational processes and outcomes. They recommend increased attention to restructuring at the classroom level-specifically restructuring in student learning and in the teaching needed to bring about improvements in student teaching (Hannah, 2016). Such recommendations for restructuring the teaching and learning processes are based on current educational research findings that support a view of learning that has come to be labeled constructivist or student-centered. In the constructivist model, learning is seen not as a transmission of information from teacher to student but as an active problem solving process in which the learner builds on his or her prior understandings to construct new knowledge (Osuji & Gbarador, 2020). Many modern researchers view learning as a process of enculturation (Okey & Mansur 2017) that is shared, developed, and refined through social interaction and conversation. Knowledge can be considered an individual property, but it can also be thought of as shared by a

group, that is, as a social construction as well as an individual one (Mankilik, 2020). Those who hold a constructivist view of learning believe that what a student learns depends to a great degree on the context in which he or she learns it (Fredrick, 2013); that is, knowledge is situated in, and inseparable from the activity, context, and culture in which it is developed the author added. When people learn in the context of meaningful activities, they are more likely to be able to use the information as a tool to solve problems (Fredrick, 2013). On the other hand, knowledge that is acquired through artificial activities (such as solving textbook mathematics problems) may be effective in certain school settings (passing tests on comparable problems), but not necessarily in the real world of work. A major goal of the restructured classroom is to provide settings in which all children have an opportunity to engage in meaningful and authentic activities, to explore complex problems, and to communicate about these activities with the teacher and peers in both the classroom and the larger community.

Technology can support students' acquisition of higher-order thinking and problem-solving skills in a number of ways. At one level, students' use of technology as a tool in school projects contributes to the authenticity of the projects, because technology pervades much of society today (Akala & Abimiku, 2020). For example, it is realistic to expect students' to use desktop publishing software to produce a class newspaper, a spreadsheet to develop a budget for a class project, and telecommunications to share information with students from other geographical areas (Luther, 2020). At another level, technology can be used to introduce a problem for student investigation. For example, videodisc based anchors or macro context, such as those developed at Vanderbilt University (Abate, 1990;), are realistic stories with dilemmas or suggested projects included in them that allow students to experience a shared context in which they engage in sustained thinking about complex problems. In some instances, technology can simulate a real-world situation that is not feasible for youngsters to explore otherwise (for example, space travel) or one in which complex episodes must be revisited or examined for information in a way that real-time activity does not allow. Thus, technology affords opportunities for making teaching and learning more efficient, more applicable to real world problems, and more accessible to students with different backgrounds than the materials and instructional approaches of the traditional classroom can afford (Carpenter, Fennema, Peterson & Carey, 2015).

### **Challenges for Teachers in Nigeria**

New educational goals that demands higher level of literacy and subject area understanding for all students, new theories about how individuals learn, and the potential that newly emerging technologies have for supporting learning all have important implications for teachers. For many teachers, the central fact in these implications is change. The student-centered classroom is quite different from the traditional classroom in which the teacher is the authority for information and students work independently on tasks that stress memorization of discrete facts and skills. As the teacher's role with students shifts from provider of information to facilitator of knowledge construction, classrooms must be reorganized to allow students to interact with the teacher and with each other. Redesigning classrooms so that all children (including those considered special or at risk) have opportunities to develop higher-order thinking and problem solving skills requires teachers "both to give up long held beliefs about teaching and learning and to devise instruction that embodies the new goals and approaches" (Vanderbilt, 2011). For many teachers, this means replacing well practiced teaching approaches, such as those associated with differentiated ability grouping, with less familiar ones, such as collaborative learning, inquiry-oriented instruction, and project-based curricula.

Their approaches and beliefs are not the only things teachers are being asked to change. Instruction designed around existing and familiar materials (for example, the spelling book or the problem worksheet) is often inconsistent with the goals of the redesigned classroom. Therefore, teachers must not only select or create new instructional materials but learn how to

use them as well. Some of the new materials will almost certainly involve technology, and this technology places additional demands on teachers. Information and communication technologies heralded by many as exciting new conceptual tools for children and youth may be both unfamiliar and threatening to the teacher who has spent much of his or her academic and professional career in a technology poor environment. Teacher education, both in service and pre service, and ongoing support for teachers throughout the restructuring process are critical to the success of any restructuring effort. Teachers tends to teach as they were taught (Goldman & Barron, 2014), and very few teachers have experienced as students the environment envisioned for the restructured classroom. Beginning teachers, in particular, have college courses as their most recent models of instruction in the subject areas they will be expected to teach, and these college courses have almost invariably been lecture based.

In addition to not knowing what student centered instruction might look like, some teachers have a narrow, fact based understanding of their subject areas and they are uncomfortable in a classroom environment that encourages students to ask question that a teacher may be unprepared to address (Goldman & Barron, 2014). Educators and researchers familiar with emerging media and communications technologies believe that these can play important roles, both in conveying new images of schools and learning to teachers and in supporting teachers who are working, or preparing to work, in student centered classrooms. Just as technology can anchor or simulate a real-world context for novices learning complex problem-solving skills in a particular specialty, technology can simulate a real classroom for novice teachers learning to teach.

### **Integrated Media Technology**

The terms hypermedia, multimedia, and integrated media refer to a computer controlled nonlinear integration of information from a variety of media such as text, audio, video, or computer graphics. However, this paper prefer to use the term integrated media unless it is describing a project or citing a publication that uses one of the other terms. In an integrated media format, a computer screen displaying text or graphics might look very much like a page of a book. However, unlike ordinary print material, which is linearly organized, these computer programs contain electronic links or “button” that allow a user immediate and random access to other information. For example, if the introduction section of this paper were presented in an integrated media format the reference citations might be linked to abstracts of the articles themselves. Moving an electronic pointer to any reference and selecting that reference (by clicking the mouse) could produce, on the screen, both the source and an abstract of the work. When a computer is connected to a videodisc player (or has access to other sources of video or audio), the electronic buttons on the computer screen can provide access to information in other formats. For example, a paragraph describing characteristics of the redesigned classroom might contain link to video segments illustrating instructional activities or to audio segments from interviews with teachers who are in the process of redesigning their approaches to instruction. The user can click on a work or icon (picture) and see the video segment on a video monitor-or in some systems, in a window on the computer screen itself.

Researchers and developers of prototype integrated media products cite several features of the materials that offer benefits for instruction. First, the integration of video with text and information from other media creates a rich context for student investigation and problem solving “(Dowhower, 2012). Second, nonlinear linking of information makes it possible for a topic to be examined from multiple perspectives, and this examination helps students organize knowledge in ways that promote retention and transfer (Akpan & Sunday, 2020). Third, when appropriate tools are available in the system, learners can create their own integrated media product, thus becoming involved in integrating or producing knowledge (Ombugus, 2016).

### **Integrated Media Technology in Pre service Teacher Education**

This section looks in more detail at some specific challenges that the redesigned classroom poses for the beginning teacher, and examines reasons why integrated media technology holds particular promise for helping teacher educators address those challenges.

### **A Different View of Knowing**

The way a teacher teaches is related to the beliefs that he or she holds about the nature of the subject and what it means to “know” the subject (Ambrose, 2014). If a teacher believes, for example, that mathematics is the process of applying rules, then that teacher is likely to teach mathematics by having children memorize rules (Chukwunyere, Chigozie & Chubuike, 2017). Teachers who spent their own elementary years memorizing terms in science class are not likely to view science as a social activity that inevitably reflects social values and viewpoints” (Adedapo, 2013); nor are they likely to understand how to organize projects and activities in which children share responsibility for learning, come to common understanding, and communicate these understandings to others. Many pre-service teachers bring from their own school experience strong beliefs about what it means to know a subject or about who is capable of knowing the subject. Their concepts of teaching, learning, and knowing a subject area are often dysfunctional in a restructured classroom, where all pupils are expected to engage in exploration, communication, and problem solving in realistic contexts.

Technology can help these pre-service teachers develop new models of teaching and learning in content areas. At University of Nigeria Nsukka, some researchers have developed integrated media materials to “help teacher education students learn to think in new ways about the nature of the work entailed in teaching elementary school mathematics”. (Carpenter, Fennema, Peterson & Carey 2015). These materials include videotapes and classroom artifacts (student products, teacher journals, and observer field notes) from the fifth and third grade mathematics classes the researchers teach. The tapes, by themselves, are useful examples of inquiry-oriented teaching in classes where students’ reason, solve problems, and engage in discussion about mathematical ideas. When annotated with teacher comments and supplemented with student products, the videotapes provide rich case studies that pre service teachers can use to explore the aspects of teaching “that are invisible thinking, reasoning, deciding, and caring (Ile, Udegbumam & Odimmega 2015). The developers of the materials state that integrated media environments make it possible to represent the complexity and the endemic dilemmas of the elementary school classroom and to integrate these representations theoretical perspectives on teaching and learning (Omame & Faga, 2020). The developers also envision that the videotaped lessons they have taught will be used by teacher educators to present pre service teachers with “a replay of a real time lesson and then conduct an analysis of that lesson in a seminar discussion format” (Ombugus, 2016).

Videodisc materials developed at Vanderbilt University for use in mathematics and science methods courses for prospective elementary teachers use pairs of contrasting lessons to show the effects of different types of instruction on children’s participation in the learning process (Goldman & Barron, 2014). One of the science videodiscs contains edited versions of two second-grade science lessons taught by the same teacher. In the first lesson, the teacher and students “discuss” a topic from the science text on change of state of matter; the second lesson is a hands-on investigation in which the children collect data on the insulating properties of cups made of different materials in order to decide which type of cup to use for a class party. The teacher is enthusiastic and encouraging in each lesson, and the class is well behaved in both. In the traditional lesson, most of the children are able to recite back to the teacher the terms or definitions that they have “learned.” However, closer analysis of the two lessons (an analysis facilitated by the viewers; ability to contrast video segments by using the HyperCard stack associated with the disc) reveals substantial differences in the level of student involvement, the degree to which the children raised questions or offered opinions about the scientific phenomena they were studying, the level of interaction between children, the level of scientific thinking, and

the general interest in the content of the lesson. The children's thinking processes and potential misconceptions are much more visible in the hands-on lesson. At specified places in the video, the lesson can be stopped and the viewer asked to interpret what a particular child was asking or suggesting. A methods course instructor might use these videodisc, in a presentation format, as a context for class discussion on such topics as what it means to "know" science, the organization and management demands in a hands on teaching environment, the role of the teacher in science investigation, children's misconceptions in science, how to make children's thinking visible, and the teacher's decision making in a student-centered environment.

Recently one of the authors of this videodisc materials developer used a videodisc containing contrasting mathematics lessons in another format in her methods course. Instead of the instructor's developing the HyperCard stack and presenting the contrasts, students in the mathematics methods course were assigned readings on certain topics (such as the role of mathematical representations in children's understanding of mathematics), and the methods course students, working in groups of four at video stations in a computer laboratory, developed their own integrated media presentations on their topic using video segments that they selected from the videodisc to illustrate points in their presentations. They then presented their projects to their classmates using a presentation console in the lab. Text from HyperCard screens, displayed from the computer through an LCD (liquid crystal display) panel on the overhead projector, served as an outline of the points the methods course students wished to make, and video buttons in the program accessed the video segments, which were played through wall-mounted monitors in the classroom.

The authors of this paper believe that this exercise not only encouraged the methods course students to consider course information in the context of actual practice, but it took the methods course instructor out of the role of providing the initial interpretation and let the students explore differences in instructional methods for themselves. After the student exploration, the instructor capitalized on the student interpretations by leading class discussions on the topics the interpretations raised. It is believe that pre service instructional activities such as this mirror the activities when working with elementary school pupils. Thus, the students experience the method of teaching that teacher would like them to try for themselves. A byproduct of this type of activity, found in Nigeria, the pre service teachers wound become more comfortable with computer.

In Vanderbilt remedial reading methods courses, Dowhower (2012) is using video-based case studies that allow pre service teachers to explore multiple sources of information about the teaching of children with reading difficulties. A videodisc with associated HyperCard stack focuses on one child and offers such information as video of the child reading, video interviews with parents and teacher, student products and assessment information and related references and abstracts from the literature. Dowhower's case materials were designed to help change prospective teachers' views of the disabled reader: "Their understanding of remedial readers tends to be narrow, usually related to 'have not' characteristics (for example, limited mental ability, deprived family life, deficient skill development), which further restricts their understanding of low achieving students' capabilities and the multiple factors that might interact to produce disabled readers". Course instructors use these case. In whole class and small-group sessions, both as a context for discussion of the factors that produce disabled readers and as a model for a case-based approach to diagnosing and addressing reading problems.

In each of the uses of integrated media technology described here, the technology provides a richer based information and a more effective vehicle for analysis and investigation than do linear videotapes, which are usually passively viewed. To change teachers' views about what it means to understand a subject or what it means to teach for understanding we believe that teachers must be able to see why traditional instruction is problematic, especially for certain children. For example, for some of our pre service teachers, the traditional text based science lesson mentioned earlier is their only model of science instruction, and when they watch that

lesson without seeing the contrast, they are impressed with the way the teacher is presenting the content. Allowing methods course students to focus on a single incident or child, to revisit parts of a lesson, and to access additional information is particularly useful in encouraging them to analyze how different children react to instruction.

### **Analyzing Pupils Understandings**

Teachers, especially beginning teachers, have difficulty knowing what their students understand and think; yet this knowledge is essential if teachers are to base their interactions with individual students on each student's prior knowledge. Kassam (2020) in describing teachers' mathematical knowledge, suggests that "the mathematical knowledge of students as perceived by teachers is an invention of the teachers." Beginning teachers have limited experience in assessing pupil knowledge and understanding, and even experienced teachers are often unaware of intuitive understandings and misconceptions that children bring to classroom instruction (Carpenter, Fennema, Peterson & Carey, 2015).

Integrated media research environments developed with research evidence are useful in helping beginning teachers construct models of how children understand subjects, models that may be quite different from the teacher's "adult" understanding of the materials. Researchers have developed interactive videodisc teacher education materials that support the "realistic mathematics" approach to teaching mathematics (Adamu, Shuaibu & Shehu, 2018,). One of the University of Nigeria Nsukka videodiscs contains interviews with young children who are asked to perform various counting tasks; another contains classroom footage of children explaining how they solved a problem that involved finding the number of tables needed to seat a certain number of people. Through the computer program that controls the videodisc, prospective teachers are asked to interpret children's thinking in the counting tasks or to examine the differences between children's written work and their verbal explanations of their strategies for solving the problem of the tables. The software allows teachers to isolate and replay student responses and explanations and to type in comments. The developers believe that this use of technology offers an advantage over real-time observations of classroom and activities since it allows prospective teachers to have focused practice in analyzing children's thinking "without the task of managing the class at the same time" (Adamu, Shuaibu & Shehu, 2018).

### **Improvisation and Instructional Choices**

Orchestrating discourse, interpreting student contributions, helping students construct mature understandings, organizing cooperative learning and problem solving, and managing instruction in complex environments all require some degree of improvisation, yet improvisation is especially problematic for beginning teachers (Kassam, 2018). Teaching is full of inherent dilemmas and teachers must often make difficult choices. For example, on the one hand, teachers who teach from a constructivist perspective must be willing to "honor students' inventions," or they will not share them. On the other hand, the teacher needs to guide students toward a more mature understanding, which frequently means challenging student constructions". Furthermore, the acknowledge that learning is a socially constructed act means that this guiding and challenging will take place publicly, and thus will require a high level of teacher sensitivity and judgment.

Omeme & Faga (2020) have developed and used videodisc examples and HyperCard programs in a secondary education methods course at Vanderbilt University in order to engage pre service teachers in a problem-solving, approach to classroom management. The videodisc examples emphasize planning for smooth classroom operations and highlight teacher decision making during the course of instruction. Results from studies concerning these materials indicate that the video examples contributed to the "pre service teachers' abilities to dimensionalize classroom events" and to sort through the "multiple layers of complexity that make up real life in classrooms" (Ile, Udegbumam & Odimmega, 2015).

Some Vanderbilt University materials use simulations of teacher-decision points to help pre service teachers confront the types of choice they will be required to make during the course of instruction (Goldman & Barron 2014). In these materials, the program stops the video at critical incidents and poses such questions as “Can you interpret what the student is asking?” or “If you were the teacher, how would you respond to this student’s suggestion?” These incidents become mini cases as groups of pre service teachers discuss options and the options’ possible consequence. Some incidents are particularly rich in the different perspectives that can be taken on the decision presented. For example, one such incident occurs in the hands on science lesson mentioned earlier. In the recorded lesson, each group of children had one metal, one glass, and one Styrofoam cup, with covers for each of the cups and an ice cube in each cup. At two minute intervals, the children remove the covers from the cups and ranked the cups according to the size of the melting ice cube, with the cup having the largest piece of ice ranking number one. At one point, while waiting to record an observation, the teacher asked the children to feel the outside of each cup and say what they had discovered. “Kevin” responded; “Well, this cup [metal] is cold-and-and this one [Styrofoam] is hot=sort of warm-but it got first place in ours.”

Kevin had noticed that the Styrofoam cup had the largest piece of ice (“got first place”), but that the sides of the cup were warm. When one watches his response, it is clear that his observation is counter to his intuition and that there is a question implied. Why isn’t the coldest cup keeping the ice frozen best? In this situation, a number of factors influence the teacher’s next move. First, she may or may not recognize that Kevin is confronting a counterintuitive event. Such recognition requires that the teacher pay attention to Kevin’s thinking as well as have some knowledge understanding. The teacher must then decide whether this is a “teachable moment” that should be followed up, either with Kevin individually or with whole class. The decision about following up may be influenced by theoretical issues such as the developmental level of the children (the teacher might consider whether a discussion of molecules is appropriate for second-graders) or practical considerations (the teacher might think that if she stops to deal with Kevin the class will miss the next timed observation).

Researchers used incidents such as the one described in methods course with the instructor showing the video and the teacher education students working in groups to suggest and justify an action for the teacher. These suggestions and justifications are then debated among the groups. In a slightly different use of video stations to review an edited version of a complete lesson, and the computer program stops the video at various points to simulate the decision-making process a teacher goes through in the course of a lesson. When the video stops, the computer poses the question. “If you were teaching this lesson, what would you do now?” The simulation software allows the methods course students to enter their comments about each lesson incident, and the comments can be retrieved and printed out for the students’ own reference or for the instructor’s review.

### **Materials and Methods**

In traditional materials and methods courses in the past, prospective teachers devoted much of their time to learning about available curricular materials and developing lesson plans or resource files for using the materials. When classroom films and, later, videotapes became available for teacher education, they were used primarily for “showing” how to teach. Today, teacher education programs that view the teacher as a problem solver or decision maker in a complex and ill-structure domain are more likely to take an analytical approach to teacher education and to use integrated materials, like those being described, in ways that encourage teacher reflection and the development of analytical skills (Okey-Golbert & Mansur, 2017). However it is still important for prospective teachers to have access to information about available curricular materials and to be able to see examples of the materials’ use.

Date bases being produced through three integrated media development projects offer resources for integrated media teaching materials and approaches for prospective and practicing

teachers. Gary Bitter and his colleagues at Arizona State University have developed videodisc materials that focus on the methodology of using manipulatives in teaching elementary school mathematics, and these materials have been used in the ASU teacher education program (Frederick & Hatfield, 2020). The main goal of the project was to “provide instructors with a generic visual data base of vignettes that they could use during their instruction. The materials show real classroom scenes from grades one, three, and five of teachers and children using garboards’ and numeration blocks. The methods course lessons about the use of these manipulative materials emphasized both content knowledge and instructional strategies for pre service teachers. The videodisc materials are used by methods course instructors in presentation format and by teacher education students working individually or in small groups at computer stations. Data collected from interviews with the pre service teachers who participated in these lessons indicated that the teachers responded positively to them (Frederick & Hatfield, 2021).

Abate (2019) had developed a multimedia data base containing videodisc/ HyperCard modules showing five approaches to teaching reading. Pre service teachers using these materials can watch video examples of the different approaches, examine a teacher’s written lesson plans (with electronic buttons to access relevant portions of the lessons), and read the teacher’s comments about decisions the teacher made in the course of planning and teaching the lesson. These materials are in use in introductory teacher education courses at Cleveland State University (Hannah, 2016) and have been field tested with teacher education students at Miami University, Ohio (Dowhower, 2019).

Akala & Abimiku (2020) supported the idea of developing a prototype multimedia data base to assist teachers “in adopting new approaches to teaching. The system puts the video viewer in the position of an apprentice, observing an expert teacher using effective instructional and management strategies; the video lessons used in the prototype materials are from videotapes produced by National Control Regional Educational Laboratory (NCREL) in Indiana University. Associated with each lesson are such ancillary materials as the teacher’s lesson plan. Related research articles, and expert commentary on the lesson. The developers explain that the various real-life teaching experiences offered through the video classrooms with accompanying supplementary materials are designed to help teachers “develop a mental model of the instructional approach being demonstrated and to develop the capability for implementing the strategy in their classrooms”(Akala & Abimiku, 2020). To develop the data base, the researchers conducted a needs analysis with practicing teachers who were attempting to restructure their classrooms, asking them what aspects of their teaching they thought they needed to improve.

### **Production and Communication Tools**

Integrated media systems can link tools as well as information, and most of the materials include incorporate tools of some type. For example, several of the systems (Ball, Lampert, & Rosenberg, 1991; & Akala & Abimiku, 2020) have, or are developing, annotating software that allows the user to enter comments about the video. Another user (or course instructor) can then watch the video and access these comments, thus building a data base of multiple perspectives on teaching and learning. The Vanderbilt students who created the integrated media presentations mentioned earlier used authoring software that allows a user to first annotate video material and then convert the annotated video into a HyperCard stack to be used for presentation.

Systems that incorporate data bases have data sorting capability. Most, possibly all, of the system now have printer connections that allow supplementary lesson plans, teacher comments, student products, and other such materials to be printed. The NCREL/Indiana University Materials have links to communications software that will allow the user (when the system is fully functional) to watch video of a classroom and use electronic mail to communicate with the teacher who taught the video lesson. This two-way communication and ability to be an apprentice to another teacher may be especially important to beginning teachers

or teachers who are trying new approaches to teaching (Fishman & Duffy, 2022). Systems with these capabilities provide not only realistic contexts for the study of teaching and learning, but tools for communicating about that study as well.

### **Obstacles to Implementation**

Educators, technologies, and cognitive psychologists agree that integrated media technologies have the potential to create environments in which learners can explore, communicate, solve authentic problems, and organize knowledge in new ways (Abate, 2019). But if researchers and school systems expect teachers to use these technologies in their own classrooms to support students' active learning and problem solving, the teachers will need time, training, and opportunity to work with the equipment and software.

Those who work with pre service teacher education programs have special opportunities and responsibilities to prepare teachers who understand both what technology can do and how to use technology. A once-popular strategy for preparing teachers to use technology is to provide workshops or "computer literacy" courses for prospective teachers. However, teacher education programs that attempt to inform teachers about instructional technology through special technology courses are open to the same criticism of inauthenticity as the traditional classrooms where children learn facts and rules out of context. A more natural and theoretically sound approach is to infuse teacher education programs (including the liberal arts courses that provide teachers' content background) with the types of technological applications education reformers hope to see in the schools. The use of technology in teacher education should produce new teachers who are comfortable with the technology, appreciate its potential, and are able to create their own applications. More importantly, if courses in pedagogy are to prepare teachers to be effective problem solvers and decision makers in the complex domain of the classroom, then novice teachers should be provided the same kinds of rich learning environments that are advocated for children and youth in the restructured schools.

In the mid-1980s, the American Association of Colleges for Teacher Education (AACTE) appointed a task force to study and make recommendations about the use of technology in teacher education. That task force warned that "the credibility of program which fail to practice the approaches they espouse will be suspect. Contact with electronic information communications technology as a natural part of the life of the school, college, or department of education is the most potent way to show how and why technology is used in educational environment.

Despite encouragement from professional organizations such as AACTE, Akala and Abimiku (2020) found that teacher education institutions in Nigeria were "behind scheduled" in the broad application of existing technologies such as productivity software or electronic networks. Teacher educators have been slow to infuse technology into their courses and programs for a number of reasons. Lack of funding is perhaps the greatest obstacle (Abate, 2019). Funding buys more than hardware and software for classroom use; with adequate funds, a program can provide technical support, equipment for a faculty member's out-of-class use (for example, a computer and printer in the office or at home), adequate and convenient teaching facilities (so equipment need not be transported from place to place), and perhaps most importantly, release time for faculty who want to incorporate technology into courses.

Authors of this paper observe some teacher education faculty and administrators attending two Annual conferences on technology and found that lack of time to learn about the equipment and to prepare to use new materials in class is a critical obstacle, particularly for faculty from non-research institutions, where teaching loads tend to be heavy. Because descriptions and research-based information on the effectiveness of such materials are just beginning to appear in the literature, teacher educators and administrators still question whether the pedagogical benefits of integrated media or other technologies justify an institution's investment in equipment, facilities, and staff development.

Inadequate staff development opportunities and lack of technical support are other factors cited frequently as barriers to the use of technology by teacher education faculty. Institutions that are more successful than others in integrating technology throughout a teacher education program tend to have a critical mass of faculty who use the technology and can share ideas and expertise with novice users.

### **Conclusion**

Transforming schools to improve the education of students is engaging the productive energies of educators, researchers, and policy-makers throughout Nigeria. Informing these efforts is new research on how children learn, research that suggest challenging new approaches to teaching. This paper theoretical framework supports the use of technology in preparing teachers for the restructured classroom, and has taken the position that beginning teachers have instructional needs that are different from those of experienced teachers and that integrated media materials offer special pedagogical promise for meeting those needs. Many of the features of the materials described in this paper are still in the development stage.

Some technical limitations still must be overcome before the educators of teachers can make widespread use of integrated media materials. At present, it is not economically feasible to store large quantities of high-quality video for rapid random access by a computer (one side of a videodisc is limited to thirty minutes of running video).

Although it is not practical for each teacher education program to produce its own materials, it is believe that it is important to have different examples of integrated media and a critical mass of developers and researchers to share ideas and evaluate each other's materials. From our own experience with pre service teachers and research efforts at other institutions, the authors are encouraged about the use and potential of integrated media materials in preparing teachers for the challenges of the classroom.

### **Suggestions**

1. Education reformers in Nigeria must develop strategies for teacher education faculty/institutions to make use of existing technologies such as computers, camcorders, videocassette recorder for teaching purposes.
2. Justification for technology should be based on designed program demand and not idiosyncratic faculty demand.
3. Smaller or less well funded institutions should seek technical support and ideas through inter institutional networks.

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