Mobile Teaching and Learning of Basic Scientific and Technological Concepts: An Innovative Approach Towards Knowledge and Skill Acquisition Among Pastoral Nomads

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ABSTRACT
About 9.4 million Nigerians are pastoral nomads including children of school going age. The participation of pastoral nomads in the existing formal and non formal educational programs is reportedly low with the population literacy rate ranging from 0.2% - 2.0% as at 1988. The pastoral nomads of Nigeria appears short changed by the Nigerian educational systems as indicators have revealed that the pastoral nomads presently occupies the bottom end of the national enrolment rates, participation, achievement, gender balance, classroom performance as well as training and progress. This paper explores why these approaches have not notably helped to improve the literacy rate among Nigeria’s nomadic people. Thus, there remains a need for alternative approaches to educational delivery. In face of the revolutionary trends taking place in information and communication technologies (ICTs) in Nigeria, there is now opportunity to embrace mobile learning using low cost mobile technologies (i.e., mobile phones) to enhance the literacy rates among Nigeria’s nomadic people, some of whom are enrolled in Nigeria’s current Nomadic Education Program. This paper also dug deep to advance some novel innovative strategies to be used by basic science teachers to best communicate the basic scientific concepts to the listening audience of pastoral nomads in Nigeria. The innovations should help raise the level of comprehension of basic science concepts among the teeming populace of pastoral nomads as they embark on the journey towards scientific literacy in the 21st century and beyond.

Keywords: Nomadic Education, mobile schools, Pastoral Nomads, Literacy by Radio

INTRODUCTION
About 9.4 million Nigerians are nomads including school going age children. Pastoral Nomads are found in at least 20 different countries across the continent of Africa. The pastoral nomadic population in Nigeria, the Fulani (with population of 5.3 million) the Shuwa (with population of 1.0 million), the Buduman (with population of 35,001), the Kwayam (with population of 20,000) the Badawi (with population yet to be established) accounts for 9.0 million people, including 3.1 million school –age children. Akinpelu (1993) stated that nomadism refers to any type of existence characterized by the absence of a fixed domicile.
Delivery of education services to the children of all pastoral nomads has tended to be slow and ineffective. Special attention was paid to these groups by the Nigeria Government when it set-up the National Commission for Nomadic Education by Decree 41 of 12 December 1989 (Federal Government of Nigeria, 1989). Of the estimated 9.3 million people that currently comprise Nigeria’s nomadic groups, approximately one third, that is 3.1 million are of school age in terms of access to education primarily
because they are more itinerant. As a result, the literacy rate of pastoral nomads is only 0.28 percent, (FME, 2010). The basic responsibility of the Commission for Nomadic Education, among others, is to provide primary education to the children of pastoralist nomads- a responsibility shared with the States and Local governments.

A multifaceted strategy has been adopted by the Commission to provide education to its nomads, this includes on –site school, the “shift system”, schools system in the strictest sense remains sparingly used, primarily due to the enormity of problems associated with this model. Some mobile schools, however, are in operation in the River Benue area of Taraba, Benue, Adamawa, Nassarawa, Borno, and Yobe States.

### Table 1. Enrolment of Pastoral Nomads in the 1990s

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<td>46,982</td>
<td>49,617</td>
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Note that between 1994 ($n=46,982$ students were enrolled) and 1999 ($n=122,517$ student were enrolled), there has been an increase of 260.8 %. Considering that there are an estimated 3.1 million pastoral nomads of school age in Nigeria, however, there is still a long way to go.

The participation of the nomads in existing formal and non-formal education programmes used to be and is still extremely low, with the population’s literacy rate ranging from 0.2% to 2.0% in 1988. National education systems have generally failed the nomadic communities. All the education indicators have revealed that the nomadic groups are at the bottom of the table in national statistics pertaining to enrolment rates, participation, classroom performance, gender balance, achievement, progression to the next level of education and training. In spite of these efforts, access to education is still a major problem affecting Nigeria’s pastoral nomadic people (see Table 1).

Nigeria’s nomadic people are typically described in terms of what they do not have. They do not have access to adequate food, clean water, health care, clothes, or shelter. They do not possess basic literacy skills. Their children do not have access to basic education. Young female nomads do not have the cultural freedom to marry who they want to marry. Nigeria’s pastoral nomads, therefore, arguably need a better understanding of their socio-cultural predicament, which many consider as less developed.

Educating Nigeria’s nomadic populations via distance education (and using mobile –learning methods), can be viewed as a positive innovative step towards effective implementation of the provision of Nigeria’s National Policy on Education (NPE) on equal access and brighter opportunities for all its citizens regardless of where they live. The establishment of nomadic schools in Nigeria, however, has failed to produce the desired results because of the non integration of mobile learning technologies. It has been identified that mobile learning consists of any service that supplies a learner with general electronic information and educational content that aids in acquisition of knowledge regardless of location and time (Lehner & Nosekabel, 2002).

In recent years, Nigerian has witnessed a steady growth in mobile telephone infrastructure and a concomitant acquisition and use of mobile telephones amongst Nigerians. Increasing rates of accessibility throughout Nigeria is encouraging more and more people to have access to, or to purchase, mobile phone. Service providers in Nigeria are also on the increase to meet this growing demand, and over time, interconnectivity is projected to be both easier and more affordable, especially for Nigeria’s nomadic population.

According to Aderinoye, Ojokheta and Olojede (2007), current education provision aimed at Nigeria’s Nomadic People includes “Literacy by Radio”. Literacy by Radio” is an educational programme that has been implemented throughout the country. Indeed, radio currently provides instructions and relays
messages to Nigeria’s pastoral nomads, who are typically on the move while grazing their cattle. The provision of tele-centres that provide Nigeria’s rural and nomadic peoples with practical skills acquisition are currently being used to teach topics such as basic science concepts, health and socio-economic issues that affects their daily lives. According to Kinshuk (2003), mobile learning facilitates provision of educational opportunities. In the Nigerian context, Kinshuk’s (2003) work can be expanded to include the integration of mobile learning into nomadic educational contexts and programmes.

The Concept of Mobile Learning
Mobile learning refers to the use of any mobile or wireless device for learning on the move. Aderioye (2007) noted that it is any service or facility that supplies a learner with general electronic information and educational content that aids their acquisition of knowledge, regardless of location and time. Kinshuk (2003) opined that learning is mobile in terms of space, in different areas of life and with respect to time. This means that mobile learning systems should be capable of delivering educational content to learners anytime and anywhere it is required.

Sharples (2000), observed that mobile learning encourages flexibility; students do not need to be a specific age, gender, or member of a specific group or geographical location, to participate in learning opportunities. In other words, time, space and place barriers have been eliminated. Mobile technologies enables students to become more adaptable to flexible and contextual lifelong learning, a situation defined by Sharples (2000) as the “knowledge and skills” people need to prosper throughout their lifetime. Clearly, these activities are not confined to specified times and places; however, they are very difficult to achieve through traditional conventional education channels. Put simply, mobile technologies fulfill the basic requirements needed to support contextual, life-long learning by virtue of its being highly portable, unobtrusive, and adaptable to the context of learning and the learners’ evolving skills and knowledge (Sharples 2000).

Approaches to Nomadic Education in Nigeria
To improve the literacy rate of Nigeria’s nomads, the National Commission for Nomadic Education employed various approaches such as on-site schools, the “shift system”, schools with alternative intake, and Islamiyya (Islamic) schools to provide literacy education to the nomads. The nomadic education programme has a multifaceted schooling arrangement designed for 5.3million in Nigeria, the government set up different agencies to implement education for the nomads; these agencies include the Federal Ministry of Education; School Management Board; National Commission for Nomadic Education; Agency for Mass Literacy, and the Scholarship Board together, they offer a mobile school system wherein the schools and the teachers move with the Fulani Children.

Mobile Schools
Mobile schools use collapsible classrooms that can be assembled or disassembled within 30 minutes and carried conveniently by pack animals. While a whole classroom and its furniture can be hauled by only four pack animals, motor caravans are replacing pack animals to move the classrooms. A typical mobile unit consists of three classrooms, each with spaces to serve between15 to 20 children. Some classrooms are equipped with audio-visual teaching aids.

Radio and Television Education
In a study jointly carried out by the Federal Government of Nigeria and UNESCO in 2004, titled “Improving Community Education and Literacy, Using Radio and Television in Nigeria, “it was established that 37.0% of Nigerians owned only radio set, while 1.3 percent owned only TV sets. 47.8% owned both radio and TV set, while 13.9% had neither. Findings from the study revealed that radios are easily affordable, accessible, and often more handy to use than TV. Those without TV and radio, however, still have access to the media through socialization in their local communities.

The pastoral nomads (Fulani) as a captive audience for radio and television programmes have radios, which they carry along during herding. The literate world can, thus, reach itinerants Fulani without disrupting their nomadic life or livelihood. To improve literacy, especially in the rural areas, the Nigeria
Government has introduced radio and television educational programmes. The government supplies hardware such as radio, television, and electric generators, and builds viewing rooms for public use. Although the Nigerian Government has spent large amount of money to support its nomadic education programme, literacy level among the Fulani remains low, and the quality of education among them is mediocre at best. The current form of nomadic education, therefore, is yet to lift the literacy and living standards of the Fulani people and their children in their quest for skills and knowledge in basic science concepts (Iro 2006).

**Time and Audience**
The time of tuning the radio varies in respect to program of interest and the period (time) of the day especially when the target audience’s attention is most valuable. The timing and the interest of the audience are quite important to capture the attention of the listening audience. UNESCO (2004) survey indicated that Nigerians tune to the radio all day long, as 97.5% were observed to listen to the radio in the morning, 88.5% in the afternoon and 91.2% listens onto the radio in the evening. It therefore shows that the scheduling of educational programs of basic scientific concepts for improving the livelihood of the target audience would be more effective when the target audiences are most available and attentive to capture their interest.

**New Learning Technologies**
Beyond the use of technology in formal education programmes for adults, wherein computer skills and other components of ‘digital literacy’ often define a given program’s learning objectives, distance learning supported by ICTs, can provide significant learning opportunities for informal and non-formal continuing literacy in adults and in basic youth education programmes. Indeed, four high-population countries – Cuba, China, Mexico and Nigeria – have each shown that the combination of distance education and ICT can and does work. Distance learning and ICTs enable interaction and practice, use of learner-generated materials, stimulates learner awareness and learner motivation, supports and trains literacy workers, facilitates the distribution of materials and information to resource centres, and gathers feedback from centres and individual learners regarding available materials and programmes (Iro, 2006). It is rare, however, for adult literacy programmes to be conducted solely through these media, which primarily are used in support of conventional educational programmes in Nigeria.

Interestingly, Cuba has used the combination of the above mentioned media to successfully promote literacy. Cuba’s track record of success, in essence, shows that Nigeria can borrow a leaf from Cuba’s experience.

**Teaching of Basic Scientific and Technological Concepts**
The merits of basic science and technology education to pastoral nomads are intended to raise and improve their living standards and quality of their livelihood. The concepts should include:
1. Health and Environmental education
2. Basic and functional literacy and numeracy
3. Modern method of animal husbandry
4. Processing of dairy products
5. Family life education
6. Sex education
7. Health related issues such as HIV/AIDS/STDS
8. Personal hygiene and cleanliness
9. Conflict and conflict resolutions

A radio participatory program can be used to educate the target population on the basic scientific concepts. The activities can be in form of news items, opinions, interviews, discussions, music, and drama and so on. The listening time should be taken into consideration by the audience.
A Model for Teaching Basic Science (Mobile)

Subject: Basic Science/ Technology
Topic: Personal cleanliness
Target Audience: Listening pastoral nomads
Time: 9.40am-10.10am (every Wednesday)

Instructional Material: Water, radio, scissors, comb, experts, pastoral nomads, soaps, Moderators and Translators
Instructional methods: Discussion and Interview
Target Objectives: By the end of the interaction and discussions the listening audience should be able to:
(a) Define hygiene/facilities for hygiene
(b) Outline types of hygiene
(c) Discuss three importance of hygiene.

Critique of the Approaches and Adoption of the Innovative Approaches
The role of the National Commission for Nomadic Education (which does not have a school of its own) is to provide instructional and infrastructural support to schools catering for nomads, and conduct training courses for teachers working in nomadic schools. The reality is, however, Nigeria’s States and Local Governments tend not to coordinate their activities to support this programme; they also make little effort to discover what is happening in the schools.

Infrastructure and facilities that were provided during the mobilization period – 1988 to 1990 – have either been destroyed or dismantled, and replacement and renovation have not taken place.

The demise in 1991 of the National Primary Education Commission, which by law allocated 2.5 percent of the National Fund to support Nomadic Education, affected the funding of the Nomadic Education Commission until a new Primary Education Commission (NPEC) was re-established in 1993. The re-injection of funding has improved the situation.

In sum, nomadic education in Nigeria is affected by defective policy, inadequate finance, faulty school placement, and continual migration of pupils, unreliable and obsolete data, and cultural and religious taboos (UBE, 2006). While some of these problems can be solved by policy and infrastructure interventions, the fact remains that most problems are complex and difficult to solve. The persistence of these problems is causing the roaming Fulani to remain educationally deficient.

The current top-down planning process, wherein the Fulani are the passive recipients rather than proactive planners of their education, dominates the nomadic education policies. For instance, during the first national workshop on nomadic education, only a few Fulanis were invited to attend. Ironically, it was at this particular workshop that far-reaching decisions that affected the lives of the pastoral Fulanis were made (Iro, 2006). Writing about education among the East African pastoralists, Iro stated further “Pastoralist, in our education system, get knocked on the head, being told they don’t know anything . . . although they, in fact, come in with knowledge that even if we studied half our lives, we wouldn’t achieve”.

This is exactly what is happening to the pastoralist Fulani in Nigeria. The Fulani are concerned that their children who go to school will graduate with ideas that will be at odds with their traditional pastoral practices. In quoting a Fulani leader, Iro (2006) wrote “. . . we are not opposed to the idea of getting our children to schools, but we fear that at the end of their schooling they will only be good at eating up cattle instead of tending and caring for them”.

How Mobile learning can be used in Nomadic Education in Nigeria
In a recent Mobile Telecommunication Nigerian (MTN) advertisement, a Fulani pastoralist is depicted making a call and telling other Fulani friends that MTN network was now available, even in the remotest regions. This advertisement portrays the fact the pastoralist-like other Nigerians-can also use mobile telephones wherever and for whatever reason. In terms of using mobile technologies to teach basic science literacy skills to Nigeria’s nomadic pastoralist, one of the most practice mobile technologies
currently available is mobile telephony. The processes of using mobile phones for educational purposes
can be illustrated as:
1. Mobile schools that can be dismantled and quickly moved have proven their worth and appear to fit
with Nigeria’s nomadic peoples’ peripatetic culture, lifestyle and livelihood.
2. The National Commission for Nomadic Education can enter into contractual agreement with the
network providers to procure relatively inexpensive mobile phones, which can then be distributed to the
nomads in their schools.
3. Designated learning centres can be established at strategic locations along the nomads traveling routes,
providing a place where a facilitator can attend to the needs of the nomads. Other materials, such as
learning manuals and programme syllabi, can also be distributed from these strategic locations.
4. Facilitators, via a simple call using their mobile telephones, can call the nomads to track their students’
progress in their studies, and to determine and address any problems that any learner – whether they are
stationary or mobile – typically face in mastering the course materials and learning objectives. Similarly,
the nomadic learners can also be regularly encouraged to call the course facilitator on their mobile
phones, should they encounter any problems or require clarification or help. Facilitators are also
encouraged to call and network with their fellow facilitators. Use of mobile phone in one’s native
language, helps to establish a cordial and hence, sustainable learning atmosphere based on trust and
colleaguality.
Mobile learning system to a great extent, are capable of delivering educational content anytime and
anywhere learners need it. In this regard, there are many benefits that Nigeria’s nomadic populations can
draw upon if mobile learning is integrated into Nigeria’s current nomadic education programme. Some
project benefits are:

i) Mobile learning will afford Nigeria’s nomadic people the opportunity to acquire scientific literacy
skills with little disruption to their nomadic lifestyles and livelihoods. The establishment of nomadic
schools, in fixed locations, appears to be a misguided educational policy. Indeed, the inherent nature of
Nigeria’s nomads as group of wandering people was not taken into consideration during the formulation
of this policy. Therefore, one viable option available for these wandering people is to learn through a
mobile learning system.

ii) One major problem usually faced by Nigeria’s nomads in their wandering activities, is that they
lack “interactional” and “transactional” skills, through the mobile learning system will to a large extent,
equip them with valuable interactional and transactional skills needed to enhance their relationships with
the people they meet.

iii) Lastly, the modern world is knocking on their door; nomads need to develop a sense of belonging
to the larger, modern world wherein learning is a key commodity for survival.

The Challenges of Mobile Learning in Nomadic Programmes in Nigeria

Of course, other, perhaps hidden, challenges still must be faced in the integration of mobile learning into
nomadic education programmes in Nigeria. Some apparent challenges are:
1. Nigeria’s nomads may not wish or be willing to embrace mobile learning
2. The sheer cost of procuring enough mobile phones for distribution among Nigeria’s nomads and
literacy facilitators may be seen by some as too costly an endeavor to undertake.
3. Effective monitoring and evaluation of mobile learning in the nomadic education programme in
Nigeria, as in most developing and underdeveloped countries, remains a big challenge.

CONCLUSION

The processes described certainly look novel. Most innovative ideas usually start as something – a project
or a technology – that looks funny or virtually impossible, before they are implemented and subsequently
widely accepted (Rogers, 1995). However, because current approaches to addressing problems of nomad
literacy have been found to be inadequate, trials of innovative ideas, such as mobile phones for mobile
learning, is worth the expense and effort. Mobile technologies have been found to be very relevant in
certain educational contexts. Nigeria’s pastoralists and nomads are equally aware of the importance of these technologies as portrayed in the Mobile Telecommunication Nigeria advertisement. Mobile teaching and learning is an innovative instructional approach of teaching basic science concepts to pastoral nomads. The procurement of these devices would not only motivate learning but would also instill positive attitudes, sustain interest towards acquiring scientific literacy skills. The Nigerian government should by this and as a matter of urgent attention devote some money into the project so as to join the committee of nations in promoting mobile teaching and learning to increase access to education among the pastoral nomads.

REFERENCES