Roles of Technology Enhanced Learning in Tackling Antimicrobial Resistance among Laboratory Professionals in Public Health Facilities in Nigeria

Nura Bawa1* and Hafsat Yusuf Imam2

1Department of Curriculum Studies and Educational Technology, Faculty of Education and Extension Services, Usmanu Danfodiyo University, Sokoto, Nigeria.
2Department of Primary Education, Shehu Shagari College of Education, Sokoto State, Nigeria.

Authors’ contributions

This work was carried out in collaboration between both authors. Author NB designed the study, performed the statistical analysis, managed the analyses of the study, wrote the protocol and wrote the first draft of the manuscript. Author HYI managed the literature searches. Both authors read and approved the final manuscript.

ABSTRACT

Technology has been found effective in almost all aspects of life. This includes its effectiveness in the field of education through technology enhanced learning. This paper aimed to look at roles of technology enhanced learning in tackling antimicrobial resistance among laboratory professionals in public health facilities in Nigeria. Qualitative research design was adopted for the study. Population of the study included all 75300 laboratory professionals in the North-west Nigeria. Convenience sampling technique was used to select 382 participants as sample for the study. This was guided by Research Advisors Model for selection of sample size. The instrument (open ended questionnaire) was used to gather data for the study. It was validated by experts, pilot study was conducted, and reliability index of 0.88 was obtained. It was found from the study that most of the health care professionals lamented not only they lack modern laboratory equipment but also lack technical knows how to operate the modern laboratory equipment/tools/apparatuses. It also was gathered that vast majority of them use handheld devices (smart phones) with few of them using...
laptops and in extreme cases desktops computers for learning and other day-to-day activities. Based on the findings from the study, it was concluded that in the 21st Century, collaborations through technology has become imminent. Thus, technology enhanced professional learning will not only help share information about global challenges but also help in providing lasting solutions to it. The study recommended that workshops and regular trainings should be organized to teach health care professionals on how to effectively collaborate, generate and share information through social media platforms.

Keywords: Technology; learning; antimicrobial resistance; public health facilities.

1. INTRODUCTION

Antimicrobial Resistance Bacteria (AMRB) has been a challenge all over the world. Many researches were carried out to substantially determine what actually causes it and how its prevalence could be controlled. It is a common belief that AMRB is mostly from the food we consume. In line with this, the Scientific Committee of Food Safety Authority of Ireland [1] in its report on Potential for Transmission of Antimicrobial Resistance in the Food Chain revealed that to effectively control the prevalence of AMRB, certain measures need to be taken, these include: Good Hygiene Practice (GHP), Good Agricultural Practice (GAP), and Hazard Analysis and Critical Control Point (HACCP). This is for the fact that most forms of AMRB are contracted from the consumption of primary food products. Because globalization increases the vulnerability of any country to diseases occurring in other countries, resistance presents a major threat to public health globally, and no country acting on its own can adequately protect the health of its population against it [2].

Some of the problems that may hinder the efforts to providing lasting solutions to antimicrobial resistance include: methodological obstacles; laboratory capacity; data management; diagnostic testing; economic condition, among others. In relation to methodology, avenues through which a group of medical personnel addresses AMR may differ from how another group does. This could be as a result of differences that may exist in health-seeking behaviour, health-care delivery, availability of records, drug policies and so on. In respect of laboratory capacity also, major problem exists especially in the developing economies like Nigeria. Limited number of professionals and equipment in relation to the demand of the outbreak is another lingering issue. Handling of antimicrobial resistance bacteria also, can be influenced by the economic status of individuals, institutions and or agencies. Measures to improve rational use of drugs have cost implications, which need to be weighed against the costs saved by reducing unnecessary use and the future costs that would result from not taking action [3].

Mostly in Nigeria, Community Acquired and Health Care-Associated Infections are considered as strongholds of infections. Antimicrobials are used intensively in health care institutions, which house individuals who, due to infirmities, are more susceptible to disease. Health care related infections are drivers of the resistant endemic and can spore resistant organisms into the community where they become prevalent. The risk of acquisition of HCAI is 2 to 20 times higher in developing countries such as Nigeria [4]. Common examples of HCAIs include surgical site infections (SSI), urinary tract infections (UTI) and blood stream infections (BSI) [5].

AMR was noticed in some identified organisms however, patterns of the resistance were not explicitly described and resistance averting pneumococcal conjugate vaccines are yet to be rolled out nationally in Nigeria. In spite of the presence of Human Immunodeficiency Virus (HIV), malaria, bacteremia and meningitis, a wide review and experts consultations revealed that tuberculosis (TB), respiratory infections (RIs) and diarrheal disease remain leading causes of infectious disease morbidity and mortality in Nigeria. A systematic review in Nigeria found marked resistance to all drugs commonly prescribed for urinary tract infections in the country. There are high rates of resistance to ceftriaxone, ampicillin and cotrimoxazole. Most organisms have proven 100% resistance to ampicillin and cotrimoxazole which have long been used as first line drugs in the treatment of UTI.

Antimicrobial resistance bacteria are a global issue that requires collaborations. Healthcare
professionals from Asia, Europe, America, Arabia and Africa need to join hands to provide solutions to any problem that is consistently costing human lives. In Africa, Nigeria to be précised, healthcare professionals are scarce, allowing them to leave the country for collaborative learning may affect healthcare services provision in the country. Taken this into account, the current researchers are of the opinion that technological tools such as handheld devices, laptop computers, personal digital assistants can be used for effective collaborations. This, in the view of the current researchers will help the healthcare professional learn while on seat.

Collaborative learning through utilization of technological tools will not only provide the desired outcome, it will also help the country reduce cost of sending the healthcare professionals to other countries for learning purpose. The only thing that could be a challenge here is if the healthcare professionals do not possess the digital literacy required for collaboration through social media platforms and other learning websites. It in line with this background that the researchers raised 10 questions in order to have an idea of the status of healthcare professionals in Nigeria, what they consider as learning, how effectively they can handle the technological tools for learning, the kind of social media platforms they can handle for effective collaborative learning, and how they prefer to learn without jeopardizing their services to the humanity. This will help the researchers to suggest how technological tools should be used to enhance learning among healthcare professionals in Nigeria.

1.1 Place of Technology Enhanced Learning

Technology enhanced learning aims to facilitate learning and improve performance (academic or otherwise) by creating, using and managing appropriate technological resources and processes. In modern days, Educators that are ICT biased use it for improved performance in the transfer of knowledge and sharing of ideas [6]. ICT include all the technology used to handle telecommunications, broadcast media, intelligent building management systems, audiovisual processing and transmission systems and network-based control and monitoring functions. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form, e.g. personal computers, handheld devices, digital television, email, robots, and so on. One of the amazing factors that makes ICT unique in learning process is that, it helps teacher (instructor) to teach with ease, and student to learn without stress.

1.2 Models That Guide This Study

Educational technology is aimed at supporting learning by creating, using, and managing educational resources and processes. It provides guidelines that help in utilizing technological tools for effective learning process. Some of the models that the current researchers considered relevant when carrying out this study include: Technology Acceptance Model (TAM); Bate’s SECTIONS Model and ASSURE Model. Technology Acceptance Model (TAM), it can be used as a practical tool for early user acceptance and adoption of testing technological devices for learning by evaluating the relationships among perceived usefulness, perceived ease of use, attitude towards using, behavioural intentions to use and actual use; SECTIONS Model is a technology selection Model which help in selecting the best technologies that can be used for effecting learning. The model takes into account the students (including professionals); ease of use; cost; teaching and learning process; interactions; organisation; neutrality/novelty; speed; The only aspect the model lacks is learner active participation which can be found in ASSURE Model.

1.3 Objectives of the Study

To do justice to the topic of discussion, the researcher intended to work in line with the following objectives:

1. To determine healthcare professionals’ perception on antimicrobial resistance.
2. To determine laboratory professionals’ perceived ways to control antimicrobial resistance.
3. To ascertain whether modern laboratory equipment are available in public health cares.
4. To investigate how healthcare professionals in Nigeria can be supported in their work.
5. To determine what laboratory professionals in the public health care consider to be learning.
6. To determine media literacy level of laboratory professionals in the public health cares.
7. To identify ICT tools (devices) frequently used by the laboratory professionals in public health cares
8. To find out social networking sites frequently used by the laboratory professionals in public health cares
9. To ascertain the roles technology plays in learning about global challenges
10. To determine preferred mode of learning (synchronous or asynchronous) of the laboratory professionals in public health cares.

1.4 Research Questions

1. How do healthcare professionals’ perceived antimicrobial resistance?
2. How do laboratory professionals’ perceived ways to control antimicrobial resistance?
3. Are there modern laboratory equipment in public health cares?
4. How can healthcare professionals in Nigeria be supported in their work?
5. What do laboratory professionals in the public health care consider to be learning?
6. What is the media literacy level of laboratory professionals in the public health cares?
7. What ICT tools (devices) are frequently used by the laboratory professionals in public health cares?
8. What social networking sites are frequently used by the laboratory professionals in public health cares?
9. What roles does technology play in learning about global challenges?
10. Which mode of learning (synchronous or asynchronous) do laboratory professionals in public health cares preferred?

2. METHODOLOGY

Qualitative method was employed for this study. This enabled the researchers to present information as collected without any manipulation. Population of the study included all the 75300 public healthcare professionals in North-Western part of Nigeria. Sample of 382 was drawn from the population using Research Advisor 2013 Model for selection of sample size. Convenience sampling technique was used during the administration of research questionnaire. This is a sampling technique that qualitative researchers use to recruit participants who are easily accessible and convenient to the researchers. Instruments (open ended questionnaire) developed by the researchers, and validated by experts in health sector and educational research. Pilot study was conducted to establish the reliability (consistency) of the instruments, and reliability index of 0.88 was obtained. Even though difficult to be analyzed, open ended questionnaire allows for a greater variety of responses from participants. Thus, qualitative approach was used to analyze the data collected.

3. RESULTS, ANALYSES AND DISCUSSION

Question One:

Majority of the respondents believed antimicrobial resistance bacteria to be a global challenge that led to loss of over 3 million lives in five years. From their feedbacks, the respondents also confirmed that the challenges of AMRB are more pronounced in sub-Saharan Africa. This finding is in agreement with the assertion made by Leopold, [7] that a high level of resistance to the commonly used antibiotics in the sub-Saharan African region. For example, 90% of Gram negatives were resistant to chloramphenicol, a commonly used antibiotic. Current researchers are of the opinion that this could be as a result of the harsh weather within the sub-Saharan Africa.

Question Two:

It was a submission from majority of the respondents that antimicrobial resistance mostly got its roots from food chains. In this view, they recommended food security and control as one of the ways to control the prevalence of AMRB. In agreement with this finding, [8] claimed that food animals are considered as key reservoirs of antibiotic-resistant bacteria with the use of antibiotics in the food production industry having contributed to the actual global challenge of ABR. If preventive and containment measures are not applied locally, nationally and regionally, the limited interventions in one country, continent and for instance, in the developing world, could compromise the efficacy and endanger ABR containment policies implemented in other parts of the world, the best-managed high-resource countries included. They also added that there would be need for inter professions’ exchange of ideas to effectively tackle the challenge.
Question Three:

With regards to the availability of modern laboratory equipment in public health cares, most of the health care professionals lamented that not only they lack modern laboratory equipment but also lack technical know how to operate the modern laboratory equipment/tools/apparatuses. In addition to that, they recommended staff development programmes to enrich their professional status. This finding did not contradict the statement that patients with serious ailments in the country are facing hard times as many of the country’s teaching hospitals have been hit by acute shortage of vital medical equipment to treat them. Finding of their study revealed that public hospitals are battling with obsolete equipment in some hospitals while some medical facilities have none [9].

Question Four:

Apart from financial supports which are believed to be backbone to successful run of all organizations, the respondents solicited for help from international development partners. Their requests include provision of enough modern laboratory equipment; workshops and trainings for staff (professional) development; need for infrastructural development of public health cares.

Question Five:

Questions raised in respect to what health care professional considered to be learning include: Is learning restricted to classroom situation alone? Is what one learned from interactions with colleagues considered as learning? Could one learn through technology enhanced interactions on social media and other social networking sites?

From the first question asked, majority of the respondents believed that learning superseded only what is learned in the classroom. They also acknowledged that learning could take place anywhere irrespective of location and age limit (lifelong learning). From the second question, most of the respondents believed learning through friends/colleagues to be one of the best form of learning. Those among them that are technology biased lamented that technology enhanced learning and or learning through social media is encouraging and modern in its approach.

Question Six:

Media literacy level strongly determines how one learns through technology. This is because media literacy helps one to identify, generate, analyse and evaluate online information for further utilization. When asked about their media literacy levels, most of the respondents are not technology biased but showed concerned to acquire at least a proficiency on media literacy. Only few among them acquired high level of media literacy.

Question Seven:

When asked about ICT tools (devices) frequently being used by health care professionals, it was gathered that vast majority of them use handheld devices (smart phones) with few of them using laptops and in extreme cases desktops computers for learning and other day-to-day activities. Mobile technologies such as handheld devices advance learning experiences which can effectively educate present-day learners and which are by far different from those offered by desktop computers. These devices are utilized flexibly, in different settings, giving access to an extensive range of uses and situated learning activities [10].

Question Eight:

On the social networking sites frequently used by the laboratory professionals in public health cares, about half of those among them that use social media revealed that they use WhatsApp and Facebook. Few among use Telegram, Instagram and WeChat. This finding is not far from the report that the wide access to the internet on mobile phones across Nigeria shows that there is a huge market and high demand for smart phones in Nigeria, giving credence to the claim that Nigeria is Africa’s biggest smartphone market [11]. Most respondents (95 percent) who access the internet revealed that they use the internet to engage social networking sites and applications. This finding also held true across geo-political zones and across various age demographics.

Question Nine:

Majority of the respondents submitted that technology enhanced learning, which they described as learning through social media platforms has major role to play in propounding solutions to global challenges such as
antimicrobial resistance Bacteria. From the data collected, the respondents acknowledged some significant roles played by social media, these include: facilitating collaborative learning; video conferencing; transfer of files (videos, audios, audio-visuals, words, spreadsheets and PDF); among other functions. Several institutions globally are encouraging students to forge international partnerships using social media for taking up some project assignments. This is because they get engaged with each other and learn how to manage projects and coordinate with teams sitting globally along with cross cultural sensitivities. Similarly, the use of social media has made it easier and faster to interact with peers or teachers about class-related topics [12].

Question Ten:

Vast majority of the participants lamented that in the 21st Century learner has no choice of how he/she learns. As stated under question five, the respondents were of the view that learning has to be lifelong in its approach. Thus, both synchronous and asynchronous modes of learning are relevant and timely. A synchronous learning refers to all types of learning in which learner(s) and instructor(s) are in the same place, at the same time, in order for learning to take place. This includes in-person classes, live online meetings when the whole class or smaller groups get together. While asynchronous learning is a student-centered teaching method widely used in online learning. Its basic premise is that learning can occur in different times and spaces particular to each learner, as opposed to synchronous learning at a same time and place with groups of learners and their instructor, or one learner and their instructor. In asynchronous learning, instructors usually set up a learning path, which students engage with at their own pace [13].

4. CONCLUSION

Antimicrobial resistance Bacteria is a global challenge that requires immediate attentions of multidisciplinary professionals all over the world. In the 21st Century, collaborations through technology has become imminent. Thus, technology enhanced professional learning will not only help share information about global challenges but also help in providing lasting solutions to it. Web-based environments are important forums for joint problem solving, knowledge building and the sharing of ideas. A problem could be that the healthcare professionals’ capacities to work cooperatively through the technological tools may be weak. Without technology a flexible learning environment would hardly be possible, therefore, as a healthcare professional, accommodating devices and connectivity within your space becomes of high importance.

5. RECOMMENDATIONS

Based on the findings of this study, the following are recommended:

1. Government through collaboration with international development partners should provide modern laboratory equipment to public health cares.
2. Workshops and regular trainings should be organized to teach health care professionals on how to effectively collaborate, generate and share information through social media platforms.

CONSENT

As per international standard or university standard, participant’s written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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