Assessment of Information Literacy Skills of Librarians in Selected Academic Libraries in South-Western, Nigeria

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Abstract
The study assessed the information literacy skills of library and information science professionals in Selected Academic Libraries in South-Western, Nigeria. Survey research design was adopted and total enumeration was used for the selection of respondents with minimum of bachelor degree from eight (8) selected academic libraries. All librarians from the selected libraries constitute the study population while a simple random sampling technique was used to select two hundred (200) librarians from the libraries under study. Questionnaire was the main data collection instrument. Out of the two hundred (200) copies of questionnaires that were administered, only one hundred and seventy-five (175) was found usable and analyzed. The data collected was analyzed using descriptive statistics. The study revealed that majority (98.1%) of the library and information science professionals acquired their information literacy skills through self-development, training (92.6%) and seminar (62.5%) and use these skills on daily basis. Also, the study shown irregular training (90.5%), inadequate technological facilities (90.8%), poor state of power supply (87.7%), low level of development in the country (86.4%), shortage of manpower (82.1%), low literacy level of people (79.2%), lack of access to the internet (61.7%) as some of the factors affecting the information literacy skills of information professionals. The study concluded that information professionals use these skills mostly on a daily basis despite been negatively affected by some highlighted factors. Therefore, it was recommended that lasting solutions should be provided to the highlighted factors and information literacy should be taught as a course in library school. This is to equip the intending information professionals with necessary skills to meet the specific information needs of their users and remain relevant in the information profession.
***Keywords*:** Information literacy, Skills, Library and Information Science professionals and Academic libraries.

Introduction

Information is a processed data that is capable of answering users query, proffers solution to problems, reduces uncertainty as well as gives one the opportunity to know when, how and where to seek for knowledge at any given time. A lot of information (whether printed, electronic,

or in any other format, such as artefacts, biological specimens, etc) is generated, and its generation has led to information explosion which, give room for information users to access vast amounts of information that is often unsupported, unfiltered, and unreliable. The upsurge of technology driven accessible information has made knowledge sharing overwhelming. But in some cases, the overwhelming amount of information does not always translate into quality and usable information. (White, 2009). Traditionally, accessing information can take a lot of effort, time and energy because it involves physically visiting information centres such as libraries, archives and museum. The library in the opinion of IFLA (2008) is a place and space for accessing dependable information where the library collection developments are guided by time-tested ideologies and standards. Thus, librarians are expected to play pivotal roles in fostering the evaluation of digital sources of information, provide appropriate and timely information to solve the needs of individuals.

For this reason, the information professional has emerged. The information profession is an umbrella term that encompasses any occupation that is involved in any aspect of the information cycle, such as generation, processing, storage, dissemination, and preservation of information. The information professional are engaged in the following activities: ordering, acquiring, processing, maintaining, providing, retrieving, disseminating information to end users, either directly or indirectly. The information professional is involved in the organisation, storage, management and distribution of information. Information professionals can be categorised as Librarian, Archivist, Records manager, Information scientist, Information systems analyst and designer, Information Manager, Information broker, Curator and Educator. Other information professionals are editors, database managers, information consultant and journalist but generally they are expected to have undergone some years of training in any aspect of information circle (Aina, 2004).

These information professionals can be found in libraries and information centres, archives and records management centres, museums, publishing and book trade centre, education and training institutions for information personnel, communication and media houses, information companies and database industries. Library and information science professionals have championed the development of information literacy at individual, organisational, national and international levels. The idea of information literacy, emerging with the advent of information technologies in the early 1970s, has grown, taken shape and strengthened to become recognized as the critical literacy for the twenty-first century. The term "information literacy" was first used by Zurkowski (1974), who suggested that information literate people know how to apply information resources to their work. Information Literacy is not just a library issue. It is the critical campus wide issue for the twenty-first century, of keen importance to all educational stakeholders, media and information technologists, assessment coordinators, administrators, faculty, librarians, and faculty development directors, service-learning specialists, student's affairs personnel and career development professionals.

In recent years, information literacy was broadly explained by American Library Association (2018), as a set of abilities requiring individuals to recognize when information is needed and have the ability to evaluate and use effectively the needed information. An information literate person should therefore be in the position to find out information need, the extent of information need, locate and retrieve appropriate information sources, evaluate and use them. CILLIP, (2018) added that information literacy is the ability to think critically and make balanced judgments about any information we find and use. Gbaje and Okojie (2011) stated that information literacy helps in access to knowledge which is essential for promoting human rights activities, economic and cultural development, innovations, individual freedom and creativity. In

the opinion of SCONUL (2011) information literate person is expected to exhibit a responsiveness of how to gather, use, manage, synthesise and create information and data in an ethical conduct and will have the information skills to do so effectively.

Also, Blakes, Bowles, Terry, Pearson and Kiraiyi, (2017) affirmed that students retention rate is higher for those whose courses included information literacy instruction components. Ekong and Ebong (2018) agreed that there is a correlation between effective information literacy and academic performance of students but decried lack of reasonable ICT components in information literacy instruction in Nigerian schools; they further suggested that ICT facilities should be installed in academic libraries for effective teaching and learning of information literacy. Association of College and Research Libraries (2018) stated that a literate person should be able to identify, locate, retrieve, evaluate, synthesize and present the newly acquired knowledge so that others can use it and translate these abilities and concepts to new projects and disciplines. The library user is expected to exploit information resources in the library with minimal help from the library staff.

Therefore, as there is so much information available, information professionals should be able to locate and provide the relevant source(s) of information when needed by a user. This corroborates the result of Anyaoku, Ezeani and Osuigwe (2015) which scored the search skills of librarians in universities in southeast, Nigeria very high with the ability to locating information using library catalogues, encyclopaedia, indexes and abstracts. This requires some knowledge or competence which must be used. Librarians need to be knowledgeable of a vast array of scholarly and public information resources and have to follow trends and advancements in publishing, computers, and the media as they direct the selection and organization of information materials. Libraries employ staff with the expertise to locate, retrieve and exploit information in order to: enable easy access to information resources in all formats while taking responsibility for its currency and relevance, identify and acquire the materials of most relevance, organise those materials in an easily accessible manner, train staff to access and exploit relevant information resources in the most effective way, take the lead in raising the levels of information literacy within the organisation.

Information literacy skills can be acquired through various means. Among these was established in a study conducted by Emiri (2015) who found colleague's assistance, trial and error, IT programmes and formal education as the means of acquiring literacy skills of librarians in Edo and Delta States in Nigeria. Also, there are some challenges affecting the information literacy skills of librarians. This was revealed through a study by Anyaoku, Ezeani, and Osuigwe, (2015) which found lack of information literacy policy, lack of university commitment to information literacy, and lack of adequate computers and teaching aids as challenges militating against information literacy skills. However, the ability to provide the right information to the right person at the right time is the key to the success of any organisation.

It therefore becomes necessary to assess the frequency of use of information literacy skills, rate the search skills, assess how these skills were acquired and the challenges affecting the information literacy skills of library and information science professionals by limiting such professionals to only librarians with minimum of bachelor degree in library and information science/studies from eight (8) selected university libraries in South-west, Nigeria.

Statement of the Problem

The available information in this modern time come from sources very difficult to verify and confirm, these uncertainties have the capacity to cast a shadow of doubt on the authenticity,

validity, and reliability of information resources. Large quantity of information does not automatically reflect the quality of information that is available to information users. The library in the opinion of IFLA (2008) is a place and space for accessing dependable information where the library collection developments are guided by time-tested ideologies and standards. Consequently, the knowledge of information literacy becomes necessary for information providers who are eager to play a distinguished role in 21st century information provision and usage. It is in view of this that this study aims at assessing the frequency of use of information literacy skills, rate the search skills, assess how these skills were acquired and the challenges affecting the information literacy skills of library and information science professionals using eight selected academic libraries in South-West as the survey area.

Research Questions

The study sought answers to the following research questions:

1. What is the frequency of the use of information literacy skills of library and information science professionals in the selected academic libraries?
2. What is the level of the search skills of library and information science professionals?
3. What are the modes of acquisition of information literacy skills of library and information science professionals?
4. What are the challenges affecting the information literacy skills of library and information science professionals?

Methodology

The study used the descriptive research design. The selected population for this study comprised of all library staff with minimum of bachelor degree in library and information science/studies from eight (8) selected university libraries in South-west, Nigeria. The questionnaire was used as the only instrument of data collection and it was considered the most suitable instrument to reach out to a sizeable number of respondents. 200 copies of the questionnaire were administered to the respondents in selected eight (8) university libraries in South-West, Nigeria but only 175 were returned and subsequently analysed as shown in Table 1.

Table 1: Name of Institution of the respondents, Questionnaire Administration and Response Rate

University Libraries	Population/Number Administered	Number Returned	Number Usable	Response Rate (%)
Kenneth Dike Library of University of Ibadan (UI)	42	37	36	85.7
Hezekiah Oluwasanmi Library of Obafemi Awolowo University (OAU)	27	25	24	88.9
University of Lagos library (UNILAG)	30	28	25	83.3
Federal University of Technology's library, Akure (FUTA)	22	19	15	68.2
Nimbe Adedipe Library, University of Agriculture Abeokuta (FUNAAB)	21	20	20	95.2
Olabisi Onabanjo University library (OOU)	27	26	26	96.3
Tai-Solarin University of Education library (TASUED)	9	9	9	100
Ladoke Akintola University of Technology Ogbomoso (LAUTECH)	22	21	20	91.0
TOTAL	**200**	**185**	**175**	

The questionnaire was in five sections. Section A elicited the demographic information (e.g. name of institution, sex age, qualification, and status/designation etc.) of the respondents, Section B treated the frequency of the use of information literacy skills of library and information science professionals in the selected academic libraries, Section C asked the respondents to rate their search skill, Section D emphasised on the mode of acquisition of their present information literacy skills while Section E focused on the challenges affecting the information literacy skills of library and information science professionals. The data collected from the survey through the research instrument was analysed using a simple percentage.

Analysis of the Research Questions

Research Question 1**:** What is the frequency of the use of information literacy skills of library and information science professionals?

Table 2: Frequency of use of information literacy skills

Frequency of use	UI		OAU		UNILAG		FUTA		FUNAAB		OOU		TASUED		LAUTECH		TOTAL
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Daily	17	47.2	10	41.7	9	37.5	2	13.3	8	50.0	7	29.0	2	22.2	6	30.0	61
Twice a week	6	16.8	2	8.3	5	20.8	3	20.0	0	0.0	3	13.0	4	44.4	5	25.0	28
Once a week	5	13.9	4	16.7	5	20.8	2	13.3	4	25.0	6	25.0	0	0.0	3	15.0	29
Twice a month	2	5.6	4	16.7	4	16.7	1	6.7	4	25.0	5	21.0	2	22.2	2	10.0	24
Once a month	1	2.8	0	0.0	1	4.2	4	26.7	0	0.0	1	4.2	1	11.1	2	10.0	10
Occasionally	4	11.1	3	12.5	0	0.0	1	6.7	0	0.0	2	8.3		0.0	1	5.0	11
Never	1	2.8	1	4.2	0	0.0	2	13.3	0	0 .0	0	0 .0	0	0.0	1	5.0	5

Table 2 showed that majority of the respondents with the highest frequency of use of information literacy skills was daily in UI, OAU, UNILAG, FUNAAB, OOU, LAUTECH, indicated by 17 (47.2%), 10 (41.7%), 9 (37.5%), 8 (8.50%), 7 (29.0%), and 6(30.0%) respectively while FUTA was once in a month indicated by 4 (26.7%) and TASUED twice a week by 4 (44.4%).

Research Question 2: What is the level of the search skills of library and information science professionals?

Table 3: Rating of search skills

Rating	UI		OAU		UNILAG		FUTA		FUNAAB		OOU		TASUED		LAUTECH		TOTAL
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Very good	11	34.4	6	27.3	8	32.0	1	6.7	7	43.8	7	26.9	1	11.1	3	15.0	44
Good	13	40.6	8	36.4	7	28.0	6	40.0	3	18.8	7	26.9	3	33.3	9	45.0	56
Average	4	12.5	3	13.6	7	28.0	6	40.0	4	25.0	8	30.8	4	44.4	6	3 0.0	42
Poor	2	6.3	4	18.2	2	8.0	0	0.0	2	12.5	3	11.5	1	11.1	1	5.0	15
Very poor	2	6.3	1	4.5	1	4.0	2	13.3	0	0.0	1	3.8	0	0.0	1	5.0	8

The result in Table 3 showed that FUNAAB had the highest number of respondents that rated their search skills as very good with 43.8%, LAUTECH very good with 9 (45.0%), TASUED average with 44.4%, OAU poor with 18.2%, FUTA very poor with 13.3% respectively.

Research Question 3: What are the modes of acquisition of information literacy skills of library and information science professionals?

The respondents in all the universities agreed that the mode of acquisition of information literacy skills were through training and self-development although this varied within each university (Table 4). FUTA, TASUED and LAUTECH had 100% respondents that agreed to training as mode of acquisition of information literacy skills, OOU agreed with seminar with 87.5%, LAUTECH agreed with conference with 50.0%, 100% respondents agreed with workshop from TASUED. OAU, UNILAG, FUTA, FUNAAB, TASUED had 100% respondents that agreed with self-development as a means of acquiring information literacy skills.

Research Question 4: What are the problems affecting the information literacy skills of library and information science professionals?

Table 4: Mode of acquisition of information literacy skills

Mode of acquisition of information literacy skills	UI				OAU				UNILAG				FUTA				FUNAAB				OOU				TASUED				LAUTECH				TOTAL			
	N%				N%				N%				N%				N%				N%				N%				N%				N			
	A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D	
Training	93.5	6.5	0.0		84.2	15.8	0.0		95.2	4.8	0.0		100.0	0.0	0.0		87.4	6.3	6.3		87.5	12.5	0.0		100	0.0	0.0		100	0.0	0.0		92.6	6.7	0.7	
Seminar	61.5	15.4	23.1		100.0	0.0	0.0		71.4	0.0	28.6		100.0	0.0	0.0		100.0	0.0	0.0		87.5	0.0	12.5		33.3	66.7	0.0		71.4	0.0	28.6		62.5	18.8	18.7	
Conference	46.2	23.1	30.7		50.0	37.5	12.5		42.8	28.6	28.6		0.0	0.0	0.0		75.0	0.0	25.0		42.8	28.6	28.6		0.0	0.0	0.0		50.0	25.0	25.0		39.5	30.2	30.3	
Workshop	20.0	40.0	40.0		50.0	25.0	25.0		42.8	28.6	28.6		50.0	50.0	0.0		80.0	0.0	20.0		14.3	28.6	57.1		100	0.0	0.0		0.0	66.7	33.3		35.3	29.4	35.3	
Self-development	100	0.0	0.0		100	0.0	0.0		100	0.0	0.0		100	0.0	0.0		100	0.0	0.0		88.9	11.1	0.0		100	0.0	0.0		91.7	8.3	0.0		98.1	1.9	0.0	

Table 5: Challenges affecting the information literacy skills of Information Professionals

PROBLEMS	UI				OAU				UNILAG				FUTA				FUNAAB				OOU				TASUED				LAUTECH				TOTAL			
	N%				N%				N%				N%				N%				N%				N%				N%				N			
	A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D		A	U	D	
Low level of development in the country	88.2	8.8	2.9		91.3	8.7	0.0		88.0	8.0	4.0		85.7	0.0	14.3		88.2	11.8	0		76.0	8.0	16.0		75.0	25.0	0.0		93.8	0.0	6.2		86.4	8.0	5.6	
Poor reading habit of people	79.4	2.9	17.7		91.7	0.0	8.3		87.0	4.3	8.7		80.0	20.0	0.0		85.0	0.0	15.0		84.0	4.0	12.0		62.5	0.0	37.5		68.4	15.8	15.8		81.5	5.4	13.1	
Low literacy level of people	85.7	8.6	5.7		79.2	12.5	8.3		78.3	13.0	8.7		60.0	20.0	20.0		80.0	10.0	10.0		88.0	0.0	12.0		71.4	28.6	0.0		73.7	15.9	10.4		79.2	11.3	9.5	
Attitude of library users	77.8	13.9	8.3		87.5	8.3	4.2		83.3	8.3	8.4		57.1	14.3	28.6		85.0	10.0	5.0		88.0	0.0	12.0		66.7	33.3	0.0		75.0	15.0	10.0		80.8	10.8	8.4	
Irregular training	97.1	2.9	0.0		95.8	4.2	0.0		84.0	0.0	16.0		85.7	14.3	0.0		94.7	5.3	0.0		88.0	8.0	4.0		87.5	12.0	0.5		94.2	15.8	0.0		90.5	6.5	3.0	
Shortage of man power	80.0	11.4	8.6		87.0	8.7	4.3		88.0	4.0	8.0		64.3	21.4	14.3		84.2	10.5	5.3		76.9	19.2	3.9		100	0.0	0.0		84.3	5.3	10.4		82.1	10.7	7.2	
Inadequate technology facilities	88.6	11.4	0.0		91.7	8.3	0.0		92.0	4.0	4.0		60.0	26.7	13.3		89.5	10.5	0.0		76.0	14.3	10.7		87.5	12.5	0.0		89.5	10.5	0.0		90.8	7.4	1.8	
Poor state of power supply	88.9	2.8	8.3		87.0	8.7	4.3		84.0	8.0	8.0		78.6	0.0	21.4		100	0.0	0.0		92.3	0.0	7.7		75.	00	25.0		84.2	10.5	5.3		87.7	4.1	8.2	
Lack of access to the internet	62.9	8.6	28.5		78.3	8.7	13.0		79.2	4.2	16.6		35.7	14.3	50.0		47.4	15.8	36.8		64.0	0.0	36.0		50.0	0.0	50.0		52.6	21.1	26.3		61.7	9.0	29.3	
Library environment	52.9	20.6	26.5		60.9	17.4	21.7		52.0	24.0	24.0		20.0	40.0	40.0		55.0	15.0	30.0		56.0	24.0	20.0		25.0	25	12.5		38.9	11.1	50.0		48.8	23.2	28.0	
Lack of motivation by boss	44.1	26.5	29.4		52.2	21.7	26.1		58.3	16.7	25.0		50.0	21.4	28.6		60.0	15.0	25.0		54.2	20.8	25.0		42.9	0.00	57.1		73.7	15.8	10.5		54.5	19.4	26.1	

The result revealed the institution(s) with the highest number of respondents on the factors affecting the information literacy skills of information professionals. LAUTECH had 93.8% and 73.3% in low level of development in the country and lack of motivation by boss, OAU had 91.7% and 60.9% in poor reading habit of people and library environment, OOU had 88.0% in both, low literacy level of people and attitude of library users, UI had 97.1% in irregular training, TASUED had 100% in shortage of manpower, UNILAG had 92.0% and 79.2% in inadequate

technology facilities and lack of access to the internet, FUNAAB had 100% in poor state of power supply respectively (Table 5).

Discussion of Findings

The result of the present study shows that almost two/third (60.6%) of the librarians rated their search skills as both very good and good. This corroborates the result of Anyaoku, et al (2015) which scored the search skills of librarians in universities in Southeast, Nigeria very high with the ability to locating information using library catalogues, encyclopaedia, indexes and abstracts. The similarity between this study and that of Anyaoku, et al (2015) lies in the importance of possessing these search skills by librarians. This is so because the inability of librarians to possess the said skills may hinder them from proffering solutions to users' information needs which could bring low usage, waste of resources and users ignoring valuable resources that are difficult to access in favour of those that are easier to access.

Also, the present study revealed that the majority of the librarians acquired their information literacy skills through self-development, training and seminar. Conversely, this finding contradicted the result from the study of Emiri (2015) who found colleague's assistance, trial and error, IT programmes and formal education as the means of acquisition of literacy skills of librarians in Edo and Delta States in Nigeria. This contrast in findings may be attributed to the difference in geo-political zones where the studies were conducted.

Similarly, the study revealed irregular training, the poor state of power supply, inadequate technology facilities, low level of development in the country and shortage of manpower, attitude of library users, low literacy level of people and lack of access to the internet as the inhibiting factors to information literacy skills. This contradicted the outcome of the study conducted by Lwehabura and Stilwell (2008) which found lack of adequate resources, policy, proactive solutions among librarians and collaboration between librarians and teaching staff as challenges facing the effectiveness of information literacy skills. The result of the present study is also at variance with the report of Anyaoku, Ezeani, and Osuigwe, (2015) who found the challenges militating against information literacy skills as lack of information literacy policy, lack of university commitment to information literacy, and lack of adequate computers and teaching aids. A possible explanation might be recency and the use of more respondents in the present study who shared different views from the results of earlier studies.

Summary of findings

The study revealed that:

(i) majority of the respondents in the eight (8) selected academic libraries used their information literacy skills daily while minority used these skills once a month;

(ii) almost two/third of the respondents rated their search skills as both very good and good;

(iii) majority of the respondents acquired these skills through self-development, training, and Seminar; and

(vi) the challenges to information literacy skills as irregular training, the poor state of power supply, inadequate technology facilities, low level of development in the country and shortage of manpower. Others included an attitude of library users, low literacy level of people and lack of access to the internet.

Conclusion

In this period of overabundance information, information literacy is the essential skill that empowers anyone to identify, retrieve and effectively use the information for continual relevance. The acquisitions of such skills by librarians have been discovered to enhance their productivity. Also, their level of expertise will determine to a large extent how effectively they are able to perform their jobs and carry out routine jobs in the library. For librarians to fulfil their primary aim of proffering solutions to the information needs of their users and the institutions, such librarians must be empowered with all necessary information literacy skills to accomplish their mission. Librarians of this present age have very high search skills in the sampled area and most of them use their information literacy skills on daily basis. The study revealed that these skills were acquired mostly through self-development, training, and seminar. However, various factors inhibiting these skills must be checked and corrected. Finally, the findings of the study would be described as a scholarly contribution to the information profession in general and information literacy skills among librarians in Nigeria in specific.

Recommendations

Based on the findings of this study, the following recommendations were made:

i). Information literacy in library schools should be more emphasised by making it a course to equip the intending information professionals with the necessary skills to meet the specific needs of their organization on daily basis.

ii). Library associations (e.g. Nigeria Library Association – NLA, Librarians' Registration Council of Nigeria – LRCN) should constantly organise training, workshops and conferences focused on the improvement of the search skills of their members.

iii). Library management should regularly organise training and seminars on the acquisition of information literacy skills for their members of staff to remain relevant in the information profession.

iv). All stakeholders (Library schools, Library associations, Organisations/Institutions, Library managements and Information professionals) should provide lasting solutions to the identified challenges to information literacy skills of information professionals.

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UNDERGRADUATES' PERCEPTION ON THE USE OF LEARNING MANAGEMENT SYSTEM TO STUDY IN ILORIN, KWARA STATE

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Abstract

The application of Information and Communication Technology in teaching is a relevant and functional way of providing education to learners that will assist to inculcate the required capacity for the world of work. Hence, Learning Management Systems are solutions built and integrated into education to facilitate delivery of learning instructions to the learners. This study, therefore, explored undergraduates' perception of the use of learning management system to study in Ilorin, Kwara state. University of Ilorin was purposively selected as the target location because the institution has a dedicated learning management system built to deliver one of her core courses for all 300 level students- GNS 312. The questionnaire was utilized to obtain data from 100 undergraduates from five faculties in the University. The findings revealed that most respondents had a positive perception of the usefulness and ease of use of LMS to learn GNS 312 in University of Ilorin. The students also expressed satisfaction at this mode of delivery of the lesson. The study concludes that undergraduates in Ilorin, Kwara State have a positive perception of the utilization of LMS because they are satisfied with it. The study thereby recommended that GNS 312 should remain on the platform of LMS because undergraduates see its usefulness; they find it easy to use, learn effectively with it and are satisfied with it.

Keywords: Learning Management System (LMS), Academic Study, Undergraduates' Perception, Perceived Ease of Use, Perceived Usefulness, Satisfaction, Technology Acceptance Model

Introduction

The 21st century has witnessed massive utilisation of Information and Communication Technology (ICT) in the everyday life of an individual. This is because ICT has provided users with the capability to perform various life functions like learning, entertainment, trade, networking and lots more ubiquitously. The types of use of ubiquitous technology either for learning or leisure purposes will open to a thousand possibilities for the students, in creating an open environment and connecting classes around the world and providing more individualized instruction for students (Lei, 2010). The use of e-learning can give various benefits to teaching and in terms of the use of technology and pedagogy. E-learning integrates the main components of e-learning, such as Learning Management Systems (LMS), content management systems and learning content management systems. As technology in education is developing, many specialists in the ICT field are introducing new tools for online learning into the classroom, which are changing the learning environment (Kasim & Khalid, 2016).

Internet technology affects students' learning and teachers' performance by using online networks to create links between teachers and students, among students, and also between students and learning tools. In addition, the integration of learning management systems with mobile learning services

is able to make e-learning accessible anytime and anywhere by using communication devices such as smartphones. Khalid (2011) state that the accessibility of smartphones in linking to Learning Management Systems can facilitate students in the use of learning management systems. Learning management system (LMS) refers to software applications and web-based technologies that are used by faculty and students to administer, plan, access, supplement, examine and assess learning content or to communicate about learning. LMSs are centralized, online platforms that treat curriculum, assessment delivery, and reception as commodities (Park & Mills, 2014). It is often described interchangeably as Virtual Learning Environments (VLE), Knowledge Management Systems (KMS), Collaborative Learning Environments (CLE) and Content Management Systems (CMS) (Sloan et al 2009; Moore, Dickson-Deane & Galyen, 2011).

Learning Management Systems are similar in functionality and typically includes methods to manage users, role, course information, online communication, grading, and web-based or blended delivery of content (Sloan et al, 2009). LMS as a teaching tool has been developed to organize and regulate the administrative tasks of schools and organizations. Teachers and instructors who use LMS have the opportunity to share course materials, calendars, notes, links, syllabus, opinions, and online assignments (Papadakis, Dovros, Paschalis & Rossioi, 2012). It provides students and teachers with a set of tools for improving the learning process and its management, and functions as a support in the traditional classroom education as well as in distance education (Al-Busaidi, 2012).

LMS can either be open source or commercial. When it is open source, the tutor and learners can use it for free. There are many open-source platforms, such as Moodle, Sakai, ATutor, Claroline, MyGuru2, and MyLMS. Meanwhile**,** Learning Management Systems like Blackboard, SuccessFactors, SumTotal, Litmos, Angle learning, Geo learning, Cornerstone and Connect Edu are commercial. A Learning Management System is a web-based software application that is designed to handle learning content, student interaction, assessment tools and reports of learning progress and student activities (Adobe, 2009). Learning content that is online is accessed through an LMS, which allows students to see and interact with learning tools via web browsers using any operating system, computer or mobile devices.

The role of a Learning Management System varies depending on the Institution's objectives, online training strategy, and desired outcomes. However, the most common use of LMS software is to deploy and track online training and learning initiatives. Typically, learning contents are uploaded to the Learning Management System, which makes them easily accessible for learners who are at a remote distance from the school location. Sometimes, LMS is deployed to tackle problems associated with a large crowd of students who have registered for the same course. In some cases, the LMS may even have built-in eLearning authoring tools that allow lecturers and tutors to develop online training materials without additional third-party software. Tutors that utilise Learning Management System can also embed external sources like media, link and forms in the classroom for students to access (Pappas, 2019)

Learning Management System can be thought of as a vast repository where you an institution can store and track information regarding classroom activities of both the learners and the tutors. Anyone with a login and password can access these online training resources whenever and wherever. For self-hosted Learning Management Systems, users must also have the LMS software installed on their hard drive or access to the institution's server. Whatever the installation option, the thing to bear in mind is that LMS users fall into two categories: First, online learners who use the Learning Management System to participate in online training courses; second, the eLearning team who relies on the LMS platform to disburse information and update the online training content.

Use of the learning management system has become nearly ubiquitous in the modern college experience and essential elements of the modern college experience. Whether distance or traditional

student, residential or commuter campus, undergraduate or graduate, these systems have rapidly been accepted throughout higher education. In the past ten years, online course management systems have replaced other alternative means to deliver class contents such as live satellite or closed-circuit television (Falvo & Johnson, 2007). The introduction of learning management systems, along with increased computer use in the home and in business has brought an increasing number of students and teachers to the online learning environment.

The success of LMS, however, is dependent on the user's perception of the delivery channel as user's perception is capable of pushing people towards or away from a particular new technology. Perception is the ability to see, hear, or become aware of something through the senses, or awareness of something through the senses. Perception is the subsequent selection, organization, and interpretation of sensory input, it is the process of obtaining information about both the external and internal environments, which results, via integration utilizing memory, in the conscious experience, recognition, and interpretation of objects, object relationships, and events. Perception is understood as the improvement in performance due to prolonged exposure to a particular training or task (Marc, 2015). Perception can be viewed as the way or how a person sees and feels about a concept in technology that could influence the acceptance of such technology for utilisation.

Technology Acceptance Model has been used by many researchers to test user acceptance towards a given type of information and communication technology (ICT). This technology can be in the form of software, application, computer-based system, and hardware. The Technology Acceptance Model (TAM) is an expansion of Ajzen and Fishbein's Theory of Reasoned Action (TRA) (Priyanka & Kumar, 2013) which was a theory initiated by Fred Davis in1986 and since then has gone through several modifications and validation. The aim of the theory is to describe factors that determine technology acceptance, information technology usage behaviour and to provide a parsimonious theoretical explanatory model (Bertrand & Bouchard, 2008). Ducey (2013) explains that the TAM includes Perceived Ease of Use and Perceived Usefulness which are the important determinants of technology acceptance and user behaviour. Since the introduction of TAM, the model has been used to explain all kinds of computer-based systems, software, and hardware acceptance.

TAM has proven to be a theoretical model in helping to explain and predict user behaviour of information technology (Legris, Ingham, & Collerette, 2003). TAM provides a basis with which one traces how external variables influence belief, attitude, and intention to use. Two cognitive beliefs are posited by TAM: perceived usefulness and perceived ease of use. According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system, and perceived ease of the system. TAM also proposes that external factors affect intention and actual use through mediated effects on perceived usefulness and perceived ease of use. Figure 1 depicts the TAM model (Davis, 1989).

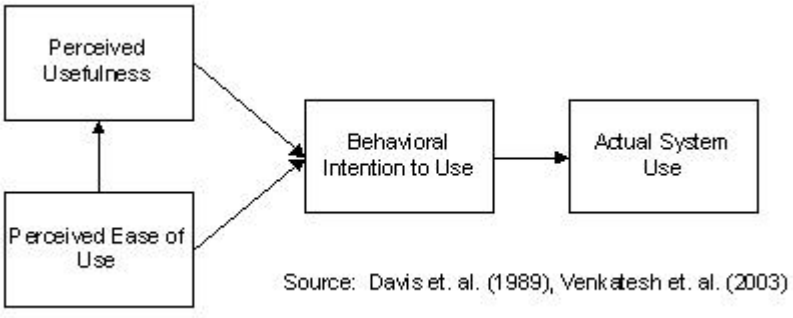

Figure 1: Technology Acceptance Model

Perceived ease of use (PEU) is the degree to which the student believes that using the learning management system is free of effort. This is an important aspect for online students since an easy system to use will lead to satisfaction and reuse of the system. A difficult system will lead to more effort required by the student to use the system. This may make students feel unsatisfied and leave the course he/she is attending. Perceived Usefulness (PU) is the degree to which the student believes that using the learning management system would enhance his or her grade performance. Perceived Ease of Learning (PEOL) is the enjoyable and convenience as a subjective physiological experience that is the context of information technology and computer-mediated environments.

Behavioural intention (BI) is the degree to which a person's perceived likelihood or subjective probability that he or she will engage in a given behaviour. Behavioural Intention reflects how hard a person is willing to try learning management system, and how motivated he or she is, to use a particular technology. Undergraduates behavioural intention to use learning management systems in the university would to a great extent determine how well they would be engaged academically in the course of study. For instance, all Undergraduates in the University of Ilorin offer general courses like GNS 312 and this made the institution integrate LMS to administer the general course. The introduction of the LMS removed issues of overcrowded classrooms that stakeholders experience during lectures. GNS 312 is a general studies course offered by 300 level students of the University of Ilorin. The course title is Digital Skill Acquisition. The course is usually offered 2 hours per week for 15 weeks and students are expected to be engaged for 30 hours before the end of the semester. The University of Ilorin adopts LMS to teach this course because of the mammoth number of students that offer the course.

The course content includes the following Computer Fundamentals: types of computers, computer network and information sharing, elements of a personal computer, Understanding Memory, Identifying Input/output devices, storage systems, types of Printers, and troubleshooting techniques; Computer Security and Privacy: Protecting data and computer, safe working environment, ergonomics, computer viruses, and data backup; The Internet and the Web: Internet providers, connections and protocols. E-mail, Internet services, E-commerce, Browsers, search tools, Web utilities, Intranets, extranets, and firewalls; Office Applications: Operating Systems, Word processor, spreadsheet, database Management system, and presentation graphics.

The course is designed to deliver required digital literacy skills to all 21st century graduates so as to be able to compete for the 21st century jobs. The course covers the general introduction of computing and computer fundamentals, computer security and privacy, internet and the world wide web, operating systems and office applications. The emerging technology-driven society has changed the required skills and knowledge by university Graduates. This can only be delivered through a digital literacy course with relevance in all disciplines.

The main objectives of GNS 312 are to enable students to acquire the required digital literacy skills. At the end of the course, the students would be able to:

1. Demonstrate an understanding of computing practice and concepts;
2. Understand how to interact with computer and internet resources;
3. Use the wealth of internet to their advantage;
4. Use an operating system in a more productive way;
5. Use appropriate office applications depending on their field of study

Students are expected to satisfy all requirements as specified in the course. Students must as well participate in all assignments whether individual or group. Students log in to the LMS portal through their e-mail accounts. Continuous Assessments are carried out on the LMS site. Students require the use of computer or mobile gadgets with internet access to participate in the class. The university place priority on students' activities while online as this is included in the grading rubric for the final semester score of the student.

The course delivery strategies for lectures and practical are purely virtual. An online discussion is made available to all students registered for the course to exchange ideas with their lecturer. Students are expected to be familiar with the following: Components of computer, Ways of securing data and information on the internet, identify components of an E-mail address, Creation of E-mail accounts, Microsoft Access, Establish a one-many relationship between entities of a database, Command prompt, Common windows icons e.g, taskbar, menu bar. The course A questionnaire down into modules that the students access weekly.

Many studies have been conducted to test the application of TAM. For example, Aypay, et al. (2012) tested the theory in predicting the intensity of technology acceptance among pre-service teachers and results indicated that there is a relationship between the model and information acquisition. Burger and Naude (2019) checked students' perception of the technology environment and results indicated that students' satisfaction is greatly linked with the ease of utilisation which in turns affects the students' academic performance. Jaffar et al (2019) worked on medical students' perception of technological environment and concluded that the perception of the students is a great determinant of how motivated they are to learn in the institution. Vukovic, Pivac and Kundid (2019) tested hypothesis regarding TAM for internet banking acceptance among users and reported that both elements of Perceived Usefulness and Perceived Ease of Use influence the acceptance of internet banking.

The objective of the Study

The main objective of this study is to investigate the Perception of Undergraduates on the use of Learning Management System to learn in University of Ilorin, Ilorin, Nigeria. Specifically, this study:

1. Investigated undergraduates' perception of the usefulness of the Learning Management System for learning
2. Examined undergraduates' perception of ease of usability of the Learning Management System to learn
3. Determined the satisfaction derived from the use of the Learning Management System for study

Research Questions

1. What is the perception of undergraduates about the usefulness of the Learning Management System for learning?
2. What is the perception of undergraduates on ease of usability of the Learning Management System to learn?
3. Determined the satisfaction derived from the use of the Learning Management System for study

Research Methodology

The research was a descriptive research method of the survey type. The survey was chosen for this study because it enables the researcher to collect large amounts of information about the ease of use, usefulness, satisfaction and enjoyment undergraduates derived from the use of learning management system to learn GNS 312. The population of the study were undergraduates in Ilorin Kwara State. University of Ilorin undergraduates were purposively selected as target population because the institution has a learning management solution specifically built and integrated into the administration of the core

compulsory courses of the university which are the General Studies (GNS), most especially the GNS312. 100 undergraduates among those who have utilised the developed LMS were selected across 5 faculties of the University to form the sample for the study. The Faculties are Education, Agriculture, Social Science, Management Science and Communication and Information Science. 20 undergraduates were randomly selected from each of the faculties listed above bring the total number of samples to 100. The data generated were analysed using frequency, percentages and correlation analysis.

Data Analysis and discussions

The data presented provide a summary of the major characteristics of the respondents that were involved in the study. A total of 100 copies of questionnaires were distributed but 99 were properly filled and retrieved amounting to 99% return rate. This was thus used for the analysis.

Demographic Information

Table 1:
Respondents Distribution by Their Gender

Gender of Respondents	Frequency	Percent	Cumulative Percent
Male	52	52.5	52.5
Female	47	47.5	100.0
Total	**99**	**100.0**	

Table 1 shows the distribution of undergraduates that formed the sample for this study. 52 were male students and 47 were female students.

Table 2:
Respondents Distribution by Their Faculties

Faculties	Frequency	Percent	Cumulative Percent
Agricultural Sciences	20	20.2	20.2
Communication and Information Sciences	20	20.2	40.4
Education	20	20.2	60.6
Management Sciences	19	19.2	79.8
Social Sciences	20	20.2	100.0
Total	99	100.0	

Table 2 shows the distribution of respondents according to their various faculties. 20 undergraduates were randomly selected as a sample from five faculties in the University of Ilorin. The Table indicated that all faculties have 20 respondents except management sciences with 19 valid respondents.

Results of the Research Questions

Research Question 1:

What is the perception of undergraduates about the usefulness of the Learning Management System for learning?

Table 3: Undergraduates' Perception of Usefulness of LMS

S/N	Items	Mean
1.	Learning Management System helps me to be more effective.	.98
2.	Learning Management System helps me to be more productive.	.88
3.	Learning Management System is useful.	.99
4.	Learning Management System gives me more control over the activities.	.80
5.	Learning Management System saves me time when I use it.	.81
6.	Learning Management System meets my needs.	.54
7.	Learning Management System does everything I would expect it to do.	.55
	Grand Mean	**0.79**

Undergraduate's view about the usefulness of the learning management system to learn GNS 312 in University of Ilorin was investigated and the result was presented in table 3. Table 3 shows that a number of undergraduates still express concern about the LMS being able to meet their needs and do what everything they expect it to do. However, the students agree that LMS makes them more effective, productive and efficient. Overall, the grand mean score was 0.79 which was greater than the benchmark of 0.50 established that most respondents had positive perception on the usefulness of learning management system to learn GNS 312 in University of Ilorin.

Research Question 2:

What is the perception of undergraduates on ease of usability of the Learning Management System to learn?

Table 4: Undergraduates Perception of the Ease of use of LMS

S/n	Items	Mean
1.	Learning Management System is easy to use.	.88
2.	Learning Management System is simple to use.	.89
3.	Learning Management System is user-friendly.	.88
4.	Learning Management System is flexible.	.77
5.	Using Learning Management System is effortless.	.60
6.	I can use the Learning Management System without written instructions.	.73
7.	Both occasional and regular users would like the Learning Management System.	.89
8.	I can recover from mistakes quickly and easily using the Learning Management System.	.94
9.	I can use the Learning Management System successfully every time.	.80
10.	I learned to use Learning Management System quickly.	.84
11.	I easily remember how to use the Learning Management System.	.82
12.	It is easy to learn to use the Learning Management System.	.92
13	I quickly became skilful with the Learning Management System.	.88
	Grand Mean	**0.82**

Table 4 shows undergraduates' perception of the ease of use of LMS to learn. The undergraduate's opinion on how easy the learning management system in University of Ilorin is to learn GNS 312 was investigated and the result was presented in table 4. A number of students expressed concern at how effortless the LMS used for EDU312 as it requires certain inputs from the students. Overall, the grand mean score was 0.82 which was greater than the benchmark of 0.50 showed that most respondents opined that learning management system is easy to learn GNS 312. The students showed

quite a positive perception at the ease of use of learning management system to learn as they expressed that the system is easy to understand and they gained quick mastery of the system.

Research Question 3:

What are the satisfactions derived from the use of the learning management system to learn GNS 312 in University of Ilorin?

Table 5: Satisfaction Derived with LMS

S/n	Items	Mean
1.	I am satisfied with the Learning Management System.	.81
2.	I would recommend the Learning Management System to a friend.	.95
3.	Learning Management System is fun to use.	.84
4.	Learning Management System works the way I want it to work.	.73
5.	Learning Management System is wonderful.	.85
6.	Learning Management System is pleasant to use.	.96
	Grand Mean	**0.86**

Research question 3 investigates the satisfaction derived from the use of learning management system to learn GNS 312 in University of Ilorin. Table 5 shows the satisfaction index of undergraduates at the use of LMS for learning. The table indicates that the undergraduates were satisfied with their experience on the LMS. The grand mean of 0.86 which is greater than benchmark of 0.5 established that the respondents were satisfied with the use of learning management system to learn GNS 312 in University of Ilorin.

Summary of Findings

The findings were summarized as follows:

1. Most respondents had a positive view on the usefulness of learning management system to learn GNS 312 in University of Ilorin.
2. Most respondents opined that the learning management system is easy to learn GNS 312.
3. Respondents were satisfied with the use of the learning management system to learn GNS 312 in University of Ilorin.

Discussion on Research Findings

Research question one sought to find out undergraduate's view about the usefulness of the learning management system to learn GNS 312. The result obtained specified that undergraduates in University of Ilorin see the usefulness of GNS 312 being taking on learning management system platform. Due to digitalization taking place of everything in the world, undergraduates consider learning management system useful because it helps to be more effective using the internet. They prefer to learn online than going to the normal conventional classes. This result corroborates the finding of Vukovic, Pivac and Kundid (2019) that showed that users of internet banking technology perceive technology as useful. Peart, Rumbold, Keane and Allin (2017) in an earlier similar study on student's perception of technology-enhanced learning also showed that students have positive perception on the use of technology being examined.

Undergraduate's opinion on how easy the learning management system is to learn GNS 312 were examined in research question two. The result specified that the learning management system is easy to learn GNS 312 in University of Ilorin. Using learning management system to learn GNS 312 does not require undergraduates to carry manual to use it because they are conversant with using the internet frequently. They find it simple to use because it is user-friendly. This finding supports Peart et al (2017) that showed that students expressed great ease at utilisation of new technology once they have mastered the techniques involved. This could be due to the fact that the generation of undergraduates in 21st century haven't known a life without technology. Technology in various forms has been an integral part of their existence, in many cases for the whole of their lives. Hence, the undergraduates bound to adapt to technology and embrace it as a perfectly natural part of their lives because it has been part of their environment since early age.

Undergraduates in Ilorin Kwara State expressed deep satisfaction at the use of LMS to learn. The findings showed that undergraduates in the University of Ilorin learn effectively with learning management system. Using learning management system to learn GNS 312 makes undergraduates learn faster because it involves self-learning. With self-learning, undergraduates remember things done online personally than teaching taking a group of class. Thus, learning management system encourages self-learning and learners learning at their own pace. Undergraduates derive satisfaction in using learning management system because they don't need to be on the campus before learning, which makes it fun to use. Learning management system platforms is easy to toggle around due to its user-friendly interface.

Conclusion and Recommendation

This research examined the Perception of Undergraduates on the use Learning Management System to learn GNS 312 in University of Ilorin. The result obtained from the data gathered and analyzed in this study indicated that undergraduates in University of Ilorin see the usefulness of learning management system in GNS 312. The result obtained also indicated that undergraduates find it easy to learn GNS 312 with Learning Management System. This research further established that undergraduates in University of Ilorin are satisfied with the use of Learning Management System to learn GNS 312. Conclusively, GNS 312 should remain on the platform of Learning Management System because undergraduates see its usefulness; they find it easy to use, learn effectively with it and are satisfied with it. Based on the findings and conclusions of this study, the study recommends that the University should consider administering other largely registered courses in the University through the learning management system since Undergraduates perceived learning management system developed for GNS311 as useful, easy to use and enjoyable.

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EVALUATION OF RESOURCES AVAILABLE FOR SPECIAL-NEEDS SCHOOL IN ILORIN METROPOLIS BASED ON INTERNATIONAL APPROVED STANDARDS

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Abstract

Special-needs students require diverse and individually specific resources for learning and rehabilitation process in a special needs school. This study evaluates the resources available in special needs school in Ilorin metropolis based on International approved standards. The study identified the list of globally accepted resources, both human and non-human resources in special needs schools; investigated the available resources in special needs school in Ilorin amidst the globally accepted list; investigated the status of the available resources; and determined teachers actual use of available non-human resources in special needs school to teach special students in Ilorin metropolis. The study adopted descriptive research of survey type with questionnaire and checklist utilised as research instruments to elicit response from 42 special needs teachers. The study revealed that most of the internationally approved human and non-human resources are available, but not in good quantity compared to the internationally accepted standard. Likewise, most of the available non-human resources are not functional, and as such teachers in special needs schools are not utilizing the available resources as expected. The study concluded that special needs teachers do not utilise instructional resources as they do for their classes due to insufficient number of the resources available. It was recommended that adequate provisions should be made for instructional resources by the special needs school owners which in most times are the state governments and special-teachers should be trained on maintenance and use of the existing resources.

Keywords: Special-needs Students, Assistive Technology, Instructional Resources, Special Teachers, Education for Persons with Special Educational Needs (EPSEN)

Introduction

Education is a prerequisite to national development and an indispensable means of unlocking and protecting human rights since it provides the environment required for securing good health, liberty, security, economic well-being, and participation in social and political activities. Good performance in education, training and research sectors immensely contributes to any country's national development. Performing education sectors produce appropriate human resource capital that is integral in spurring productivity. Improved national productivity is an important channel in the elimination of poverty, disease and ignorance, hence improving human welfare (National Policy on Education, Federal Republic of Nigeria FRN, 2014).

Education was defined by Wosu (2016) as a social mechanism adjudged all over the world as acceptable processes designed by the society to transmit and inculcate cherished values, skills, attitudes, norms cultures to bring about in those submitted to it positive change that would ultimately lead to a fulfilled life. The education process, therefore, is not exclusive of one person or group of persons in the society. The education process is usually comprehensive enough to embrace everyone including the disabled ones. The basic function of education is to equip an individual to be useful to himself and contribute to the development of society.

Education is globally recognized as the bedrock for individual and national development. This is especially true irrespective of ability or disability of the learners been taught for national development (Bosick, Starcher, Kelly, & Hapke, 2008). Learners are with different intellectual, physical, sensory, or emotional abilities or disabilities. Both the abilities and disabilities can be managed for effective national development. Students with learning disabilities may be visual, auditory or physical difficulties leading to some not been able to walk, manipulate objects, use one or both arms and legs, run or maintain balance which may affect effective learning in the classroom. These set of students require special attention in order to benefit from formal education. Hence, the term “Special Needs”.

The Education for Persons with Special Educational Needs (EPSEN) Act (2004) was enacted by the European Union to make detailed provision through which the education of persons who have special educational needs because of disabilities can be guaranteed as a right enforceable in law. EPSEN (2004) defined an individual that needs special education as someone who has a restriction in the capacity to participate in and benefit from education on account of an enduring physical, sensory, mental health or learning disability, or any other condition which results in a person learning differently from a person without that condition. The EPSEN Act (2004) recognizes that special educational needs may arise from four different areas of disability which are physical, sensory, mental health and learning disability or from any other condition that results in the child learning differently from a child without that condition. Special education is for students with special educational needs.

Individuals with Disabilities Education Act (IDEA 2004) of the United States of America ensure that special education is specially designed instruction, at no cost to parents, to meet unique needs of a child with a disability. IDEA is a United States federal law that governs how states and public agencies provide early intervention, special education, and related services to children with disabilities. It addresses the educational needs of children with disabilities from birth to age 18 or 21 in cases that involve different specified categories of disability. Likewise, National Policy on Education of the Federal Republic of Nigeria (FRN, 2014) described how

special needs schools in Nigeria should run in such a way as to enable special need persons to perform and benefit from adequate educational planning and welfare programme available in schools. Similarly, EPSEN act is a European Union act that was enacted to perform similar functions under the supervisory role of the National Council for Special Education (NCSE).

Special education provides special training to adult or children with special needs so that they can fit in society and perform like every other human. Special education is also known as special needs education, aided education or exceptional education is the practice of educating students in a way that addresses their individual differences and needs. Special education is the education specially designed to suit the special needs children who may experience learning problems and learning difficulties as a result of disabilities or handicaps or other forms of special educational needs (Obani, 2004). Special education should provide the student with resources, adapted instruction, and specialized assistance to mitigate the effects of his or her disability, and so allow the student to successfully benefit from the school's general curriculum (Bateman & Lindem, 2006). Special Needs Education is the education of children and adult who have learning difficulties because of different kinds of handicaps – blindness, partial sightedness, deafness, hardness of hearing, mental retardation, social maladjustment, limb deformation or malformation and so on; due to circumstances of birth, inheritance, social position, mental and physical health patterns, or accident later in life (FRN 2014)

Special education teachers work with students who have a wide range of learning, mental, emotional, and physical disabilities. They adapt general education lessons and teach various subjects, such as reading, writing, and math, to students with mild and moderate disabilities. They also teach basic skills such as literacy and communication techniques, to students with severe disabilities (College Grad, 2017). Resource and learning support teachers work to improve educational outcomes for children with special educational needs in a number of different ways which include assessing and recording the student's needs and progress, setting specific, time-related targets for students, meeting with and advising parents of special needs students, meeting other professionals such as psychologists, speech and language therapists, visiting teachers in relation to a child's special educational needs (National Council for Special Education, 2014).

Special education teachers should be exposed to technological tools that can help students to bypass their academic weaknesses (Mull & Sitlington, 2003). The teachers will help students by training them to use portable and cheap tools that, in most cases, could make students live and behave more independently when they leave high school, which will increase their chances of maximizing their degree of achievement and independence (Blackorby & Wagner, 1996). Special needs students require additional education services which are a different approach to teaching; an example of such service is the use of technology such as assistive technology devices. In many cases adopting the right assistive technology for students with disabilities could save time and effort. Assistive technology is known as (AT) is an item or piece of equipment or product system either acquired commercially, off the shelf, modified, or customized and used to increase, maintain, or improve functional capability for individual with disabilities (Johnston, Beard, & Carpenter, 2007).

The Individuals with Disabilities Education (IDEA) Act (2004) defined assistive technology as any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the

functional capabilities of a child with a disability. Ignoring the existence of such devices and equipment that can help students with disabilities facilitate and maximize their educational and academic gains can also prevent students from having opportunities to reach their maximum performance. Assistive technology covers a set of functions that includes adaptive, assistive and rehabilitative equipment for students with disabilities which will enable the students to perform tasks that they are unable to finish successfully; helping them to perform better academically, socially and even physically (Lee, 2006).

These assistive technology resources are to support student performance achievement and independence. Areas, where students with disabilities require assistive resources, include academic and learning aids, assistive listening and environmental aids for the hearing impaired and deaf, augmentative communication, computer access, seating, positioning, mobility, and vision. Academic and Learning aids/resources addresses student needs in all academic areas including writing, reading and spelling, math, study and organization. Assisted living devices and environmental resources assist students who are hard of hearing or deaf, such resources help to access information that is typically presented verbally, and amplifies speech and other auditory signals. Augmentative communication resources assist students with severe expressive communication impairments; many of such students need a means of supplementing communication with peers and teachers. Such resources that could assist to supplement communication includes object-based communication displays, picture communication boards and books, talking switches, voice output communication devices and computer-based communication devices (Richard, 2014).

Mobility aids assist students with physical disabilities to provide them with a means of moving about their environments, comprising of canes, crutches, walkers, scooters, and wheelchairs. Seating and positioning aids assist students with disabilities requiring adaptive seating and positioning systems as an alternative to the standard classroom seating arrangements. Adaptive seating and positioning system include seat inserts for wheelchairs, side liers, prone standers and adaptive chairs. Visual aids help students with visual impairment. Visual aids include talking dictionaries, adapted tape players/recorders, large prints and talking calculators, Braille writers, and software such as screen reading and text enlargement programs (Richard, 2014). The introduction of assistive technology resources such as computer screen magnifiers, Braille printers and screen reading software will help students with visual impairment. Also, Cook et al (2010) identified that special need student with communication and cognitive deficits are better expressing their thoughts and needs to teachers with the help of technological resources such as communication boards, picture exchange communication systems and computer electronic speech devices.

A key determinant for effective assistive technology use is finding an appropriate match between the resource tool, the students' exceptionality, and the task. Therefore, students with disabilities or special needs students will have to attend a special need school. A special needs school is a school catering for students who have special educational needs due to severe learning difficulties, physical disabilities or behavioural problems. Special schools may be specifically designed, staffed and resourced to provide appropriate special education for children with additional needs. Special schools provide individualized education, addressing specific needs. Special schools will also have other facilities for children with special needs, such as soft play areas, which are necessary for treating students with certain conditions. A special needs

school takes into consideration the student's need, the student's best interest, and the needs of other children in the school setting (Kano & Onyeachu, 2018)

Policy implementation in Nigeria has not been commensurate with its enactment in Nigeria educational sector generally and this undoubtedly affects the school for special needs. Obiakor and Maltby (1998) compared Nigeria to other countries like United States of America and Ireland and found that funding of special education has been slow and difficult to procure because Nigeria lacks the legal mandate to enforce special education policies. As a result, services for people with disabilities are not delivered appropriately and the schools for special needs were inadequately equipped to cater for students and teachers. The inadequate funding could lead to inadequate resources which in turn could lead to poor education of the special needs. Hence, the need to evaluate the resources in Ilorin school for special needs in line with globally International standards.

Purpose of the Study

The main purpose of this study is to evaluate the resources available in special needs school, Ilorin metropolis based on international approved standards. Specifically, this study:

1. Identified the list of globally accepted resources for special needs schools
2. Investigated the available resources in special needs school in Ilorin Compared the available resources at special needs school Ilorin with the Global Standard
3. Investigated the teachers' actual use of the available resources in school for special needs

Research Questions

The following research questions guided the course of this study:

1. What are the globally accepted resources for special needs schools?
2. What are the available resources for special needs in special needs schools Ilorin?
3. What is the status of the available resources at special needs school Ilorin?
4. What is the rate of utilization of the available resources by teachers in school for Special Needs?

Methodology

This study is a descriptive research design of the cross-sectional survey type. The populations for this study were all special education teachers at the secondary school level in Ilorin metropolis. The target populations for this study were all secondary school education teachers at Kwara State School of Special Needs, Ilorin. 42 teachers from Kwara State School of Special Needs were selected as sample for this study. The instrument for data collection in this research was a structured questionnaire and checklist titled the "Evaluation of Resources Available in Special Needs School, Ilorin Metropolis Based on International Approved Standards.

The questionnaire was divided into four sections. Section A contained demographic variables such as name of school, gender, qualifications and years of teaching experience, section B contains the expected human resources that were used to establish and measure responses from special needs schools teachers on the evaluation of resources available in special needs school, Ilorin metropolis based on international approved standards, section C contains the

expected non-human resources that was used to measure the availability and functionality based on responses from special needs schools teachers on the evaluation of resources available in special needs school, Ilorin metropolis based on internationally approved standards, while the last section (D) contains information on the utilization of available resources by teachers. The items for human resources were on a Likert scale of A (Available), NA (Not Available), QA (Quantity Available). The items for non-human resources were on the Likert scale of A & F (Available & Functional), ABF (Available but Not Functional), NA (Not Available), QA (Quantity Available).

Results and Findings

Research Question 1: What are the globally accepted resources for special needs?

The resource needs for a special needs school are discussed in two categories: The Human Resources and Non-Human Resources. Table 1 shows the internationally accepted Human Resources for special needs schools according to the National Policy on Education, Nigeria (2015) and UNESCO (2001).

Table 5:
Globally accepted Human Resources for special needs schools

S/No	Human Resources
1	Teachers
2	Special Education Administrator
3	Educational Diagnostician
4	Technology Specialist
5	Therapeutic Recreation Specialist
6	Speech-Language Pathologist
7	School Social Worker
8	School Psychologist
9	School Nurse
10	School Counselor
11	Physical Therapist
12	Occupational Therapist
13	Music Therapist
14	Interpreter for Hearing Impaired
15	Educational Audiologists
16	Art Therapist
17	Adapted Physical Education Teacher
18	Sign Language Interpreters
19	Refractionists
20	Braillists
21	Transcribers
22	Readers
23	Orientation and Mobility Trainers

Source: National Policy on Education, Nigeria (2015), IDEA (2004), EPSEN (2004)

Table 6:
Internationally accepted Non-Human Resources for Special Needs Schools

S. No.	Non-Human Resources	S. No.	Non-Human Resources
1	Braille Translator	30	Automatic Page Turner
2	Braille Writers	31	Communication Boards
3	Screen Reading and Text Enlargement Programs	32	Computer Electronic Speech Devices
4	Pencil Grips	33	Picture Exchange Communicator
		34	Crutches
5	Screen Reader	35	Walkers
6	High-Performance Wheelchairs	36	Scooters
7	Prosthetic Devices	37	Wheelchairs
8	Maths Talk	38	Side Liers
9	Picture Communication Boards and Books	39	Prone Standers
10	Voice Output Communication Devices	40	Talking Switches
11	Audio Tapes	41	Projectors
12	Talking Calculators	42	Signalling Devices
13	Acoustic Cabinet	43	Telecommunication Device for the Deaf
14	Scanner	44	Audiometer
15	Laptop	45	Motion Film
16	Binocular and Camera	46	Amplifier
17	Oral and Lip Reader	47	Electronic Speech Trainer
18	Hearing Aids	48	Computer Software (Text To Speech and Speech To Text)
19	Speech Synthesizer	49	Tablets and Phones
20	Teletype (TTY)	50	Android Apps
21	Doorbell	51	Onscreen Keyboard
22	Alarm and Auto Scope	52	Hand-Held Text Readers
23	Sensory Stimulation Toys	53	Text to Braille Converter
26	Drawing Sheets	54	Closed Circuit TV Magnification System
27	Talking Dictionaries	55	Cochlear Implant
28	Adapted Tape Players/Recorders	56	Jouse3
29	Large Prints	57	Ghitit

The lists of both the Human and Non-Human Resources shows that the international community, as well as government of the federal republic of Nigeria, have adequate policy on resources to cater for several categories of disabilities that could warrant a student's need for special education. It is believed that if these resources are available in schools for special needs, students suffering from conditions such as dyslexia, deafness, blindness, autism, limb paralysis among others can learn effectively with ease. Likewise, teachers of students with any of these impairments would be able to effectively teach and cater to students' needs when there are professionals to be consulted for different categories of impairments in students.

Research Question 2: What are the available resources for special needs in special needs schools Ilorin?

Table 7:
Available Human Resources for special needs

S/No	Human Resources	Available	Not Available	Quantity Available
1	Teachers	42 (100%)	-	40
2	Special Education Administrator	42 (100%)	-	4
3	Educational Diagnostician	34 (81%)	8 (19%)	3
4	Technology Specialist	7 (16.7%)	35 (83.3%)	0
5	Therapeutic Recreation Specialist	28 (66.7%)	14 (33.3%)	2
6	Speech-Language Pathologist	31 (73.8%)	11 (26.2%)	2
7	School Social Worker	34 (81%)	8 (19%)	2
8	School Psychologist	28 (66.7%)	14 (33.3%)	2
9	School Nurse	36 (85.7%)	6 (14.3%)	5
10	School Counselor	34 (81%)	8 (19%)	1
11	Physical Therapist	31 (73.8%)	11 (26.2%)	1
12	Occupational Therapist	29 (69%)	13 (31%)	1
13	Music Therapist	7 (16.7%)	35 (83.3%)	0
14	Interpreter for Hearing Impaired	31 (73.8%)	11 (26.2%)	1
15	Educational Audiologists	22 (52.3%)	20 (47.7%)	0
16	Art Therapist	15 (36.7%)	27 (63.3%)	0
17	Adapted Physical Education Teacher	30 (73.3%)	12 (26.7%)	1
18	Sign Language Interpreters	35 (83.3%)	7 (16.7%)	1
19	Refractionists	17 (40%)	25 (60%)	0
20	Braillists	30 (73.3%)	12 (26.7%)	2
21	Transcribers	12 (26.7%)	30 (73.3%)	0
22	Readers	28 (66.7%)	14 (33.3%)	1
23	Orientation and Mobility Trainers	34 (80%)	8 (20%)	1

Table 3 reveals the availability of human resources for special needs schools in Ilorin. The table showed that all the respondents indicated that teachers, School Nurse, educational diagnostician and special education administrators are available in good numbers. Two each of Even though few of the respondents indicated availability of Technology Specialist, Music therapist, Educational audiologist, Art therapist, Refractionists and Transcribers, these professional or human resources were actually not in the schools as all the respondents indicated zero as the number available in the school. Available but obviously inadequate in number to

cater for the special needs' students are human-resources or professionals such as school counsellor, Physical therapist, Occupational therapist, Interpreter for hearing impaired, Sign language interpreter, Readers, Orientation trainers and mobility trainers.

From Table 3, it can be deduced that out of all the globally accepted human resources listed, technology specialist, music therapist, educational audiologist, art therapist, refractionists and transcribers are not available in special need schools. Also, it is evident from the above table that the available resources are not in good quantity.

Research Question 3: What is the status of the available resources for special needs school Ilorin?

Table 8:
Status of Available Resources at the School for Special-Needs

S/No	Resources	A & F	ABNF	NA	Quantity Available
1	Braille Translator	29 (70%)	13 (30%)	-	2
2	Braille Writers	28(66.7%)	8 (20%)	6 (13.3%)	2
3	Screen Reading and Text Enlargement Programs	6 (13.3%)	36(86.7%)	-	3
4	Pencil Grips	25 (60%)	11 (26.7%)	6 (13.3%)	5
5	Screen Reader	31 (73.3%)	7 (16.7%)	4 (10%)	7
6	High-Performance Wheelchairs	13 (30%)	6 (13.3%)	23 (56.7%)	0
7	Prosthetic Devices	4 (10%)	11 (26.7%)	27 (63.3%)	0
8	Maths Talk	9 (23.3%)	6 (13.3%)	27 (63.3%)	0
9	Picture Communication Boards and Books	4 (10%)	13 (30%)	25 (60%)	0
10	Voice Output Communication Devices	3 (6.7%)	6 (13.3%)	33 (80%)	0
11	Audio Tapes	27 (63.3%)	12 (30%)	3 (6.7%)	10
12	Talking Calculators	29 (66.7%)	9 (23.3%)	4 (10%)	8
13	Acoustic Cabinet	27 (63.3%)	12 (30%)	3 (6.7%)	4
14	Scanner	26 (60%)	14 (33.3%)	2(6.7%)	2
15	Laptop	24 (57%)	15 (36%)	3 (7%)	40
16	Binocular and Camera	32 (77%)	7 (16%)	3 (7%)	4
17	Oral and Lip Reader		7 (16.7%)	35 (83.3%)	0
18	Hearing Aids	29 (66.7%)	8 (20%)	5 (13.3%)	15
19	Speech Synthesizer	7 (16.7%)	11 (26.7%)	24 (56.7%)	0
20	Teletype (TTY)	7 (16.7%)	15 (36.7%)	20 (46.7%)	0
21	Doorbell	29 (70%)	7 (16.7%)	6 (13.3%)	6
22	Alarm and Auto Scope	14 (33.3%)	25 (60%)	3 (6.7%)	8
23	Sensory Stimulation Toys	27(63.3%)	14(33.3%)	1 (3.3%)	17
24	Drawing Sheets	28 (66.7%)	14 (33.3%)	-	20
25	Talking Dictionaries	4 (10%)	6(13.3%)	32(76.7%)	0
26	Adapted Tape Players/Recorders	10 (23.3%)	28(66.7%)	4(10%)	7

27	Large Prints	31 (73.3%)	11 (26.7%)	-	6
28	Automatic Page Turner	4 (10%)	13 (30%)	25(60%)	0
29	Communication Boards	8 (20%)	30 (70%)	4 (10%)	8
30	Computer Electronic Speech Devices	7 (16.7%)	10 (23.3%)	25(60%)	0
31	Picture Exchange Communicator	8 (20%)	6 (13.3%)	28(66.7%)	0
32	Crutches	29 (70%)	9 (20%)	4 (10%)	16
33	Walkers	35(83.3%)	7(16.7%)	-	10
34	Scooters	10 (23.3%)	31 (73.3%)	1(3.3%)	7
35	Wheelchairs	-	42 (100%)	-	8
36	Side Liers	-	-	42(100%)	0
37	Prone Standers	-	-	42 (100%)	0
38	Talking Switches	-	-	42 (100%)	0
39	Projectors	34 (80%)	8 (20%)	-	20
40	Signalling Devices	-	8 (20%)	34 (80%)	0
41	Telecommunication Device for the Deaf	-	14 (33.3%)	28 (66.7%)	0
42	Audiometer	5 (13.3%)	30 (70%)	7(16.7%)	4
43	Motion Film	30 (70%)	7 (16.7%)	5 (13.3%)	6
44	Amplifier	25(56.7%)	12 (30.0%)	5 (13.3%)	7
45	Electronic Speech Trainer	11 (26.7%)	20 (46.7%)	11 (26.7%)	10
46	Computer Software (Text To Speech and Speech To Text)	27 (63.3%)	14 (33.3%)	1 (3.3%)	2
47	Tablets and Phones	37 (86.7%)	5 (13.3%)	-	40
48	Android Apps	32 (76.7%)	10(23.3%)	-	55
49	Onscreen Keyboard	10 (23.3%)	28 (66.7%)	4 (10%)	5
50	Hand Held Text Readers	7 (16.7%)	31 (73.3%)	4 (10%)	4
51	Text to Braille Converter	14 (33.3%)	27 (63.3%)	1(3.3%)	2
52	Close Circuit TV Magnification System	8 (20%)	30 (70%)	4 (10%)	1
53	Cochlea Implant	-	10 (23.3%)	32 (76.7%)	0
54	Jouse3	-	12 (30%)	30 (70%)	0
55	Ghitit	5 (13.3%)	10 (23.3%)	27(63.3%)	0
56	Draft Builder	3 (6.7%)	12 (30%)	27 (63.3%)	0
57	Kurzweils 3000	10 (23.3%)	8 (20%)	24 (56.7%)	0

***KEY: A&F** = Available & Functional, ABNF = Available but Not Functional, NA = Not available*

Table 4 reveals that drawing sheets, projectors, crutches, wheelchairs, laptops, android tablets and walkers were reported to be largely available at special-needs teachers' use in the school for special needs. However, other non-human resources on the checklist such as signalling device, handheld text reader, electronic speech trainer, scooters, side liers, prone standers and talking switches were either reported as not available or not functional.

Research Question 4: What is the rate of utilization of the available resources by teachers in school for Special Needs?

Table 9:
Rate of utilization of available resources by Special-Needs teachers

S/No	Resources	Mean	S.D
1	Braille Translator	3.33	0.922
2	Braille Writer	3.33	0.158
3	Hearing Aids	2.57	0.774
4	Doorbell	3.00	1.017
5	Crutches	2.07	0.740
6	Motion Film	1.50	0.777
7	Amplifier	2.93	0.691
8	Computer Software	2.20	0.714
9	Acoustic Cabinet	1.43	0.858
10	Screen Reader	1.80	0.805
	Grand Mean	**2.416**	

Table 5 reveals the rate of utilization of available resources by teachers in schools for special needs. The table showed that out of all the globally acceptable resources highlighted earlier in this chapter, only a few are utilized. It was revealed that Braille translator and braille writer was ranked highest with mean score of 3.33, while acoustic cabinet has the lowest rank with mean score of 1.43. Resources like hearing aids, doorbell, and amplifier were ranked above the average benchmark (2.50) with mean scores of 2.57, 3.00, and 2.93 respectively. While resources like crutches, motion film, computer software, and screen reader were ranked below the average benchmark (2.50) with mean scores of 2.07, 1.50, 2.20, and 1.80 respectively.

The grand mean score for evaluation was found to be 2.416 which is below the average benchmark, it can, therefore, be resolved that teachers in special needs schools are not utilizing the available resources as expected.

Discussion

The available resources evaluated are human resources and non-human (material) resources. Human resources are the teachers and other special education professionals that are essential resources for learning and administration of a special needs school: the quality of a special needs school system cannot exceed the quality of its human resources (OECD, 2005). Gamoran, Secada and Marrett (2000) emphasized that educational resources available in a special needs school tend to be related to the system's overall performance as well as schools' average level of performance; while an adequate physical infrastructure and supply of educational resources does not guarantee good learning outcomes in special needs students, the absence of such material resources could negatively affect learning.

Research Question one sought information on identifying the list of globally accepted resources for special needs schools. For a special needs school to be considered effective and efficient, some resources must be available. The globally accepted resources according to international standard includes teachers, special education administrator, educational diagnostician, technology specialist, therapeutic recreation specialist, speech-language pathologist, school social worker, readers and orientation and mobility trainers, Braille

Translator, Braille Writers, Speech Synthesizer, automatic page-turner, scooters, side liers, signalling devices, among others.

The second finding of this study revealed that special needs schools have majority of the human resources required by local and international standards, while the non-human resources are sufficient to meet the globally accepted international requirement. Available resources (human and non-human) in special need schools includes special education administrator, educational diagnostician, technology specialist, therapeutic recreation specialist, speech-language pathologist, school social worker, readers and orientation and mobility trainers, Braille Translator, Braille Writers, and Speech Synthesizer among others. The study also revealed that the available human and non-human resources are not in good quantity, which deprives the special need students the enjoyment of receiving quality instructions from their corresponding teachers. This is consistent with the findings of Buanben-Andoh (2012) who states that some of the factors that affect teachers' integration of assistive technology are availability and access to technological resources. Buanben-Andoh (2012) further stated that schools that are well equipped with these resources tend to impart their students more.

Research questions three sought to investigate the status of the available resources. The result revealed that most of the resources that are available are not functional. The available and functional resources include braille translator, braille writers, pencil grips, screen readers, audiotapes, talking calculators, acoustic cabinet, scanner, laptop, binocular and camera, hearing aids, doorbell, sensory stimulation toys, drawing sheets, large prints, walkers, projectors, motion film, amplifier, computer software, tablets and phones, and android apps. Out of the 35 available resources, 22 are functional while the remaining 13 are not functional. From the above listed functional resources, it was evident that the available and functional resources are not up to average as expected by globally accepted standard. Part of problems/difficulties special education programmes are facing is lack of adequate and functional resources which impedes the achievement of special children (Gesinde 2010; Kanno and Onyeachu 2018). Maintenance of instructional resources at the school for special needs for the optimal performance is as important as procurement itself as this is what will guarantee the functionality of those resources.

Jabulani and Almon (2017) attributed the non-functionality of the resources to the lack of initiative by the teachers to improvise resources or maintain the ones procured by the school administration. In a case where resources are available and functional, qualified teachers will be motivated to venture more into the career of special education. The way in which individual special needs schools store and manage equipment further determines the accessibility of devices for spontaneous and functional use. It was discovered while carrying out this study that difficulties with repair and maintenance of equipment are a constant source of frustration to users and administrators in a school for special needs. Similar to studies of Omede and Sam (2013) special needs teachers report that students may be without their assistive devices for months when it gets damaged in order for it to be repaired or returned to manufacturer for replacement.

Finding number four showed that out of the globally acceptable resources highlighted; only a few are utilized by the teachers in the school for special needs. The utilized resources include braille writer, amplifier, hearing aids, and doorbell respectively. Also, it was discovered that teachers in special needs schools are not utilizing the available resources as expected. This is consistent with the findings of Adebisi, Jerry, Rasaki and Igwe (2014) confirmed that lack of facilities and materials has been one of the barriers to special needs education in Nigeria and in a

case where the materials are available, the level of utilization of such materials by teachers is very low. Adebisi et al (2014) further stated that provision of support services in terms of teachers' monitoring in public special and inclusive schools is lacking which poses a serious challenge to special education in Nigeria. It is important that the available resources in a special needs school perform optimally so that the teachers could always use them to teach anytime they intend. Special-needs student achievement and other educational outcomes are not necessarily the availability of resources, but the quality of those resources and how effectively they are used.

Kang and Martin (2018) asserted that it's not only the academic performance that gets improved when special students have access to scientific resources (such as microscopes and glassware for experiments) but they are also motivated them to learn more. Infrequent use of assistive devices in special needs school and also poor rates of use of assistive technology resources by teachers and other professionals who work with students with disabilities limit educational improvements in students with disabilities. Olukotun, (2004) asserted that students with special educational needs require qualified teachers trained and equipped with the skills necessary to meet their educational and care needs and lack of these specialist teachers to provide important services that would assist regular teachers in managing the learners with special needs limit effective utilization of available resources

Conclusion

The study concluded School for special Needs possess most of the that out of all the globally accepted resources required for special needs schools, most of the resources are available in special need schools. Though the resources are available, they are not in good quantity, that is they are not enough compared to the globally accepted standard. Regarding the status of the available resources, it was concluded that most of the available resources are not functional. Also, teachers in special need schools are not utilizing the available resources as expected. Lack of suitable training for school personnel, however, constitutes a major barrier to effective assistive material resources implementation.

Recommendations

1. The result showed that the rate at which teachers are utilizing the available resources is low. The recommendation is that workshops and seminars should be organized for teachers on how to effectively utilize the available resources as this will contribute to the improvement of the students' performance and achievement.
2. From the findings, the available resources are not in good quantity. Thus, government and special needs school owners should procure more resources for the special need schools
3. It was discovered from the findings that some of the available resources are not functional. To this effect, schools should ensure the functionality of the available resources. Also, maintenance should be done on those resources on a monthly basis.

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OPEN AND DISTANCE LEARNING: OPPORTUNITIES FOR UNIVERSITY DEGREE AS VIEWED BY SENIOR SCHOOL STUDENTS IN ILORIN METROPOLIS

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Abstract

Open and Distance Learning are degree-awarding programmes of *institutions like the National Open University of Nigeria (NOUN), University of Ibadan, Obafemi Awolowo University and other accredited Universities that provide alternative opportunities for applicants (both senior school students and working-class) to secure admission in pursuit of a university degree. However, in spite of the challenges senior school students face in securing admission into universities regular degree programmes, students are unaware of an equal degree-awarding opportunity in accredited universities under the Open and Distance Learning programmes. Findings of the study revealed that; most of the respondents were aware of Open and Distance Learning and also viewed Open and Distance Learning programmes as a preferable opportunity for a university degree. The study further revealed that a significant difference existed between male and female senior school students' views on open and distance learning* programmes *as an opportunity for university degree. The study concluded that even though most senior school students were aware of Open and Distance Learning, and also viewed Open and Distance Learning programmes as a preferable opportunity for a university degree. Nevertheless, the researchers briefed the respondents on ODL as an introduction during data collection. It was therefore recommended that a lot more awareness and orientation programs need to be conducted for school students, in other to further encourage their views and interest in ODL as a viable opportunity for university degree.*

Keywords: Open and Distance Learning (ODL), ICTs, Senior School Students, Gender

Introduction

Education is considered as the best legacy any nation can bequeath its young populace and invest for national development. But the socio-economic dimensions of providing quality education to school leavers in a country as large in population as Nigeria, within the context of prevailing challenges of dwindling financial resources and admission challenges into universities regular degree programmes are enormous. Thus, open and distance learning is alternative degree-awarding extension programs of universities that has emerged as one of the viable solutions to solving prevailing admission challenges in Nigeria. Distance learning can be seen as a teaching-learning process in which students are mostly separated from the instructors by physical distance which is often bridged by a variety of modern technological communication media including the internet, social media, print and several forms of ICTs.

Jegede, (2003) noted that distance education is the type provided by a mode other than the conventional face-to-face method whose goals are similar to and just as noble and practical as those of on-campus full-time face-to-face system. Thus, the erratic situation of admission into Nigerian universities regular full-time programmes should necessitate the need for the Nigerian government to strengthen and encourage institutions to create more open and distance learning programmes and the center's across the country.

NUC, (2015), in its guidelines for the state of ODL in the Nigerian university system revealed that the national open university of Nigeria (NOUN) is currently the only Uni-mode university mandated for open and distance learning in the delivery of university education in Nigeria. While there are other universities such like the university of Ibadan, Obafemi Awolowo University, University of Lagos, Ahmadu Bello University, and the University of Maiduguri amongst others, that can be regarded as dual-mode universities due to their interest and capacity to deliver degree programmes by the open and distance learning (ODL) mode, in addition to the conventional face-to-face mode. This however, would enable institutions absolve more senior school leavers into the open and distance learning programs as an opportunity for university degree, instead of wasting time waiting for admission into regular full-time programs. Therefore, the need for this study to examine the views of senior school students (prospective admission seekers) on open and distance learning programs; as an opportunity to secure university degree.

Statement of the Problem

The inability of senior school students in gaining admission into conventional or regular university programs despite passing qualifying exams like SSCE and UTME is no doubt a challenge to both students and the educational system of Nigeria. The problem arises every year, as universities witness huge numbers of applications for admissions into regular degree programs than the carrying capacity of most universities in Nigeria. Hence, one of the notable reasons why admission to conventional universities in Nigeria is hard to come by. Similarly, admission seeking students often show little or no interest in securing university degree through open and distance learning systems such as extension campuses or programmes and even the national open university of Nigeria, which is the only notable single-mode distance learning institution in Nigeria. Yet the number of senior schools leaving students seeking admission yearly continues to be on the high increase. These however, poses a lot of problems to both students and the educational system of Nigeria.

These problems have, therefore, resigned many school leavers into forgoing their dream of a university degree, while many others have been left to engage in a lot of uncultured social vices as a result. In spite of the prevailing problems, school leavers seem to be unaware and ignorant of the opportunities that is avail to them through open and distance learning institution like the national open university of Nigeria (NOUN) and other conventional institutions that offers a dual-mode learning system (regular and distance), such as the University of Lagos, University of Ibadan, Ahmadu Bello university amongst others.

Often times, most previous research in open and distance learning has been centred on already admitted students, instructors, and the quality of instruction and its various delivery modes. Whereas there has been no or very scarce empirical study to address the issue of admission problems in Nigeria educational systems through the opportunities ODL offers school leavers. Thus, the gap that this study tried to address, which necessitated this study to carry out a survey to determine senior school students' awareness of open and distance learning and also examined their views in securing admission through open and distance learning programs as an alternative opportunity for a university degree.

Purpose of the Study

The main purpose of this study was to investigate open and distance learning, as an opportunity for a university degree, as viewed by senior school students in Ilorin metropolis. Specifically, this study:

1. determined if senior school students are aware of open and distance learning programme as an opportunity for a university degree; and

2. examined the views of senior school students on open and distance learning programme as an opportunity for a university degree.

Research Questions

Answers were sought for the following research questions:

1. Are the senior school students aware of open and distance learning programme opportunities for university degree?

2. What are the views of senior school students on open and distance learning programme as an opportunity for a university degree?

Research Hypothesis

The hypothesis tested in the study states as thus:

H_{O1}: There is no significant difference in the views of male and female senior school students on open and distance learning programme as an opportunity for a university degree.

Review of Related Literature

Distance education and open learning can both be regarded as a self-paced learning process which makes it possible for all categories of students to plan their study schedule according to their own pace and time. ODL is an educational system basically notable for the separation of learners and teachers in physical location aided by communication and

technological apparatus. Similarly, Messo, (2014) further distinguished between both ODL terms as such that, distance education is an approach in which there is a quasi-separation of both learners and the instructor in time and space. While, the term open learning, on the other hand, refers to the philosophical construct that seeks to remove barriers and constraints which may prevent learners from accessing and succeeding in quality, lifelong education.

In a similar development, Nwaocha and Iyiama (2008) highlighted the relevance of open and distance education to Nigeria's educational system as such that increases educational access to individuals who might be financially or circumstantially disadvantaged to achieve their academic ambitions. In addition, individuals who were unable to continue their undergraduate or postgraduate education for whatever reason may now do so through distance learning. Therefore, distance learning offers equality of opportunity to individuals (Kör, 2013). The opportunities and possibilities that ODL offers are enormous, which according to Mehrotra *et al*. (2001) has made ODL to not only be about a future prospect for which higher education must prepare to attain, but rather, it is an already established reality that creates opportunities amid challenges for educational stakeholders (institutions, teachers and students). According to the researchers, it is a reality that offers students multiple choices based on where, when, how, and from whom they learn, a reality which is aimed at making education accessible to an ever-larger population of enthusiast.

It has been said severally in pieces of literature that distance education is one mode of education that provides and enhances broader means of communication through the use of various ICT and current innovative media technologies. Consequently, the domain of distance education has not been unaffected by the penetrating influence of ICTs. Which undeniably has impacted the quality of teaching, learning, and research in distance education. Therefore, ICT provides opportunities for distance education students, as well as instructors and non-academic staffs to communicate with one another more effectively during formal and informal teaching and learning process (Yusuf, 2005).

Manijeh Sadeghi, (2019) noted that the various electronic means used in ODL are basically to distribute the learning materials, keep students in touch with teachers, and provide access to communication between students. Of course, distance learning can also use other technological formats like television, DVDs, teleconferencing, and printable materials. But the immediacy and functionality of Web (online) learning have made it the first choice for many distance learners and teachers to utilize for faster instructional delivery. Similarly, Velasenko and Bozhok, (2014) also reckon that online programs often take advantage of a number of emerging technologies to make keeping in touch among students and teachers an effective, easier and more efficient communication system than ever before. While, students may also find themselves using interactive online videos, e-mail, and discussion boards to complete their lessons.

Furthermore, Traxler (2018) opined that in ideal distance education, there is enormous potential for widening access to higher education and increasing the diversity of students population since online technologies provide opportunities to learn anywhere, anytime from anyone. Because new technologies have proven to help facilitate greater collaborations among students and teachers both on a global and local level. All in all, the integration of the use of ICTs in open and distance learning will without doubts enhance students' technological awareness and use in and outside instruction. However, it is pertinent to know whether ICTs, other media, and strategies used in open and distance learning system are enough motivation for prospective admission seekers (senior school students) to seek alternative degree opportunities through accredited universities open and distance learning programs in Nigeria.

Durak and Ataizi, (2016) revealed that almost all the learners observed in its study reported that the course they took through the distance learning platform created for the study offered great convenience in terms of time and location, and these factors played a crucial role in their preference for distance learning. The researchers also revealed that the respondents felt that the distance learning platform integration of multiple media was able to meet all their needs. Hence, the structure of online distance learning was found to be more suitable and very helpful for them to easily communicate among themselves and with the course instructor, and also to access course resources anytime they wanted. Messo, (2014) also revealed in another study that the selected respondents (learners) had a positive perception of the registration procedures, quality of course materials, access to instructors, clarity of syllabi and course objectives. Hence, a clear positive perception of open and distance learning setting.

Be that as it may, several challenges facing senior school levers in gaining admission into conventional universities regular degree programs among other emerging situations necessitated the need to look for a viable alternative program opportunity that is equally efficient, and cost-effective solution that would enable school levers to realise their academic ambitions. This according to Jegede, (2003), the most logical pathway to achieve these is for students to embrace open and distance education. UNESCO (2002) also stated that in its efforts to meet the new and changing demand for education and training, open and distance learning may be seen as an approach that is at least complementary and under certain circumstances, an appropriate substitute for the face-to-face regular degree programs which still dominate most educational systems in the world.

Methodology

The study used a quantitative method of descriptive research design of the survey type to collect data for the study. The study population included all senior secondary school students in Ilorin metropolis, from which the target population for the study was purposively selected to include senior secondary school students of Chapel secondary school, Effective International College, Government Day secondary school and Saint Anthony secondary school, Tanke, Oke-Odo Ilorin.

A total of 200 senior school students (class three) were randomly selected to actively participate in the study. A researcher designed questionnaire was used to collect data for the study. The researcher ensured strict adherence to ethical guidelines such as respondents' voluntary participation, confidentiality, anonymity, amongst others while carrying out the study. Data collected was coded on an Excel spreadsheet. IBM Statistical Package for Social Sciences (SPSS) version 20.0 software was used to perform descriptive and inferential statistics. Frequency counts, percentage and mean scores were used to analyse demographic information and to answer research questions, while chi-square was used to test the study hypothesis at significant level of 0.05.

Data Analysis and Results

Research Participants of the Study

A total of 200 randomly selected students from four (4) senior secondary schools in Ilorin metropolis participated in the study.

Demographic Information of the Respondents

This section presents the data analysis of respondents' demographic information used for the study. The analysis was done based on the percentage of respondents' participation per school.

Table 1:
Distribution of respondents based on school

S/N	Secondary Schools	%
1	Chapel Secondary School	23.5
2	Effective International College	20.5
3	Government Day Secondary School	32.0
4	Saint Anthony Secondary School	24.0
	Total	**100%**

Table 1, shows the distribution of respondents based on school, 23.5% of the participated respondents were selected from Chapel secondary school, 20.5% were selected from Effective International College, 32% were drawn from Government Day Secondary School, while, 24% of the population were selected from Saint Anthony secondary school, Ilorin metropolis. The demographic analysis by percentage selection thus shows that most of the respondents drawn from Government day secondary school participated in the study.

Table 2:
Distribution of respondents based on gender

S/N	Gender	%
1	Female	43.0
2	Male	57.0
	Total	**100 %**

Table 2, shows that 43% of the respondents were female, while 57% of the respondents were male. This means that most of the participated respondents were male students.

Results

Results of data collected from the study were analysed in percentages to answer the study research questions. While the study hypothesis was tested using chi-square (X^2) at a significant level of 0.05 as presented on tables below and subsequently interpreted.

Analysis of Research Questions

Research Question One: Are senior school students aware of open and distance learning opportunities for a university degree in Nigeria?

To determine senior school students' awareness of open and distance learning opportunities for university degree in Nigeria, data were collected from senior school students in class three, and percentage was used to determine the respondents' awareness while responding to the question items was based on the response mode of aware (A) and not aware (NA). Results of the analysis are shown in table 3 and subsequently interpreted.

Table 3:

Awareness of senior school students on open and distance learning opportunities for a university degree

S/N	Question Items	A%	NA (%)
1	I am aware of open and distance learning	71	29
2	I am not aware of any national open university (NOUN) in my state	35	65
3	I know of a distance learning centre, but it doesn't feel like a university system.	39	61
4	I heard about open and distance learning from my older sibling	53	47
5	I am aware distance education offers higher degree, but I am not interested in such a degree.	68	32
6	I am aware of open and distance learning, but never knew it offers university degrees	64	36
7	My brother told me that the national open university (NOUN) is also an open and distance learning centre that offers a higher degree	72	28
8	My parents told me instruction in distance education is offered through various electronic and technological media.	60	40
9	My only interest is that I am aware distance learning is not as expensive as conventional institutions.	52	48
10	I am aware some conventional universities have distance-learning centres across the country.	62	38
	Total	**57.6**	**42.4**

The percentile results of respondents' awareness of open and distance learning from item one shows that 71% were aware and 29% were not aware of open and distance learning, 35% of the respondents were aware of NOUN while 65% were not aware of NOUN in their respective states. 39% knew about a distance learning centre but don't consider it in the same fold as a conventional university, while 61% were not aware of this at all. For those who heard about open and distance learning from their older siblings, 53% were for, while 47% were against. As much as 68% of the respondents were aware that distance education also offers higher degree, but they were still not interested, while only 32% were otherwise not aware. On the irony however, a good number of the respondents 64% were aware of open and distance learning, but never knew it offers higher degree, while 36% were not aware.

72% of the respondents' found out through their brothers that national open university (NOUN) is also an open and distance learning centre that offers higher degrees, while 28% did not find out through their brothers. 60% of the respondents' found out through their parents that distance education mode of instruction is usually through various electronic and technological media, while 40% didn't find out from their parents. 52% were aware distance learning is not as expensive as conventional institutions, while 48% were not aware distance learning is not as expensive as conventional institutions. 62% of the respondents were aware some conventional

universities have distance-learning centres across the country, while 38% were not aware some conventional universities have distance-learning centres across the country.

Research Question Two: What are the views of secondary school students on open and distance learning as an opportunity for a university degree?

To determine senior school students' views on open and distance learning as an opportunity for a university degree, data were collected from senior school students in class three. Mean was used to determine the respondents' views in seeking university degree opportunity through open and distance learning.

Table 4:

Views of secondary school students on open and distance learning as an opportunity for a university degree

S/N	Question Items	Mean
1	University degree through open and distance learning is an option I would like to explore	3.10
2	I would rather get a degree through distance education than wait years for conventional admission	2.28
3	In my opinion, admission through open and distance learning is much easier than conventional institutions.	2.67
4	Admission through open and distance learning will afford me the freedom to learn at my own pace.	2.52
5	The technological model of instruction makes degree through distance learning interests me a lot.	2.14
6	I prefer open and distance learning degree because it is easier to combine work with study, unlike in the conventional institutions.	2.38
7	Instruction through electronic media such as the internet, CD-ROM, electronic materials etc. does not make distance learning degree interest me	2.54
8	I like an ICT driven learning method distance learning offers compared to classroom methods.	2.13
9	A learning process without the physical guide of a teacher is boring in my view.	2.68
10	I believe the delivery modes in distance learning will help develop my technological use.	2.73
11	A degree through distance learning would only make me inferior to my friends in conventional universities	2.91
12	I will not go for a distance learning degree, because it does not really feel like a conventional university degree	2.63
13	Degree through distance learning can solve admission problems in Nigeria if given attention	1.39
14	Open institutions (i.e. NOUN) students don't go for NYSC, hence, open and distance learning degree do not interest me at all	2.81
15	My uncle went to the NOUN; hence, it makes open and distance learning an extension of adult education in my view	2.72
	Grand Mean	**2.51**

The table above is interpreted using a 2.5 benchmark mean score on a four-point Likert scale to examine the views of senior school students on open and distance learning as an opportunity for a university degree. Item one with a mean value of 3.10 showed that university degree through open and distance learning is option respondents were willing to explore. Item two with a mean of 2.28 below the benchmark, showed that most respondents did not have interest in a degree through distance education, instead they would rather wait for admission through conventional university. With a mean of 2.67 more than the benchmark for item three, the respondents' opinion was that admission through open and distance learning is much easier than conventional institutions. With a 2.52 mean for item four, the respondents view that admission through open and distance learning will afford them freedom to learn at their own pace.

Furthermore, with a 2.14 mean, the technological mode of instruction does not make a degree through distance learning interest the respondents. Despite the opportunity to combine work with study, with a mean of 2.38, the respondents did not prefer open and distance learning degree to conventional university degree. 2.54 mean showed that instruction through electronic media such as the internet, CD-ROM, electronic materials etc. does not actually make distance learning degree interest the respondents. Considering the 21st century ICT driven instruction, respondents with a 2.13 mean came short of a preference for ICT driven instruction compared to classroom teacher's methods. A mean of 2.68 showed respondents view that a learning process without the physical guide of a teacher is boring. Item 10 with a mean value of 2.73, showed that respondents believed the delivery modes in distance learning will help develop their technological use.

Item 11 had a mean value of 2.91, which means that the respondents viewed degree through distance learning to only make them inferior to their friends who would pursue degrees through conventional universities. With 2.63 mean value for item 12, respondents believed that a distance education degree does not really feel like a conventional university degree. With 1.39 mean value, the respondents bluntly did not view distance education as the solution to admission problems in Nigeria. With a mean value of 2.81, open and distance learning degree do not interest the respondents basically because open institutions like NOUN students don't go for national service (NYSC). Similarly, 2.72 mean value makes the respondents view open learning institutions an extension of adult education. Therefore, with the grand mean value of 2.51, it can be deduced that the respondents viewed open and distance learning as a viable opportunity for a university degree to be considered.

Result of Hypothesis Tested in the Study

Result of the hypothesis tested in this study is presented in subsequent table and interpreted as thus. The hypothesis was tested at significant level of 0.05.

Hypothesis One

$H_{O1:}$ There is no significant difference in the views of male and female senior school students on open and distance learning as an opportunity for a university degree.

Table 4: Hypothesis (H0) test using Chi-Square (X^2)

Gender

	Observed	Expected	Residual
	N	N	
F	86	100.0	-14.0
M	114	100.0	14.0
Total	**200**		

Test Statistics

	Gender
Chi-Square	3.920[a]
Df	1
Asymp. Sig.	.048

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 100.0.

The table above shows the result of the hypothesis tested in the study using Chi-square. Since the p-value of 0.048 is less than 0.05 significant value, the null hypothesis is therefore ‘‘rejected’’ and thus by implication means that a significant difference exists in the views of male and female senior school students on open and distance learning, as an opportunity for university degree.

Discussions and Conclusion

After an exhaustive review of related literature to this study. The researchers observed that keen attention was focused on challenges facing open and distance learning, thereby neglecting other pressing areas such as the disparity between conventional universities and open learning institutions like the national open university of Nigeria (NOUN) as regards admission opportunities and the chances school leavers stand to achieve their dream of a university degree. Much research neglect was also made of the views of school leavers in terms of seeking admission into NOUN (which is Nigeria’s known uni-mode) ODL institution and other distance learning programs of dual-mode institutions like the University of Ibadan, University of Lagos, Ahmadu Bello University and other institutions accredited by the national university commission (NUC) to run dual-mode systems (regular and ODL).

The challenges facing senior school leavers in securing admission into conventional universities regular degree programs are enormous, despite having an alternative opportunity to secure university degree into open and distance learning programs. The gap that this study has, therefore, tried to address is the mitigating problem of how open and distance learning degree programs can be equally competitive in terms of prospective students’ choice and interest in securing admission for a university degree, instead of waiting for regular degree program admission.

In conclusion, this study examined open and distance learning, as an alternative degree program opportunity, as viewed by senior school students, in Ilorin metropolis, Kwara State, Nigeria. The findings showed that senior school students were aware of open and distance learning degree programs through ODL institutions like the national open university of Nigeria (NOUN) and viewed it as a preferable option for them to actualise their dreams of a higher degree instead of waiting years to gain admission into conventional regular university degree programs. Although, a significant difference existed in the views of male and female senior school students on open and distance learning, as an opportunity for university degree.

However, even though the findings showed that the students were aware of open and distance learning institution like the national open university of Nigeria (NOUN), the researchers still had to briefly explain to the respondents what open and distance learning means (as an introduction before administering copies of the study instrument). Therefore, senior school students still need to be oriented on the awareness of open and distance learning and to encourage their views of open and distance learning, in other to be well informed about open and distance learning, and the opportunities it affords them for a university degree.

Recommendations

Based on the findings and conclusion made in this study, the following recommendations were made:

1. More awareness and orientation guidance should be carried out by school teachers during class lessons and organized seminars aimed at enhancing the understanding of senior school students on open and distance learning, as an opportunity for a university degree.
2. Schools guidance and counselling units should ensure organized seminars for students in their final year, so as to positively influence their views in seeking higher institution admissions, to avoid time-wasting out of ignorance.
3. In conducting more awareness for school students, gender disparity should, however, be avoided. Especially as more female students need to be encouraged in this regard.
4. The national youth service corps (NYSC) should be encouraged to put an end to the service disparity between ODL and conventional institutions, in other to encourage students to seek degree admissions through ODL institution or programs.
5. The unified tertiary and matriculation examination (UTME) as a governing body for tertiary institutions admission in Nigeria, should also contribute its quota in putting an end to the disparity between open and distance learning and conventional universities by encouraging institutions to also pay attention to admit students into ODL programs.
6. Great efforts should be made by teachers and parents in encouraging school student's interest in choosing uni-mode ODL institution like the National Open University of Nigeria (NOUN) or ODL programs with dual-mode institutions right from their UTME application, which will help increase the importance prospective admission seekers give to ODL.
7. The government should also do more to encourage admissions into ODL programs by creating more NOUN centres in all states of the federation, and also increase the carrying capacity of existing ODL centres.

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Assessment of Drinking Water Sources in Selected Village Schools Within Offa and Oyun Local Government Areas of Kwara State

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ABSTRACT

Monitoring of water quality is of utmost importance in order to prevent outbreak of diseases associated with low quality water. This study was aimed at assessing the health risk associated with drinking water sources in selected village schools in Offa and Oyun Local government areas, Kwara State. Total coliform MPN values ranged from 2 to 17 MPN/100ml, feacal coliform 0.0 to 14 MPN/100ml. The results obtained for viable count of drinking water sources ranged from 1.5 x 10^1 to 4.1 x 10^2 cfu/ ml (*Staphylococcal* count), 0.3 x 10^1 to 4.7 x 10^1 cfu/ml (*Pseudomonas* count) and 0.9 x 10^1 to 2.8 x 10^1 cfu/ ml (*Bacillus* count). The result obtained from the colilert and petrifilm plates confirmed the presence of the coliforms and feacal coliform (*E.coli*) in some of the samples collected. The pH values of all the water sampled ranged from 5.9 to 7.2. The turbidity values ranged from 2.0 to 3.9 NTU while the Total Dissolved Solids (Mg/L), Electric conductivity (µS/cm), Calcium ion, Fluoride ion, and Magnesium ion, of all the water sampled ranged from 51 to 81,130 to 171, 7.5 to 12.5, 0.32 to 0.43 and 3.7 to 7.9, respectively. Urgent interventions in term of adequate provision of portable water and enlightenment of the populace within the community schools on the risk associated with drinking contaminated water should be carried out.

Key words: PMLKit, Health Risk, Geomapping, Community School

INTRODUCTION

Good quality water is essential for the sustenance of life and monitoring its quality is of utmost importance in order to prevent any disease outbreak associated with low quality of water. Good quality water supply and accessibility are one of the objectives of the sustainable development goals (SDGs) and aims at ensuring environmental sustainability (Onyango, Okoth, Kunyang and Aliwa, 2018).

Majority of the regions in the developing countries Nigeria inclusive, are experiencing shortage of good quality water supply as the portable water sources are mostly available in the urban settlements (Omalu and Olayemi, 2010). The sources of water like streams, lakes, rivers as well as unprotected open wells are vehicles for water borne bacterial diseases such as cholera and typhoid fevers. Untreated waters can equally transmit water washed viral enteric disease like hepatitis caused by hepatitis A and E viruses, gastroenteritis caused by rotaviruses, noroviruses and sapoviruses. Other enteric viruses that cause ill-defined diseases are adenoviruses, astroviruses, coxsackieviruses and echoviruses (Burgess and Pletschke, 2012).

The lack of access to adequate portable water supplies results to the occurrence of diseases. Contaminated drinking water poses a high risk to human health as it may contains pathogens (Homaida and Goja, 2013). Water pollutants can be categorized into contaminants of biological origin, physical origin and chemical origin according to their properties (Fuquan, Guodong, Huazhun, Shangchuan and Xiuyuan, 2009). One of the serious problems faced by the populace in developing countries is the contamination of water bodies with feacal materials, industrial sewage, domestic and agricultural wastes (Homaida and Goja, 2013).

Population increase has exerted more pressure on the water availability. Consequently, more than 1.2 billion people worldwide do not have access to safe water (Onyango *et* a*l*., 2018). Majority of the rural dwellers in developing countries lack access to portable water. Seventeen (17) % of children under the age of 5 die annually as a result of diarrhea usually following the intake of contaminated water (Roch, Gratien, Hermione, Yves, Gabriel, Didier, Ghislain and Michel, 2016). Majorly, people residing in some villages within Offa and Oyun local government areas of Kwara State lack access to portable water supply which negatively affected their wellbeing. People of these communities resulted to drinking of water majorly from unprotected water sources such as well and pond.

The rural water sources and water quality health risk assessment show relationship between water quality and human health. The health risk assessment can provide scientific information for the management and protection of rural water sources (Fuquan *et al.,* 2009).

The geographic information system (GIS) in health risk assessment can be adopted to establish relationship between the water-borne pathogens and the associated environmental factors thereby providing explanation for possible causes of water borne diseases and the implications on the community (Olalubi, Ajao, Sawyerr, and Salako, 2018).

RESEARCH OBJECTIVES

The objectives of this research are to:

i. Identify the major sources of water available to the community schools and the proportion of the community schools that have access to improved water sources.
ii. Determine the quality of the community schools' water sources and assess the potential health risk associated with each water source.

MATERIALS AND METHODS

Surveillance visit was undertaken to identify community schools without good quality drinking water sources within Offa and Oyun Local Government Areass of Kwara State. The selected study areas were Alenibare, Bolohunduro, Gbosun, Igbonna G, Ilota, Kanmonu, Kere-aje, Ogbondoroko, Reke-oja and Temidire. All the sources of water (motorized borehole, hand pump borehole, well, and pond) available to and used by each community school were identified and defined as recommended by the World Health Organization (WHO, 2004; 2011).

A three part questionnaire was designed based on the WHO guideline for drinking water quality. The first part was focused on demographic information, the second part looked at water sourcing and the third part was based on water usage. The close ended questionnaire was administered to thirty three (33) residents' community schools teachers of the ten (10) different communities where twenty five (25) samples of drinking water were collected in a completely randomized manner. However, household whole schools were targeted rather than individuals. The questionnaire was directly administered and collected immediately.

Samples of water from the various sources for drinking and other uses were collected between October 2018 and January 2019 with sterile transparent whirl pack sample bag of 200 ml by volume. The samples were coded (sample ID) first based on the selected alphabets from the name of each village school as ALB, BOH, GB, IGB G, ILO, KAN, KA, OGBO, RO and TE representing Alenibare, Bolohunduro, Gbosun, Igbonna G, Ilota, Kanmonu, Kere-aje, Ogbondoroko, Reke-oja and Temidire respectively (Fig.1). The second part of coding was based on the type of water source as MBH, HPB, W and P representing motorized borehole, hand pump borehole, well and pond, respectively. The last part of the sample code consisted 1,2,3,4 and 5 represented the different sample site of the same water type within the same village. A total of twenty-five (25) samples of drinking water from different sources within the study areas were purposively collected aseptically for analysis. The samples consisted of sixteen (16) well water, five (5) hand pump borehole water, three (3) motorized borehole water and one (1) pond water. The samples were transported immediately to the microbiology laboratory of the Science Laboratory Technology Department, Federal Polytechnic, Offa where they were examined

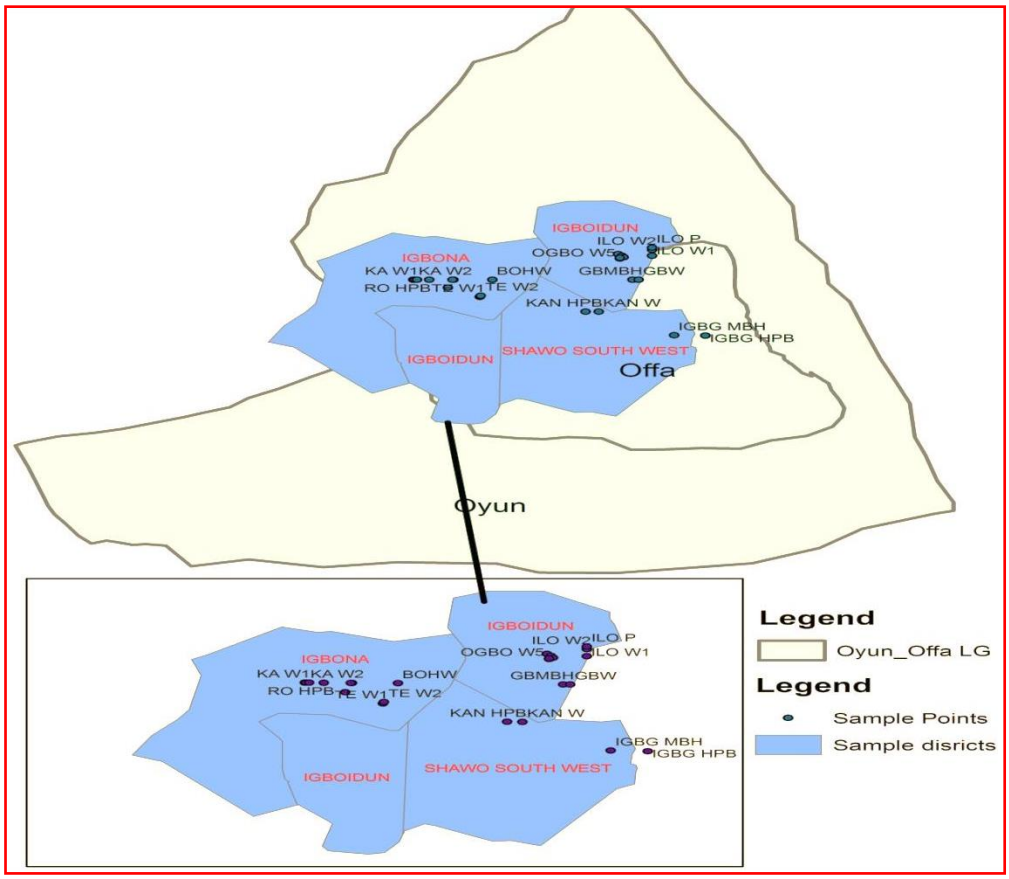

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Fig. 1: The Sampling Sites (points) and location of wards within the local governments

Analytical Methods

The quality of water for each water source was analyzed based on WHO guideline for drinking water (WHO, 2011).

The population of heterotrophic bacteria in each water sample was determined by inoculating 1ml of the sample on plate count agar. Mannitol salt agar was used for the enumeration of *Staphylococcus aureus*, Centrimide agar was used for the enumeration of *Pseudomonas spp* while Tryptic soy agar and KF streptococcal agar were used for the enumeration of *Bacillus Spp* and feacal *Streptococci* respectively.

All these media were prepared based on the manufacturers description. Each inoculated medium was incubated at 37 ^{o}C for 24-48 hours. The bacterial counts were expressed as colony forming units per ml (cfu/ml) as described by (Onyango *et al*., 2018). The isolates from all the media were sub-cultured separately on sterile nutrient agar plates. The plates were incubated at 37 ^{o}C for 24 hours in order to carry out morphological and biochemical tests.

The total coliform bacteria and feacal coliform bacteria were determined as most probable number (MPN) using the multiple tube fermentation test as described by Folorunso, Adetunji, Laseinde, and Onibi, (2014). The multiple tube fermentation test was performed in three steps using lactose broth medium. The steps include: (1) Presumptive test (2) Confirmatory test and (3) Completed test.

The lactose broth was weighed and dispensed in distilled water based on the manufacturer description to prepare both double and single strength media. 10ml of the double strength broth was dispensed separately in five tubes and the single strength broth in 10 tubes. The inner vial (Durham's tube) was inserted in each of the fifteen tubes in inverted position and they were examined to be full of the medium with no air bubble. All the fifteen tubes were sterilized inside the autoclave at 121 ^{o}C for 15 minutes.

Presumptive test: After sterilization of the medium, the tubes and content were allowed to cool down and inoculated with water sample. 10ml each of water sample was inoculated in the five tubes containing 10ml double strength broth using sterile pipette. One ml each of water sample was added to 5 out of 10 tubes containing single strength broth while 0.1ml each of water sample was inoculated into the remaining 5 tubes. All the tubes were incubated at 37 ^{o}C for 24 hours. The number of positive tubes (the tubes that showed both acid production as a result of colour change in the medium and gas production as trapped with inverted Durham's tubes) were counted and recorded as MPN/100ml of the sample. This procedure of presumptive test was repeated to enumerate the feacal coliform (thermotolerant) bacteria of each water sample by incubating the tubes at elevated temperature of 44.5 ^{o}C for 24 hours. The results were then recorded as MPN/100ml of the sample.

Confirmatory Test: Sterilized wire loop was used to transfer 2 drops of feacal coliform culture medium from each of the fermentative tubes with presumptive positive result to:

1. Three (3) ml of lactose broth inside the fermentative tube containing inverted Durham's tubes.

2. Nutrient agar slant.

3. Three (3) ml of tryptone water. The inoculated lactose broth fermentation tube and the tryptone water were incubated at 44.5 ^{o}C for 24hiurs while the inoculated agar slant was incubated at 37 ^{o}C for 24 hours. Gram stained preparation was made from the slant and viewed under the microscope to reveal Gram-negative non-spore forming rods. Kovacs reagent (0.1 ml) was added to the tryptone water after incubation and was gently mixed. The presence of indole was indicated by a red colour forming a film over the aqueous phase of the medium.

Completed test: The inoculum from each positive tube of the confirmatory test was streaked on plates of Eosin methylene blue (EMB) agar which had previously prepared according to the manufacturer description. The plates were incubated at 44.5 ^{o}C for 24 hours.

Potential health risk was equally assessed by inoculating 10 ml of each water sample into the tube of colilert specialized medium containing *O*-nitrophenyl-β-D-galactopyranoside (ONPG) and 4-methylumbelliferyl-β-D-glucuronide (MUG) as the only nutrient. Also, 1ml of each water sample was inoculated into the 3M petrifilm aqua coliform plate. The colilert tubes and petrifilms were incubated at temperature of 37^{o}C for 24 hours. After the incubation period, the colilert tubes with positive coliforms

growth that is, yellow colouration of the medium were observed under long wave length ultra violet (UV) light for fluorescence to detect the presence of *Escherichia coli*.

The isolates of *E. coli* obtained in water sample collected from Temidire well 1 were subjected to antibiotic susceptibility testing using Kirby-Bauer method as described by Odonkor and Addo (2018).
The isolates from this water source was used because it has the highest number of *E. coli* isolates out of all the well water samples analysed. Also, Temidire community school has no other sources of water apart from well.

The isolates were inoculated into plates of nutrient agar incubated for 24 hours at 37^0C after which each isolates was suspended in sterile normal saline (0.9% w/v Nacl) using a sterile wire loop until the turbidity was equivalent to 0.5 Mcfarland standard. Each standardized inoculum was separately streaked on the entire surface of Mueller-Hinton agar plates using sterile cotton swab Penicillin, Gentamicin, Erythromycin, Chloramphenicol, Ampicillin, Tetracycline antibiotic disks were aseptically placed using sterile forceps and all the plates were incubated at 37^0C for 24 hours.

All isolates obtained were characterized based on colonial morphology, staining reaction and biochemical characteristics. The colonial morphology of the organisms were observed to reveal the shape, size, consistency, optical characteristics, pigmentation and elevation. The microscopic examination and staining techniques were carried out to determine the cellular morphology of the isolates. Various biochemical tests were carried out on the bacterial isolates. These tests included catalase, oxidase, coagulase, urease, Indole, starch hydrolysis, methyl red, voges proskaur, spore and citrate.

The *E. coli* isolates with multiple drug resistance strains were further characterized using molecular method of polymerase chain reaction (PCR) based on 16SrRNA sequence.
This was done for confirmation of bacteria isolated from the water sample and to ascertain the strains of bacteria. The first step involved DNA extraction from the isolates already in broths, second step was based on Polymerase Chain reaction and the third step of molecular characterization was on sequencing to get the nucleotides of the organism.

RESULTS

The results of the Heterotrophic plate counts (HPC), Total coliform count (TCC), Feacal coliform counts (FCC) and Feacal Streptococcal counts (FSC) are shown on Table 1. The Staphylococcal counts were ranged from 7.2×10^1 - 3.8×10^2cfu/ml for well water, 3.5×10^1 - 6.3×10^1 cfu/ml for hand pump borehole while the range for the motorized borehole was 1.5×10^1 - 3.1×10^1. For the pond water sample, a Staphylococcal count was 4.1×10^2 cfu/ml. The growth counts for *Pseudomonas* were ranged from 0.8×10^1- 3.9×10^1 and 0.5×10^1- 0.8×10^1 for well water and hand pump borehole water samples respectively. Out of the three motorized borehole water sampled, only the water sample from Gbosun motorized borehole had growth count for *Pseudomonas* which was 0.3×10^1cfu/ml while the pond had 4.7×10^1cfu/ml.

The growth counts for *Bacillus* were ranged from 0.9×10^1-2.1×10^1 for well water while the pond had 2.8×10^1. Both the hand pump borehole and motorized borehole had no growth for *Baci)llus.* The pond had the highest count while the least growth was observed from well water sample from Gbosun motorized borehole. Six (6) well water samples collected from Bolohunduro well, Ilotal well 2, Kere-aje well 1 and 2, Ogbondoroko well 3 and Temidire well 1 had Bacilli growth in all 28% of the water sampled had *Bacillus* spp.

Total coliform MPN values were ranged from 4.0 to 14/100ml, 2.0 to 6.0/100ml for well and hand pump borehole water respectively. None of the motorized borehole water sampled has coliform growth. The pond water had the highest total coliform MPN value of 21/100ml.

For the feacal coliform MPN values, the pond water sample had the highest MPN value of 17/100ml while the lowest MPN value of 2/100ml detected in hand pump well water sample from Alenibare community. The well water samples had MPN values ranged from 2.0 to 12/100ml with the highest value recorded from Temidire well 1. None of the motorized borehole and hand pump borehole water samples had feacal coliform growth. The feacal streptococcal growth counts were ranged from 7.0 to 32 cfu/ml for the well water samples with the highest and lowest counts observed from Kere-aje well 1 and Ilota well 1 respectively. The hand pump borehole water sample collected from Alenibare village had 8 cfu/ml count of feacal Streptococci while 5 cfu/ml was counted in Reke-Oja hand pumped borehole water samples. Out of the five boreholes water samples collected, Gbosun, Bolohunduro and Igbonna Garage water samples had no feacal Streptococci. The highest feacal streptococcal counts from all the water samples were recorded in the sample collected from Ilota pond with 43cfu/ml.

Table 1: The Bacteriological Examination of Drinking Water Samples from Various Sources

Sample	Staphylococcal count	*Pseudomonas* count	*Bacillus* Count	TCC MPN/100ML	FCC MPN/100ML	FSC Count
Well	$7.2x10^1$ – $3.8x10^2$	$0.8x10^1$ – $3.9x10^1$	$0.9x10^1$ – $2.1x10^1$	4.0-14	2.0-12	$0.7x10^1$- $3.2x10^1$
Hand Pump Borehole	$3.5x10^1$ – $6.3x10^1$	$0.5x10^1$ – $0.8x10^1$	0.0	2.0 -6.0	0.0-2.0	$0.5x10^1$ – $0.8x10^1$
Motorised Borehole	$1.5x10^1$ – $3.1x10^1$	$0.3x10^1$	0.0	2.0 -4.0	0.0	0.0
Pond	$4.1x10^2$	$4.7x10^1$	$2.8x10^1$	17	14	$4.3X10^1$

TCC = Total coliform count; FCC; Feacal coliform count; FSC = Feacal streptococci count;

The Portable Microbiology Laboratory kit (Colilert and Petrifilm) water analysis results are shown on Table 1 which revealed that all the water samples collected except the three motorized borehole water samples showed positive result inside the colilert tubes after incubation period by changed in colour of the medium to yellow as a result of the hydrolysis of *O*-nitrophenyl -β-D-galactopyranoside (ONPG) which released *O*-nitrophenol.

The results of the 4-methylumbelliferyl-β-D-glucuronide (MUG) modification inside the colilert tube to yield fluorescence upon observing under the UV light which indicated the presence of *Escherichia coli* corroborate with the 3M Petrifilm aqua plate positive counts for *Escherichia coli,* that is, bluish colonies with gas. In all, thirteen (13) water samples, all well water had *E. coli* bluish colony growth with gas on the petrifilm plates representing 52%.

The predicted distribution map for the *E. coli* counts on the petrifilm is shown in figure 2. The result indicated that the presence rate of *E. coli* in Ilota pond, Temidire well 1, Kere-aje well 1 and 2 and Ogbondoroko well 1, well 2 and well 4 is high which puts these communities at very high risk level of water borne diseases with the presence of dump site, soak away as major risk factors at very close distance of less than 10 metres to the sampling sites.

However, sampling sites with very low risk level of water borne diseases included all the motorized borehole and hand pump borehole. Table 2 shows the comprehensive results for various water samples analysed using colilert and petrifilm with the corresponding risk level of water borne diseases.

Morphological and Biochemical identification test of the bacteria isolated revealed the presence of *Bacillus, Pseudomones, Staphlococus, Streptococcus* and *Escherichia coli* as shown on Table 2.

The antibiotics susceptibility testing of the *Escherichia coli* isolated from Temidire well 1. The zones of inhibition of each *E. coli* isolate was measured in millimeter and recorded as shown in Table 4. Two out of the eleven isolates were observed to be multidrug resistant by showing resistivity to four antibiotics.

The nucleotide sequence analysis of the test isolates using clustal W program revealed that isolate KB1 showed maximum homology (99%) with *Escherichia coli* strain (JCM1649). Also, Isolate KB 2 was found to show maximum (96%) homolog with *Escherichia coli* sp (UIWRF0947). The test bacterial isolates clustered with members of the genus *Escherichia* thus differentiating bacterial isolates on the genetic basis shown in Figure 2.

Table 2: Water Samples Analysis using Colilert and Petrifilms

S/N	Sample ID	Date collected	Location Collected	24hr Colilert		24hr Petrifilm # Blue &Gas	Risk Level
				ONPG	MUG		
1.	ALB HPB	14-01-19	Alenibare Hand pumped borehole	+	-	0	Low
2.	ALB W1	14-01-19	Alenibare Well 1	+	+	3	High
3.	ALB W2	14-01-19	Alenibare Well 2	+	-	0	Low
4.	BOH HPB	14-01-19	Bolohunduro Hand pumped borehole	+	-	0	Low
5.	BOH W	14-01-19	Bolohunduro Well	+	+	2	High
6.	GB MBH	14-01-19	Gbosun Motorized BH	-	-	0	Nil
7.	GB W	14-01-19	Gbosun Well	+	-	0	Low
8.	ILO W1	04-02-19	Ilota well 1	+	+	6	High
9.	ILO W2	14-01-19	Ilota well 2	+	+	5	High
10.	ILO P	04-02-19	Ilota pond	+	+	15	Very High
11.	Igb G HPB	04-03-19	Igbonna garage hand pumped borehole	+	-	0	Low
12.	Igb G MBH	04-03-19	Igbonna garage motorized borehole	-	-	0	Nil
13.	KA W1	04-02-19	Kere-aje Well 1	+	+	13	Very High
14.	KA W2	04-02-19	Kere-aje Well 2	+	+	8	High
15.	KA MBH	04-02-19	Kere-aje motorized borehole	-	-	0	Nil
16.	Kan HPB	04-02-19	Kanmonu Hand pumped borehole	+	-	0	Low
17.	Kan W	04-02-19	Kanmonu Well	+	-	0	Low
18.	Ogbo W1	04-03-19	Ogbondoroko Well 1	+	+	6	High
19.	Ogbo W2	04-03-19	Ogbondoroko Well 2	+	-	0	Low

20.	Ogbo W3	04-03-19	Ogbondoroko Well 3	+	+	5	High
21.	Ogbo W4	04-03-19	Ogbondoroko Well 4	+	+	8	High
22.	Ogbo W5	04-03-19	Ogbondoroko Well 5	+	+	3	High
23.	R.O HPB	04-02-19	Reke-Oja hand pumped borehole	+	-	0	Low
24.	TE W1	04-03-19	Temidire Well 1	+	+	14	Very High
25.	TE W2	04-03-19	Temidire Well 2	+	+	2	Low

Risk Level	***E. coli* in sample**	**Colliert MUG+**	**# Blue Colonies on Petrifilm**
Nil	-	-	0
Low	<1/10 ml	-	0
Moderate	1-10/10 ml	+	0
High	1-10/ml	+	1-10
Very High	>10/ml	+	>10

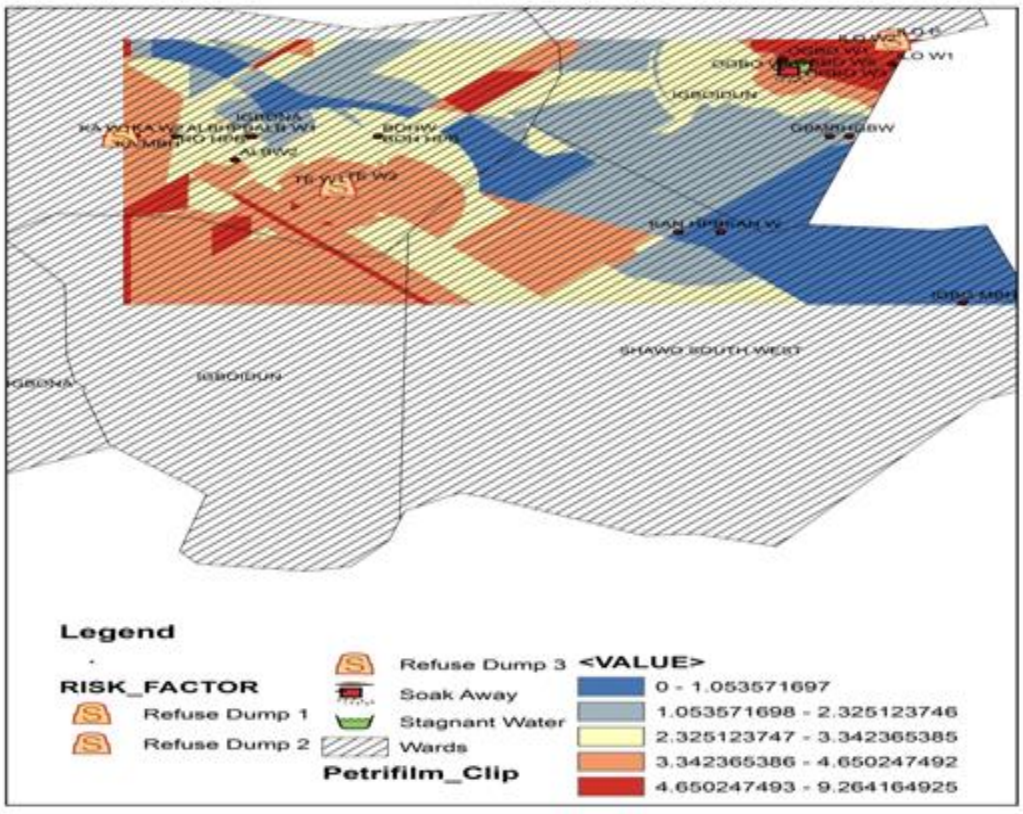

Fig. 2: Map for the *E. coli* Growth on Petrifilm

Table 3: Morphological and Biochemical Characteristics of the Isolates

Test isolate organisms	Elevation	Surface	Colony	Pigment	Gram stain	Shape	Spore stain	Motility	Catalase	Oxidase	Glucose	Lactose	Gas	MR	VP	Citrate	Motility
E. coli	Raised	Smooth	Mucoid	Greyish white	- ve	Short rod	- ve	+ ve	+ ve	- ve	+ ve	+ ve	+ ve	+	- ve	- ve	- ve
Bacillus	Flat	Rough	Mucoid	Yellow	+ ve	Rod	+ ve	+ ve	+ ve	- ve	+ ve	- ve	+ ve	-	+	+	- ve
Staphylococcus aur	Convex	Smooth	Soft	Golden yellow	+ ve	Sphere (cluster)	- ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	+ ve	+	- ve	- ve
Pseudomonas	Flat	Rough	Mucoid	Blue green	- ve	Rod	- ve	+ ve	+ ve	+ ve	+ ve	- ve	- ve	- ve	+	+	- ve
Enterobacter aerogenes	Raised	Rough	Mucoid	Dark red	+ ve	Sphere (chain form)	+ ve	+ ve	+ ve	+ ve	+ ve	+ ve	+ ve	+ ve	+	- ve	+ ve

Key: MR= Methyl red, VP: Voges proskauer, Cit: Citrate, Ure: Urease, Pig: Pigmentation, Coag: Coagulase, Motility, + ve = Positive, - ve = Negative

Table 4: Antibiotic susceptibility test on *E. coli* isolates from Temidire well 1

Isolates	Pen. (clear zone) in mm	Eryth. (clear zone) in mm	Tetra (clear zone) in mm	Gent (clear zone) in mm	Amp. (clear zone) in mm	Chlor. (clear zone) in mm
Is1	21 ±1.00	23 ±0.87	–	23±0.71	–	28 ±1.00
Is2	30 ±1.32	23 ±1.00	–	22 ±0.00	30 ±0.00	–
Is3	–	–	–	32 ±1.00	33 ±1.00	–
Is4	25 ±1.00	27 ±1.32	25 ±0.00	–	–	30 ±1.00
Is5	–	28 ±1.00	32±0.71	31 ±1.32	–	32 ±0.87
Is6	–	32 ±0.00	25 ±0.71	25 ±1.00	28 ±0.00	–
Is7	–	–	–	23 ±0.87	–	29 ±1.00
Is8	28 ±1.32	+	33 ±0.87	–	25 ±0.87	–
Is9	29 ±0.00	–	–	35 ±1.00	31 ±0.71	28 ±0.00
Is10	30 ±1.00	32 ±1.00	28 ±0.00	–	26 ±1.00	–
Is11	–	–	28 ±0.87	32 ±0.71	33 ±0.00	–

Key: Pen = Penicillin, Eryth = Erythromycin, Tetra = Tetracycline, Gent = Gentamycin, Amp = Ampicillin, Chlor = Chloramphenicel

Is1 – Is11 are isolates

– : No zone observed

The results for the physicochemical parameters of the various water sources are shown in table 5 and figure 3, 4 and 5. The pH values of all the water sampled from different villages ranged from 5.9 – 7.2. Out of the 25 sampled water, Temidire well1 and 2, Ilota well 1 and 2, Ogbondoroko well 4, Reke-Oja hand pump borehole, Kere-Aje motorized borehole, Kere-Aje well 2, Kanmonu well, Gbosun motorized borehole and Alenibare hand pump borehole water sample had pH values that conform with WHO standard pH value of (6.5-8.5). The predicted distribution map for pH values in figure 3 revealed that: Alenibare well 1 and well 2, Bolohunduro well and hand pump borehole, Kanmonnu hand pump borehole, Kere-aje well 1, Reke-oja hand pump borehole, Ilota pond, Igbonna garage motorized borehole, Igbonna garage hand pump borehole, Ogbondoroko well 1, 2, 3 and 5 and Gbosun well had pH values that are slightly acidic indicated by the blue colour on the map. The highest pH value of 7.1 was recorded in Kere-aje well 2 and Temidire well 1 while the lowest value of 5.9 was recorded in Ilota pond.

Determination of the turbidity of all the water samples showed that WHO standard of any water sample should be less than 5 NTU as reported by Homaida and Goja (2013). Ilota pond had the highest turbidity value of 3.9 NTU while the lowest turbidity value of 2. 0 NTU was observed in Gbosun and Kere- Aje motorized borehole water samples. The predicted distribution map for turbidity values in figure 4 shows that Bolohunduro hand pump borehole, Ilota pond, Reke-oja hand pump borehole, Gbosun well 2 had higher turbidity values while lower values recorded in Gbosun hand pump borehole, Temidire well 1 and 2, Igbonna garage motorized and hand pump borehole.

The total dissolved solids (TDS) mg/l, Electric conductivity (EC) μs/cm, calcium ion (Ca^{2+}), fluoride ion (F^{-}) and magnesium ion (mg^{2+}) values of all the twenty five (25) water, sampled are within the limit of WHO standard. The WHO maximum permitted level are stated respectively as 500mg/l, 1000 μs/cm, 75mg/l, 1.5 and 30mg/l.

The predicted distribution map for total dissolved solids level of the water sources was shown in figure 5. The result indicated that the values for total dissolved solid for Reke-oja hand pump borehole, Kanmonnu hand pump borehole, Gbosun well 1, 2 and 4 were higher while the lower values were recorded in Alenibare hand pump borehole, Bolohunduro and Kere-aje hand pump borehole.

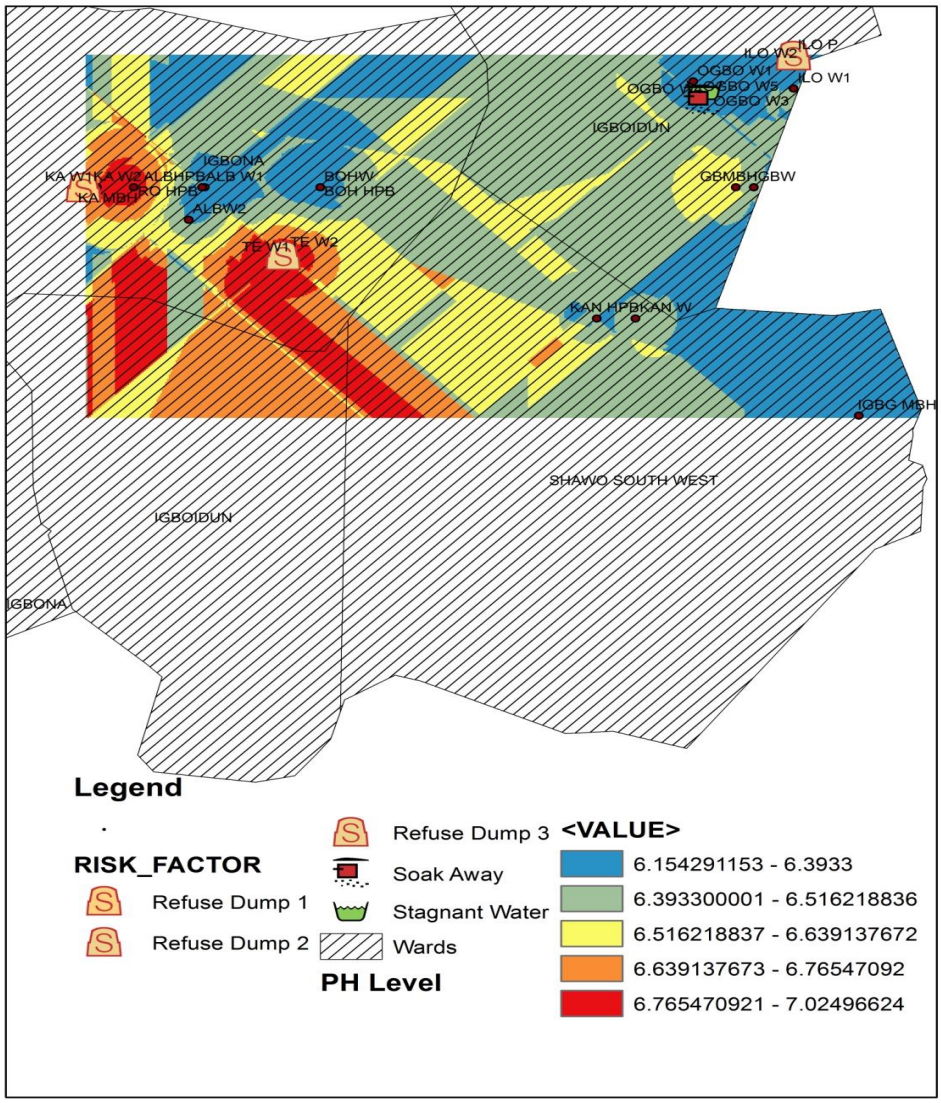

Figure 3: pH level of various water sources in the community schools

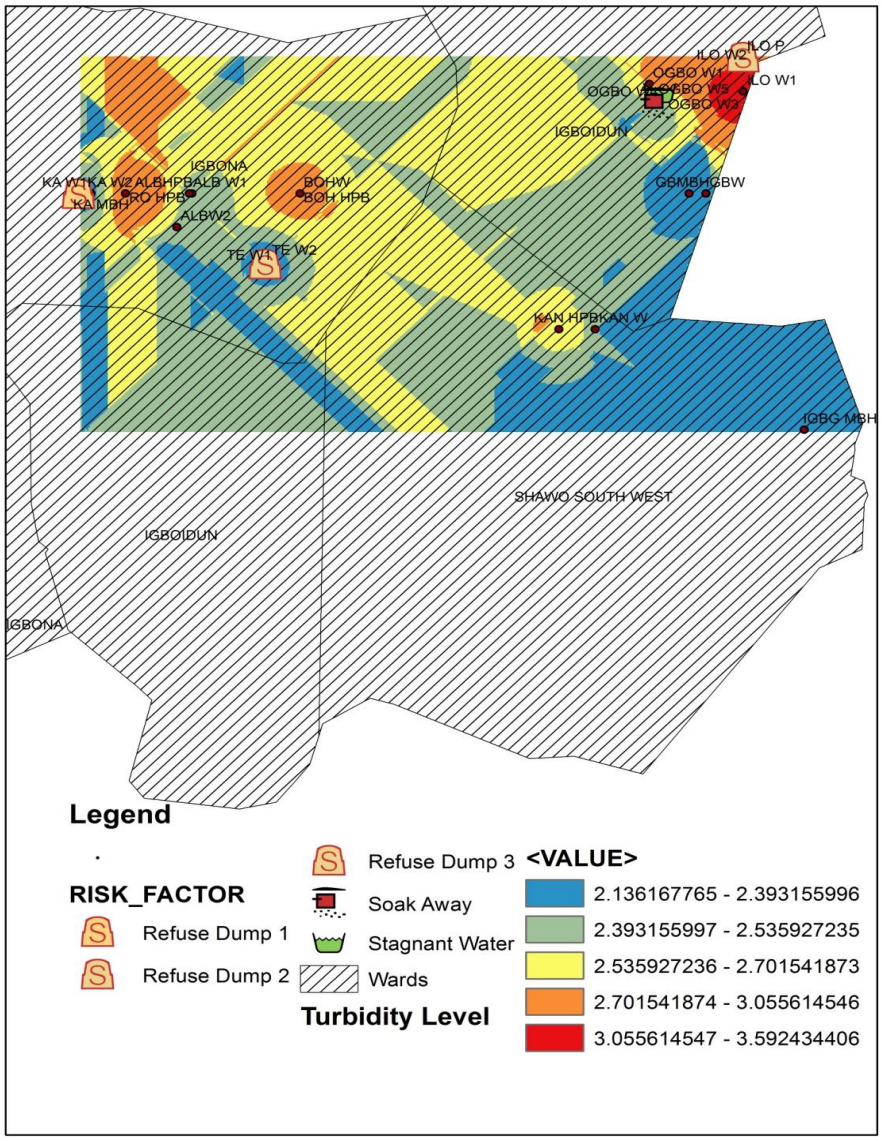

Figure 4: Turbidity level of various water sources in the community schools

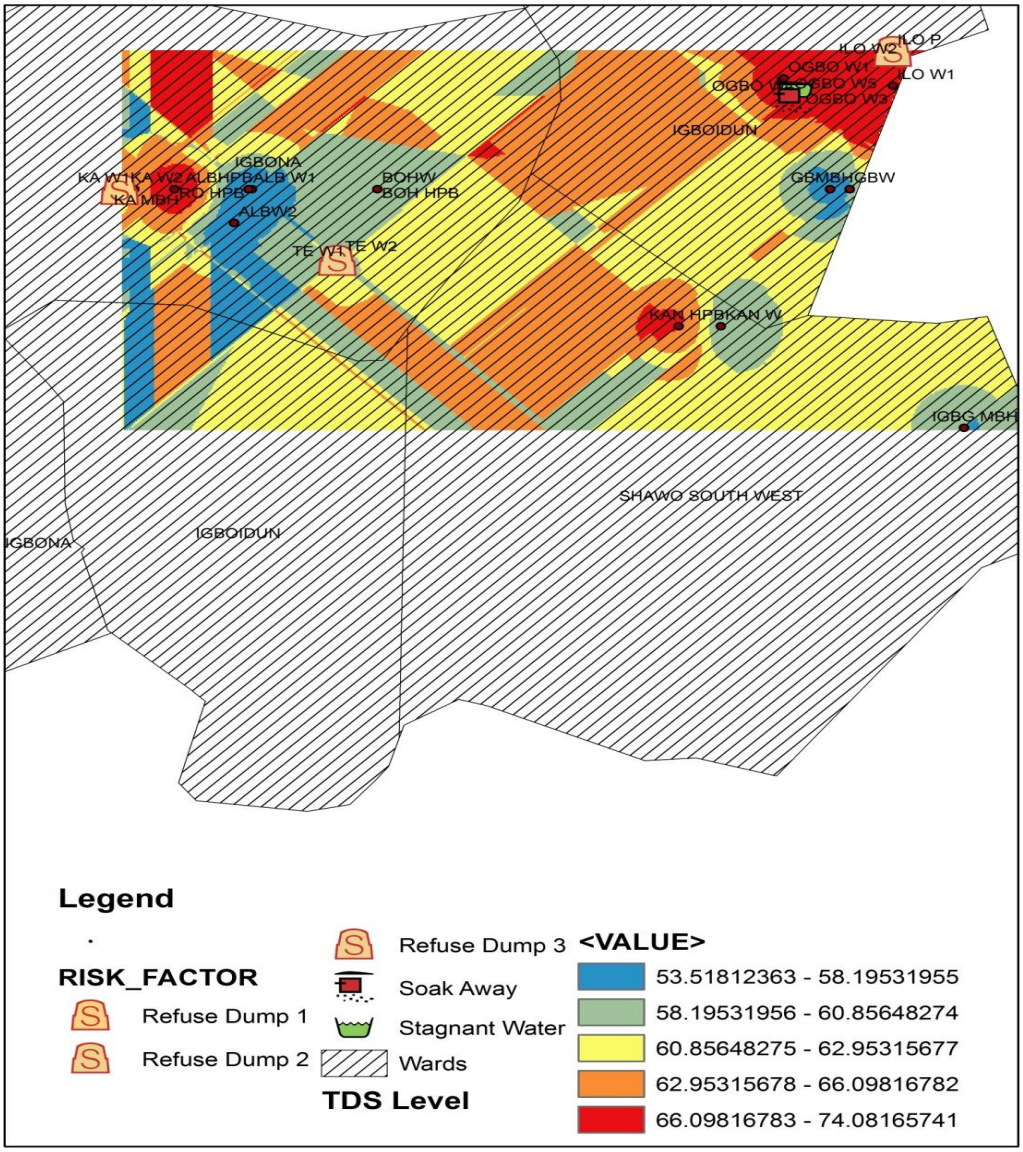

Figure 5: TDS level of various water sources in the community schools

Table 5: Physicochemical Parameters of Various Water Sources in Various Community Schools

S/N	Location	Source	pH	Turbidity NTU	TDS Mg/L	EC µs/cm	Ca^{2+}	F^{-}	Mg^{2+}
	WHO Standard		(6.5 – 8.5)	(< 5.0 NTU)	(500 mg/L)	(1000 µs/cm)	(75 mg/L)	(1.5 mg/L)	(30 mg/L)
1.	Alenibare	Hand pumped borehole	6.5 ± 0.10	2.2 ± 0.12	51 ± 0.16	130 ± 0.10	7.5 ± 0.26	0.72 ± 0.10	3.7 ± 0.20
2.	Alenibare	Well 1	6.0 ± 0.10	2.7 ± 0.22	35 ± 0.17	133 ± 0.17	7.9 ± 0.10	0.34 ± 0.17	3.9 ± 0.26
3.	Alenibare	Well 2	6.1 ± 0.70	2.5 ± 0.10	51 ± 0.17	134 ± 0.76	[illegible]	0.36 ± 0.00	4.2 ± 0.10
4.	Balebanlaw	Hand Pumped Borehole	6.0 ± 0.10	3.0 ± 0.10	38 ± 0.60	142 ± 0.20	8.5 ± 0.20	0.38 ± 0.10	4.2 ± 0.16
5.	Holobundoro	Well	6.7 ± 0.70	2.9 ± 0.17	61 ± 0.21	145 ± 0.00	8.9 ± 0.70	4.0 ± 0.76	5.0 ± 0.17
6.	Gbeum	Motorized borehole	6.0 ± 0.20	2.0 ± 0.60	53 ± 0.00	132 ± 0.20	7.8 ± 0.00	0.32 ± 0.20	4.7 ± 0.10
7.	Ilora	Well 2	6.5 ± 0.50	3.1 ± 0.2	65 ± 0.17	151 ± 0.26	10.0 ± 0.17	0.41 ± 0.20	6.4 ± 0.26
8.	Kamoora	Hand pumped borehole	6.7 ± 0.26	2.8 ± 0.02	72 ± 0.10	149 ± 0.16	9.2 ± 0.00	0.40 ± 0.10	6.1 ± 0.06
9.	Kamoora	Well	6.7 ± 0.70	2.11 ± 0.10	56 ± 0.25	150 ± 0.10	8.5 ± 0.20	0.38 ± 0.10	5.8 ± 0.10
10.	Kerosje	Well 1	6.1 ± 0.45	2.7 ± 0.20	75 ± 0.17	140 ± 0.20	9.2 ± 0.10	0.79 ± 0.00	6.7 ± 0.10
11.	Kerosje	Well 2	7.1 ± 0.00	2.1 ± 0.17	52 ± 0.23	132 ± 0.00	8.1 ± 0.00	0.33 ± 0.10	5.0 ± 0.20
12.	Kerosje	Motorized borehole	6.9 ± 0.30	2.0 ± 0.26	39 ± 0.26	138 ± 0.26	9.2 ± 0.17	0.38 ± 0.20	6.0 ± 0.26
13.	Reluorya	Hand pumped borehole	6.2 ± 0.40	3.2 ± 0.17	78 ± 0.00	157 ± 0.17	10.3 ± 0.26	4.0 ± 0.20	6.7 ± 0.06
14.	Ilora	Well 1	6.5 ± 0.00	2.5 ± 0.10	61 ± 0.25	161 ± 0.17	11.1 ± 0.23	0.41 ± 0.10	7.2 ± 0.10
15.	Ilora	Pond	5.9 ± 0.10	3.9 ± 0.26	65 ± 0.44	171 ± 0.10	11.9 ± 0.20	0.42 ± 0.00	7.5 ± 0.10
16.	Igbooma Garage	Motorized borehole	6.1 ± 0.32	2.1 ± 0.00	67 ± 0.00	169 ± 0.10	11.6 ± 0.23	0.41 ± 0.17	7.2 ± 0.20
17.	Igbooma Garage	Hand pumped borehole	6.0 ± 0.10	2.4 ± 0.10	69 ± 0.10	167 ± 0.20	11.2 ± 0.17	0.40 ± 0.10	7.1 ± 0.06
18.	Ogbondoroko	Well 1	6.3 ± 0.30	2.6 ± 0.20	72 ± 0.26	170 ± 0.26	12.0 ± 0.00	0.41 ± 0.60	7.8 ± 0.26
19.	Ogbondoroko	Well 2	6.1 ± 0.10	2.0 ± 0.26	75 ± 0.20	173 ± 0.00	12.5 ± 0.00	0.41 ± 0.20	7.9 ± 0.10
20.	Ogbondoroko	Well 3	6.3 ± 0.00	2.1 ± 0.26	68 ± 0.17	171 ± 0.10	11.5 ± 0.20	0.59 ± 0.20	7.3 ± 0.09
21.	Ogbondoroko	Well 4	6.6 ± 0.30	2.8 ± 0.17	71 ± 0.00	163 ± 0.70	11.7 ± 0.10	0.38 ± 0.10	7.2 ± 0.00
22.	Ogbondoroko	Well 5	6.2 ± 0.36	2.7 ± 0.17	65 ± 0.20	158 ± 0.20	10.8 ± 0.17	0.34 ± 0.28	6.9 ± 0.79
23.	Gbugu	Well	6.1 ± 0.10	2.3 ± 0.2	39 ± 0.10	161 ± 0.17	11.6 ± 0.26	0.39 ± 0.10	7.3 ± 0.20
24.	Temidire	Well 1	7.1 ± 0.50	2.2 ± 0.26	58 ± 0.24	135 ± 0.09	8.1 ± 0.00	0.33 ± 0.20	5.5 ± 0.09
25.	Temidire	Well 2	7.0 ± 0.26	2.3 ± 0.10	62 ± 0.00	139 ± 0.10	9.6 ± 0.26	0.37 ± 0.60	6.1 ± 0.10

TDS: Total dissolved solids, Ca^{2+}: Calcium ion, F^{-}: Fluoride ion, EC: Electric conductivity, Mg^{2+}: Magnesium ion

The results of the integration of the laboratory data and the coordinate data for the various water samples from the study community schools were shown in the attribute (Table 5) for the geospatial mapping of the study areas.

Discussion

Ground water is a major source of drinking water and its pollution by pathogens and elevated concentration of dissolved solids are of concern due to its use for drinking and other domestic purposes including food processing (Onyango et al., 2018). Data presented in table 1 shows that the pond water sample had the highest staphylococcal growth count followed by the well water, hand pump borehole while the motorized borehole water sample had the lowest count likewise for microbial had for Pseudomonas and Bacillus. This is reflecting the high organic matters present in the pond followed by the wells which serve as source of nutrients to the microorganisms. This result corroborate with the findings from the study undertaken by Hamaida and Goja. The pH value of water is an important physicochemical parameter which can be used to classify water as acidic or alkaline. The minimum and maximum acceptable pH level of any water source is 6.5 and 8.5 respectively as revealed by Oko, Aremu, Odoh, Yebpella and Shenge (2014). Odonkor and Addo (2018) reported that multidrug resistant E.coli wree isolated from well water that were resistant to four different antibiotics namely tetracycline, gentamicin, penicillin and erythromycin which corroborate with the findings of this work where two E.coli strains isolated from the well water at Temidere village were observed to be multidrug resistant.

Conclusion

Multidrug resistant *Escherichia coli* strains were isolated from the drinking water sources available in the study community schools which can cause diseases such as diarrhea. Hence, good quality water must be adequately provided at all times for wellbeing of every individual most especially in our schools in rural communities.

Recommendations

- Urgent intervention in terms of adequate provisions of portable water in the community schools is highly necessary.
- The distance of well to the septic tanks should not be less than 10 metres as recommended by WHO.
- Dumping site should be far away from the source of drinking water.
- Further research should be undertaken on the strains of other bacteria isolated that might be multiple drug resistant.

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