

Awareness, Application and Utilization of Educational Technologies in Science Education Classroom in Secondary Schools

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Abstract

This study explored the extent of the awareness, application and utilization of educational technology items in science education classroom. Educational technology is a term used to describe a wide array of teaching and learning related software and hardware that is increasingly being used in secondary school, college and university classrooms. The study surveyed science teachers' awareness, and application of these educational technologies and the extent of utilization in teaching and learning. The study adopted a descriptive survey. The population for the study comprised 255 science teachers irrespective of subject area of teachers teaching science in Nsukka Local Government Area of Enugu State. The sample was obtained using a purposive sampling technique. The instrument was validated by two experts, one from Department of Science Education and the other from the Department of Computer Education. The data obtained from the study was analyzed using percentages. The result showed that the science teachers apply the educational technologies because they are aware of the existence of the educational technologies, the science teachers showed limited utilization and application of the educational technologies, they have low access to these educational technologies for use in the classroom instruction. Recommendations were made to help improve the situation.

Key words: Educational technologies, Awareness, Application, Utilization, Science Education Classroom, Secondary School

Introduction

The industrial and technology development of any nation depend to a large extent on the level of scientific education of her citizens including secondary school teachers and students. According to Ahiakwo as cited in Nwoji (2016), the development and growth in the domain of science and technology call for the desire to be informed at all times. Through telephones, radio and television sets, scientific knowledge has been communicated for a long time now. Computers have been used in various ways to aid learning and instruction at one stage or the other. They are used in management of education and technology literacy. Technology literacy is the ability to use, manage, understand and access technology. It is related to digital literacy in that when an individual is proficient in using a computer and other digital devices to access the internet, digital literacy gives them the ability to use the internet to discover, evaluate, create and use information via digital platforms such as web browser, databases, online journals, magazines, newspapers, blogs and social media sites. Technology literacy

enables science students/teachers to communicate and express ideas in diverse ways and to develop strong non-linear reading and thinking skills. (The National Academies of Sciences, Engineering & Medicine, 2000).

Educational technology is the field of study that investigates the process of analyzing, designing, developing, implementing and evaluating the instructional environment, learning materials, learners and the learning process in order to improve teaching and learning. Educational technology examples include using cloud – based learning software, app blogs or discussion boards, digital white boards and other interactive online tools for students and teachers. Also, immersive learning through virtual reality, digital lessons personalized for each student, online games that teach important information while showing students that learning is fun. Educational technology is of different types namely: Synchronous and Asynchronous learning, Linear learning and collaborative learning. Synchronous learning happens

at the same time, that is, happening, existing or arising at precisely the same periods. With synchronous learning, participants can receive immediate feedback. Asynchronous learning does not happen at the same time; the participants can learn at their own pace. More specifically, asynchronous describes the relationship between two or more events/objects that do interact within the same system but do not occur at predetermined intervals and do not necessarily rely on each other's existence to function. Linear learning is computer-based training (CBT), which refers to self – paced learning activities delivered on a computer or hand held device such as a tablet or smartphone. Collaborative learning is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning technologies range from communication tools that allow for synchronous and asynchronous text, voice, or video chat to online spaces that facilitate brainstorming, document editing and remote presentations of topics. Educational technology helps in changing teaching and learning methods. The goal is to make it effective and to bring a positive outcome. This paper examined the science teacher's awareness, application and utilization of educational technology items for teaching in secondary schools in Nsukka Local Government Area of Enugu State.

Research Questions

The following research questions were posed for the study.

1. Are the science teachers aware of the existence of the various types of educational technology items in Nsukka Local Government Area of Enugu State.?
2. What are the educational technology items applied by science teachers in Nsukka Local Government Area of Enugu State?
3. Do science teacher's use educational technology items in the classroom for teaching students at all in Nsukka Local Government Area of Enugu State?

Research Method

Design of the Study

The design adopted for the study was a descriptive survey. Descriptive survey involves collection of data, often using questionnaire for the purpose of describing and interpreting existing conditions or qualities or perceptions about a given population (Anaekwe and Ozoigbo, 2003). The population of the study consisted of two hundred and fifty-five science teachers from all the secondary schools in Nsukka Local Government Area of Enugu State. The sample consisted of one hundred science teachers who brought back the questionnaire to the researcher. The researcher lost some of the questionnaires because some of the science teachers lost them. The sampling technique adopted was purposive. The instrument used for the study is a questionnaire. The questionnaire has two sections. Section A demands bio-data of the respondents. Section B was drawn in order to find out the educational technology items that existed in the secondary schools in Nsukka Local Government Area of Enugu State. The respondents were to indicate 'YES' or 'NO' in their 'awareness', 'application' of the listed educational technology items in the schools' and their 'utilization' of the educational technology items. The instrument (questionnaire) was validated by two experts, one from Science Education and one from Computer Education.

Procedure for data collection

The researchers sought for permission from the principals of the schools sampled for the study for the researchers to be allowed to share the questionnaires to the Science teachers in the school. The questionnaire was given to the first ten teachers seen by the researchers in the schools visited. 120 copies of the questionnaire were distributed. The respondents were given some time to fill out the questionnaire, some of the respondents left with the copies of the questionnaire before the researchers came back from the other schools. 100 copies of the questionnaire were actually submitted back by the respondents and then used for the study. The results are shown in tables 1, 2 and 3.

Results

Table 1: Responses of Science teachers on the “Awareness” of existence of Education Technology (ET) items in the secondary schools

S/N	Column 1 Educational Technology Items	Column 2 Science Teachers Awareness		
		(n)	%	Remarks
1.	Tutorial software/ Generative Artificial Intelligence	100	100	Yes
2.	Assessment software	100	100	Yes
3.	Reference software	100	100	Yes
4.	Classroom aid	100	100	Yes
5.	Collaborative videos	90	90	Yes
6.	Virtual reality devices	80	80	Yes
7.	White boards	70	70	Yes
8.	Webcasts and Podcast	85	85	Yes
9.	VHS tapes	40	40	Yes
10.	Webcams (synchronous)	80	80	Yes
11.	Screen casting	80	80	Yes
12.	Computer set and tablets	100	100	Yes
13.	Internet facility	100	100	Yes
14.	Electronic mail (e-mail)	95	95	Yes
15.	World Wide Web (www)	93	93	Yes
16.	Telephone and mobile phones	100	100	Yes
17.	Calculator	98	98	Yes
18.	Computer printer	100	100	Yes
19.	Video cassettes	100	100	Yes
20.	Television set	97	97	Yes
21.	Multipurpose projector	30	30	No
22.	Scanner	60	60	Yes
23.	Fax machine and telex	60	60	Yes
24.	Radio receiver	85	85	Yes
25.	Film strips	68	68	Yes

N= 100 N= Total Population, n= number of respondents, %= Percentage of responses

Table 2: Responses of Science teachers on the “Application” of Educational Technology (ET) items in the secondary schools.

S/N	Column 3 Educational Technology Items	Column 4 Science Teachers Application		
		(n)	%	Remarks
1.	Tutorial software/ Generative Artificial Intelligence	30	30	No
2.	Assessment software	40	40	Yes
3.	Reference software	30	30	No
4.	Classroom aid	50	50	Yes
5.	Collaborative videos	30	30	No
6.	Virtual reality devices	50	50	Yes
7.	White boards	40	40	Yes
8.	Webcasts and Podcast	45	45	Yes
9.	VHS tapes	10	10	No
10.	Webcams (synchronous)	40	40	Yes

11.	Screen casting	30	30	No
12.	Computer set and tablets	80	80	Yes
13.	Internet facility	60	60	Yes
14.	Electronic mail (e-mail)	40	40	Yes
15.	World Wide Web (www)	40	40	Yes
16.	Telephone and mobile phones	100	100	Yes
17.	Calculator	98	98	Yes
18.	Computer printer	50	50	Yes
19.	Video cassettes	30	30	No
20.	Television set	97	97	Yes
21.	Multipurpose projector	00	00	No
22.	Scanner	30	30	No
23.	Fax machine and telex	30	30	No
24.	Radio receiver	65	65	Yes
25.	Film strips	35	35	No

N= 100 N= Total Population, n= number of respondents, %= Percentage of responses

Table 3: Responses of Science teachers on the “Utilization” of Educational Technology (ET) items in the secondary schools.

S/N	Column 1 Educational Technology Items	Column 2 Science Teachers Utilization.		
		(n)	%	Remarks
1.	Tutorial software/ Generative Artificial Intelligence	30	30	No
2.	Assessment software	40	40	Yes
3.	Reference software	30	30	No
4.	Classroom aid	30	30	No
5.	Collaborative videos	00	00	No
6.	Virtual reality devices	00	00	No
7.	White boards	40	40	Yes
8.	Webcasts and Pozdcast	00	00	No
9.	VHS tapes	00	00	No
10.	Webcams (synchronous)	00	00	No
11.	Screen casting	30	30	No
12.	Computer set and tablets	80	80	Yes
13.	Internet facility	60	60	Yes
14.	Electronic mail (e-mail)	40	40	Yes
15.	World Wide Web (www)	40	40	Yes
16.	Telephone and mobile phones	100	100	Yes
17.	Calculator	98	98	Yes
18.	Computer printer	50	50	Yes
19.	Video cassettes	30	30	No
20.	Television set	40	40	Yes
21.	Multipurpose projector	00	00	No
22.	Scanner	00	00	No
23.	Fax machine and telex	30	30	No
24.	Radio receiver	65	65	Yes
25.	Film strips	35	35	No

N= 100 N= Total Population, n= number of respondents, %= Percentage of responses

In Table 1, Responses of Science teachers on the “Awareness”, columns 1 and 2, science teachers indicated “YES” for all the items except “21” which is Multi-Purpose projector. In Table 2, Responses of Science teachers on the “Application” of Education technology (ET) items, columns 3 and 4, science teachers indicated “NO” to some items which include numbers- 1, 3, 5, 9, 11, 19, 21, 22, 23, 25. In Table 3, Response of science teachers on the “Utilization” of Educational technology items in the secondary schools, column 5 and 6, science teachers indicated “NO” for some Educational technology items on Utilization which include numbers 1, 3, 4, 5, 6, 8, 9, 10, 11, 19, 21, 22, 23, 25, as seen in table 3.

Discussion of Result

The discussion of the result was based on three headings namely Awareness, Application and Utilization.

Result in Table 1, shows that the awareness of the existence of Education Technology (ET) items in the Secondary Schools as listed, majority of the science teachers indicated their awareness of the existence for all the Educational Technology items listed. The “soft wares, computer set and tablets, internet facility, telephone and mobile phones, computer printer, video cassettes had the highest number of awareness (100%) and the least is the multipurpose projector (30%). Awareness does not depend on the knowledge of the operations and use of the educational technology items. From the result shown in Table 1, the result of the study indicated that science teachers were aware of the existence of (ET) items as teaching and learning materials in secondary school. What is the extent of awareness? Chemistry teachers may claim from their responses that they are aware of the existence of Educational technologies which are novel instructional strategies they are not aware of, they do not apply them during chemistry instruction. These findings are in agreement with the findings of Njoku (2004), Onyejegbu (2004), Nzewi and Osisima, (1997). This shows that chemistry teachers are not aware of some of the innovative instructional strategies and so chemistry teachers do not apply educational technologies during instruction.

Result in Table 2, What is the extent of application of the Educational technology by chemistry teachers. The importance of teaching chemistry and its application cannot be over emphasized. It shows that only about fifteen items were applied. Telephone and mobile phones (100%) had the highest application and

multipurpose projector had the least application by science teachers of zero. The percentage score for these items indicate poor usage of educational technology items. Science teachers were able to indicate that the Educational Technology (ET) items were not applied. Chemistry teachers need to display passion and enthusiasm for teaching and demonstrate positive emotion and attitude about the subject and carry students along, ensuring that they participate actively by use of hands-on and minds-on activities. Onwuka (2014) stated that educational technology materials do not achieve any of the attributed values on their own, their usefulness depends on what the students and teacher makes out of them. Intelligent handling of these materials in the classroom is necessary.

A research conducted by Nwosu (2011) indicated that there is little utilization of educational technology materials by teachers during the process of teaching and the improvised local substitutes are rarely used in teaching. The utilization of educational technologies tools by students and teachers should therefore be highly encouraged for effective teaching and learning process.

In Table 3, Utilization is the act of using methods and resources for learning (Echendu, 2006) During utilization the teacher applies the principles of selection and use of materials to choose instructional materials that are relevant and appropriate for the learners and the topic...Telephone and mobile phones had the highest percentage score (100%) on utilization, while so many educational technology items had zero on utilization indicating poor access to those items. From the result shown in Table 3, the findings of the study based on the utilization, the teachers were able to use about nine items. Science teacher’s utilization of Educational Technology (ET) is poor because science teachers do not have access to them. The result is in line with the study of Omiko (2015) that revealed lack of fund, inadequate computers. Internet facilities and motivations as challenges faced by teachers in the use of educational technology in teaching chemistry.

The use of educational technologies creates a powerful learning environment and it transforms the learning and teaching processes in which students deal with knowledge in active, self-directed and constructive ways (Achuonye, 2012). Education has taken a significant overhauling with technological advances coming our way. Gadgets, like laptops, iPod, mobile phones, iPhone and others are taking the place of textbooks and libraries. It is therefore imperative that

teachers update their online skills so as to reach their students and get them interested in improving their academic performances (Emilia,2015). The use of educational technologies has changed the conventional ways of learning and proposes the need to rethink education in terms of a more current context (White, 2010). Guzel (2011), also concluded that the effectiveness of the use of computer through the teaching process has contributed to the teaching of chemistry. Therefore, there is the need for the chemistry teachers and students to familiarize and acquaint themselves with educational technology tools to enhance effective teaching and learning of the subject.

Recommendation

The researchers, do recommend that science teachers need a high level of awareness, application and utilization of educational technology for effective teaching and learning of chemistry concepts to students.

Conclusion

The awareness, application and utilization of educational technology items should be encouraged for effective teaching and better stimulation and understanding of students taught by the science teachers. Educational technology items literacy is a valued possession in the world. Efforts should be made by the science teachers to be educational technology items literate.

References

- Achuonye, K A (2012) Stakeholders' perception of ICT impact on higher education in Rivers State, Nigeria.. *Asian Journal of Education and E-Learning*, 2(4), 76 -81.
- Acril. Journal. Org.>winter (2015)
- Ahiakwo, D.F., (2003). The use of computer system in information and communication technology: implications for science teaching. *STAN Proceedings*, PP 116-118
- Anaekwe, M.C., (2003). Identification of some information and communications technology (ICT) enhancing skills of pupils needed for sustainable Science, Technology and Mathematics (STM) Education. *STAN proceedings*, PP 18-20.
- Emilia, I .B, (2015). "Utilization of ICT in teaching chemistry, the case of Eastern Samar State University". *International Journal of Current Research*, 7 (8), 19199 – 19201.
- Guzel, H (2011) Factors affecting computer usage of Mathematics working at the private training center. *The Journal of Educational Technology* 12 (2), 34-42.
- Mallon, M. and Bernstein, S (2015). Collaborative Learning Technologies, *acrl.ala.org*> winter 2015
- Nzewi, U. M. and Osisioma . N (1997), *A review of instructional strategies for science teaching in effective teaching the Nigerian perspectives*. Chidolue M. E and Anadi, C. C (ed) . 126- 133, Onitsha: Meks Publishers.
- Nwoji, I . H.N(2016), *Science, Technology and Mathematics Teachers' Awareness of Communication Technology (CT): Implication for Secondary School Education*, *STAN Proceedings*, PP 38- 41
- Nwosu, P. O.(2009), *Understanding African's intercultural conceptualizations of intercultural competence*. *The SAGE handbook of intercultural competence*, 158- 178.
- Okonkwo, I. G A (2012), *Effects of concept mapping and simulating- game teaching strategies On students' achievement and interest i environmental concepts in chemistry*. An (unpublished Ph. Thesis), *Department of Science Education, Nsukka, of Nigeria, Enugu State*.
- Okoyeefi, Q . O & Nzewi, U. M (2013), Effect of four mode applicatio instructional model on students' achievement and interest in Basic Science. 54th Annual Conference Proceedings of Science Teachers Association of Nigeria. 54, 167-176. 2015..
- Omiko, A. (2015). Impact of instructional scaffolding on student achievement in chemistry in secondary schools in Ebony State of Nigeria. *International journal of Education, Learning and Development (IJELD)*, 4 (3), 1- 11,
- Onyegegbu, N. (2004), Usage of science education findings by practicing biology teachers: lesson and conversations. 45th Annual conference proceedings of Science Teacher Association of Nigeria (STAN) 124-127
- White, K . G. (2010). *Beyond the Horseless Carriage: Harnessing the Potential of ICT in Education and Training*. Retrieved from: <http://works.bepress.com/gerry~white/11/>.