

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development



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ABSTRACT: The integration of ICT in secondary school curriculum has been widely advocated as much needed in the 21st century skills to improve the standard of education. However, this can be promoted through acquiring ICT skills in several ways such as software development, programming, networking, web design, cloud computing, Augmented Virtual Reality (AVR), Internet-of-Things (IoT), and artificial intelligence (AI) are effectively leading tools and ICT environments to help worldwide leadership, facilitators, and learners with quick, effective, and healthy interaction towards a sustainable development. This study investigated the principals' integration of ICT in curriculum implementation for sustainable development. The respondents of the study consisted of 263 principals in public secondary schools in Anambra State. The study used descriptive survey design. The findings of the study revealed among others that lack of modern ICT facilities, poor internet network, poor maintenance culture, budgetary constrain of ICT personnel are the challenges. Based on the findings, it was recommended among others that Government should equip schools with ICT facilities, provides fund for training of ICT personnel for sustainable development.

KEYWORDS: ICT Integration, curriculum implementation and sustainable development

INTRODUCTION

Globalization and rapid changes in technology have created a knowledge based economy in the 21st Century. Consequently, governments have invested in the integration of ICT in education at all levels to equip the learners with what are needed for sustainable development (Wambiri and Ndani, 2016). In furtherance, Information and Communication Technologies (ICTs), which include radio and television, as well as newer digital technologies such as computers and the internet have been touted as potentially powerfully enabling tools for educational change and sustainable development. When used appropriately, different ICTs are said to have helped expand access to sustainable development. Strengthening the relevance of ICT in education; organization (both private and public sectors) will lead to the success of achieving goals and objectives for self-reliance.

According to Blurton (2018), Information and Communication Technologies (ICT) can be defined as a "device set of technological tools and resources used to communicate, to create, disseminate, store, and manage information". In agreement with the above, International Institute for Sustainable Development (2007) added these technologies to include computers, the internet, broadcasting technologies (radio and television), and telephone. Also, the term ICT refers to: information channels such as the World Wide Web, online database, electronic documents, management and accounting systems, intranet, etc. communication channels such as e-mail, electronic discussion groups, electronic conferences, the use of cell phones, etc. hardware and software used to generate, prepare, transmit, and store data, such as computers, radio, TV, computer programmes/tools etc. All these technologies, when applied into the curriculum implementation in schools will enhance sustainable development.

Sustainable development according to Ayodele (2007) can be broadly defined as the ability of the economy to support the needs of the people of a country over a time, taking into consideration the economic, social and ecological constraints of the country. The fundamental concept is "sustainable requirement," namely that the fulfillment of the needs of the present generation should not compromise the ability of future generations to meet their own needs. Explaining further, ICT for sustainable development on the other hand represents a catalytic process for social change that seeks to foster through education training and public awareness-the values, behaviours and lifestyles required for sustainable future. It is about learning needed to maintain and improve our quality of life of generations to come. Also, it is about individuals, communities, groups, business and government to live and act sustainably; as well as giving them an understanding of the environmental factor, good moral behaviours, economic and cultural issues involved.

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development

It becomes obvious that principals cannot adequately apply ICT in curriculum implementation without considering teachers' perception on the integration of ICT in the classroom. On this note, Wambiri and Ndani (2016) argued that what teachers think about the use of technology affect their acceptance and subsequent integration in their teaching and learning activities in the classroom. In addition, Weiss and Barth (2019), opined that curriculum is mostly perceived as an educational project that is developed in a specific historical, social and political context and has the ability to form identities in the "knowledge," "action" and "self" area.

Nevertheless, Karmasin and Voci (2021) argued that ICT does not only play a central role in the transfer of knowledge and information or creating awareness on sustainability by placing it on the political and public agenda, rather it initiates a social change process towards a sustainable society and lifestyle, as ICT and behavior are interrelated, and behavior cannot change without proper communication. They further stated that sustainability ICT, therefore, faces the challenge of improving its information and knowledge sharing process, as well as linking the idea of sustainability to different educational levels. This could be done by initiating and establishing ICT process on what kind of values should lead societal development and, therefore, encourage and stimulate teachers' engagement.

Similarly, Hwang, Yang and Kim (2010) added that since digital literacy is considered as an important skill to cope with the 21st century for sustainable development, the teacher is a crucial player in the successful ICT curriculum implementation in the classroom and should be well prepared through adequate training. Thus, the vision of the basic education curriculum reforms is to equip learners with world class standards and skills needed to thrive in the 21st Century such as digital literacy. To achieve this, the integration of ICT in the curriculum implementation by the principal becomes a paramount.

The Education for Sustainable Development of student entails that students competence framework be based on generic and disciplinary competences structured along five clusters which should be used as a guide for curriculum design (Makrakis, 2012). Transformative learning focuses on learning-based change that involves 'learning to know', 'learning to do', 'learning to live together' and 'learning to be'. It is a shift of consciousness that alters: our way of being in the world (learning to be), our way for discovering others by discovering ourselves (learning to live together), our way of learning how to learn as well as acquiring, constructing, disseminating and managing knowledge (learning to know) and our way of putting knowledge into action (learning to do). It is above all learning that "transforms problematic frames of references – sets of fixed assumptions and expectations – to make them more inclusive, discriminating, open reflective and emotionally able to change" Learning to transform oneself and society has been added by UNESCO as a fifth pillar of learning along with the previous four pillars advocated sustainable development.

Furthermore, when principals integrate ICTs in the curriculum implementation, it can go a long way in transforming learning experiences, depending the considerable extent the curriculum is conceived and enacted through the processes of teaching and learning (Makrakis, 2012). Consequently, Tilbury (2011) argued that if principals are willing to make a meaningful contribution to sustainable development, such relevant ICTs have to be integrated in teaching content in school's curricula, as teaching together with the use of technology form the core of the learning experience. Traditionally, Etse and Ingley (2016) stated that curricula are more likely formulated to impart specific knowledge than to convey knowledge and skills that contribute to designing a sustainable development. Thus, Garraway, (2010) noted curricula should be designed in such a way that both academic and work-related knowledge is considered and the requirements of both areas are adequately met. Also, Mintz and Tal (2013) argued that one of the key challenges of the 21st century sustainability needs is to find a place in curricula of secondary education, namely not only within the field of environmental sciences or those disciplines included in the area of sustainability sciences but rather has to be integrated into all fields of study and be made accessible to all students.

Accordingly, it is of fundamental relevance to impart basic knowledge of sustainability to secondary students and raise their awareness about their crucial role as ICT professionals in relation to communicating sustainability to achieve sustainable development so that they can take responsibility in their duty. Similarly, Ordieres-Mere et al (2020) stated that if ICT is understood as a core dynamic of social behavior and take into account the importance of communication in the attempts to achieve attitude and behavioral change, as well as to convey inconvenient truths, then the investigation of how ICT is integrated into the curriculum implementation should be seen as essential. When ICT is integrated in the curriculum implementation in secondary schools, it will bring about digital changes which are one of the fundamental driving forces behind social change. Thus, change toward sustainable development is only achievable if both risks and opportunities, as well the dynamics of digitization are brought into harmony with the SDGs of the 2030 Agenda.

On the other hand, digitization as a driver for societal changes, potentially carries strong disruptive power. Therefore, if digitization is not designed, structured appropriately in the school curriculum, in line with the SDGs and the principles of sustainability not handled with caution and innovativeness, it could exacerbate existing problems in society, such as inequalities related to the digital divide and even multiply the alarming trends of a degraded social cohesion. Accordingly, courses and lectures

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development

dealing with issues of sustainability have the potential not only to convey relevant sustainability-related knowledge, but they also create a basis of knowledge and understanding of and for its concepts and principles, which students can apply in their later professional fields (Etse and Ingley 2016). Thus, both the demand for a curricula reorientation and the examination of the extent of such restructuring are essential in schools. The principal has major responsibility, though critical for initiating and implementing integration of ICT in the curriculum, to facilitate simple to complex decisions about its integration with real practice of learning and teaching, which effectively can improve and change the school system.

Consequently, there are many challenges that could hinder principals integration of ICT in curriculum implementation, like Wi-Fi connectivity, security and privacy of data of students or school's infrastructure, IT equipment and devices, cost, professional ethics, quality of digital courses and delivery modes such as audio video, and the necessary fundamental and advanced training of teachers (Dwivedi and Joshi 2019). Thus, transformation and survival of personal to professional life has become dependent on ICT and the digital environment, such as, health, sports, tourism, research, entrepreneurship, transportation, fashion, entertainment, automobile industry and education. In as much as the integration of ICT in the curriculum implementation could be hindered by some factors, the advantages according to Weinstein and Hernández (2015) supersede those factors in that ICT integration in the curriculum will stimulate the students' critical thinking, problem solving, collaborative communication skills and synthesizing reliable information, and creating valuable cognitive ability that motivates social and individual sustainable productive progress in schools. Would principals' integration of ICT in the curriculum implementation not be a panacea for sustainable development?

Purpose of the study

1. To investigate principals' computer operational skills for integrating ICT in the curriculum implementation in public secondary schools in Anambra State.
2. To identify principals' networking skills in the ICT integration in the curriculum implementation in the public secondary schools in Anambra State.
3. To investigate the principals' ICT safety skills in ICT integration in the curriculum implementation in public secondary schools in Anambra State.

Research questions

1. What are the principals' computer operational skills for sustainable development in public secondary schools in Anambra State.
2. What are the principals' networking skills for sustainable development in public secondary schools in Anambra State.
3. What are the principals ICT safety skills for sustainable development in public secondary school in Anambra State.

Hypotheses

- Principals of public secondary schools do not differ in their computer operational skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.
- Principals of public secondary schools do not differ in their social networking skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.
- Principals of public secondary schools do not differ in their ICT safety skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.

METHODS

The research design was a descriptive survey research design. The sample size was 263 teachers in the public secondary schools in Anambra State. The instrument for data collection was a questionnaire titled "Principals' Integration of Information and Communication Technology Questionnaire (PIICTQ)" which was a 4 points rating scale of 'Strongly Agree', 'Agree', Disagree, Strongly Disagree. The data collected were analyzed using mean and standard deviation and t-test for testing the null hypotheses. The decision rule for the research questions is that mean rating of 2.50 and above was taken as 'Agree', while below 2.50 was taken to indicate 'Disagree'. The decision rule is if the p-value is equal or greater than the level of significance 0.05, the difference was adjudged not to be significant and then the null hypothesis was not rejected. On the other hand, if the p-value is less than 0.05 level of significance, the difference was adjudged to be significant and null hypothesis was rejected.

Presentation and data analysis

The results are presented in the following tables in relation with the research questions and hypotheses.

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development

Research Question One: What are the principals' computer operational skills for sustainable development in public secondary schools in Anambra State.

Table 1: Mean ratings on Principal's computer operational skills for sustainable development in public secondary schools in Anambra State.

S/N	Item	Mean	SD	Decision
1	Installing an application	3.28	0.89	Agree
2	Connecting scanner	3.60	0.59	Agree
3	Inserting and ejecting external storage devices	3.64	0.56	Agree
4	Using computer aided design	2.12	1.02	Disagree
5	Copying from hard disk to external storage drives	2.37	1.15	Disagree
6	Using word processors	3.21	1.12	Agree

Criterion mean= 2.5

Grand Mean = 3.03

From table 1, item 1, item 2, item 3, and item 6 have a mean above the criterion mean hence agree from the respondents response and item 4 , item 6 were disagree by respondents because its mean is below the criterion mean. Therefore, the Grand Mean is 3.03 shows that principals of public schools in Anambra State have Good knowledge of computer skills which will enhanced sustainable development in public schools.

Research Question 2: What are the principals' networking skills for sustainable development in public secondary schools in Anambra State.

Table 2: Summary of Principal's networking skills for sustainable development in public secondary schools in Anambra State.

S/N	Item	Mean	SD	Decision
7	Choosing a suitable connection method to access the internet	3.03	1.09	Agree
8	Creating e-mail account for exchanging information with others	2.34	1.23	Disagree
9	Downloading and saving data	2.23	1.21	Disagree
10	Purchasing materials online	1.43	0.71	Disagree
11	Customizing browser settings to improve performance	1.35	0.65	Disagree
12	Creating website's and publishing material on the web	2.95	1.06	Agree
13	Selecting suitable hardware and software for different network	1.39	0.49	Disagree

Criterion Mean: 2.5

Grand Mean: 2.10

From table 2, items 8, 9, 10, 11, and 13 indicated disagreed, because their mean is below the criterion mean and only items 7 and 12 were agreed because its mean is above the criterion mean. Therefore, the Grand Mean which is 2.10 shows that principals of public schools has no networking skills for sustainable development of public secondary schools in Anambra State .

Research Question 3: What are the principals ICT safety skills for sustainable development in public secondary school in Anambra State.

Table 3: Summary of the Principal's ICT safety skills for sustainable development in public secondary schools in Anambra State.

S)N	Item	Mean	SD	Decision
14	Blocking students access to irrelevant websites and materials	2.93	1.10	Agree
15	Preventing unauthorized network connections being created	3.19	0.92	Agree
16	Preventing opportunities for online abuse and exploitation	2.95	0.92	Agree
17	Guarding against digital theft and plagiarism	2.14	0.99	Disagree
18	Identifying inappropriate online contact	2.63	1.14	Agree
19	Changing private settings to protect personal information online	3.11	0.95	Agree
20	Using antivirus to protect computer from network attacks	2.00	0.98	Disagree

Criterion Mean: 2.5

Grand Mean: 2.77

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development

From table 3: items 14, 15, 16, 18 and 19 indicated agreed because its mean is above the criterion mean while items 17 and 20 were disagreed. Therefore the Grand Mean which is 2.77 shows that principals of public secondary schools in Anambra State are very conscious of the ICT safety skills.

Hypothesis One

H0: There was no significant difference on the responses of teachers on principals' computer operational skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.

Table 4: t-test results of respondents on the response of teachers on Principals' computer operational skills on ICT integration.

N	STD	df	p	t-cal	t-crit	Decision
263	0,88	262	0.05	0.037	1.965	Accept null hypothesis

From table 4, the null hypothesis was tested using t-test for the mean of a population. The result showed that t calculated is less than critical T- value when tested at 0.05 alpha level at 262 degree of freedom. Hence we accept the null hypothesis that there was no significant difference on the responses of teachers on principals' computer operational skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.

Hypothesis two:

H0: There was no significance difference on the responses of teachers on the principals' networking skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.

Table 5: t-test results on respondents of teachers on the principals networking skills on ICT integration in the curriculum.

N	STD	df	p	t-cal	t-crit	Decision
263	0.92	262	0.05	-0.03	1.965	Accept null hypothesis

Since the t calculated is less than critical t-value, we accept the null hypothesis that there was no significant difference on the response of teachers on the Principals networking skills on ICT integration in the curriculum.

Hypotheses three:

H0: There was no significance difference on the responses of teachers on Principals' ICT safety skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State.

Table 6: t test results of teachers on Principals ICT safety skills on ICT integration.

N	STD	df	p	t-cal	t-crit	Decision
263	0.92	262	0.05	-0.03	1.965	Accept null hypothesis

Therefore from table 6, the t calculated is less than critical t-value we accept the null hypothesis that there was no significance difference on the response of teachers on Principals ICT safety skills on ICT integration in the curriculum implementation.

DISCUSSION OF RESULTS

The grand mean of 3.03 on table 1 indicated that principals of public schools in Anambra State have good knowledge of computer skills which will enhanced sustainable development in public schools. This points to the fact that more awareness needs to be created on the acquisition of ICT skills by the public secondary school principals. From research hypothesis one, the t test calculated is 0.037, and the t test critical value is 1.965 at 5% level of significance. Since the t test calculated is less than t-test table, we accept the null hypothesis. This finding concurs with the study of Toomey, (2001) whose results indicated that ICT leadership of school principals is the critical element in establishing technology as a part of school culture.

Table 2 with the grand mean of 2.10 also demonstrates that principals of public secondary schools has little or no networking skills for sustainable development. This could as a result of some factors like, lack of interest, inadequate facilities, high cost of ICT. This corroborates with the findings of Adomi and Kpangban (2010) which reported that poor perception, high cost of ICT facilities among administrators are cause for low ICT usage in schools. Therefore, it is necessary that this knowledge gap be filled to achieve the goals of sustainability. From research hypothesis, the t -test calculated at -0.03 is less than t -test critical value which is 1.965 at 5% level of significance. Therefore we accept the null hypothesis based on the responses of principals on the principals' networking skills on ICT integration in the curriculum implementation in public secondary schools in Anambra State is not significant.

Principals' Integration of ICT in Curriculum Implementation for Sustainable Development

Table 3 with grand mean of 2.77, items 14, 15, 16, 18 and 19 indicated agreed because its mean is above the criterion mean while items 17 and 20 indicated disagreed. In testing the hypothesis, the t- test calculated is 0.017 and the t- test critical value is 1.965 at 5 % level of significance. Therefore we accept the null hypothesis.

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