

Curriculum Crisis in ICT and its Impact on Sustainable Science Education, Research and Innovations in Nigeria

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ABSTRACT

Globally, Information and Communication Technology (ICT) curriculum is significant in realising sustainable science education. Despite this laudable global impact, curriculum crisis in ICT have plagued sustainable science education in Nigeria. The Unified Theory of Acceptance and Use of Technology (UTAUT) was adopted as the conceptual framework in this study. UTAUT model claims that the benefits of using technology and the factors that drive users' decision to use it, is what determines users' acceptance behaviour. The authors explored a narrative review, analysis, and synthesis of vast works of literature that revealed significant information on impact of curriculum Crisis in ICT on sustainable science education in Nigeria. The authors also used some keywords such as "Curriculum Crisis in ICT", "ICT curriculum Crisis effect on science education", and so on, to extract peer-reviewed articles within the last five years. Results revealed that inclusion of good ICT curriculum design, policies, guidelines, equipment, motivations, high speed internet, etc., may leverage curriculum crisis in ICT. Results from this study may positively impact research and innovations in Nigerian following the absence of curriculum crisis in ICT resulting from inclusion of ICT policies, laws, guidelines.

Keywords: Curriculum crisis in ICT, ICT, ICT policies, Research and innovations, Science education

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1. INTRODUCTION

Curriculum can be understood as what should be learnt in school, combined with the technological innovations or human and non-human structures which have to be inaugurated for this learning to take place, in relation to the cultural and sociocultural agreement about what should be learned in schools. The global presence of Information Communication Technology (ICT) and its adoption complexities has rendered curriculum rather an ambiguous term because of its nature (Akpınar, Batdı, Özeren, & Kirilmazkaya, 2017). The inability of curriculum to reflect the typical modern examples of Information Age and its dominant Phenomenon, further exemplifies ineffective adoption of ICT as enablers of curriculum (Wachter & Barrio, 2012; Yayeh, 2017), thereby resulting in even greater ambiguity on education, generally referred to as curriculum crisis (Akpınar, *et al.*, 2017). Curriculum is not synonymous with study plans organized around disciplines (Tedesco, Operti, & Amadio, 2014), but seen as socio-political and cultural constructions interwoven with theories and practical in the field's ability to enlighten stakeholders about what should happen in schools in relation to the values and narratives which will be handed present learners and the subsequent generation (Tedesco, *et al.*, 2014; Young, 2013; Young & Muller, 2010).

What is trending in our educational system currently has been referred to curriculum crisis because there is a serious gap between governments' curriculum structures, values, and policies and the actual practice or implementation of curriculum by curriculum stakeholders or scholars in terms of the difficulties or inability of the field to notify or convey social dialogues about what should occur in schools. Wraga and Hlebowitsh (2003), found out that curriculum crisis, results from the fact that curriculum studies have become too theoretical, speculative, or hypothetical, thereby distancing themselves from concerns of fact or practical challenges in schools. Curriculum crisis has resulted because there are more manifestations of theoretical commitment to curriculum than practical engagement in relation to the technological inventions that drive the curriculum (Garcia-Huidobro, 2017; Menon, Chandrasekhar, Kosztin, & Steinhoff, 2020). Tedesco, *et al.* (2014), suggest that crisis in curriculum are increasing complexities in the curriculum implementation leading to the fact that many students or communities are living in a culture or sociocultural environments that are often contradictory or alien to the globalized modern technological innovations that drive the curriculum, resulting in stakeholders paying attention more to the theory or knowledge-centred aspect of the curriculum.

Globally, there are a lot of excellent practices that show that sustainable ICT drives science education and positively research innovations for tertiary education (Domenico, 2012). ICT can be simply defined as the physical devices and infrastructures used for the collection, storage, processing, and disseminating of all forms and formats of data and information, and the prerequisite platforms or means for the transmission and disseminating of same (Oladimeji & Foltyn, 2018; Olise, 2010). Sustainable ICT is of significant importance in realising or attaining sustainable research innovation for national economic growth in Nigeria, and an influential enablers and pedagogical tools for propagating knowledge and information for research and innovations generally. This inability to comprehend or adopt the technological innovations that drive the curriculum, resulted in a state of ICT curriculum theorizing which can also be perceived as or interpreted as a curriculum crisis in ICT since it created controversies in areas of determining appropriate ICT curriculum that should be implemented in schools (IBO, 2014; IBO, 2016; Lin, 2012).

Technology, though complex and modern, has become enablers of enablers (Laureate Education (Producer), 2012f), making design and implementation of curriculum to depend extensively on technology. These technologies are enabled in a complex interconnectivity platform that seemingly opened up avenues for curriculum crisis that comes from all aspects of the educational systems: stakeholders, teachers, students, and others that even come from within the system. Granted that implementation of curriculum in schools are leveraged by effective adoption of ICT, it is important to understand and get better sense of what curriculum and technology were meant for, and try to focus on the psychology of their design and use rather than on the technical details of how they work or what they are designed to do. Sustainability of curriculum implementation or efficiency is all about psychology, not technology (Cottrell, 2016). Effective curriculum implementation does not end in the design and what it does alone, but in comprehending of the psychology of their design, use, the user problems, and affective adoption of ICT: the policy that drives curriculum productivity and its sustainability. Even self-driving cars won't work until we change our roads and attitudes. When the United States wanted to launch the first humans on the moon, they did not just get the technology; they understood both the technology and the problem. Educationist should not only understand curriculum, but also the curriculum platform enablers or driver. Here lies the curriculum crisis in ICT. According to Rahman and Badayai (2012), class performance in all facets of life, in this ubiquitous technological age, must refer to the appropriate use and adoption of ICT, as well as to the understanding of ICTs as key enablers of curriculum in the effort to reduce curriculum crisis in ICT and its impact on sustainable science education, research and innovation especially in an ageing society.

1.1. Problem Statement

Sustainable curriculum for sustainable science education for research innovations in tertiary education is ICT driven and can only be meaningful when it aligns with the ICT policies, rules, goals and values in a sustainable manner. Our purpose in this study was to identify why curriculum studies have manifested more of theoretical commitment than practical engagement in relation to the technological innovations that

drive them, thereby resulting in curriculum crisis. The general IT problem postulated in this study was the poor practical engagement of curriculum majorly due to the fact that socio-political and cultural background of learners are not effectively interwoven with theories and practical in the field's ability to inform learners and stakeholders. The specific IT problem is that some curriculum and ICT strategies, policies, laws, guidelines and value system on the adoption and sustainability of ICT required to drive curriculum, do not effectively interweave socio-political and cultural constructions with theories and practical in the field's ability to enlighten stakeholders about what should happen in schools for sustainable science education and research innovation in Nigeria.

2. Literature Review

Sustainable curriculum for sustainable science education and research innovation is far-fetched in Nigeria because ICT that drives curriculum is not adequately valued, adopted or used in a manner that can interweave curriculum theory and practice. This is because it takes sustainable ICT to achieve sustainable curriculum for sustainable science education and research innovations (Marangunic & Granic, 2015). The value, adoption, and use of ICT are measured by its sustainability. Users are encouraged to use ICT based on their perceived level of trust, perceived ease of use and easy-to-use (Aguboshim & Miles, 2019). Failure to value and use ICTs can destabilise even the robust curriculum plans, because what contributes to non-sustainable ICT innovations has proven to cause or be related to non-sustainable curriculum for science education (Peiris, Kulkarni, & Mawatha, 2015). Sustainable ICT technological innovations have significant importance in leveraging sustainable curriculum for sustainable science education (Bennett, 2017).

Several researchers believe that the field of curriculum studies especially in ICT is in a crisis (Hoadley, 2015; Tahirsylaj, 2017; Wheelahan, 2015; Young, 2013). A major sign of this crisis is the distance between the field's analyses and increasingly strong government curricular interventions based on results. Hoadley (2015) saw curriculum crisis as consequence of how teachers view education that resulted in teachers stressing on how they teach at the expense of a theoretical conception of what is being taught. Contributing, Young (2013) opined that curriculum crisis is due to the field's loss of its object of study: knowledge that should be imparted and learned in schools. Contributing, Tahirsylaj (2017) posited that critical theories have driven the field to issues of power and culture to the extreme that knowledge has been confused with students' daily experiences. Wheelahan (2015), agreeing with Tahirsylaj, opined that curriculum studies lacked what constitutes powerful knowledge in teaching and learning, and has created educational gap in practical based learning. Another reason for the vagueness of curriculum is the period it is dealt and its philosophy. Curriculum is affected by political, social, scientific and technological developments and changes, hence differ in the way it handles human, its epistemological approach, and school type and level. Tedesco *et al.* (2014) added that we have lost capacity for the required democratic discourses about curricular matters. Generally, these analyses indicated that the supposed crisis has technical, ideological, and political aspects.

Researchers have identified major key causes of curriculum crisis in ICT as unsuitable use and adoption of ICT, as well as misunderstanding of ICTs as key enablers of curriculum that resulted in ineffective interweaving of socio-political and cultural constructions with theories and practical in the field's ability to effectively inform stakeholders about what should happen in schools (Hill, Overton, & Thompson, 2019; McClellan, 2020; Melese, Tadege, & Agosto, 2019). The idea about curriculum is so ambiguous in terms of meaning, definition and content, and as such, has the potential to lead to a crisis in practice (Akpinar, et al., 2017; Baker, 2015). Curriculum crisis results from the fact that curriculum studies have become too theoretical, speculative, or hypothetical, thereby avoiding emotional involvement of the fact or practical challenges in schools (Cho, 2019; Melese, et al., 2019). Garcia-Huidobro (2017) claimed that there are more appearances of theoretical commitment to curriculum than practical engagement, especially in relation to the technology that drives the curriculum. This is because, debatably, some teachers are applying this official document called curriculum which they cannot make sense of. We have observed in some tertiary institutions where an accountant or a biologist is allowed to teach computer science simply because he or she has taken a few computer electives while in the university. This is one of the major indicators of curriculum crisis in schools, where curriculum problems and solutions are "translocation" from curriculum specialist to experts of other fields or disciplines, a term referred to as *Flight of the field* (Akpinar, et al., 2017; Odey & Opoh, 2015). This issue can only be elucidated in practice "... only if curriculum energies are in enormous part diverted from theoretic pursuits ... to three other modes of operation ... the *practical*, the *quasi-practical*, and the *eclectic*" (Schwab, 1978a, p. 287).

Other indicators or signs of curriculum crisis occasioned from the fact that there is little or no involvement of subject area professionals in the design of the curriculum, thereby leading to a retreat of curriculum experts to "the role of observer, interpreter, historian, commentator and critic of contribution of others to the field" (Schwab, 1978b, p. 301). Additionally, ICTs have expanded the cause and meaning of curriculum crisis (Tahirsylaj, 2019), in the sense that ICTs have made education independent from time and place constraints (Friesen, 2020; Hill, et al., 2019). The depth of knowledge and understanding gained from same curriculum is now a function of teachers' adoption, usage, and perceived usefulness of technological innovations in that community or environment. Information age curriculum is not standard anymore, since ICT has made curriculum closer to postmodernism which is a paradigm of Information Age. Although there are varied and extended perceptions of curriculum crisis, researchers have quite different understandings of it, notably based on contradiction regarding globalized modern culture (Deng, 2018; Melese, et al., 2019).

2.1. Conceptual Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh, Morris, Davis, & Davis (2003) was adopted as the conceptual framework for this study. UTAUT model claims that the benefits of using technology and the factors that drive users' decision to use it, is what determines users' acceptance behaviour. The theory considers factors: user adoption behaviour toward intention

to use ICT, and users' usage behaviour of ICT. Both user adoption and usage of ICT are affected by four constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC), and four moderators: gender, age, experience and voluntariness of use. UTAUT model in recent times has been widely adopted (Oye, Alahad, & Abraham, 2014). UTAUT was adopted as our theoretical foundation to study curriculum crisis in ICT, and its impact on sustainable science education for sustainable research and innovations.

2.2. Enablers of Curriculum in the Technological Age (CTA).

Two major enablers of CTA are sustainable information and communication technology (ICT), and sustainable research and library database repository. ICT can be simply defined as the physical devices and infrastructures used for the collection, storage, processing, and propagating of all forms and formats of data and information, and the required platforms or means for the transmission and disseminating of same (Oladimeji & Foltyn, 2018; Olise, 2010). Sustainable ICT is what defines sustainable research and library database repository (Oladimeji & Foltyn, 2018), and occupies a substantial key position in leveraging sustainable curriculum.

A significant association exists between sustainable ICT and sustainable research and library database repository (Bennett, 2017). Also, Sustainable ICT operations, and standards with appropriate databases are required to implement curriculum studies. Sustainable science education is a function of its level of sustainable adoption of ICT policies, ethics and values (Hoffman, Singh, & Prakash, 2015). Where Sustainable ICT, availability, operations, and standards with appropriate databases required to implement sustainable research database repository, are not in place, sustainable curriculum studies will be farfetched. This is why effective curriculum studies is next to zero in Nigeria, resulting in curriculum crisis, because ICT technological innovations, as enablers of sustainable research database repository and curriculum studies ethics, values, and policies are not respectfully adopted. The value placed on any technological innovation is measured by its adoption, embedded ethics, values, acceptance, and sustainability (Hoffman, et al., 2015). Sustainable ICT, therefore, plays an important role in sustainable research database repository and curriculum studies implementation (Oladimeji & Foltyn, 2018). This is because ICT is a major enabler of sustainable research database repository and curriculum studies (Toyo & Ejedafiru, 2016).

3. Methodology

We adopted a narrative review methodology, where analysis and synthesis of related and different research findings are required to draw holistic interpretations or conclusions based on the reviewers' own experience, existing theories and models (Hill & Burrows, 2017). We also reviewed, analysed and synthesised prior research findings. A narrative study approach is best suited for a descriptive or explanatory study (Bell, 2017), where results from such narrative studies are of qualitative rather than quantitative in nature (Scarnato, 2017). Narrative studies exhibit significant strengths in that they have ability to provide platforms for comprehension of diverse and numerous understanding around scholarly research findings, and the

opportunity to make reflective practice and acknowledgement of researchers' views and knowledge (Scarnato, 2017). Methodological triangulation has been defined as the use of multiple sources of data to gain multiple perspectives, maximise reliability and validation of data and build coherent justification of data interpretation that relates to the study case or phenomenon (Durif-Bruckert, *et al.*, 2014). We also adopted methodological triangulation to certify the reliability and validity of data, and justification of interpretations from the reviews.

4. Data Collection

Professional and academic research findings that are relevant and related to our study were reviewed. Many of such findings came from the ProQuest databases, Science Direct, and peer-reviewed, and other related texts. We also used phrases as such as "Curriculum Crisis in ICT", "ICT curriculum Crisis effect on science education", and so on. Our reviews incorporated 44 references. Twenty (93%) of total references incorporated in the study are peer-reviewed, while (66%) are peer-reviewed journals that are within the last 5 years.

5. Conclusion and Recommendations

Based on the analysis, synthesis, and reflections this study, findings identified that a lot of researchers and scholars regarded the situation of curriculum studies as being in crisis on two major counts. First, curriculum studies has been reduced to development of study plans, without much need for theorising, the fact that these plans are increasingly perceived as outdated and not responding to today's needs notwithstanding. Second, curriculum studies have emphasised theory with no relevance to practical empowered within educational ICT curriculum ethics and policies. Sustainable and rigorous curriculum theorising is urgently needed; theorising that is close to teachers' concrete work and gives centrality both to offering access to powerful knowledge and to addressing identity issues, analysing the tensions lived by students, families, and teachers at the heart of sustainable ICT ethics, values, and policies. To minimise curriculum crisis, effort should be made to incorporate recent technological advancements in the relevant curriculum studies, first to make the curriculum relevant, and second to balance the theoretical expressions of the curriculum studies with practical challenges or engagement in school in relation to the technological innovations that drive the curriculum. Crisis in curriculum suggests that there are increasing complexities in the curriculum implementation resulting from the fact that students' culture or sociocultural environments often contradicts the globalized modern technological innovations that drive the curriculum, resulting in stakeholders paying attention more to the theory or knowledge-centred aspect of the curriculum.

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