Designing and Evaluating Learning Technology: An African Dilemma and Approach

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Abstract: This position paper is concerned with understanding, evaluating and designing technologies to support learning in African higher education. Its central focus is on epistemological and methodological issues and commitments – specifically whether stereotypical and established Western methodological approaches are suited for investigating African contexts. Considering various ideas about 'indigenous knowledge' and sensitivities, an eclectic approach is adopted and deployed. The resulting 'method' presented can be adopted by those interested in finding indigeneity in conventional forms of investigation, and those that wish to engage in having a rather eclectic standpoint in research. This perspective has important implications for those investigating 'technology acceptance and adoption' in Africa; the use and development of learning technologies and the idea of 'blended learning' and those considering 'post-colonial' computing.

1 INTRODUCTION

The field of Human-Computer Interaction (HCI) has demonstrated that technology design should be different for different environments, that an understanding of context is central to the design effort. Research has often attempted to develop an understanding of technology across cultures, and how it can be tailored to meeting the needs of different user groups. However, most of the technologies used in Africa might be considered alien - as they might fail to capture the life and sensitivities of an African person, his environment and his approaches and style of knowing. My research focuses on how to design learning technologies in an African context - specifically a Nigerian. This position paper presents the ideation process of my research and the research approaches, methods and analysis employed, notably the notion of blending conventional western methods and more indigenous approaches, and, thereby, contribute to the developing debate about epistemology and methodology in conducting research in technology and education. Whilst research methodology has long been an area of contention in HCI and educational research – for example Buscher's argument that we mostly attempt to use methods in understanding the world around us that are stationary, (in Buscher's forthcoming 'Changing Mobilities'), referred to as 'mobile imperialism' (in Ben-Ghiat and Hom, 2015). I am particularly interested in advancing an agenda that acknowledges and recognises some notion of 'indigenous knowledge' and its impact on how we conduct research and design, deploy and evaluate technology of all kinds, including educational technology.

2 MOTIVATION, PROBLEM STATEMENT, AND QUESTIONS

As an African studying in a former colonial state, there is some frustration in developing a specifically African understanding of the purpose of education, and its use of technology. My understanding is that, in Hoopers (2000) words, the African Voice of education is "the voice of wounded healers struggling against many odds to remember the past, engage with the present, and determine a future built on new foundations" (p. 1). In a modern world, technology, if implemented effectively, offers enormous potential and prospect for the improvement of education. So much of the debate around technology and education is based on the premise that technology is a catalyst to create change (Marshall, 2018) - change in the ways we teach and learn. Much attention has been given on the technology in Nigeria, rather than on its

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implication, on interaction, on engagement, on experience, and on the development of the knowledgeable individual, and thus conceals its education potential. Wa Thiong'o' noted, "I talk about the past mainly because I am interested in the present" (in Gray, 1985 p. 455). I am more concerned about what we are doing now- the present, and how we come to be here- the past, in moving towards a transnational future of using educational technologies in Nigerian higher education.

My research questions and direction for the research have been to develop a set of questions that consider, in a Nigerian context, what exactly might constitute education technologies design practices that will foster meaningful interaction, better engagement, and improve the learning experience in a blended learning environment.

3 IDEATION PROCESS AND BACKGROUND WORK: IS IT RELEVANT?

When I started my research, I was aware, but not curious enough to ask questions challenging the conventional methods and approaches I planned to use. After a literature search and ideation process, I came to ask myself the following questions: What worldview would frame the purpose of the study, the questions to ask, the methods of collecting data, analysis, and evaluation? Am I going to solemnly use Western constructs, or can I attempt to view what indigenous constructs can offer? Can I ensure the validity and credibility of my work and the conclusions I can draw by using western or indigenous standards? Or would be it be possible or ideal to integrate both standards? How can I bring about reflecting and reporting the contextual and cultural contingencies of an African community, and in which language? These questions were motivated by Hart's (2018) claim that "contemporary society is dominated by information rather than knowledge" (p. 20), and her emphasis that beginner researchers need to be critical and questioning when conducting research. As provoking as this seemed, I felt it was important to begin on such note.

Before looking at related work that has been done with regards to the general ideas of my work, I asked myself the simple question that most indigenous researchers ask; is the existing research literature and research methodologies the only way to inform or situate research?, or am I going to use other methods to justify what I consider worthy or rather problematic that needs investigation? The question might seem simple although daunting to argue further. However, I attempted to situate and inform my research by identifying a gap in the literature across the disciplines of Education Technology, Developmental Studies, and HCI, and also through brainstorming of my ideas with researchers at Lancaster (under the theme Value in computing, see Ferrario et al., 2017) and in Nigeria, and across a selected few researchers cutting across the areas of learning technology, African HCI, and indigenous researcher methodology. My initial ideas and research direction were altered after the initial fieldwork in that I discussed the direction of my work and engaged in some sort of dialogue with those that I believed are directly or indirectly working in these areas of research.

However, coming back to the notion of how to inform or situate my work based on the literature, I have carried out a substantive review of the literature across disciplines, namely social science, educational research, design, and HCI. The literature survey looked at notions of education in African, before and after colonization. I was interested in the historical narrative of Nigerian higher education institutions and how the use of technology has shifted the discourse of blended eLearning and mobile learning in Nigeria and the gap that exists in the literature, notably the notion of technology design and use and on why and how adoption and use needed to be enhanced. I was particularly interested in the applicability of indigenous and traditional knowledge (ITK) and relevance of ideas concerning post-colonial/de-colonial computing in technology design and in the need to advance the argument about culture and social norms as key indicators on how technology should be designed in an indigenous community; the general argument about the mismatch in developmental discourses and more importantly themes about Information Communication Technology for Development (ICT4D) (see. Unwin, 2009) and Human-Computer Interaction for Development (HCI4D) (see. Dell and Kumar, 2016).

The literature suggested that the future of education in Africa, specifically Nigeria, after colonization might be regarded as some variant of education elsewhere - either indigenous or colonial. Formally or informally, the rationale behind education or learning is to acquire knowledge, skills or values. Research has shifted our perception of the fact that what we see as education in Africa is in fact not African, but rather a reflection of Europe in Africa (Hopper, 2002; Van Wyk and Higgs, 2004). Pre-colonial, indigenous education in Africa is generally

ignored and silenced, due mainly to the positioning of it, by Eurocentric scholars, as irrelevant (Jagusah, 2001). Kay and Nystrom (1971) are of the opinion that education in post-colonial Africa ought to be a reflective activity, recapturing the past through critical analysis and selective use of some form of the well-suited pre-colonial form of education. Another popular view is that education in sub-Saharan Africa is misdirected or at a crossroad (Amukowa and Ayuya, 2013). Nowadays, technologies (i.e basic phones, computers, and smartphones) have been widely adopted in teaching and learning in Africa. The adage, "education is about moving to the unknown from the known", calls for the transformation of education with technology that is culturally and developmentally relevant to an African environment.

Within the African context, HCI and interaction design see technology in Africa mostly through the lens of development i.e. HCI4D. This is because most of the paradigms in these fields are based on western epistemology and methodologies (Winschiers-Theophilus and Bidwell, 2013). In recent years, the perception has shifted as Africa is becoming seen as a place where exciting innovations are pioneered e.g. M-PESA mobile payment and the pay-as-you-go model, and as an emerging market for technology, mostly mobile phones. This shift thus offers an ideal avenue for localizing design and research to fit into a cross-cultural context. This has been achieved by drawing inspiration from the notion of post-colonial computing (Irani et al., 2010; Philip et al., 2012), de-colonial computing (see Ali, 2006), and other developmental studies (i.e HCI4D). Stakeholders-Africans and non-Africans- have advocated for decades that development in Africa ought to be an African agenda, through a collection of local, specific, and ongoing concerns and practice of Africans e.g. (Bidwell, 2016; Winschiers-Theophilus and Bidwell, 2013).

From my discussions with the set of 'experts' identified, I came to gauge the relevance of my work with regards to education and technology in an African context. This reflection included the methodological dilemmas faced by researchers working in under-served, under-resourced, and under-represented communities, on how to judge the credibility of results and disseminate findings so as to bring changes to the communities, and on how it can advance the interest of a growing community i.e. African HCI. This might be considered as another way of situating one's work within the context of the community investigated and the research community with which one identifies. With regard to my initial research and methodological questions, in areas where there is a sense of marginalization or perhaps rejection of non-conventional approaches by the academic community, I am not suggesting that we inform our work based on our own idiosyncratic assumptions of a problem that needed investigation, but more of situating our work based on some sensitivity towards the context investigated even when the literature offers little with which to work.

So, the arguments that are yet to be fully explored are, does the innovation we see in African education fit into the context of creating a knowledgeable individual and thus developing Africa; and whether what we see as design and research practices of computing and related disciplines in Africa should be regarded as a local agenda or is it perhaps just another form of modern colonial imposition or phenomenon? These arguments call for the critical transformation of both what we see as education and technology and the ways we conduct research in Africa to be more indigenously rooted based on socio-cultural frameworks.

4 APPROACHES AND METHODS

In the anthropology of understanding, Edward Said's Orientalism (1979) demonstrates the ontological and epistemological distinction between the orient and the occident, how the world is constructed, understood and shaped by its inhabitants differently. Equally important is the idea that an understanding of the world, in its peculiarity and universality is constructed from the aesthetic viewpoint of the individual as an entity and as a whole. When one attempts to understand their physical, social, cultural, and spiritual world or that of others, one devises 'with', 'through', 'by means of' (Geertz, 1974 p.30) mechanisms, approaches, concepts, constructs, methodologies and methods. Due to the differences in knowing and how one comes to know, understanding might be regarded as significant from the viewpoint of the knower. On this premise, the research involves an interpretive and grounded approach (Glaser and Strauss, 2017). This pragmatic approach is informed by both indigenous African notions and empirical inquiries. It is a deliberately eclectic methodological approach, not committed to any specific methodology, western or indigenous, but more of identifying how different approaches and sensitivities will assist in bringing about "the qualitative richness of the phenomenon" (Boyatzis, 1998 p.41) investigated. Having a rather eclectic focus rather than 'decolonized' as Smith (2006) contends, I

believe we – as a research community- will come to see the implication of encapsulating western approaches and methodologies with indigenous perspective.

In indigenous research landscape, scholars like Linda Smith (2006), Shawn Wilson (2008), Margaret Kovach (2010), and Bagele Chilisa (2012) have written extensively for, on, and about an indigenous research methodology. Such methodologies are informed by indigenous worldviews, values, and cultures (Wilson, 2008); or consciously driven from traditional norms and social values. For example, the Maori research methodology, Afrocentric methodologies, and medicine wheel methodology (Chilisa, 2012). Others like Lester Rigney (1999) have advocated for an indigenous methodology that will move towards developing indigenous theorists and practitioners i.e. 'indigenist research' (p. 178). The indigenist research as Rigney (1999) suggested is an investigation by the indigenous whose goals are to assist and educate the indigenous through direct engagement and representation with the indigenous in an attempt for sovereignty. Others like Asante (1991) and Reviere (2001) also have called for an Afrocentric emancipatory methodology. Afrocentricity is a perspective which allows Africans to be subjects of their own experience rather than objects and seek the "appropriate centrality of the African person" (Asante,1991 p. 171). This form of inquiry moves beyond the conventional Eurocentric criterion of objectivity, reliability, and validity (Reviere, 2001), and allows societal values norms to be more visible.

The popular view among the proponent of Indigenous research methodology is that it can be considered as a paradigm for the decolonization of indigenous knowledge as it is drawn from indigenous languages, views, experiences, and philosophies of the community (Chilisa, 2012). Through this paradigm, indigenousness is integrated culturally so that multiple voices can be heard: a liberal, collaborative, engaging, diverse, accommodating, self-reflective and transformative approach drawn from indigenous knowledge. It is argued that such methodologies allow questioning one's epistemological underpinning as to what knowledge system we identify within the research approach and challenges a western individuality-bounded view. What it means is that there is less of terminologies like 'subject and objects' as evident in western views, but rather a reflection of "the relationship we hold and are part of" (Wilson, 2008 p. 80). This, I believe moves towards bringing an end to the popular view of a western superiority over indigenous ways of doing and conducting research, or move in finding indigeneity in conventional research landscapes, or perhaps finding a balance between those worldviews - this is the main argument of this short position paper.

Furthermore, a recent study by Kivunja and Kuyini (2017) provided an overview of research paradigms in an educational context and suggested having postcolonial/indigenous methodology suited for use in critical paradigm. In the design and development of learning technologies to fit an African community, other approaches are applicable, for example, an indigenous narrative. The indigenous narrative offers an avenue where stakeholders can engage local experience and participate in issues about their knowledge system. African narratives - for example rituals, myth, metaphor, taboos, folklore, proverbs, and language e.t.c. - can be considered a process of structuring information in that we can understand the relationship between events. It is true that narratives are believed not because they have been 'empirically verified' or 'logically proofed' (Mwewa and Bidwell, 2015 p. 359), but because they are meaningful by convention. Such a process of identifying methods that conventionally and logically fit into the context it references will have an impact on local practices. It might also inform and provide an insightful view as to how we can design technologies to be used in an educational setting that other data collection techniques might not.

Chilisa (2012) claims that most data collection methods are "biased and based mostly on a western individualistic assumption" (p. 161) and calls for a more culturally appropriate and sensitive approach as to how we collect data, interpret results, and draw a conclusion. However, the empirical data was collected conventionally through, in Traxler's term 'the usual suspects' (private conversation), namely an interview, focus group discussion and survey in the Northern and Southern part of Nigeria. These methods of data collection were selected on the assumption and requirement for using culturally and socially sensitive and relevant methods, and not just for their abstract methodological potential. This approach also providing rich reporting of the participant experience- understood in Winch's term (Winch, 1964) what Geertz (1973) might term a 'thick description'. Two of the 'usual suspects' were approached from an indigenous outlook, i.e. talking circles in focus group discussion and consideration of cultural and infrastructural barriers in administering questionnaires. A talking circle is an approach to conducting focus group discussion where the dialogue is regarded as a form of giving a voice to all

participants. This form of "reciprocal learning and sharing of ideas, views, and experiences" (Chilisa, 2012 p. 106) of participants allows a more democratic way of allowing the participant to have equal chance to speak and be heard without being judged or interrupted in the process. The infrastructural barriers are about accessibility to devices and access to the internet to fill in the questionnaires, while the cultural barriers might of the attitude towards creating rapport and having more responses.

I completed, transcribed, analyzed and interpreted interviews with students in group discussions; with tutors; university managers; with developers and designers in technology companies; and experienced researchers in the field of computing, distance learning, and education research in Nigeria – what might be considered as a dialogue evaluation method with experts in the community. In recording, analysing and conceptualizing local experience, indigenous perspectives demonstrate how knowledge is articulated and advanced.

Equally important is the practical implications of using indigenous methodologies or approaches in developing an understanding of technology design and development within an educational context. Khupe and colleague (in Khupe, 2014; Khupe and Keane, 2017) reflect and contributed to the narrative of how such approaches or rather processes fit within the context of indigenous knowledge and education in Africa. They identify six key aspect of indigenous methodology within an African context, viz the people to work with; the physical, mental and spiritual places/space where those people engage; negotiating and outlining the expectations of both researcher and co-researchers; consideration of frameworks grounding the research; the ethical consideration both scholarly and locally; the way data is to be collected analysis and interpreted; how data is to be represented and disseminated and on the implications of the research to the share interest of the community and knowledge. What they highlighted is an example of how applicable research processes in education within rural communities in Africa might inform/aspire the ideas of indigenous methodology and knowledge. One might argue that these methods might be considered as befitting to the lived experience of an African community and how local knowledge, culture and social norms can be embedded in forms of informing/ conducting research. This is exactly what Khupe and Keane called for, i.e. "developing and applying appropriate methods for research with, for, and among indigenous communities" (2107 p. 35). The appropriateness of this methods might be gauge in how sensitives they are adopted and employed within a particular context and on how the members of the community are placed central regarding their problem. This illustrate how indigenous African methodology can be applicable to the design and development of learning technologies as it compares with the approaches adopted in this work.

5 ANALYSIS AND EVALUATION OF DATA

During the initial analysis of my data, I have conducted a largely 'grounded' approach using the thematic analysis approach of Boyatzis (1998) and Nowell et al., (2017). The rationale is that, and as Wittgenstein argues, description is what is needed rather than an explanation in providing a critical social understanding about the world. What I have tried to do is to bring forth a critical understanding and solid account of the data collected regarding the use of technology in education in Nigeria. What I am after is an approach that would provide me with some form of understanding of the world of my participants, and I don't necessarily need any theory to develop such an understanding, what I need is a careful and sensitive description and solid account about the notion of education with technology in Nigeria as expressed by the participants. The analysis and the interpretation drawn, and the quotes of the actual words of the participants are a powerful and unbiased form of rhetoric in talking about education and technology design. This form of description I believe allowed me to draw and make design and educational.

I also employed another theortical framework to contextualize and sensitize the analysis process, namely the People Activity Context and Technology (PACT) framework and the the notion of 'trajectory' in contemporary HCI – both of which I suggest developing some sensitivity towards ideas about indigenous culture and knowledge. PACT was implemented at the start of the analytic phase. The PACT framework has been mostly used when designing user-centered systems (Benyon, 2014). Using this framework, one will come to think of and understand the people to use the systems, the activities they would want to undertake, the context those activities would take place, and also develop an understanding of the social and technical aspects and features of the technologies and on how to design such systems within a culturally sensitive environment. It is my understanding, in Wilson's

words that "the closer you get to defining or explaining an idea, the more its losses it context……the more the context of an idea is explained, the further you get its definition or focus" (Wislon, 2008 p. 99). As tricky as it seems, it is hoped that the PACT analysis might be regarded as part of the indigenousness as it would allow understanding the relationality within the analysis undertaken. There is also the assumption that conducting the PACT analysis will move towards bridging the disparity and general misconception of western and indigenous ways of conducting research and developing knowledge. This is because, and as a commonplace it is expected that indigenous researchers have to explain how different- no matter how slight that might be- their perspective is to that of dominant (Western) thought, (dominant scholars have supposedly needed no such justification and accountability to indigenous researchers). Then I thought, why do I have to explain myself to a community that would predominantly see no need to justify to a more indigenously community? It's more like we – meaning indigenous peoples- "have to explain ourselves, fight for our way of doing things, fight off the inevitable attack whenever we try something that is traditional for us but is 'new' to them and therefore perceived as a challenge "(Wilson, 2008 p. 104). It is my hope that the PACT framework will demonstrate how the notion of education and technology across and within different and interrelated groups are viewed and expressed, and also on how to provide a clearer conceptualization of the analysis process that follows.

I also employed the concepts of trajectories in the analysis of how concepts regarding the use of learning technologies are experienced and expressed by different stakeholders, and on how different and how similar those experiences and expression are at different time intervals. A trajectory is simply a path of a journey. In a recent study, Velt et al., (2017) presented an analysis of theoretical construct in HCI, and how trajectories might be considered an "empirically-driven form of practical theory development for HCI" (p. 2091) even when it doesn't fit into the universal criteria - in science and humanity- of most theories imported into HCI. Their analysis showed how trajectory can be applicable in analyzing, describing and generating user design experience in cultural context; in evaluating and suggesting future design; and in how it can assist in conceptualizing and building concepts and ideas. Trajectory here acts as a sensitization toolbox that will aid in identifyinging the disconnect between ideas expressed regarding the same concept by different participants. It also helped in demonstrating the relationship that existss between those ideas regarding technology design in an African context, and on how such a relationship might be viewed in an indigenous form of understanding reality. It is the assumption that the framework, as informative as it is, would specifically show how an African HCI is different to contemporary HCI due to its differences in epistemology and methodologies, and the implication of some kind of methodological synergy in advancing discussions about an African HCI and the design, deployment and evaluation of technology.

6 CONCLUSIONS: TOWARDS AN AFRICAN HCI

In 'Understanding a Primitive Society' Peter Winch points to some of the conceptual difficulties in simplistically applying predominantly Western notions to the analysis of other cultures and thereby producing interpretations and understandings that are simplistic (and wrong) at best and borderline racist at worst. This is not an argument about relativism, Winch is pointing to a conceptual mistake. The argument is that due to the different nature of western and indigenous thoughts, there is the possibility, likelihood even, of making a conceptual mistake in understanding and using social science methods and applying them uncritically to other societies and cultures, as they have their own ontology (i.e. assumption about nature of existence or reality) and epistemology (i.e. nature of knowledge). It might be logical to say that we tend to misunderstand and ignore the ontology and epistemology of research methods when conducting research in indigenous communities or communities that are culturally or socially sensitive. We view and understand the world differently – not enormously differently (this is not a case of 'Wittgenstein's lions' - "if a lion could speak, we could not understand him" (Wittgenstein, PI 2009 p. 223) but different enough and subtle enough that we should be aware of it as we embark on research, design, deployment and evaluation. Even when and if this might be a popular view, we still tend to make a comparison of research findings that come out of using those methods, even when the epistemologies in the societies they are used might be different. What we need is to understand the different context of those societies and use methods and approaches that might be considered sensitive and culturally or socially relevant to how the societies view and understand the world around them. It is to pose the issue that we need

to critically question all those methods used, not necessarily in the sense of "decolonizing" as Smith (2006) puts, but more of a careful and sensitive outlook to other forms of conducting research. In some ways I am suggesting an 'African Standpoint' methodology based on an approach to research and specifically HCI in Africa that considers the social world, and how that world is constructed and shaped, from the view or standpoint of Africans, and the perhaps inevitable conclusion that research should move away from what might be termed 'eurosplaining' to a form of research and analysis that acknowledges indigenous knowledge and viewpoints.

What I have presented here is a range of ideas and procedures applied (and to be applied in my research), and methods used and argued for, alongside some logical evidence and reasoning to support my arguments. What I have argued is for an acknowledgement that research in any culturally and socially embedded society, be it in the global south or global north is different due to (unacknowledged and unrecognised) differences in ontology, epistemology, and methodology. What we need are approaches and methods that will assist us in providing a descriptive and solid account of the world around us and on how we come to develop that understanding. We ought to look outward.

To conclude, I believe I have contributed to the developing argument about the appropriate ways of conducting research. There clearly isn't any single candidate – there is no panacea for the problems of research methodology. We have a bunch of approaches and methods, and each has its particular limitations. What I offer might be considered a different and new - specifically African - perspective regarding some general ideas about epistemology and methodology, and an attempt to echo the voice of the 'wounded healer' in why and how educational research should/can be carried out in a conventional landscape, indigenously.

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REFERENCES

Ali, S. M., 2016. A brief introduction to decolonial computing. *XRDS: Crossroads, The ACM Magazine for Students*, *22*(4), pp.16-21.

Amukowa, W. and Ayuya, C. V., 2013. The 21st Century Educated African Person and the Loss of Africans' Educational Identity: Towards an Afro Education Model. Academic Journal of Interdisciplinary Studies, 2(1), p.269.

Asante, M. K., 1991. The Afrocentric idea in education. The journal of negro education, 60(2), pp.170-180.

Ben-Ghiat, R. and Hom, S. M. eds., 2015. Italian mobilities. Routledge.

Benyon, D., 2014. Designing Interactive Systems: A comprehensive guide to HCI, UX and interaction design, 3/E.

Bidwell, N. J., 2016. Decolonising HCI and interaction design discourse: some considerations in planning AfriCHI. XRDS: Crossroads, The ACM Magazine for Students, 22(4), pp.22-27.

Boyatzis, R. E., 1998. Transforming qualitative information: Thematic analysis and code development. sage.

Chilisa, B., 2011. Indigenous research methodologies. Sage Publications.

Dell, N. and Kumar, N., 2016, May. The ins and outs of HCI for development. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (pp. 2220-2232). ACM.

Ferrario, M. A., Simm, W., Whittle, J., Frauenberger, C., Fitzpatrick, G. and Purgathofer, P., 2017, May. Values in computing. In Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems (pp. 660-667). ACM.

Geertz, C., 1973. Thick description. The interpretation of cultures, pp.3-30.

Geertz, C., 1974. "From the native's point of view": On the nature of anthropological understanding. Bulletin of the American Academy of Arts and Sciences, pp.26-45.

Glaser, B. G. and Strauss, A. L., 2017. Discovery of grounded theory: Strategies for qualitative research. Routledge.

Gray, S., 1988. South African fiction and a case history revised: an account of research into retellings of the John Ross story of early Natal. Research in African Literatures, 19(4), pp.455-476.

Hart, C., 2018. Doing a Literature Review: Releasing the Research Imagination. Sage.

Hoppers, C. A. O., 2000. African voices in education: retrieving the past, engaging the present and shaping the future. African voices in education, pp.1-11.

Irani, L., Vertesi, J., Dourish, P., Philip, K. and Grinter, R. E., 2010, April. Postcolonial computing: a lens on design and development. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 1311-1320). ACM.

Jagusah, O. I., 2001. Educational policy in Africa and the issue (s) of context: The case of Nigeria and South Africa. International Education Journal, 2(5), pp.113-125.

Kay, S. and Nystrom, B., 1971. Education and colonialism in Africa: an annotated bibliography. Comparative education review, 15(2), pp.240-259.

Kivunja, C. and Kuyini, A. B., 2017. Understanding and Applying Research Paradigms in Educational Contexts. International Journal of Higher Education, 6(5), pp.26-41.

Khupe, C., 2014. Indigenous knowledge and school science: Possibilities for integration (Doctoral dissertation).

Khupe, C. and Keane, M., 2017. Towards an African education research methodology: decolonising new knowledge. Educational Research for Social Change, 6(1), pp.25-37.

Kovach, M., 2010. Indigenous methodologies: Characteristics, conversations, and contexts. University of Toronto Press.

Marshall, S. J., 2018. Technology as a Catalyst for Change. In Shaping the University of the Future (pp. 147-166). Springer, Singapore.

Mwewa, L. and Bidwell, N., 2015. African Narratives in Technology Research & Design. At the Intersection of Indigenous and Traditional Knowledge and Technology Design, p.353.

Nowell, L. S., Norris, J. M., White, D. E. and Moules, N. J., 2017. Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods, 16(1), p.1609406917733847.

Philip, K., Irani, L. and Dourish, P., 2012. Postcolonial computing: A tactical survey. Science, Technology, & Human Values, 37(1), pp.3-29.

Reviere, R., 2001. Toward an Afrocentric research methodology journal of Black Studies, 31(6), pp.709-728.

Rigney, L. I., 1999. Internationalization of an Indigenous anticolonial cultural critique of research methodologies: A guide to Indigenist research methodology and its principles. Wicazo sa review, 14(2), pp.109-121.

Smith, L.T., 2013. Decolonizing methodologies: Research and indigenous peoples. Zed Books Ltd.

Unwin, T., 2009. ICT4D: Information and communication technology for development. Cambridge University Press.

Van Wyk, B. and Higgs, P., 2004. Towards an African philosophy of higher education: perspectives on higher education. South African Journal of Higher Education, 18(3), pp.196-210.

Velt, R., Benford, S. and Reeves, S., 2017, May. A survey of the trajectories conceptual framework: investigating theory use in HCI. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (pp. 2091-2105). ACM.

Wilson, S., 2008. Research is ceremony: Indigenous research methods.

Winch, P., 1964. Understanding a primitive society. American Philosophical Quarterly, 1(4), pp.307-324.

Winschiers-Theophilus, H. and Bidwell, N. J., 2013. Toward an Afro-Centric indigenous HCI paradigm. International Journal of Human-Computer Interaction, 29(4), pp.243-255.

Wittgenstein, L., 2009. Philosophical investigations. John Wiley & Sons.