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Using Technology for Learning: Generalizable Lessons from Educational Technology Integration in Kenya
Utiliser la technologie pour l'apprentissage : leçons généralisables de l'intégration des technologies éducatives au Kenya

Adeela Arshad-Ayaz, M. Ayaz Naseem et Justus O. Inyega

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Résumé de l'article

Cet article présente certains résultats initiaux d'un projet de partenariat pluriannuel sur l'intégration de la technologie dans le système éducatif kenyan. Plus précisément, des preuves qualitatives sont présentées sur la façon dont les résultats et les leçons tirées du projet de partenariat peuvent être généralisés et utilisés par d'autres équipes de recherche et projets utilisant d'autres plateformes technologiques. Fondé sur la théorie critique de la technologie éducative et utilisant des stratégies méthodologiques à l'intersection de l'analyse critique du discours et de l'ethnographie critique, cet article examine l'intégration de la technologie dans les écoles publiques kenyanes à l'aide de la Trousse d'apprentissage+ développé au Centre d'études sur l'apprentissage et la performance de l'Université Concordia à Montréal, Canada.

Using Technology for Learning: Generalizable Lessons from Educational Technology Integration in Kenya

Utiliser la technologie pour l'apprentissage : Leçons généralisables de l'intégration des technologies éducatives au Kenya

Adeela Arshad-Ayaz, Concordia University, Montreal, Canada

M. Ayaz Naseem, Concordia University, Montreal, Canada

Justus O. Inyega, University of Nairobi, Kenya

Abstract

This paper presents some initial findings from a multi-year partnership project on the integration of technology into the Kenyan education system. Specifically, qualitative evidence is presented on how results and lessons learned from the partnership project can be generalized and used by other research teams and projects using other technology platforms. Grounded in the critical theory of educational technology and using methodological strategies on the intersections of critical discourse analysis and critical ethnography, this paper examines technology integration in Kenyan public schools using the Learning Toolkit+ developed at the Centre for the Study of Learning and Performance at Concordia University in Montreal, Canada.

Keywords: LTK+; Kenyan education; Technology platforms

Résumé

Cet article présente certains résultats initiaux d'un projet de partenariat pluriannuel sur l'intégration de la technologie dans le système éducatif kenyan. Plus précisément, des preuves qualitatives sont présentées sur la façon dont les résultats et les leçons tirées du projet de partenariat peuvent être généralisés et utilisés par d'autres équipes de recherche et projets utilisant d'autres plateformes technologiques. Fondé sur la théorie critique de la technologie éducative et utilisant des stratégies méthodologiques à l'intersection de l'analyse critique du discours et de l'ethnographie critique, cet article examine l'intégration de la technologie dans les écoles publiques kenyanes à l'aide de la Trousse d'apprentissage+ développé au Centre d'études sur l'apprentissage et la performance de l'Université Concordia à Montréal, Canada.

Mots-clés : LTK+ ; éducation kenyane ; plateformes technologiques

Introduction

This paper is organized into four main sections starting with a brief overview of the Kenyan education system and the various vicissitudes in its evolution by tracing changes/reforms in curriculum development. In this respect, this paper focuses on how the Kenyan education system has evolved from its colonial groundings to realigning its education and curricula to the National Constitution (2010) to a more Westernized Competency-Based Curriculum under Vision 2030 and Kenya National Curriculum Policy (2015). Proceeding to examine the introduction/integration of technology in Kenyan education, this paper specifically takes examples and evidence from The Learning Toolkit+ (LTK+) project, to assess the pedagogical and societal successes and challenges during its technology integration. Finally, some generalizable lessons from qualitative research in Kenya in the Fall of 2018 are presented.

Objectives

There are two overarching research objectives:

1. To analyze the curriculum reform processes in Kenya through a reading of relationality between the historical, political, philosophical, societal, and post-colonial dynamics in Kenya since its independence; and

2. To examine the sustainability and scalability of a major technology integration project for early literacy and numeracy, The Learning Toolkit+ project.

Overview of Reforms in the Kenyan Educational System

This section presents an overview of the Kenyan education system to contextualize the debates and dynamics surrounding the integration of technology into the nation's educational system. Currently, Kenyan educational policymakers are in the process of revising the 8-4-4 curriculum with an aim to replace it with a competency-based curriculum. The erstwhile educational model is archaic, teacher-centered, authoritarian, and rigid (Jepkemei, 2017). The current system is also thought to be focused more on examination, inappropriate language training, and rote-learning of curricular content—all of which prevent the full realization of expected learning outcomes and learners' capabilities. The main motivation behind the reform is to develop competencies that are in line with the demand of the global economy which requires the applicability of core competencies outside the classroom and the transferability of competencies and skills in order to address world issues, such as systemic inequalities, in upskilling the workforce adequately.

Kenya's education system has come a long way since its independence in 1963. There have been numerous quantitative gains in the realm of education. Since 2003, primary education has been free, net enrollment has considerably increased, and near-gender parity in enrollment has been achieved. There has been a marked improvement in the distribution of educational resources across

different regions of Kenya. Budget outlays of 10-15% have been a regular benefit since 2015/2016. Plans for infrastructure development, such as the electrification of 22,000 primary schools, are in the offing as well as plans to connect schools through a high-speed fiber-optic network. However, the statistical gains are often eclipsed when compared to the qualitative gains in the system. For example, recent research demonstrates that reading and numeracy levels in the country remain very low (Piper & Suilkowski, 2015; Uwezo, 2012, 2013, 2014), while there are inconsistencies in reading and numeracy levels across the rural-urban divide. These problems are compounded by high levels of student and teacher absenteeism, inadequate infrastructure, unequal availability of teachers across regions, lack of monitoring and accountability, and regional disparities (Uwezo, 2015). According to Onsomu et al. (2005) only 21% of the students in the sixth grade had a "desirable" level of reading. Similarly, Uwezo (2015) notes that the percentage of students with a minimum threshold in reading required to follow the reading requirements decreased between 1998 and 2000. A large study demonstrates that by 2013, Kenya (along with Tanzania and Uganda) had missed the target of ensuring access to quality education for its student population (2015). Another critical challenge for the Kenyan education system has been a dire shortage of teachers at almost all levels of schooling.

It was in this context that the current educational reform was articulated by the educational policymakers in Kenya. It is envisaged that the alignment of the Kenyan curriculum with the 2010 Constitution, the Basic Education Act 2013, the Kenyan Institute for Curriculum Development (KICD) Act 2013, and NESP ensures that the education system can create effective pathways for seamless transition of all children from one level to the next. It is also hoped that the curriculum aligns with the post-2015 sustainable development goals to guarantee lifelong, life-deep and life-wide learning. Kenyan educational policymakers are also cognizant of the need to harmonize Kenyan education with the international benchmarking regime, such as the International Bureau of Education.

The reorganized basic education curriculum framework replaces the 8-4-4 model with a 2-3-3-3 model (Inyega, et al., 2021). Under the new learner-centred system, the early years' education spans five years, including a two-year pre-primary and three-year lower primary education. Instead of "subjects," the pre-primary students have "learning areas" such as mathematics, language arts, environment, and religious education, in addition to mandatory community service learning. The students' learning performance is to be assessed over time in accordance with developmental milestones. Teachers assess students by observing their activities and by oral testing instead of the erstwhile examination-based assessment regime. Authorities gather data to further refine the system. Information and communication technologies (ICT) are integrated as learning tools in all learning areas (Jepkemei, 2017; Kaviti, 2018; Njeng'ere & Lili, 2017; Wanjohi, 2018).

Middle school education spans three years of upper primary (grades 4-6) and three years of junior secondary education (grades 7-9). In addition to the learning areas in early years education, students are exposed to science and technology education and social studies, with the learning of foreign languages as an available option. The reform retains the emphasis on ICT as a delivery and learning tool across all learning areas. The reform also adds a rigorous career counseling program to enable students to make informed choices for their future educational pursuits. The assessment at the

middle school education level is a curious mix of 70% formative and 30% national examination (Inyega et al., 2021; Jepkemei, 2017).

Middle school education is followed by three years of senior school education (grades 10-12) targeted at learners 15-17 years of age. At this stage, the reform envisages the students to choose either of the three pathways, namely science, technical, engineering, and mathematics (STEM), arts and sports sciences, or social sciences in accordance with their envisioned interests and career paths. Regardless of the chosen pathway, the students will have to complete physical education hours as well as a minimum of 135 hours of community service outside of school. The idea of channeling students into relevant pathways is grounded in a constructivist paradigm of pedagogy pioneered by Jean Piaget (1968) and Lev Vygotsky (1987), which recognizes that each student/child has unique competencies that can be nurtured in specific pathways.

The new education reform in Kenya is clearly based on the constructivist student-centered pedagogical model that seeks to move away from the subject-oriented, teacher-centered, and norm-referenced educational system. Instead, the newly envisioned educational system aims to focus on students' competencies at the end of each cycle to identify their interests and abilities for different educational pathways leading to 21st-century skills (Njeng'ere & Lili, 2017) required for economic and societal development. The move from norm-referenced assessment to criterion-referenced assessment aims to gauge students' understanding and application of the skill and not just knowledge of the subject matter. Although the focus of the reform remains integration in and contribution to the economy, it also reignites previous efforts at making the education system relevant to society. While recognizing English as the lingua franca of the business and industrial world, the reform also recognizes the importance of bringing back the indigenous Kenyan languages "without resurrecting emotive feelings of a colonial past" (Inyega et al., 2021). The reform is also cognizant of the importance of indigenous knowledges, the role of language and culture in representations and identity formation, and the maintenance of cultural heritage. Finally, a major focus of the reform is to harness the potential and proven benefits of ICT systems to reach learners, including the marginalized, the vulnerable, and those with differing abilities. The guiding principle in this respect is learning—anytime, anywhere, anyhow.

In the next section, we elucidate the integration of technology into the Kenyan educational system. Specifically, we highlight an early literacy and numeracy software — Learning Toolkit (LTK+) that has been employed to realize the aims and objectives of the current educational reform in Kenya.

Conceptual Framework

Our study draws its theoretical and conceptual orientation from the critical theory of educational technology (Feenberg, 2002), which in turn, owes its epistemic roots to critical theory and critical pedagogy. The critical theory of educational technology retains all the aims and goals of critical pedagogy, except that the context of investigation is technology. True to its critical pedigree, the central focus of the critical theory of educational technology is to examine the possibilities that technology can

offer in an educational context, either as a tool for the imposition of dominant social norms and control or as an educational tool for equitable and liberating educational experiences for learners.

In this context, the critical theory of educational technology aims to interrogate how educational institutions and educational systems in general appropriate and use technology for pedagogical purposes. Furthermore, it is concerned with finding out ways in which technology in education can lead to raising critical awareness in learners so that they can transform the world (Arshad-Ayaz, 2010; Feenberg, 2002, 2005) rather than becoming a tool of oppression and means of control. The critical theory of educational technology acknowledges the importance of the dynamic inter-relationships between different stakeholders in the learning context and seeks to examine various external influences on the process and politics of learning. To this end, critical scholars are interested in hearing and bringing in the voices of key stakeholders such as teachers, school administrators, students, parents, and technology-related support staff working in this field. Educational technology can offer opportunities for communication, dialogue, audiovisual aids, and diverse and unlimited resources, and can, therefore, be used as a great resource for educational purposes (Arshad-Ayaz, 2010; Feenberg, 2002, 2005; Franklin, 1999).

Technology Integration in Kenya via the Learning Toolkit+

The educational policymakers in Kenya are keen to explore and utilize the potential of ICT to advance educational reform. As Allen et al. (2017) points out, the ICT sector in Kenya is perceived by educators in public universities to be an asset for communicating with youth, and ICT could be used more effectively in the future as a resource for coordinating a more united national system (p. 7). The study points to mobile learning as a promising possibility thanks to the increasing accessibility of the Internet and the growing ICT infrastructure in the country. Cunningham (2016) suggests the wider adoption of ICT to support blended, online, and distance learning as a coping mechanism for the vast increases in enrolment within the past decade, given that there is not enough physical space or human resources to accommodate the increases. The benefits of increasing the use of technology include more effective support systems for more students, accommodation of diverse types of students, more diverse materials and languages, and access to online forums and learning communities (Cunningham, 2016; Piper et al., 2016). While the primary focus of Cunningham's arguments is the application of ICT in the higher education context, his arguments are also true for primary and secondary educational contexts. However, it will be prudent to heed Cunningham (2016) and Pipe et al. (2016) regarding expectations of ICT playing a major role in achieving the goals set by the current educational reform. Kenya needs a marked improvement in the infrastructure (networks and bandwidth), focusing on skills development and training, developing a clearly articulated institutional policy, working towards online content development, creating assessment policies, and implementing overarching change management systems to provide support. Political leadership and educational policymakers in Kenya seem to have grasped the message. The Ministry of Education, on the other hand, aims to mainstream ICT in "20,000 public primary schools, 6,000 public secondary schools, 22 provincial teacher training colleges, 2 diploma colleges, and 10 model e-learning centres for Adult and Continuing Education" (Abrami et al.,

2014, p. 950). It is in this context that the Centre for the Study of Learning and Performance (CSLP) at Concordia University in Montreal, Canada, in partnership with the Government of Kenya and various institutional partners, designed and implemented an early literacy and early numeracy ICT-based intervention. Starting in 2013, the evidence-based and evidence-proven LTK+ was implemented in select Kenyan public schools in Nairobi and Mombasa.

The LTK+ is a suite of tools in English and French that includes *A Balanced Reading Approach for Children and Designed to Achieve Best Results for All* (ABRACADABRA or ABRA) — an early literacy tool; ELM, an early numeracy tool; READS, a digital library of reading resources; and ePEARL, a self-regulation tool. The LTK+ was conceived and developed by the CSLP at Concordia University in Montreal, Canada. The toolkit is available free of charge to institutions worldwide and has been successfully used in Canada, Northern Australia, China, Hong Kong, and Kenya. Plans are afoot for the introduction of LTK+ in Francophone Africa, notably in the Ivory Coast.

In the Kenyan educational context, three tools from the LTK+ namely ABRA, ELM, and READS have been employed thus far. ABRA is a collection of 32 learning tools aimed at improving the literacy skills (reading and writing) of children, including at-risk students (Bailey et al., 2016). According to Bailey et al. (2016), ABRA seeks a "balance between children's code (i.e., phonics and word study) and meaning-based skill development (i.e., reading comprehension), and engagement with real literature" (p. 2). One of the cardinal features of the ABRA software is its flexibility and modular design, which allows it to be used by teachers in a variety of educational and pedagogical settings. To this end, Abrami et al.'s 2014 article contributes an in-depth exposé of the software.

Methodology

For the qualitative data collection, methods and insights from critical ethnography were used to collect and analyze narratives from key stakeholders in the Kenyan education system. Critical ethnography provides the researchers with intimate access to the subject perspectives, provides phenomenological accounts by the subjects—what Geertz (1973) calls "thick descriptions" —and direct access to the local culture and practices. In particular, we used ethnographic interviews, focus groups, and participant observation to collect data. The critical ethnographic data consisted of ethnographic interviews with teachers, school administrators, trainers, parents, policymakers, and faculty at the University of Nairobi's Teachers Education Program. A total of 12 interviews were conducted. Additionally, we also conducted two focus groups with teachers and carried out participant observations at schools that are partnering in the implementation of LTK+ for early literacy and early numeracy education. While ethnographic interviews provided the depth of subjects' experiences regarding the implementation process, the focus groups provided a breadth of perspectives on related issues. Specifically, in-depth interviews were conducted with one teachers' union leader (Nairobi), two technical support staff (LTK+ related; Mombasa), two public schools' principals (one in Nairobi and one in Mombasa), one vice-principal (Mombasa), eight teachers using ABRA for early grade literacy instruction, two teachers who were using the conventional methods for teaching literacy, and seven

parents. In the discussion, the principals and vice-principal are referred to as administrators. Several University of Nairobi professors were also interviewed. These professors were directly and/or indirectly involved in the conceptualization and/or implementation of various technology-related projects over the years. Critical ethnographic methods (Carspecken, 1996; Madison, 2005) were combined with a critical discourse analysis (Fairclough, 1995; Gee, 2011; Jorgensen & Phillips, 2002) of the policy, curricular, and textbook data. The textual data corpus consisted of historical and current policy documents, historical and current curricular documents, and current social studies and language arts textbooks for classes pre-10. The textual data corpus was used to understand the historical context of reforms in the Kenyan educational system.

Sustainability and Scalability of Technology Integration in the Kenyan Education System

Insights from Two Qualitative Research Projects

One of the foremost challenges for any large technology integration project is the sustainability and scalability of the project. The sustainability of an educational technology integration project largely depends on two sets of factors. First, the technical efficacy, i.e., how well is the project designed? Does it deliver what it is intended for? The second set of factors that determines if the educational technology intervention is sustainable after the initial phase, marked by the enthusiasm of the early adaptors and the availability of funding expires, depends on several societal factors that include (but are not limited to): the reception of the project by the local culture, preparedness of the teachers, parental cooperation, relevance to local needs and ethos, buy-in by the educational leadership (political and bureaucratic) and school administration, and local technical expertise to sustain the project after the initial phase. Finally, the development of and investment in technology-related infrastructure is also important for the sustainability and scalability of the project. In terms of technical design and efficacy criteria, the LTK+ based early literacy and numeracy intervention has proven to be well articulated, well designed, flexible, and engaging.

A research project was designed to examine the societal and institutional conditions in Kenya to see if these conditions were conducive to the sustainability and scalability of the project. The qualitative research segment also sought to find out if the lessons learned could be generalized to benefit other research teams and projects. In this section, the results of the critical ethnographic research carried out in public schools in Kenya, particularly in public schools in Nairobi and Mombasa in Fall 2018 (see discussion on methodology above), are presented. The following discussion reflects the major themes that emanated from ethnographic interviews, narrative data, and focus groups conducted with teachers, school administrators, officials at the Kenya Institute for Curriculum Development, teachers' union representatives, and parents.

Findings and Results

Is Kenyan Educational System Ready for Educational Technology-Assisted Competency-Based Education?

Research on the introduction/integration of educational technology, especially in developing societies, shows that it is important to ask the question: Is the country (including the society and the educational system) ready for educational technology? (Arshad-Ayaz, 2010). The readiness refers to societal buy-in and levels of infrastructure (equipment in the schools, provision of electricity, training levels for teachers and support staff, the sustainability of technical services, etc.). This is the question that was asked of all groups mentioned above. Overall, there seems to be a marked difference in opinions and perceptions between the different educational stakeholders (policymakers, university-based teacher education specialists, schoolteachers, school administrators, and parents). For instance, a key official at the Kenyan Institute for Curriculum Development (KICD) was confident but cautious, responding, "the question is not if the society is ready for educational technology. The question is: can society do without utilizing this proven key resource to raise literacy levels in a developing country like Kenya?" (Interview). The policymaker went on to explain that in the current global knowledge economy countries like Kenya, there is no choice but to raise literacy levels and prioritize education as a key resource for the economic and social development of the country. According to the policymaker, in a resource-strapped country like Kenya, governments have two broad choices. One is to provide massive amounts of money to ensure access to education (at all levels), training of teachers, etc., and the other is to utilize existing technology that is already developed and used elsewhere in the world. As the policymaker stated, "in the current day and age, the second option cannot be ignored. It is cost-efficient and is already proven to yield results". They told us that the KICD is examining several educational software options developed in countries such as the US, Canada, and Europe to assess their suitability for Kenyan educational needs.

In contrast, a group of professors in the teachers' education program at the University of Nairobi believed that Kenya needs to tread carefully before adopting educational technology developed by other countries, as purported by the research focus group at the University of Nairobi. The university professors pointed out several factors that can make an educational technology intervention successful or render it "yet another resource-draining fad." It must, however, be noted that the above views were not specific to ABRA and the LTK+ and reflect their perspective on the introduction of educational technology interventions in Kenya.

The professors specifically pointed to the recent one-tablet-per-student initiative of the Kenyan government. According to one professor,

> introduction of tablets in Kenya had a political taint. It was received with a lot of enthusiasm…but later some think the project was hijacked by persons for some political mileage. So even wherever they were received, they were received with some suspicion. Even the government found it was on the wrong footing because electricity is not within reach for every institution; even as we talk, not all schools are within an electrical grid.

Addressing the question of the Kenyan educational system's preparedness for the educational technology interventions, the focus group's view was summarized by one professor:

> The closest that that document *Medium Plan 2* [1] said about ICT was that ICT should be integrated into the education sector. Now, as my colleagues have already hinted, there was no unpacking of that to know which are the priorities, but in late 2012 towards 2013, when there was a general election, the ruling party at the time, which was campaigning to come to power, just out of the blue without any consultations, they said we want to give a tablet per child in every primary school. And that is where the problems began. Teachers were not aware. Many of them are not well-versed in ICT. They are struggling because they went to primary teacher colleges; some are university graduates, but they are not versed in ICT in the security of those gadgets.

The teachers in public schools, in general, were more supportive of the initiatives related to the introduction and integration of educational technology. Most teachers interviewed were categorically in support of such initiatives despite the problems they (and their schools) were facing in terms of teacher training, resources, etc. A distinct message from the teachers, especially those using educational software such as ABRA, was that society is welcoming of such initiatives. According to one teacher, "even the parents who themselves are not educated do realize the importance of technology and the value it has for educating their children." At the same time, they also point out that in the lower strata of society, this means students cannot work/practice at home as they do not have computers or tablets available at home. In general, there is an across-the-board realization that educational technology can alleviate the standards of education in the country. At the same time, there is an accompanying caution (and desire) that, unlike the previous educational reforms and initiatives, this time, the authorities will exercise due diligence before committing precious resources.

Buy-in From Educational Leadership and School Administration

In conjunction with the buy-in by society at large, one of the most important factors in the success of an educational technology project is the buy-in from school leadership and administration. Among the Kenyan public schools' leadership and administrators that were interviewed, there was almost a universal buy-in of the various initiatives related to the introduction and integration of educational technology in their schools. Despite trepidations about resources, these leaders and administrators seem to realize the potential of educational technology for learning and teaching. A principal of a public school in Mombasa stated, "I know that most kids enjoy learning by viewing so, in fact, I felt it's a great idea because it's going to assist the teachers to get the students to concentrate because it's something they'll be seeing and now their interesting will be captured" (Interview). It was

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[1] "The Second Medium Term Plan (MTP2) identified key policy actions, reforms, programmes and projects that the Government was to implement in the 2013-2017 period in line with the Government's priorities, the Kenya 2010 Constitution and the long-term objective of Vision 2030" (https://vision2030.go.ke/2013-2017/).

also clear that they were aware that the introduction of computer-assisted learning also brings an added workload for the teachers. However, this was something that, in their view, was surmountable. According to them, teachers, especially the younger ones, were enthusiastic about using the technology.

A vice-principal at another public school in Mombasa confirmed that the younger teachers show more enthusiasm for using educational technology. However, they also dispelled the view that older teachers were resistant to the use of ICT in classrooms. They wished that they could have all the teachers on board. However, there were still those who had not embraced it fully.

Specific to LTK+ and particularly ABRA, the majority of school administrators felt that it is working well beyond expectations. They identified the improvements in reading levels as a welcome sign that the software was working well. However, they also cautioned that it might be too soon to generalize success. One of the most encouraging signs of the success of LTK+ was peer education. While some students adapted to the technology almost immediately, for others, it was not instantaneous. However, they also noticed that the former group of students took it upon themselves to reach out to those who were struggling (or seemed not interested in using ICT). Almost all of the administrators interviewed were concerned about the resources, especially once the initial funding ran out. Administrators at one school in Mombasa were confident that they had built up (limited) capacity for technical support. As one administrator stated:

> LTK is technology-based. I'm sure it started, but not all schools have adopted it because this now depends on the financial position of the school. For instance, [the] servicing of computers, maybe some schools could have computers, but they couldn't afford the servicing. And maybe in some schools, they don't have the Internet, so…that can also be a problem. The willingness is there, but the resources are limited, more so in the public schools. We count ourselves lucky because we have a provision for [the] maintenance of computers.

Local Technical Expertise to Sustain the Project After the Initial Phase

Central to the sustainability and scalability of any educational technology project is capacity building among the local stakeholders. The CSLP (Authors and developers of LTK+) have been attentive to this cardinal principle. In Mombasa, the CSLP partnered with I Choose Life (ICL) and the Aga Khan Academies in this respect. The principle that underlines the capacity-building exercise is to train the trainers who, in turn, can train others at the school level. Thus, the capacity developed can sustain the project even after the return of the original trainers. Selected teachers from schools that are participating in using LTK+ are trained by a team of master trainers from the CSLP and ICL. Upon their return to their school, these teachers then train other teachers at their respective schools. According to one of these trainers, the criteria for the selection of teachers could include if they "are good in terms of 21st-century skills" since these skills are "really in tandem with…the LTK".

To sustain the capacity building, the trainers maintain a follow-up regime with the teachers. The follow-up support includes regular check-ups, advice, and support for networking, personal visits to the

schools, auxiliary coaching, etc. A lengthy quote from one trainer explained the procedure for the follow-up:

> Yeah, we follow up that's a good question. I can tell you for sure if you are trained and no one…your morale goes down. So, we have made tremendous plans and strategies with the teachers we are dealing with. We have given them channels of sharing their feedback one: we have a WhatsApp group with the teachers and us staff and the Aga Khan staff also are part of the group. So, the teachers are sharing first-hand information from class and therefore you can be able to advise you can be able to upload you can be able to appreciate whatever they are doing in case they go they run into a problem. You can even troubleshoot from where you are because of that live sharing. Number two we have given them our numbers. Of course, so they can call sometimes.

According to those working at building capacity among the teachers using LTK+, one of the most important aspects is to have the teachers realize that technology (LTK+) adds value to their work and is not a burden. According to a trainer, "one way of adding value to teachers is by telling them that you can have an alternative to whatever you are doing. But if you tell them that it is something additional, they will actually just have resistance. So, first of all, we appreciate what they are doing first and then try to tell them". As such, ethnographic data from our research suggests that while the local technical expertise in this respect is limited, it is expected to grow, thus improving the chances for both sustainability and scalability of technology-assisted learning through software such as LTK+.

Localization of Content

One of the keys to engaging the students with the learning materials is the relevance of the material and content to the local knowledge. One of the major concerns about educational models, content, curricula, and software or platforms that are developed in the Global North and then exported to developing countries is the relevance of these to the local conditions, cultures, knowledges, and narratives (Naseem & Arshad-Ayaz, 2016; Steiner-Khamsi & Stolpe, 2006). As a professor at the University of Nairobi's focus group stated, "any content the children interact with, they want to see themselves in it. And so, if we are reading about our character, it could be from South Africa or any other country within the African continent or even elsewhere in the world, but is it relatable? Is the child able to relate to it? Is it culturally relevant?" When asked if they think LTK+ addresses these concerns about local relevance, the professors participating in the focus group were generally satisfied. One member of the focus group suggested it had been addressed in the software.

Public school teachers, especially those who are working with ABRA want to see more local content in the software. While they are generally appreciative of the software and the neutral vocals used by the narrators, they would like to see more Kenyan and even regional stories and voices used in the software. A number of teachers expressed a desire to see a Kiswahili version of ABRA that they could use to teach the language. Opinions about the relevance of the LTK+ to the local ethos, cultures, narratives, etc., were mixed. Improvement in localizing the local content, perhaps, will be the right step toward both sustainability as well as scalability.

Teachers' Buy-in and Resistance

Teacher preparedness lies at the heart of the sustainability of any pedagogical initiative. The application of the critical pedagogy framework compels researchers to understand teachers' perspectives on their teaching practices and teaching tools through social, pedagogical, and power lenses to evaluate the possible sustainability of any project. Teachers' narratives are important not only to highlight the gaps but also to understand the worldviews of the teachers, how teachers reflect on their teaching practices and teaching tools, and how teachers articulate their experiences and define the value of LTK+ in everyday teaching and learning practices.

Important clues to the long-term sustainability of the LTK+ can be gained from the study of the narratives of the teachers, which highlight their experiential understanding and thinking in terms of their daily practices and engagement with the LTK+. Teachers' narratives help us understand how teachers teach and the way students engage with the knowledge content in LTK+. As previously mentioned, eight teachers were interviewed from five schools that have piloted the use of LTK+, especially ABRA to teach primary and secondary school classes. In response to open-ended questions about the preparedness of public school teachers to use educational technology, two narratives were evident. First, there was enthusiasm among the teachers to use educational software like ABRA. Second, those who did not get a chance to be trained by the LTK+ team felt a little left out. Most teachers who were subsequently trained by their colleagues (the latter having received training from the LTK+ teams and their associates) felt that they were missing out on something. Furthermore, both groups felt that the training should be expanded, and more sessions and follow-ups offered. This is notably in contrast to the views of the trainer-of-trainers, who stressed that they were engaged in follow-up with the teachers initially trained. Teachers using ABRA were also less than satisfied with the opportunity to practice what they learned from the trainers. One teacher at a public school in Mombasa expressed that they would like to use ABRA in their free time to get more familiar with the software, stating, "we only have about an hour or so each week when we have the IT class. Even in there, a lot of time is spent on signing in by the students…there is no time for me…I feel I might forget some of the features of the program".

Not all Kenyan public-school teachers are totally on board with using educational software like ABRA, and ethnographic research revealed that resistance is multi-faceted. On the one hand, there seems to be resistance that has generational dimensions. Several public school administrators advised that older teachers seem less open to using the software than younger teachers. When asked to explain why, teachers and administrators indicated that it could be because the former group has had less exposure to technology than the latter group. It was also pointed out that the senior teachers are more familiar with the erstwhile pedagogical paradigm and, given the state of credential/knowledge renewal in Kenya, has not had many opportunities to be exposed to more current paradigms. One administrator told us that "normally, the professional development among Kenyan public-school teachers is in the form of one to two-days workshops which are considered time-off from work and are not taken too seriously." A professor who participated in the University of Nairobi's focus group confirmed this and went on to say, "once the teachers have been trained, they never get trained again."

Finally, conversations also reveal that the teachers' heavy workloads were also a factor in the teachers' resistance to learning about and employing educational software in their classrooms. A number of teachers interviewed for the project expressed these sentiments. Several teachers believe that they already had a heavy workload and that learning the software did not bring them additional recognition or remuneration. While the school administrators generally agreed with the remuneration part, they did not agree with the lack of recognition argument. It was, for example, pointed out by a number of administrators that the "keenness of the students to learn via ABRA was its own recognition and reward." As much as it is not a software-related issue, it is safe to say that for any educational technology intervention to be sustainable and scalable, it is important to bring the teachers onboard.

Discussion

This paper sets out to examine:

a) the curriculum reform processes in Kenya, and
b) the sustainability and scalability of the LTK+ project in the overall context of the latest (ongoing) curricular reforms in Kenya.

Below is the concluding discussion of the research results, i.e., the curriculum reform process in Kenya, especially with reference to the introduction/integration of technology in education and the factors that impact the potential for the Toolkit to be an effective, sustainable technology tool for education in Kenya.

Objectives of Educational Reforms in Kenya

The discourse analysis of the curricular reform shows that there are two major motivations behind the reform process. First, Kenyan policymakers aim to transform the educational system to comply with the demands of the global productive processes (the global financial landscape and the global labor pool). As conceived, the reform is expected to give Kenya a larger stake in the regional as well as the global production landscape. Juxtaposed with this is the objective to produce a national workforce that is flexible, tech-savvy, and sectorally mobile.

A second educarional reform objective is to develop a Kenyan citizenry that is critical, communally responsible, and cohesive. Conversations and ethnographic research with educational stakeholders in Kenya show that, in general, the stakeholders are cautiously optimistic about the ongoing curricular reform in the country. At the same time, there are several areas in which trepidations were expressed. It was, for instance, pointed out by several university professors in the teachers' education program that Kenyan education, once again, is moving towards an imported model of education without sufficient preparation and thought into the pre-planning phase. As one policymaker in Nairobi commented, "they are again adopting a western model without a) sufficient thought into its relevance to Kenyan needs and b) without sufficient preparation." Several university professors, public school administrators, and public school teachers also expressed reservations that the competency-based model being implemented without sufficiently preparing the teachers first. While the Kenyan

educational policymakers stressed that the reform process is based on national conversations and feedback from key stakeholders, a number of our respondents contested these claims and pointed to a lack of consultancy process before the policy was articulated.

Is Kenya Ready for Technology-Assisted Competency-Based Education?

Perceptions and views of Kenyan educational stakeholders on the issue of technology integration in education, a key thrust of the reform, also presents a cautiously optimistic yet critical picture. Although the focus of the reform remains integration in and contribution to the economy, it also reignites previous efforts at making the education system relevant to society. While there is an across-the-board consensus that integration of technology in the educational realm is unavoidable, Kenyan academia cautions against a hasty adoption of technology in the education without first weighing the costs. It was repeatedly pointed out that before investing large sums of money, it is prudent to first take stock of the ground realities that include lack of infrastructure (severe in some regions and sectors), levels of teachers' preparedness to use technology for educating purposes, perceived usefulness, effects on teachers' workloads, etc. These reservations reflect the insights from the literature that cites regional examples to urge a cautious approach. Scholarship in the area shows that Nigeria has a much larger number of Internet users (as reported by Edo et al., 2019, there are 123.49 users per 1000 in Nigeria VS 46.87 users per 1000 in Kenya) and that Nigerian students and teachers have more mobile phones, laptops, tablets, and personal computers. Yet, they still face high dropout rates and low literacy levels (Edo et al., 2019) and have failed to integrate technology into the classrooms (Ameen et al., 2019). Thus, a prudent, well-thought-out approach is required before Kenya invests heavily in educational technology. Interestingly, the public school teachers interviewed indicated that despite the shortcomings in the system, educational technology shows great promise for raising literacy and numeracy levels.

Ethnographic research on the issues of sustainability and scalability of the LTK+, the technology integration project for early literacy and numeracy, revealed that issues such as the readiness of the Kenyan society to adopt and make efficient use of educational technology for alleviating literacy and numeracy levels, there is a cautious optimism accompanied by hopes and expectations of due diligence by the government. It is generally believed by the stakeholders that the efficacy of educational technology initiatives largely depends on an accompanying development in infrastructure. Any lag in the latter will negatively affect the former.

Technology Buy-in by Stakeholders

Specific to the integration and use of the LTK+, especially ABRA, the research results point to an impressive buy-in by the policymakers as well as the administrators and teachers in the public schools in Kenya. While there is some resistance, especially from the older generation of teachers, most teachers interviewed were enthusiastic about the results produced from the use of ABRA which showed an increased keenness and excitement among the students to use the software. Specific recommendations by teachers to improve the software include increased localization of content, enhanced training, increased follow-up by the trainers, integration of LTK+/ABRA in more subjects

(than just language instruction), improved infrastructure, especially Internet availability and bandwidth, and regulation of teachers' workloads.

While generalizability is never a concern for critical qualitative research, a key question for any critical qualitative research is whether the insights from the research process and/or results can be useful for other researchers (even those using different methodological strategies). This research offers several such insights that other teams of researchers can benefit from. First, it is important to ask questions about the readiness of a society to receive and utilize any technology and educational technology in particular. While answers to this question vary from one context to the next, they give key insights about the timing and scope before the technology is introduced in a particular society. Second, and similarly, it is important to ascertain particular national and societal ethos to gauge the level of societal buy-in of any technological intervention. Our research provides a thick description of stakeholders' perceptions about the societal buy-in in Kenya along with more personalized narratives of teachers' buy-in and resistance. Finally, our research points out the importance of examining the relevance of technology-assisted education to the local cultures and ethos. This is another strategy that can be generalized and used by other research teams.

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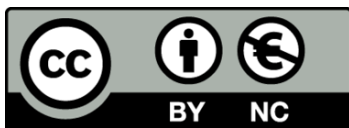Vygotsky, L. (1987). The collected works of L. S. Vygotsky. Eds. R. Rieber & A. Carton. Springer.

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Authors

Adeela Arshad-Ayaz is an Associate Professor in the Department of Education at Concordia University in Quebec, Canada. She received her Ph.D. in Comparative and International Education and Sociology of Education from McGill University. Arshad-Ayaz has published on the impact of globalization on educational policy and the impact of social media on youth's civic engagement, and issues related to diversity in culturally pluralist societies. Her ongoing research includes (FQRSC, SSHRC, and Security Canada) funded projects on social media for civic engagement and participation, social media and cultural pluralism, and the dark side of social media: hate speech in online environments. Email: Adeela.ayaz@gmail.com

M. Ayaz Naseem is a Professor in the Department of Education at Concordia University in Quebec, Canada and holds a Ph.D. in Comparative and International Education from McGill University, Montreal. His research interests are situated on the cross-section of peace education, social media as space for peace education, teaching about extremism, terror, and radicalization, feminist theory and philosophy, post-structuralism, and citizenship education. He has published widely, including six books and over 75 articles and book chapters. Email: ayaz.naseem@concordia.ca

Justus O. Inyega is an Associate Professor in the Department of Educational Communication and Technology, School of Education, College of Education and External Studies, University of Nairobi and the Director, Centre for Pedagogy and Andragogy. Inyega holds a Ph.D. in Science Education, a Postgraduate Certificate in multidisciplinary qualitative research from the University of Georgia, USA, a Masters of Education from the University of Leeds, UK, and a Masters of Education and Bachelor of Education from Kenyatta University, Kenya. Email: justus.inyega@uonbi.ac.ke