Affordances of Using Educational Technology in Teaching Critical Reading: Insights from an Action Research Study in a Ugandan University

*LYDIA NAMATENDE-SAKWA[1], GEORGE WILSON KASULE[2], JULIET KASAMBA[3]

[1,2,3]*School of Education, Kyambogo University*
Corresponding author: nsakwa@kyu.ac.ug

Abstract

The rapid increase in student enrolment and/or massification, also implicated in large class sizes, has been problematised for compromising quality education. Institutions of higher learning in Africa have embraced the use of ICT as one of the approaches to cope with the challenges of massification. The purpose of this study was to provide an examplar on how teachers can use ICTs to optimise learning from higher-order to lower-order thinking skills. The study uses action research methodology, undertaken with undergraduate students in a Ugandan university, to illuminate the researchers' experiences in using educational technologies to support the teaching of critical reading. Firstly, we demonstrate how learning progressed from lower-order to higher-order thinking skills as informed by Bloom's taxonomy. We also show how we optimised the use of technology from the dominant simple substitution, which was also teacher-centred, to a more complex redefinition, which is also learner-centred, as informed by the SAMR model. Finally, we highlight the affordances of using emerging technologies to support transformative learning. These include ongoing learning, monitoring/feedback, research, deeper interaction, peer-review, creativity, and reflection. The study has implications for in-service as well as pre-service teacher education programs which should integrate relevant theoretical frameworks in equipping teachers to optimise the use of technology in supporting teaching and learning.

Keywords: Educational technology; Massification; SAMR model; Bloom's taxonomy; Uganda.

Introduction

Massification, which refers to the surge in student numbers beyond institutional capacity, poses one of the greatest challenges to higher education, especially in the Sub-Saharan Africa (Hornsby & Osman, 2014; Hornsby, Osman, & De Matos Ala, 2013; Mohamedbhai, 2014). This rapid increase in student enrolment, also implicated in large class sizes, has been problematised for compromising teacher-student interaction, student learning, access to resources and infrastructure as well as quality education (Exeter et al., 2010; Mohamedbhai, 2011; Mulryan-Kyne, 2010; Sebbowa, Ng'ambi, & Brown, 2014; Tibarimbasa, 2010). Universities in Africa have devised several approaches to cope with the challenges of massification, among which is the use of information, communication technology (ICT) (Mohamedbhai, 2014; Mumene, 2013). ICT, albeit the limited accessibility to it in Africa, has also been effectively used for "assessment… processing of examinations results; admission and registration of students…optimal planning of lecture rooms to avoid clashes; and the automation of library services" (Mohamedbhai, 2014, p. 76). Yet, there remains a paucity in studies demonstrating how educational technologies (ETs) are taken up to support large classes, which, as Hornsby and Osman (2014) affirm, "appear to be a phenomenon that is here to stay" (p. 713).

Scholars in the field of educational technology have highlighted the importance of documenting evidence in regard to effective uses of emerging technologies in teaching/learning (Ng'ambi, 2013). In

taking the case of South Africa, for example, Ng'ambi affirms that "although there is an increasing use of emerging technologies in higher education internationally…there is little evidence that their use is transforming teaching and learning practice" (2013, p. 652). Moreover, as Mohamedbhai (2014) affirms, challenges resulting from massification in institutions are similar across African countries, substantiating "the need for greater regional collaboration among African institutions in order to share their experiences as well as their resources" (p. 82). In support of this imperative, Laurillard (2008) urges the teaching community to take on action research in order to build knowledge regarding how learning can be supported.

In heeding this scholarship therefore, we enacted the teacher/action-researcher role, illuminating our experiences in using ETs to teach reading to 1st year students in a Ugandan university. Our thesis is that the use of familiar technologies may encourage 21st century learners to appreciate and learn (Sebbowa et al., 2014). 21st century learners—also called "digital natives" (Prensky, 2001), are assumed to have grown up in the era of technology. We recognise that these 21st century learners mainly use technology for entertainment than for educational purposes (Senkbeil & Ihme, 2017; Wittwer & Senkbeil, 2008). Nonetheless, our study leveraged learners' exposure to technology, to teach study skills.

Purpose of the Study

Empirically, this paper provides an example in using emerging technologies to optimise and transform learning towards achieving higher-order thinking skills. These skills, as Hornsby and Osman (2014), argue are critical for higher education, where learning goals should move beyond knowledge acquisition to higher-order cognitive functions such as problem-solving and critical thinking. Similarly, the use of educational technology should be optimised to support learning.

Research Questions

The study was guided by the following research questions:

1. How can a teacher optimise the use of educational technologies to transform learning in large classes towards the attainment of higher-order thinking skills?

2. What affordances do the educational technologies make possible in supporting teaching/learning?

The Context of the Study

Uganda, a former British colony located in East Africa, has a population of about 40 million, of which 80% are engaged in subsistence agriculture (Namatende-Sakwa, 2018). The education system is generally afflicted by limited resources and large classes (Aguti & Fraser, 2006; Kewaza & Welch, 2013; Sikoyo, 2010), as is the case in other developing countries in the efford towards achieving "education for all" (Omoda-Onyait & Lubega, 2011). ICTs, if taken up and implemented adequately, can mitigate these challenges, not only supporting teaching and learning, but also equipping young people to participate competitively in the global economy (Newby, Hite, Hite, & Mugimu, 2013).

Yet, as Omoda-Onyait and Lubega's (2011) study on readiness for e-learning in eight institutions of higher learning in Uganda reveals, "most educational institutions in developing countries are unfamiliar with e-Learning, have low levels of computer availability, access, familiarity and internet penetration" (p. 200). This notwithstanding, there have been some efforts at integrating technology into education in Uganda (Newby et al., 2013). The Government of Uganda developed its initial ICT national policy in 2003, and subsequently established a Ministry of ICT in 2006 to support policy development and implementation (Farrell, 2007). Some organisations, such as Uganda-connectivity (UConnect), Worldlink and Schoolnet, have stepped in, providing access to contemporary communication media, computers, training and internet services to schools (Mutonyi & Norton, 2007; Nawaguna, 2005). Further, ICT has also been introduced as a subject in Ugandan schools. Universities in Uganda have also increased their investment in adapting ICT as integral to instruction, working in close collaboration with the Ministry of Education and Sports (MoES) (USAID, 2006).

Statement of the Problem

We specifically situated this paper in our undergraduate Study Skills course, taught to all undergraduates in order to inform their scholarly work at the university. These classes have a teacher-student ratio of about

one teacher to 180 students per class. Student participation and performance in the scholarly skills remain below the required standard. As lecturers in Study Skills, our brainstorming sessions problematised the large class sizes, and the three-hour contact time per week, which was inadequate for critically engaging with texts towards the acquisition of scholarly skills. Further, the overdependence on traditional face-to-face methods overlooked the considerable exposure and access by our students to technology, which we could leverage for education. Further, technologies could be used to shift our pedagogy from the teacher-centred methods which pervaded our classrooms, to learner-centred methods in order to transform teaching and learning.

Taking up ETs with affordances (Bower, 2008) for ongoing learning can mitigate the limited contact time and address the problem of large class sizes by creating more time to interface with learners beyond the classroom, allowing deeper teacher/student/content interaction. It is against this background that we share our experiences with taking up ETs to teach critical reading skills. Our goal is to provide an example of how to optimise the use of ETs to transform learning towards achieving higher-order thinking skills. We also illuminate the affordances of ETs in supporting teaching/learning.

Theoretical Underpinnings

Bloom's taxonomy of educational objectives (Churches, 2010) as well as the SMAR model (Puentedura, 2006) were taken up in undertaking this study. Bloom's taxonomy categorises thinking skills from lower-order thinking skills (LOTS) to higher-order thinking skills (HOTS) (Churches, 2010) (see Figure 1). This taxonomy framed the articulation of our lesson objectives from LOTS to HOTS, making it possible to optimise teaching and learning.
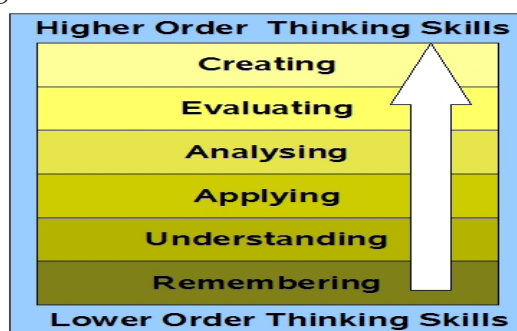
Figure 1: Bloom's Revised Taxonomy (Churches, 2010)

We also adopted the SAMR model (Puentedura, 2006), which provides four levels of technology integration (Substitution, Augmentation, Modification, and Redefinition). This framework supports educators in optimising the use of mobile devices, thereby creating optimal learning experiences. *Substitution* is, according to Hockly (2013), the most basic enactment, where technology simply replaces a teaching aid such as the use of a WhatsApp platform, instead of a whiteboard to post a task. *Augmentation* goes beyond substitution by providing functional improvement such as when students use WhatsApp to directly respond to one another. At *Modification*, technology allows for the redesign of the learning activity, for example from a discussion on WhatsApp, to a presentation. *Redefinition* then creates tasks that could not have been undertaken without the use of the technology, such as the design of a writing blog. While scholars illuminate the gains from substitution and augmentation of learning using mobile devices, it is in modification and redefinition that the full potential of learning using ETs is optimised (Hockly, 2013; Puentedura, 2006; Romrell, Kidder, & Wood, 2014).

Finally, Bloom's taxonomy as well as the SAMR model were used as lenses to demonstrate the optimisation of learning as well as the use of technology, respectively, in the teaching of critical reading skills to university students. While Bloom's taxonomy shaped the articulation of simple to complex learning objectives, the SAMR model shaped the optimisation in the use of the technology in our lesson from simple substitution, towards the more complex redefinition, making learning more transformative in teaching critical reading, as explained later.

Method and Procedure

This study was conducted with a combined group of first-year students from the Faculty of Built Environment and the Faculty of Science. This group, which comprised 110 male and 70 female students between the ages of 19 and 21, was purposively selected on the basis of their underperformance in terms of reading comprehension compared to other groups, which did the course on "Literature and Composition". This compulsory course, timetabled for three hours once a week for 16 weeks, purposed to enhance scholary competences amongst the students at the university. This sample of participants was therefore suitable specifically in terms of demonstrating how to optimise the use of technology to support learning.

Cognisant of the importance of aligning technology with the task/problem at hand (Anderson, 2003; Bower, 2008), we selected Ets, including WhatsApp, Youtube, Google Docs and Mindmup because of their affordances for extended learning. This would address the problem of the large class sizes, which require more time than allocated on the lecture timetable. We also recognised the dichotomy between "the technologies supported and used in higher education institutions (HEIs) on one hand, and technologies owned and predominately in use among students" (Ng'ambi, 2013, p. 652). As such, we were intentional in choosing both tools such as Google Docs as provided by the university as well as WhatsApp/mobile phones, which are accessible to the students.

Finally, using content analysis, we studied the posts on the online class platforms such as WhatsApp and Google Docs. The posts included pictures, audio as well as video data as used during the student engagements on the online platforms. This provided insights into patterns taken up in using technology to support learning. The use of participant observation was yet another method through which we collected data, especially during the face-to-face sessions in which students presented work which had been done remotely using the educational technology tools.

On the whole, this paper illuminates experiences of using ETs to complement the face-to-face sessions, in teaching critical reading for a duration of four weeks.

Data Analysis

We first analysed the audio-visual data posted on the online platforms, and then the observational data. This involved open and then axial coding of the data using a codebook, to reach inter-rater reliability. The analysis informed the two research questions of the study, illuminating not only how technology had been optimised to support learning, but its affordances in this regard.

Trustworthiness and Credibility

This refers to the "validity" and "reliability" equivalents in qualitative research (Creswell, 2007). We undertook instrument piloting, triangulation (using multiple methods, including content alaysis and participant observation) as well as member checking through which we shared data, analyses, interpretations and conclusions with some participants in order to establish credibility of the account. Finally, we presented our findings using a rich, thick description to allow readers to make decisions regarding their transferability.

Ethical Considerations

It was upon receiving ethical approval from the Infectious Diseases Institute-Research Ethics Committee and permission from the university as well as the two participating faculties that we proceeded with the study. The participants were assured of confidentiality, given that we used pseudonyms; we explained the purpose of the study to them; and we requested voluntary permission, which they confirmed by signing consent forms.

Findings of the Study

This section demonstrates how learning critical reading progressed from the aquisition of lower-order to higher-order thinking skills as well as how the use of ETs was optimised from simple substitution to complex redefinition.

Optimising Educational Technology towards Higher-Order Learning

In the first face-to-face session, we introduced a reading approach, which we explained using illustrations on the whiteboard. We also played a short YouTube video, which graphically explained how to use the approach to read academic texts. This task harnessed lower-order thinking as it aimed to facilitate remembering the tenets of the reading approach. We then provided a newspaper extract entitled "**Why the Miss Curvy Pageant is an assault on Ugandan women**". Given the paucity of time for students to critically engage using the reading approach, we resorted to ETs to extend learning outside the lecture time, given their affordances for ongoing synchronous and asynchronous learning. The use of the Ets, as illustrated, progressed from substitution to redefinition.

Substitution

Substitution, as explained earlier, entails the most basic use of technology through which technology simply replaces a teaching aid (Hockly, 2013). As enacted in this study, instructions were posted on the class WhatsApp platform following the face-to-face engagement with a specific reading approach to engage a newspaper extract entitled "**Why the Miss Curvy Pageant is an assault on Ugandan women".** The instructions required students to read the extract in groups of at least seven, and using the reading approach, outline and post their group perspective regarding whether the **'Miss Curvy Pageant'** was indeed an assault on Ugandan women.

Drawing on Laurillard's (2008) reminder to support students in the use of ETs, we provided instructions explaining how the students should use WhatsApp on their mobile phones to complete the task. Indeed, as Romwell et al.'s (2004) review of literature on mobile learning suggests, students were generally not as competent with their mobile devices for academic purposes as might be expected. Teachers are as such obliged to support them in using the features of their personal mobile devices.

By posting the assignment on the WhatsApp group as we would a whiteboard and/or blackboard, we had simply used WhatsApp as a substitute for the whiteboard. This as Hockly (2013) affirmed is the use of technology at its simplest, since we had simply substituted a traditional tool for a mobile device. Additionally, within Bloom's taxonomy of thinking skills, the task, which involved outlining their perspectives on whether the **'Miss Curvy Pageant'** is an assault to Ugandan women, had elicited "understanding" which is a lower-order thinking skill.

Augmentation

Augmentation goes beyond substitution by providing functional improvement in using ETs. As enacted in this study, students used icons on WhatsApp such as "reply", "attach", "copy and paste" in responding to one anothers' perspectives regarding whether **the 'Miss Curvy Pageant'** was indeed an assault on Ugandan women. The students therefore engaged other functions of WhatsApp, further optimising the use of WhatsApp for learning.

The chain discussion allowed for deeper engagement as students posted supplementary articles, links, videos and other artifacts as evidence to justify their positions in regard to the discussion. This allowed learners to engage with a greater scope of language and information for intensive comprehension, text analysis and evaluation, thereby progressing in their learning towards application, which is on the spectrum of higher-order thinking skills in Bloom's taxonomy.

Modification

At modification**,** technology allows for the creation of a new task. As enacted in this study, students summarised the key issues elicited from the discussion, with each group representing the points on WhatsApp using a mind map. These maps were useful in facilitating the layout as well as organisation of their points. In synthesising/summarising their discussion, the students harnessed higher-order thinking skills. Further, the use of WhatsApp had reached modification, given the redesign of the learning activity from a comprehension and discussion task to a summary task. The individual groups then projected the summary representation (mind map) onto either PowerPoint or Google slides. Each group was then given five minutes to explain their mind map in a face-to-face session during lecture time.

Redefinition

This phase involved the morphing of the task from the initial reading and comprehension, discussion and presentation to the more complex critical writing and evaluative peer review task, which are also higher-order thinking skills.

As informed by the reading, discussion and presentation as well as other resources uploaded to their WhatsApp platforms, each individual student wrote a critical response paper. Each paper was uploaded to Google Docs and each student was required to peer review and/or provide feedback to at least one other student's paper using icons on Google Docs. This use of peer review created deep and meaningful interaction. These first-year students had never had to give or receive peer review. This was a new experience, which, as they intimated, taught them how to give feedback as well as how to be critical about feedback provided by a peer. After revising their papers based on peers' feedback, the students then shared the final draft with us using Google Docs for additional feedback.

On the whole, the use of technology had been optimised from substitution to redefinition, also transforming a traditional reading task into a learner-centred multiple-media task, harnessing cognitive functions from lower-order to higher-order thinking skills, as summarised in Table 1.

Table 1: Optimising ETs towards higher-order thinking

No.	Activity	SMAR model	ET tool and functions	Cognitive function	Approach
1.	Posted task	Substitution	WhatsApp *WhatsApp replaced whiteboard*	LOTS Remembering	Teacher-centred
2.	Discussion	Augmentation	WhatsApp *The functions of WhatsApp optimised by "replying", "attaching images", inserting video, links, articles.*	LOTS -Comprehension -Application -Analysis	Learner-centred
3.	Summary and f2f presentation	Modification	-WhatsApp -Mind maps -PowerPoint, Google slides *The summary represented graphically on WhatsApp using other tools like PowerPoint and Google slides and then presented in f2f lecture.*	HOTS Synthesis	Learner-centred
4.	Writing; peer review; teacher feedback	Redefinition	-Google Docs *Learning optimised from a comprehension to a creation task.*	HOTS Create	Learner-centred Teacher-centred

Affordances of ETs in Teaching Critical Reading Skills

In this section, we provide a snapshot to specifically illuminate the possibilities made conceivable by using ETs to teach graduate students.

Ongoing Teaching/Learning

The Ets, specifically the mobile phone with its affordances for ongoing learning, made it possible for interactions to continue beyond the four walls of the classroom. Students continued to engage with the subject, logging in at times of their convenience, as depicted, for example, in Group 2's engagement from 2:28:16 am and 3: 02: 51 pm on 1st March 2019.

Affordances of Using Educational Technology in Teaching Critical Reading: Insights from an Action Research Study in a Ugandan University

119

Figure 2: Ongoing learning

The conversation and/or learning remained active and alive, extending in ways that would not have been possible with traditional tools of learning. This is corroborated by Romrell et al., whose review of literature revealed that scholars lauded the mobility of devices because "it allowed the students to engage in the activities at times and in places that they could not with more traditional learning" (2014, p. 7).

Monitoring Learning

Student engagement was monitored on the go, and student disengagement nipped in the bud, thereby keeping students on track. In one example on 26th February, at 1:38:25 pm, one of the researchers commented on student disengagement on a task, which was evident on their WhatsApp group platform. This kick-started work on the task.

Figure 3: Monitoring learning

Students also provided timely feedback to their teacher (Fig. 4). In one example, FOBE students texted one of the researchers, explaining their struggles in attending to the numerous assignments. We agreed to meet and find a way forward.

```
[2/22/19, 11:54:50 AM] +256 704 795008: Hello Ms. Lydia
This is one of the English and literature  groups from the faculty of the built
environment however  it comprises of one person from mass communication. First and
foremost we want to apologise  for the delay in submission  of the course work due to
studio assignments that were due the same day. Nevertheless, as students of
environmental design we would like to discuss with you certain issues and lay
strategies on how we shall go ahead with our English course work in conjunction  with
the faculty assignments  that are almost endless. This will help us to avoid getting
into problems with you in terms of attendance and doing work.
Thank you
A good day to you
[2/22/19, 11:55:51 AM] G: Hi
[2/22/19, 11:56:13 AM] G: I will be on campus next wee on Wednesday and Thursday
[2/22/19, 11:57:00 AM] +256 704 795008: Okay then meet you next week.
```

Figure 4: Timely feedback for the teacher

In addition to tracking progress and/or monitoring learning, we managed to keep organised easily retrieval records of student participation, which informed ongoing conversations as well as subsequent lesson preparation. Scholars have lauded digital platforms/tools for their affordances for tracking and storing extensive information on learners' interaction, enabling recordkeeping, as well as retrieval to support teaching/learning (Alvarez, Salavati, Nussbaum, & Milrad, 2013).

Deeper and Meaningful Interactions

The features for feedback using Google Docs, for example, made it possible to directly address students' issues. It was possible, for example, to position suggested revisions within the student's text, allowing them to accept the change by checking the tick, or reject it by checking the cross.

Figure 5: Personalised feedback

The feedback was then forwarded to the students using the "share" button, making it possible for them to receive it instantaneously – in real time, rather than wait for the teacher to return a batch of papers to the lecture room. Additionally, the WhatsApp function with features for direct reply made it possible for students to respond directly to one another's arguments in response to the reading task.

Affordances of Using Educational Technology in Teaching Critical Reading: Insights from an Action Research Study in a Ugandan University

121

Figure 6: Meaningful interactions

WhatsApp also has affordances for different types of expression and/or learner styles, as shown in the use of emojis above to give feedback. Further, students' free expression was illuminated through their jocular ways, which made learning fun. In fact, one student affirmed how much she had enjoyed the WhatsApp discussion – to which another student, in agreement, responded with laughter emojis. The limited amount of time during f2f sessions restricts informal jocular expression, which can be motivating in making learning more fun.

Transformative Learning

The affordances for uploading and sharing material from media such as YouTube enriched learning. In defence of the beauty pageant, for example, one student juxtaposed three images on WhatsApp, which she had downloaded from the internet, in order to support her argument.
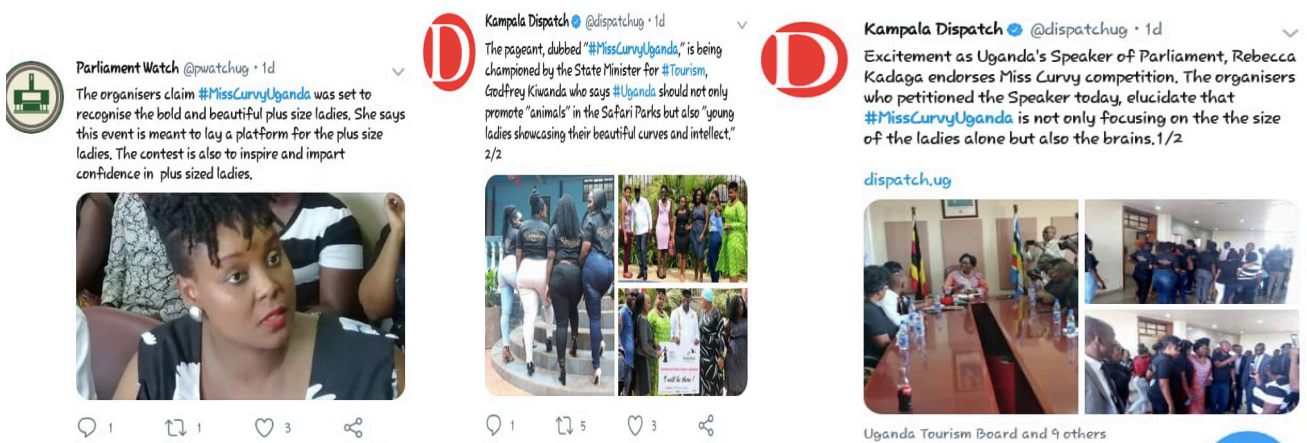
Source: Kampala Dispatch, 27th February 2019

Figure 7: Images to support an argument

The first image substantiates her argument that the pageant sought to celebrate beauty in diversity. The third buttresses this, with an endorsement from the Speaker of Parliament. The student writes a caption under the second picture, however, stating "it is such statements that raise questions about the motive of

the pageant." The student, as such, builds her argument using pictorial evidence. Students posted diverse resources, creating a repository of knowledge. Learning, as such, supported by ETs, enabled the retrieval, selection and sharing of information from multiple sources (Alvarez et al., 2013; Kong et al., 2014).

In yet another example, one student posted a couple of videos from YouTube, in order to illuminate the agency of the women who chose to participate in the pageant, by using their voices and experiences. She then summarised the key findings in the video, affirming "several contestants went in for several reasons, i.e. to boost self esteem; prove that beauty aint only with the slim size and that one has to get to love her body the way it is etc…"

On the whole, the possibilities for student expression using ETs are myriad. In the examples below, students illustrated their responses to the reading using colour-codes and pictures. This created the possibility for them to express their learning in diverse ways.
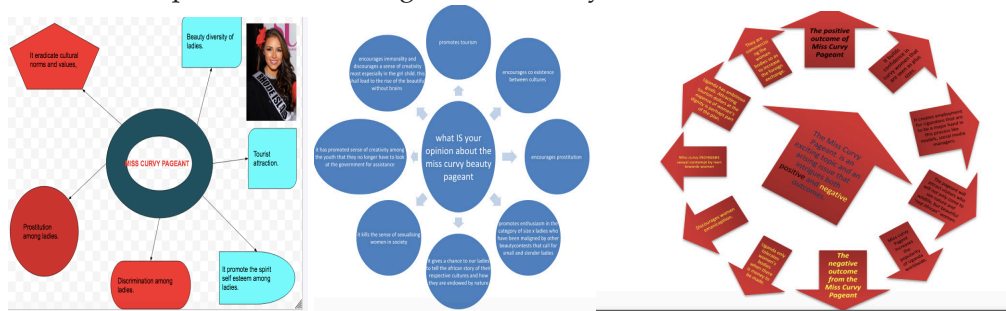

Figure 8: Diverse learner expression of learning

Research

The ET affordances for research created possibilities for transformative learning. One example involves Helen, who conducted an interview with respondents based on her engagement with the reading assignment. She posted the audio transcripts onto the WhatsApp forum. The transition from the initial critical reading task into a research task illuminates how technology can push learning boundaries, making it more transformative.

Peer Review

Each student was required to provide feedback to at least one other student's response paper, using the track-changes icon in Google Docs. This mode of engagement, which was new to the students, provided opportunities for them to learn how to critically provide and receive feedback. The Google Docs features enabled the rejection or acceptance of feedback through checking the cross or ticking, respectively.

Figure 9: Peer feedback

Affordances of Using Educational Technology in Teaching Critical Reading: Insights from an Action Research Study in a Ugandan University

123

While Google Docs had been available to the students since their first semester, many had not attempted using it. Teaching/learning using these tools was, as such, transformative in not only exposing students in this regard, but also in redefining tasks to enrich learning.

Student Reflections

ET scholars advocate reflexive practice on the process of using ETs for teaching/learning (Hockly, 2013; Romrell et al., 2014). As such, we encouraged our students to post some reflections on Google Docs, highlighting their experiences with using ETs for learning.

Figure 10: Student reflections

The student highlights illuminate the gains of using ETs such as the reduced costs, given the absence of printing; possibilities of working at individual convenience and pace; time saved, given the online submissions; affordances for editing and proofreading; wealth in practical skills gained from hands-on experience; access to more resources; as well as a more enjoyable and engaging experience. Indeed, Romrell et al. corroborated this by affirming that "overall, the students generally enjoyed using the mobile devices and thought that they provided a positive alternative to other methods of learning" (2014, p. 7).

The gains of technology notwithstanding, students also illuminated some of the encumbrances, such as the power shortages and poor network connectivity, which sometimes interrupted their work. They also explained their struggles with using some of the ETs such as Google Docs, illuminating the need for more ICT literacy to inform their work. Finally, some of them expressed concern regarding the possibility of negative health impacts that could result from prolonged computer use, such as back pain and eye defects.

Discussion

Evident from the study are the increased demands and obligations on the teacher of the 21st Century whose inventory should not only include pedagogical support and content but also technological knowledge and skills. The shift in the teacher's role to facilitator and/or "that of knowledgeable guide-on-the-side" (Tarling & Ng'ambi 2016, p. 560), which is afforded by ETs, has cut down on the "visible" teaching enacted during face-to-face sessions, at the same putting new demands on meticulous planning, monitoring learning and providing timely feedback. Teachers should be prepared in ways that enable them to support learners towards transformative learning, even as the former take on more autonomous learning outside the classroom. Indeed, this role of teacher as facilitator, as Kong explains, "would be relatively new to most teachers who get used to the role as learning authority in traditional teacher-centered paradigm" (Kong et al., 2014, p. 76). This has implications for a teacher education programme to skill teachers for the 21st Century classroom.

Further, the dominant obstacle to optimising the use of ETs for transformative learning, as illuminated in the learners' as well as our own reflections, is the paucity of access to technology, as

well as connectivity to the internet. The dominant use of WhatsApp, which is a familiar application on students' mobile phones, was an eye-opener to its affordances for supporting learning. This is supported by scholarship, which illuminates the potential of mobile phone learning, which teachers and students should leverage (Hockly, 2013).

While access to mobile technology should indeed be leveraged to support teaching/learning, our study demonstrated that learners should be supported to use their mobile phones for academic purposes. The study challenged the assumption that our 21st Century learners were technologically competent to use ETs for academic work. This corroborates studies which suggest that although young people dominantly use ICT, it is for entertainment rather than for educational purposes (Gibbs, Steel, & Kuiper, 2011; Mutonyi & Norton, 2007; Senkbeil & Ihme, 2017; Wittwer & Senkbeil, 2008). Such ICT-related skills as our study has demonstrated are inadequate for academic use.

The study also confirms scholarship which affirms that mobile literacy is an important skill (Alvarez et al., 2013). As Parry argues, "The future our students will inherit is one that will be mediated and stitched together by the mobile web…Teaching mobile web literacy seems to me as crucial as teaching basic literacy" (2011, p. 16, as cited in Hockly, 2013, p. 83). The study illuminates the importance of ICT literacy, which is considered a functional literacy to inform teachers' as well as students' utilisation of ETs for academic purposes.

Conclusions and Recommendations

This study exemplifies how to optimise the use of ETs to transform learning towards achieving higher-order thinking skills. We have demonstrated how a teacher can optimise the use ETs from simple substitution, which is the dominant model, to more complex redefinition. Therefore, technology should be selected first in alignment with the task/problem at hand, and then optimised to support and transform learning towards the achievement of higher-order thinking skills.

This has implications for both in-service and pre-service teacher education programmes, which should expose teachers to diverse theoretical frameworks and/or models to guide their selection as well as integration of technology into teaching/learning. Indeed, these instructive frameworks should inform teacher education as a key part of the teaching community's repository to inform pedagogy. Secondly, we recommend that teachers adopt, adapt and exploit the ETs that student have access to, also providing requisite support for students to optimise them for learning. Finally, teachers should take up ETs in the classroom in ways that support learners towards achieving transformative learning.

References

Aguti, J. N., & Fraser, W. J. (2006). Integration of information communication technologies (ICTs) in the distance education programme, Makerere University, Uganda. *Turkish Online Journal of Distance Education-TOJDE, 7*(3), 89–104. Retrieved from http://cees.mak.ac.ug/sites/default/files/publications/Aguti2.pdf

Alvarez, C., Salavati, S., Nussbaum, M., & Milrad, M. (2013). Collboard: Fostering new media literacies in the classroom through collaborative problem solving supported by digital pens and interactive whiteboards. *Computers and Education, 63*, 368–379.

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *International Review of Research in Open and Distance Learning, 4*(2), 126–141.

Bower, M. (2008). Affordance analysis – matching learning tasks with learning technologies. *Educational Media International, 45*(1), 3–15.

Churches, A. (2010). *Bloom's digital taxonomy.* http://burtonslifelearning.pbworks.com/f/BloomDigitalTaxonomy2001. pdf Retrieved from http://burtonslifelearning.pbworks.com/f/BloomDigitalTaxonomy2001.pdf

Kampala Dispatch, K. (Producer). (2019). #MissCurveyUganda. Retrieved from https://twitter.com/dispatchug/status/1100718177946947585

Exeter, D. J., Ameratunga, S., Ratima, M., Morton, S., Dickson, M., & Hsu, D. (2010). Student engagement in very large classes: The teachers' perspective. *Studies in Higher Education, 55*(7), 761–775.

Farrell, G. (2007). *Survey of ICT in education in Uganda.* Retrieved from nfoDev/World Bank.:

Affordances of Using Educational Technology in Teaching Critical Reading: Insights from an Action Research Study in a Ugandan University

125

Gibbs, S., Steel, G., & Kuiper, A. (2011). Expectations of competency: The mismatch between employer' and graduates' views of end-user computing skills requirements in the workplace. *Journal of Information Technology Education, 10,* 371– 382.

Hockly, N. (2013). Technology for the language teacher: Mobile learning. *ELT Journal, 67*(1), 80– 84. doi:10.1093/elt/ccs064

Hornsby, D. J., & Osman, R. (2014). Massification in higher education: Large classes and student learning. *Higher Education, Special Issue: Large Class Pedagogy: Opportunities and Challenges of Massification, 67*(6), 711–719. doi:https://www.jstor.org/stable/43648685

Hornsby, D. J., Osman, R., & De Matos Ala, J. (2013). *Teaching large classes: Interdisciplinary perspectives for quality tertiary education.* Stellenbosch: SUN Media.

Kewaza, S., & Welch, M. I. (2013). Big class size challenges: Teaching reading in primary classes in Kampala, Uganda's central municipality. *US-China Education Review, 3*(5), 283–296.

Kong, S. C., Chan, T., W., Griffin, P., Hoppe, U., Huang, R., Kinshuk, L. C. K., . . . Yu, S. (2014). E-learning in school education in the coming 10 years for developing 21st century skills: Critical research issues and policy implications. *Educational Technology & Society, 17*(1), 70–78.

Mohamedbhai, G. (2011). Higher education in Africa: The challenges ahead. *Higher Education Forum, 8*, 23–36.

Mohamedbhai, G. (2014). Massification in higher education institutions in Africa: Causes, consequences and responses. *International Journal of African Higher Education, 1*(1), 59–83. doi:https://doi.org/10.6017/ijahe.v1i1.5644

Mulryan-Kyne, C. (2010). Teaching large class sizes at college and university level: Challenges and opportunities. *Teaching in Higher Education, 15*(2), 175–185.

Mumene, I. (2013). New higher education reforms in Kenya. *New Higher Education Reforms in Kenya*(73), 14–16.

Mutonyi, H., & Norton, B. (2007). ICT on the margins: Lessons for Ugandan education. *Language and Education, 2*(3), 264–270. doi:10.2167/le751.0

Namatende-Sakwa, L. (2018). The construction of gender in Ugandan English textbooks: A focus on gendered discourses. *Pedagogy, Culture & Society, 26*(4), 609–629. doi:10.1080/14681366.2018.1436583

Nawaguna, P. (2005, 15 November 2005). Eastern students get computer skills. *New Vision.* Retrieved from http://www.newvision.co.ug/D/9/35/465671.

Newby, L. S., Hite, J. M., Hite, S. J., & Mugimu, C. B. (2013). Technology and education: ICT in Ugandan secondary schools. *Education and Information Technologies, 18*(3), 515–530. doi:10.1007/s10639-011-9180-x

Ng'ambi, D. (2013). Effective and ineffective uses of emerging technologies: Towards a transformative pedagogical model. *British Journal of Educational Technology, 44*(4), 652–661. doi:10.1111/bjet.12053

Omoda-Onyait, G., & Lubega, J. T. (2011). E-learning readiness assessment model: A case study of higher institutions of learning in Uganda. In R. Kwan, J. Fong, L. Kwok, & J. Lam (Eds.), *Hybrid learning. ICHL 2011. Lecture notes in computer science* (Vol. 6837, pp. 200– 211). Berlin, Heidelberg: Springer.

Prensky, M. (2001). Digital natives, digital immigrants part 2. Do they really think differently? *On the Horizon, 9*(6), 1–6. Retrieved from http://www.emeraldinsight.com/journals.htm?issn=1074-8121.

Puentedura, R. (2006). *Transformation, technology, and education.* Retrieved from http://www.hippasus.com/rrpweblog/archives/2013/05/29/SAMREnhancementToTransformation.pdf

Romrell, D., Kidder, L., & Wood, E. (2014). The SAMR Model as a framework for evaluating mLearning. *Online Learning Journal Volume, 18*(2), 1–15. Retrieved from https://www.learntechlib.org/p/183753/

Sebbowa, D., Ng'ambi, D., & Brown, C. (2014). Using wikis to teach history education to 21st century learners: A hermeneutic perspective. *Critical Studies in Teaching and Learning, 2*(2), 24– 48.

Senkbeil, M., & Ihme, J. M. (2017). Motivational factors predicting ICT literacy: First evidence on the structure of an ICT motivation inventory. *Computers & Education, 108*, 145–158.

Sikoyo, L. (2010). Contextual challenges of implementing learner-centred pedagogy: The case of the problem-solving approach in Uganda. *Cambridge Journal of Education, 40*(3), 247–263. doi:10.1080/0305764X.2010.509315

Tibarimbasa, A. (2010). *Factors affecting the management of private universities in Uganda* (PhD thesis, Makerere University). Retrieved from http://mak.ac.ug/documents/Makfiles/theses/Tibarimbasa_Avitus.pdf.

USAID. (2006). *ICT for teacher professional development in Uganda. Impact and scalability assessment.* Retrieved from https://dot-com-alliance.org/newsletter/article.php?article_id=160

Wittwer, J., & Senkbeil, M. (2008). Is students' computer use at home related to their mathematical performance at school? *Computers & Education, 50*, 1558–1572. doi:http://dx.doi.org/10.1016/j.compedu.2007.03.001.