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Digital fluency: necessary competence for teaching and learning in connected classrooms

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Digital fluency: necessary competence for teaching and learning in connected classrooms

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ABSTRACT

Educators' digital fluency has been noted as one of the most important skill required for effective curriculum delivery in connected classrooms. Evidence shows that even though many Western Cape classrooms have Internet connectivity, many educators are unable to take advantage of the connectivity for teaching and learning. Hence, this paper focuses on the educators' digital fluency as a necessary competence for effective curriculum delivery in connected classrooms. The study was done qualitatively by randomly selecting thirty-six educators who participated in one-on-one and focus group interviews. Results show that most educators perceive their digital fluency and the complex knowledge of how to effectively integrate digital technologies into curriculum delivery to be inadequate. Hence they are unable to take advantage of the connectivity in the classrooms. Therefore, the authorities in education need to ensure educators are well equipped to develop digital fluency and the ways of integrating technologies into curriculum delivery.

Keywords: digital fluency, digital technology, integration, teaching and learning, 21st century literacy

INTRODUCTION

In the information age, teaching and learning processes require new literacies as opposed to the traditional ones used before the onset of digital technologies. In this 21st Century, technology is taking over traditional texts and learners' attention, hence acquisition of digital fluency competences is a necessity for one to navigate effectively through the epistemological hazards of the Information Communication Technologies (ICTs) and online realm (Scott 2016). The skill is recommended for both the educators and learners. Nonetheless, the integration of the ICTs into the classrooms in this

digital age is believed to be one of the most exciting innovations in education. Where such technologies have been effectively deployed and integrated into curriculum delivery, quality teaching and learning have been enhanced (Nomass, 2013).

This paper is based on the study conducted in the Western Cape Province where the Western Cape Education Department (WCED), using the Khanya project, equipped all the public schools with digital technologies like computer laboratories, smart boards mounted into the classrooms etc. (Chigona, 2011). The project also trained educators on how to use the technologies. Currently, the Western Cape government (WCG)'s broadband initiative has been set forward to ensure that all public schools in the province are connected to broadband service within a reasonable time-frame. According to the WCG, this is important as the integration of the ICTs and the broadband is perceived extremely positive for eradication of digital divide as well as enhancing curriculum delivery in schools in the province. In the WCG's 2014 -2019 Provincial Strategic Plan, it is stipulated that:

To enable our young people to be well-equipped for the 21st century world of work, information technology must be an integral part of their learning and lives. To achieve this, we are rolling out two Game Changers, broadband and e-learning. They will create modern classrooms and improve teaching to enhance learning as well as create connected government, communities and businesses (Western Cape Government, 2016: 11)

The assumption is that educators and learners will adopt and use the technology for e-learning. However, for the connected classrooms to be used effectively, educators need to acquire knowledge on how to work with the digital technology and the connectivity. In other words, educators should acquire new fluencies necessary for the e-learning environments. Such fluencies or literacies are required because digital technologies have amplified the intensity and complexity of literate environments. Educators need to possess a wide range of digital abilities and competencies to be able to navigate and teach effectively within the connected environment (NCTE 2013). This makes, digital fluency the most important component of being able to navigate, communicate and access opportunities in this technology intensity and complex environment (Scott 2016).

However, there is evidence that despite deployment of digital tools to schools and the training of educators on how to use the ICTs, many educators in the province are still not integrating e-learning technologies into their curriculum delivery due to lack of competencies and capabilities when using digital technologies (Chigona, 2015). It is therefore necessary to understand digital fluency factors that are influencing the educators' ability to use connected classrooms effectively. Thus, the aim of this paper is to understand the influence of digital fluency on the uptake and use of connected classrooms by educators in the Western Cape. Digital Information Fluency (DIF) and Technological Pedagogical and Content Knowledge (TPACK) models were used to understand the factors uptake and use of the connected classrooms by educators. The research question guiding the study is:

What are the educators' perceptions about the influence of digital fluency on their teaching in digital classrooms?

To answer the question, the study made use of a qualitative research approach. Educators were randomly selected from public schools in Western Cape Province to participate in the study. Focus group discussions and in-depth interviews with the educators were the data collection techniques used for this study. Results show that while the educators can operate the ICTs available in their classrooms, most of them perceive their digital fluency and hence the complex knowledge of how to

effectively integrate digital technologies into curriculum delivery to be inadequate. Consequently, they are unable to take advantage of the connectivity in the classrooms. There is a need therefore, to assist the educators to develop their digital fluency and a skill on how to integrate pedagogy, content and technology for effective curriculum delivery.

What is digital fluency?

Digital fluency is critical for the effective teaching and learning in the connected classrooms. Educators and learners need skills like critical thinking, collaboration and ethical issues for the multimedia environments which includes copyright and privacy (White, 2013:8) Bell & Gilliam (2011) define digital fluency as “the aptitude to effectively and ethically interpret information, discover meaning, design content, construct knowledge, and communicate ideas in a digitally connected world”. Considering extrinsic factors that can impact on one’s fluency in a digital environment, Briggs and Makice (2011:65) refers to “digital fluency as an ability to reliably achieve desired outcomes through use of digital technology. This ability is helped or hindered by the situational forces and the digital fluency of others”. This means, to be digital fluent is more than having technological ability whereby the digital tools could be used to create and communicate complex ideas and interpretation of the communications.

Niessen (2013) concluded from the definitions stating that “digital fluency is an emerging aptitude that involves knowing when and why we use the digital media that we choose and using it with ease to communicate and/or retrieve information”. This is the improvement from the traditional literacy which meant an individual had the understanding of what to do, and how to do it but had no capacity to explain when and why a communication and the mode would be appropriate (Briggs and Makice 2011:63). NCTE (2013) has argued that for learners and educators in the digital age to be able to engage with each other and the curriculum delivery effectively, they need to:

- be proficient and fluent with the digital technologies,
- be able to manage, analyse and synthesize vast information on the digital platforms,
- create, critic and evaluate multimedia texts, and
- display ethical responsibilities required by the multimedia environments.

The abilities above can be achieved if one is able to respond issues presented in Figure 1, the Digital Information Fluency Model.

Since the nature of communication in the 21st Century requires a shift from the traditional literacy to digital literacy and digital fluency, educators have no choice but to acquire the digital fluency to effectively assist and communicate with the 21st Century learners. This entails that both educators and learners should have the ability to effectively use technology, to locate, and critically evaluate information if they are to achieve the teaching and learning goals in the digital networked environments of the 21st century (Duke & Ward 2009: 253).

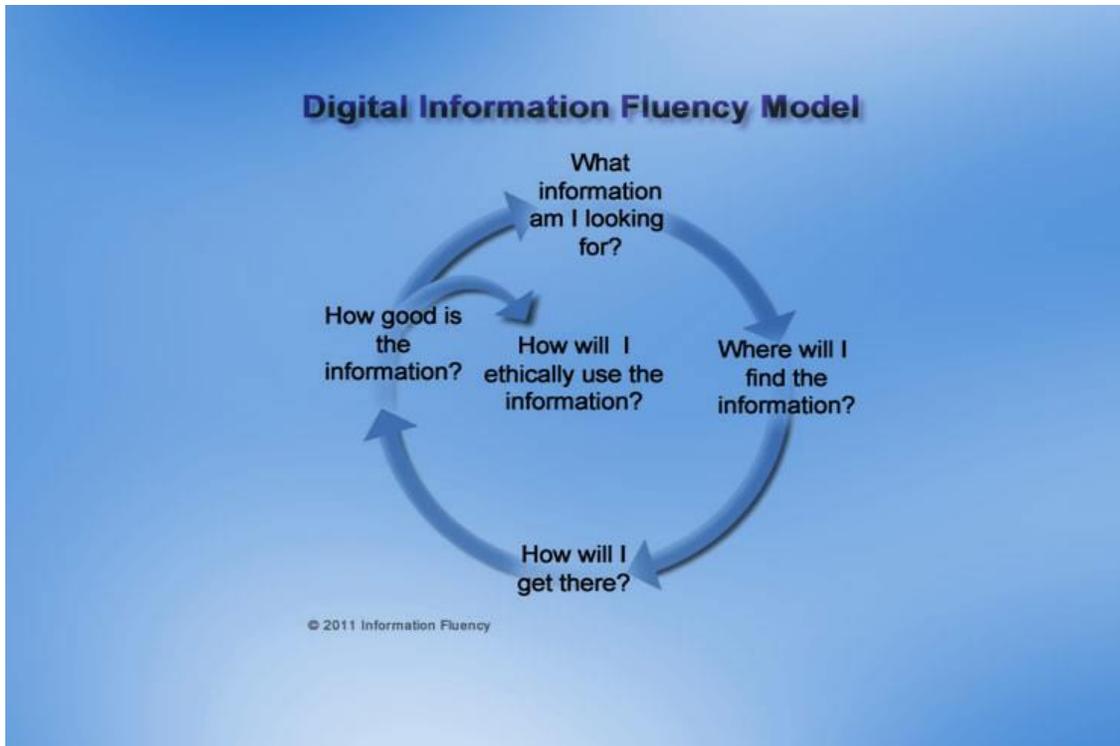


Figure 1: Digital Information Fluency Model

Source: <http://21cif.com/>

Framework for effective teaching in connected classroom

On top of digital fluency, educators in the 21st Century need to acquire TPACK to teach the digital natives effectively. TPACK is required for effective teaching with and through digital technologies. TPACK model is therefore used to understand knowledge required by educators for technology integration (Agyei & Vooigt 2012).

TPACK model developed by Mishra & Koehler (2006) is besides DIF used as framework in this study. According to Mishra & Koehler, TPACK:

is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (Mishra & Koehler, 2006:1029).

Educators understand their job of curriculum delivery is not as simple as many may perceive the activity. Curriculum delivery involves addressing the complex, multifaceted and situated nature of teacher's knowledge. In the information age, technologies are believed to enhance the process of teaching and learning; hence TPACK is believed to assist educators in identifying the nature of knowledge for digital technology integration in classrooms. According to Mishra & Koehler (2006)

effective teaching in connected classroom requires bringing together knowledge of the curriculum, what is good for learning, and technology. Thus bring together the “content knowledge –CK (curriculum that is to be taught), technological knowledge –TK (computers, the Internet, digital video, etc.), pedagogical knowledge –PK (practices, processes, strategies, procedures and methods of teaching and learning), and the transformation that occurs when combining these domains (Archambault & Barnett, 2010:1657). The three knowledges and their interrelationship are shown in the Figure 2 below.

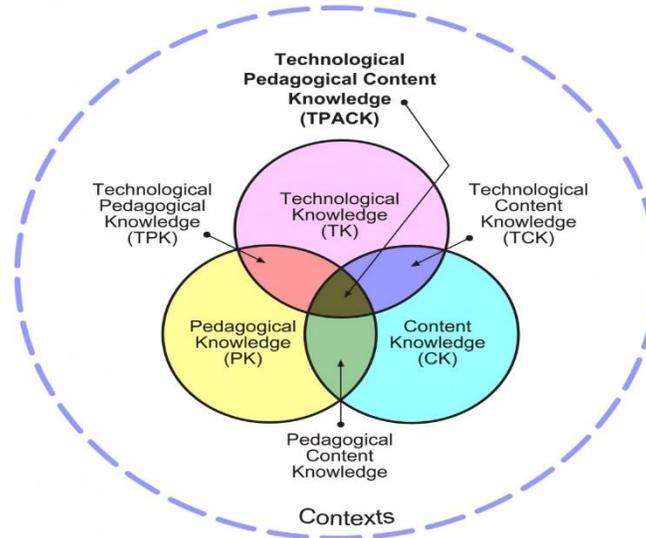


Figure 2: Technological pedagogical content knowledge (Source: Koehler & Mishra, 2008)

Effective instructions with technology can only be achieved if there is a shift in existing pedagogical and content domains (Koehler & Mishra, 2008). Therefore, it is necessary to understand the process of development of knowledge bases, interactions among components (TK, PK, CK) and, more importantly, how lack of knowledge in one knowledge domain can negatively the uptake and use of digital technologies for effective teaching and learning (Pamuk, 2012:429).

The two models TPACK and DIF combined forms the conceptual framework as illustrated in Figure 3 below. This conceptual framework provided insights to the study. The concepts from the framework are used in the study as follows:-

- Technological knowledge (TK): knowledge about use of connected classrooms; its affordances and constraints.
- Technological content knowledge (TCK): the knowledge of representing subject content in a connected classroom.
- Technological pedagogical knowledge (TPK): The knowledge of how to use connected classrooms in teaching.
- Technological pedagogical content knowledge (TPACK) and DIF: the knowledge of representing curriculum/subject content with connected classroom-(Agyei & Voogt 2012)
- Design: be proficient and fluent with the digital technologies,
- Exertion: be able to manage, analyse and synthesize vast information on the digital platforms,
- Proficiency: create, critic and evaluate multimedia texts, and
- Ethics: display ethical responsibilities required by the multimedia environments.

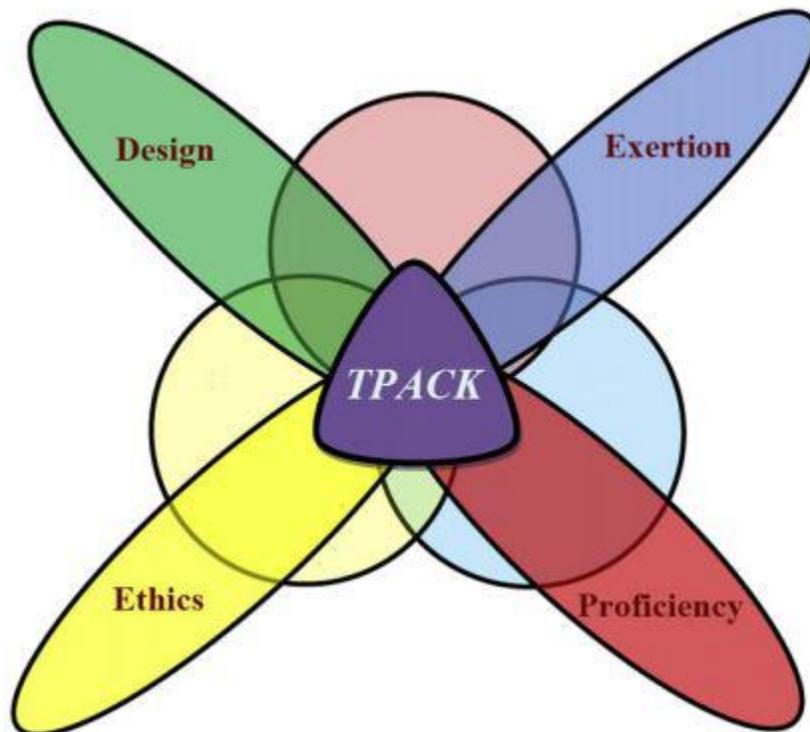


Figure 3: A combination of Digital Fluency and TPACK required for effective connected classroom teaching (Source: Kabakci Yurdakul, Odabasi, Kilicer, Coklar, Birinci & Kurt, 2012)

From Figure 3, it shows that digitally fluent does not only mean “just being able to use devices”, but also to “understand the importance being able to learn with and create with digital tools” NZTECH (2016:3). This means besides the technological knowledge, educators need the deeper understanding of how to integrate connected classrooms into curriculum delivery from a pedagogical perspective (Ibid). In other words, educators need both digital fluency and TPACK to teach effectively with and through digital technologies.

Benefits of connected classroom

Research shows that Internet, which has allowed quick access to information, has become one of the most important resources in education today (Arkorful & Abaidoo, 2015). Digital technologies coupled with the internet characterize the 21st Century environment where both educators and learners can take advantage of the innovations for connected classrooms (White, 2013). It is also stated that Connected classrooms offer today’s students and educators easier, affordable, and faster access to information, teaching and learning resources, peers, experts and the wider community (Ministry of Education, 2016)

It is believed that connected classrooms are influencing better teacher-learner relationships because teachers are becoming more of facilitators whereby the learners have the freedom to work out things for themselves, hence becoming more confident than in a traditional classroom (Salmon & Wright, 2014). Instant feedback is another advantage of connected classrooms. In such classroom, educators could get instant feedback from their learners on a given task which could instantly alert the educator whether the learners are grasping the content lesson or not (Shum, 2013; Chigona & Dagada, 2011).

Mbarek & Zaddem (2013:423) argued that teaching and learning in connected environment allows learners to master the curriculum without worrying about being tied to the classroom. Lwoga (2014:4) in summing up the benefits states that:

connected classrooms have various benefits, such as personalized learning, increased access to information, effective means to standardize and deliver content, on-demand content availability, interactivity, self-pacing and building confidence. It consequently provides flexible, convenient and diverse learning environments to meet the disparate needs of learners. The e-learning approach can open the knowledge pipelines which instill a culture of inquisitiveness and enquiry in students and graduates that is critical for life-long learning.

However, for all these benefits to be realized, both the educator and the learners in the connected classrooms should be digitally fluent. They should know how to use the digital tools as well as access and process information.

Educators' capabilities for connected classrooms

Educators and learners' ability to work with digital technologies as well as access and process information online has a great influence on the successful use of connected classrooms. Thus, following the rapid growth of digital technologies in the classroom, educators need to be digitally fluent and this assists them with the acquisition of a special skill necessary for teaching with new technologies effectively (Kohler & Mishra 2008). This means educators must acquire both digital fluency and technological pedagogical and content knowledge. However, NZTECH (2016) shows that there are not many educators that comprehend the need for digital technology in the curricula in relation to digital fluency. This attitude influences the non-adoption of digital technologies for teaching and learning.

White (2013) stressed that digital fluency is a necessary skill for teaching and learning in the digital age. This is because there are changes in the way we used to communicate and access information for teaching and learning. Therefore, "there needs to be a deeper knowledge of how to introduce technology from a pedagogical perspective; that is, the theory and practice of how best to teach (NZTECH, 2016: 7). It is argued that educators need to acquire TPACK on top of digital fluency to be able to teach effectively within the connected classroom.

RESEARCH DESIGN

Qualitative research approach was deemed appropriate for the question pursued in this paper. Thus the study is located within the qualitative research approach. In this study, educators from both urban and rural schools in the Western Cape Province were randomly selected to participate in the study. The educators took part in focus group discussions and in one-on-one in-depth interviews for this study. The data collected was also analyzed qualitatively.

Sampling and data collection

The WCED has eight education districts which are further divided into circuits. Four of the districts serve the rural population and the other four serve the urban population. Two districts from the rural and other two from the urban were randomly selected for this study. Educators from the districts were randomly included in the study. Thus, those who were selected took part in the one-on-one and focus group interviews. Sixteen educators took part in the one-on-one in-depth interviews. There were four groups for focus group discussions. Each group had an average of five educators participating

Interviews were conducted to solicit data on the participants' perceptions and experiences of their digital fluency and how that is influencing their uptake and use of the connected classroom. Educators are, in this digital age, expected to integrate digital technologies into their curriculum delivery, and do that effectively. The interviews solicited data on the educators' digital literacy development following the training they received from the WCED, and how the knowledge gained is influencing on their use of connected classrooms.

Trustworthiness was established through triangulation whereby focus group interviews and one-on-one interviews were used. The information collected from the focus group interviews was verified during the one-on-one interviews. To enhance the credibility of the study process, an external peer reviewer, who is completing her PhD thesis on "technology integration into pedagogy", verified the data collection and analysis methods and processes to be appropriate.

Data analysis

All interviews with the educators were audio-recorded following the consent from the participants. The audio-recorded interviews were then transcribed verbatim. Qualitative data analysis was used whereby a combination of inductive and deductive thematic analysis approaches were used. Following the inductive approach data were coded based on the respondents' perceptions and experiences (Braun & Clarke, 2006). The integration of deductive approach provided the opportunity to also analyze the data whilst drawing on theoretical constructs from DIF and TPACK models (Mishra & Koehler, 2008). From the data I was interested in understanding educators' perceptions about the influence of digital fluency on their ability to effectively use connected classrooms. Adopting Braun & Clarke, (2006) style, the analysis was completed in six phases namely: familiarization with the data; coding; searching for themes; reviewing themes; defining and naming themes; and writing up.

Ethical considerations

Permission to conduct such a study in the Western Province was obtained from the WCED and Research Ethics Committee in the Faculty of Education at Cape Peninsula University. Privacy and confidentiality concerns were considered at all times (Cohen, Manion, and Morrison, 2007). Again, permission to record conversations with the educators was also obtained from each of the participant taking part in the interviews. For anonymity, no identifications of the interviewees were used in the reporting on the findings.

RESULTS AND DISCUSSIONS

This paper aims at understanding the influence of digital fluency on the uptake and use of digital tools for teaching and learning in the WCED. Data gathered through one-on-one in-depth interviews and focus group discussions with the educators was analyzed thematically. The following themes were identified from the data collected:

- i. Educators' perceptions of digital technology for curriculum delivery
- ii. Challenges in handling connected classroom
 - a. Educators' digital fluency development
 - b. lack of knowledge on how to integrate digital technology into pedagogy
 - c. Inadequate technological resources

i. Educators' perceptions of digital technology for curriculum delivery

As indicated earlier on, the Education Department through the Khanya project in the Western Cape equipped all public schools in the province with 21st technologies as well as training educators on how to use the technologies in schools. However, until the time of this study, many educators claim they have not been adequately equipped to integrate the digital technologies into their classrooms. In other words, they lack the digital fluency to teach with the tools. Consequently, many educators perceive administration as main use of the technologies in schools. They are happy to just use the technology for word processing and excel. Most educators reported during the interview like:

each and every educator can handle laptops, ... educators do have laptops but its only for admin purposes, for your own planning, ...if I take my laptop now, I am doing my own stuff, my own admin.. yeah

Mostly I can say that the ICT training was just umm teaching us to use stuff quickly, like excel, Word, PowerPoint, how to write a letter...there was no incorporating with the curriculum because it [training] was equipping the educator just to be computer literate.

It was also found out that most of the educators participated in the study have the perception that digital technologies could be useful for curriculum delivery, but integrating the technology into their work seems a difficult and complicated task. Regarding the usefulness of the digital technology in class for teaching, one of the participants said:

for the simple reason the we can bring the outside world and the world to the subject matter we can bring to the kids previously the educators we so dependable on talk and chalk now they can show the kids the actual world they are talking about in fact with physical sciences, history, life science geography there is a vast world there which they can't comprehend only by listening to the educator now they can see for themselves, so it's nice to have teaching aids. It's an Incredible world out there but also in terms of the subject matter.

However, the fact that they are not able to integrate the technology into their teaching, the educators lamented like:

yes, Khanya gave us the computer lab but it was not maintained and so much that we are struggling to work with our learners on the computer lab ... if it was something that we were trained on effectively and we could have implemented it ... it would have been better, you see

I can't say it [training] was adequate because we didn't implement what we were trained on, so I can't really put my head on the block and say it was adequate, I would say it was adequate if it was practically working

Some schools have access to Internet; they have tablets or PCs in their classrooms and educators and learners are excited to have the resources. However, a lack of digital fluency on how to use such ICTs for teaching effectively is diminishing the advantage of being in a connected classroom. Though the learners can play around with the connectivity, they cannot maximize the advantage of the connected classroom because their educators are not sure how to integrate it into the teaching (Chigona 2013). The Education Department needs to ensure that all educators go through professional training tailored to the needs of the individual educators (NZTECH, 2016). The aim should be to adequately empower the educators to take advantage of the connectivity available in schools so teaching and learning could be enhanced.

ii. Challenges in handling connected classroom

While educators have vast pedagogical experiences over the years, they need to acquire new literacies viz-a-viz digital fluency to teach effectively in this digital age. The analysis of the data collected shows that the lack of digital fluency and resources coupled with 'Technological Pedagogical and Content Knowledge (TPACK)' i.e. the skill and knowledge on how to integrate the digital classroom into the educators' pedagogy, are challenges the use of the connected classrooms for teaching and learning.

a. Educators' digital fluency development

It has been observed that digital literacy is still one of the challenges for the educators to teach with new technologies. For educators in connected classrooms to be able to engage with their learners and the subject matter, they need to be proficient and fluent with the digital technologies, however, some are still not capable of doing the basics when working with technologies as can be depicted from the following utterance by one of the respondents:

... many teachers did not still know what files and folders are, and this and that, and how to send an attachment on an email I mean start with the basics the whole idea of MS school

I think some teachers are still digitally scared, they don't know even to teach with power point ... teachers who are scared to use this whiteboard. They remain to chalk and please don't get me wrong I'm not saying that digital equipment will make you a better teacher. What I am saying is that digital equipment will help you teach better

However, though most of the educators today could be computer literate, that is not enough for them to integrate digital technology into their pedagogies effectively. They need the skills which would enable them to manage, analyze and synthesize vast information on the digital platforms before integrating it into the teaching. Educators in this study reported not to be equipped with such capability. One educator suggested that in order to train educators,

you need to give them the software on the computer, show them how use it and say on such and such a date, I want you to deliver a lesson on this software so that they are playing with around, find out what works, what they are going to use. That I think would make more sense because at this stage, we had, ... 3 training sessions on the smart board and I don't know one that can actually use it as a result of the training.

The inability to critically look at the digital tools and what and how information is displayed on the platforms is influencing the educators to give up on connected classrooms (NZTECH, 2016; Duke & Ward 2009).

b. Lack of knowledge on how to integrate digital technology into pedagogy

This means they need not only the knowledge to operate the technologies but also when to integrate the digital tools into teaching for effective curriculum delivery. Regarding the training these educators received, was perceived not adequate and too generic. Some of the educators said:

I did not enjoy that [training] ... and I think the way they choose the people who presented the courses I don't think they were equipped to present this course and to answer the questions

I don't think the ICT training was really focused enough on of cause I'm thinking from my subject' view there I would say so it was general, when it comes on the pedagogy itself, I think we need to develop that on our own.

From the data it shows that the quality of professional development training the educators are exposed to with regards to technology integration is not appropriate. Educators complain that the training they were exposed to was usually generic which educators of different subjects could not relate to easily. One educator said,

even when a company does whiteboard training, it's very generic and it's not specifically for the science teacher. Training should be very specialized, and I think that is why training for the science teacher should actually be done by the science subject advisor.

It should be noted that while educators may have vast experience in pedagogy and well established subject content, this may no longer be sufficient in connected classrooms even when they know how to operate the tools. Educator need a “be a deeper knowledge of how to introduce technology from a pedagogical perspective; that is, the theory and practice of how best to teach” (NZTECH, 2016:4). Such knowledge will see the use of connected classrooms beneficial.

c. Inadequate technological resources

While some educators think they can redeem themselves by being proactive to try things on their own to perfect their integration of the technologies into their pedagogy, since the training they are receiving is not addressing their needs, lack of resources has been a challenge to such a positive attitude. It is indisputably disappointing for the educators when they do not have adequate resources to implement their ideas or work with the system. Some such educators indicated that:

but we do not have the resources to apply those things ... you see because they showed us on how to do assignments, mock assignments online things like that but we do not have the resources

On Friday I was at a school and I couldn't get internet service and I sat in front of the class and I said you know what, ... has declared access to internet as a basic human right. I don't have access to internet today, I feel violated

The challenges above are affecting the development of digital fluency for both the educators and learners. In return, the underdeveloped digital fluency and the inadequate ICT resources are negatively affecting the uptake and use of connected classrooms. Most educators are conscious about jumping onto the bandwagon of using the digital technologies while they are not sure about how to teach with and through the tools effectively (Koehler & Mishra 2008). In most of the focus group discussions participants asked for more digital resources which includes reliable software and Wi-Fi, readily available technical support and subject specific training on how to integrate the digital tools into classrooms. They believe that making available such resources could be the answer to educators' adoption and use of the connected classrooms effectively.

CONCLUSION

Both educators and learners need to be digitally fluent to teach and learn effectively in the 21st Century's digital environment. Due to underdeveloped digital fluency among educators in the Western Cape, they do not have the confidence to effectively teach within the connected classrooms. Although the educators perceive digital technologies to be necessary for enhanced curriculum delivery, most of them are stuck in their old ways of teaching. They do not have the capacity to take advantage of the connected classrooms because they lack the skill and knowledge on how and when to integrate the digital classroom into their pedagogy. For the educators to be able to demonstrate this skill they first need to be digitally fluent. They need to be able to use the digital tools to locate and critically evaluate information, and to effectively assist and communicate with their 21st Century learners.

Underdeveloped TPACK and digital fluency have been identified as the main challenges for educators to competently handle connected classrooms. Educators and schools need to be proactive in finding ways of limiting the challenges as the digital technologies are here to stay. In particular, educators are called to think carefully about when, why and how to take advantage of the connected classrooms as well as evaluating their efficiency and effectiveness when using the technologies for curriculum delivery.

It has been established in the study that educators' underdeveloped digital fluency is negatively influencing on the uptake and use of the connected classrooms. Therefore, education authorities, schools and the educators need to work towards well-developed digital fluency among educators and learners for effective use of the connected classrooms. Frequent Internet access in schools is an important influence on the use of the connected classrooms (Shum, 2013). Internet is also needed for the development of the educators and learner's fluency as they would need to acquire the digital fluency skills hands on. Schools and the Education Department should therefore, ensure availability of digital resources and strong connectivity all the time.

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