Western Cape Subject Advisors' Perception of Their Preparedness for Connected Classrooms

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Abstract: In South Africa, the Western Cape government (WCG)'s current broadband strategy aims to ensure that all schools will be connected to broadband service within a reasonable time-frame. According to the WCG integration of ICTs and the broadband will remove the digital divide and enhance curriculum delivery in schools. To achieve this, sensible long-term planning must be in place to ensure that subject advisors are adequately trained and equipped to participate in the connected schools environment and effectively assist teachers integrate digital resources into classrooms. The aim of this paper is to explore how subject advisors perceive of their preparedness to embrace new technologies for their advisory job; to ensure effective teaching and learning. A qualitative research approach was used; randomly selected education districts in the Western Cape Province provided subject advisors to be participants in the study. Results show that most subject advisors perceive their complex knowledge of how to effectively integrate ICTs into curriculum delivery as inadequate hence are hesitant to advise teachers on effective technology integration into classrooms.

Keywords: connectivity, subject advisor, integration, curriculum delivery, 21st Century, South Africa

1. Introduction

Connectivity in the classroom is an exciting innovation in education in the 21st Century. Where such technologies have been effectively used, stakeholders testify to an enhanced quality of education. The Western Cape government (WCG)'s current broadband strategy aims to ensure that all schools will be connected to broadband service within a reasonable time-frame. According to the WCG integration of ICTs and broadband can remove the digital divide and enhance curriculum delivery in schools.

Educators' pedagogical beliefs and practices in curriculum delivery are central to all teaching and learning activities using new technologies (Pamuk, 2012). In an effective curriculum delivery scenario, educators may consider a number of factors (i.e. instructional content, student background, instructional activities) to compose a pedagogical approach and to plan effectively curriculum delivery (Mishra & Koehler, 2006). The onset of ICTs for teaching and learning in the 21st Century requires subject advisors to assist teachers to integrate ICTs into the classrooms; taking advantage of the ICTs and connected classrooms. Studies on "early adopters' uses of technology indicate that this is not an easy task that educators can accomplish through simple changes in approach" (Pamuk, 2012:425). Mishra & Koehler (2006) argue that lack of Technological Pedagogical and Content Knowledge (TPACK) (i.e. the skill and knowledge on how to integrate the digital technologies into curriculum delivery), hinders effective adoption of ICTs for teaching and learning. Knowledge on how to operate and when to integrate new technologies into teaching is important to appropriate use of new technologies for curriculum delivery. Educators need three basic knowledge namely technology, pedagogy and content; and be able to integrate these in a way that could enhance the teaching and learning of subject matter.

For the WCG to realise the benefits of connected classrooms, sensible long-term planning must be in place to ensure that subject advisors are adequately trained and equipped to participate in the Connected Schools environment so they can effectively play their role of assisting teachers to integrate digital resources into classrooms. Subject advisors have the responsibility of providing guidance and mentorship to in-service teachers within their fields of specialisation. In the face of technology integration into curriculum today, in-service teachers tend to look to subject advisors for guidance on how to teach with new technologies effectively. Subject advisors need to be prepared adequately because "we ask much more of teachers today than even a decade ago. Today teachers are asked to achieve significant academic growth for all students at the same time that they instruct students with ever-more diverse needs. Teaching has never been more difficult, it has never been more important, and the desperate need for more student success has never been so urgent" (Greenhill, 2010:5). Are the subject advisors in the Western Cape adequately prepared to support and mentor teachers to win this battle?

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Given the critical responsibility of the subject advisors to ensure appropriate teaching and learning is taking place in schools, this paper aims at exploring the advisors' perceptions of their preparedness to embrace new technologies for their job. The research question for the study is:

How do subject advisors regard their preparedness for connected classrooms in the Western Cape?
To answer this question, qualitative research approach was employed; in-depth interviews with conveniently selected subject advisors from the Western Cape Province comprised primary data collection techniques. TPACK theoretical framework was adopted to guide the processes of the study. Results show that most subject advisors perceive their complex knowledge of how to effectively integrate ICTs into curriculum delivery to be inadequate. Subject advisors are hesitant to advise teachers on effective technology integration into classrooms. In this study, terms such as connectivity, e-learning and ICTs are used interchangeably.

2. Literature Review

2.1 Teaching and learning in the digital age

The world we are living in today is immersed by digital technologies and this is impacting on teaching and learning. Beck and Hughes (2014: 311) define the digital age as a "time frame in history that the use of digital technology became prevalent and of common use throughout the world. The digital age began in earnest with the widespread use of the Internet". With the onset of digital age, teaching and learning environment is changing from simply chalk-and-talk to digital where learners are not only dependent on their teachers alone for new knowledge acquisition (Bates, 2015). Similarly, the workplace has also been affected by the digital age where digital technologies have transformed the work environment and what it means to work (LittleJohn, Beetham & McGill, 2012).

For teaching and learning in the digital environment to be effective, both teachers and learners need to adopt and integrate the new technologies into curriculum delivery successfully (NZTECH 2013). This requires that teachers and their trainers and/or advisors should acquire skills for profiency and fluency with digital tools (NCTE 2013). In addition to the skills and fluency, teachers need to possess a multifaceted complex skill on how to integrate the digital technologies into their teaching if they are to teach the digital citizens successfully (Koehler & Mishra, 2013).

In line with the argument, Bates (2015: 1) suggests that in order to assimilate digital modes into the classroom, "teachers and instructors need a base of theory and knowledge that will provide a solid foundation for their teaching, no matter what changes or pressures they face". Such knowledge leads to successful adoption and use of the digital technologies for effective classroom use. For authors like Saade & Bahli (2005) successful adoption and implementation of new technologies requires a solid understanding of user acceptance, processes and ways of persuading them to engage with these technologies. It should be noted that:

> *"technology integration is, however, not a simple act. What people understand from technology integration is greatly affected by their understanding of education and technology separately and educational technologies as a whole. Broadly, technology integration policies and philosophy can be grouped into two camps: (a) a techno centric view that takes a deterministic view of technology as the agent of change and (b) a more 'integrationist' view that assigns usefulness to tools depending on their necessity in a given context (i.e. Technological Pedagogical Content Knowledge" (Akcaoglu, Gumus, Bellibas, & Boyer 2014:3).*

When digital technologies are well integrated into curriculum delivery, the role of the teacher becomes less invisible. However, this does not entail reduced or simple pedagogy, if anything, this means teaching with and through digital technologies becomes challenging as learning takes on a strong constructivist approach (Barber & King, 2016). Teachers, therefore, need professional development that equips them with skills necessary for effective integration of digital technologies into their teaching (Mishra & Koehler, 2006). Teachers depend on subject advisors whose responsibility is to facilitate curriculum delivery in schools for quality teaching and learning (Mbanjwa, 2014).

2.2 The role of subject advisors in the digital age

In this digital age, subject advisors need to be in the forefront assisting teachers to integrate digital technologies into classrooms. According to the Department of Education (2013: 11), subject advisors are "specialist office –based educators in a district office or circuit office whose function is to facilitate curriculum implementation and improve the environment and process of learning and teaching by visiting schools, consulting with and advising school principals and teachers on curriculum matters". For subject advisors to execute their responsibilities in the digital age, there is a need for them to be digitally fluent and possess a skill on how to integrate digital technologies into classrooms. In other words, the subject advisors need to have "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).

It should be noted that, the digital environment is forcing the pedagogy to shift towards constructivist strategies, hence the roles of the teachers and learners become reciprocal (Mishra & Koehler, 2006). Vast availability of information and wide use of internet means learners are also able to access new knowledge easily but this facility requires digital fluency in order to be able to separate relevant information from a plethora of information sources. Again, one needs to have a skill for making choice of tools to be used to achieve desired outcomes of the curriculum. Barber & King (2016) argue that pedagogy has shifted in nature due to the digital environment. Teaching and learning requires such skills such as "the development of creativity, self-motivation, innovation, problem-solving and collaboration skills" (Barber & King, 2016: 236).

Mbanjwa (2014) shows that subject advisors need to develop a mutual relationship with teachers for conducive teaching and learning environment that could yield to quality 21st Century education. The subject advisors are required to accelerate the uptake and integration of the digital resources into curriculum delivery. Although it is expected that newly graduated teachers will join the teaching professional adequately prepared for connected classrooms, many in-service teachers need to be supported to be able to adopt and integrate digital technologies into their pedagogies (Chigona 2015; NZTECH 2016). Earlier on, Anderson (2013) emphasised that "if we want educators to be able to be discriminatory about whether or not the use of technology will 'assist or impede' learning, educators have to have some high level knowledge in this area alongside their pre-existing Content and Pedagogical Knowledge". Subject advisors, need to take a pro-active stance in facilitating ICT connectivity in schools to ensure the adoption and appropriate use of digital tools for effective teaching and learning (Department of Education, 2013).

2.3 Benefits of digital technologies for teaching and learning

According to Mbarek & Zaddem (2013:423), teaching and learning with digital technologies allow learners to acquire new knowledge and skills without worrying about the space-time shift. NAACE (2004) and Dagada (2009) are also of the opinion that the development of digital technologies and e-learning should help to make learning more differentiated and customised to individual needs, and deliver a more engaging, exciting and enjoyable learning process that encourages better learning outcomes. Nonetheless, Lwoga (2014:4) shows that:

> e-learning has 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 instil a culture of inquisitiveness and enquiry in students and graduates that is critical for life-long learning.

UNESCO (2017) concurs with the quote above by showing that digital technologies can enhance universal access to quality teaching and learning resources. This is especially true in disadvantaged communities where school libraries may not be in existence (Chigona, 2011). Teachers and learners can take advantage of connected classrooms to access information. Again, teachers can take advantage of the connectivity attending on-line courses for their own professional development, and use digital technology for more efficient education management, governance and administration (UNESCO, 2017).

The ability to make sensible choices about when and how to use new technologies to enhance, extend and enrich e-learning reflects the increasingly digital-rich environment in which we live and learn (Pamuk, 2012;

Mishra & Koehler, 2006). It is nevertheless argued that "although skepticism remains about technology use in education, there is a broad agreement among educators that technology can be effective and support learning only if it is meaningfully adopted and integrated into teaching (ibid:426).

2.4 Challenges of digital technologies in education

Many education departments globally are working hard to rollout connectivity to schools and other institutions of learning, yet there are a number of challenges facing educators that hinder them from benefiting from digital technologies (NZTECH 2016; Koehler et al, 2013). Such challenges could be categorised into three groups: lack of resources, lack of confidence and pedagogical difficulties in integrating technology into instruction (Sime & Priestley, 2005:131). Lwoga (2014) notes that lack of digital technological resources in developing countries is a huge challenge to technology integration into education. According to NZTECH (2016: 6), building capability with regards to teacher professional development where the teachers could be equipped with new 21 century pedagogies should be implemented alongside digital technologies for teaching and learning. Nonetheless, for the capacity building to be effective in this regard, teachers need to change their mind set and accept that the ways of teaching in this digital age need to embrace the new technologies (Chigona, 2011). In line with the argument, Sime & Priestley (2005:131 citing Zhao & Cziko (2001) listed intrinsic conditions that teachers need harbour in order to accelerate integration of digital technologies into their pedagogies:-

- Teachers must believe that by using technology they are more likely to achieve a higher-level goal than through other means used ('effectiveness').
- They must believe that if used, technology will not disturb the other high-level goals that they want to achieve ('disturbances').
- Finally, teacher must believe that they are in control, having the ability and resources to use ICT effectively ('control').

Although today there is still a concern about challenges regarding digital technology integration into curriculum delivery, Sahasrabudhe & Kanungo (2014:237) claim that there has been recommendable progress in understanding the set of parameters that can influence the effectiveness of the digital technologies in education. Nonetheless, there are still gaps in the comprehending the differences in the learning outcome. For Lwoga (2014 citing Tai et al., 2012) the success of digital technologies in education relies on both its early adoption and its sustained usage (Lwoga 2014: 5). This necessitates an understanding of relevant factors that predict educators' (including subject advisors') intention to domesticate and integrate the digital technologies into their professionals (Chigona, 2013).

3. Theoretical Framework

As indicated earlier in Section 1 above, Technological Pedagogical and Content Knowledge (TPACK) was adopted for this study as a theoretical framework to guide the processes of the study. According to TPACK effective technology integration into curriculum delivery entails an understanding and negotiating the relationships between technological skill, pedagogical knowledge, and subject matter (content knowledge) (Mishra & Koehler, 2006). TPACK emphasises that teachers need to develop the skills and knowledge to thoughtfully integrate subject matter, pedagogy and technologies in their curriculum delivery. In other words, effective technology integration into classrooms can be realised if the teacher is able to skilfully fuse the three knowledge domains. Mishra & Koehler (2006) call this a complex knowledge that enables teachers to effectively teach with and through new technologies.

In this study, the subject advisors would need the TPACK knowledge to be able to assist teachers on how to integrate the new technologies available into their teaching. Thus, the subject advisors need this complex knowledge –TPACK- to demonstrate to teachers the fusing of the pedagogical knowledge (PK) content knowledge (CK) and technological knowledge (TK) for effective teaching in the 21st century (Pamuk, 2012). Figure 1 below indicates how a combination of the different knowledges necessary to teach in the 21st Century yield to TPACK environment.

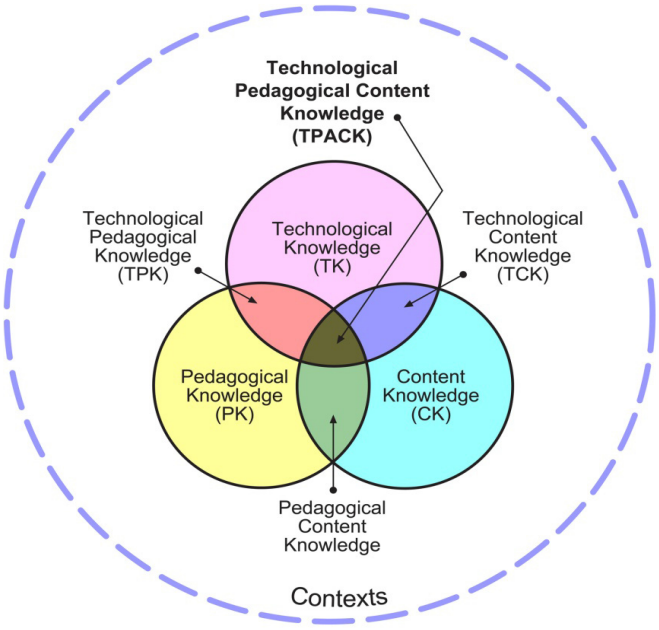

Figure 1: The TPACK framework and its knowledge components (Source: Koehler & Mishra, 2009)

The TPACK environment or condition concede effective teaching and learning outcomes in connected classrooms (Koehler & Mishra, 2009). Teachers need to develop the skill and confidence in each of the component that make up TPACK. But more importantly they need to understand the interactions among the components (TK, PK, and CK) for effective integration of the digital technologies into classrooms. Such integration means that ICTs may not be applied to every subject matter uniformly, hence educators should come to understand that the various affordances and constraints of technologies differ by curricular subject-matter content or pedagogical approach (Archambault & Crippen, 2009: 83). In this study, the assumption is that the subject advisors have the understanding of PK, CK and PCK. However, the study will reveal their competences of the rest of the TPACK components namely: TK, TCK, TPK and TPACK.

Adapting from Koehler & Mishra (2009), the components that the subject advisors need to assist their teachers especially with regards to teaching with digital technologies are explained and applied in this study as follows:

- Technological knowledge (TK): skill on how to use digital technologies. Being able to know when a particular technological tool could be necessary to use or not.
- Technological content knowledge (TCK): the understanding of specific digital technologies that can enhance curriculum delivery
- Technological pedagogical knowledge (TPK): the awareness of how the method of teaching with particular technological tools can impact on the teaching and learning outcomes. Thus the understanding of pedagogical affordances and constraints when integrating digital technologies or not.
- Technological pedagogical content knowledge (TPACK): Angeli and Valanides (2009: 154) define TPCK as a unique body of knowledge that result from the interaction of individual knowledge bases explained above. This knowledge is required for effective curriculum delivery when using digital technology. This knowledge 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 to develop new epistemologies or strengthen old ones" (Koehler & Mishra, 2009:66). TPACK is central to teaching with digital technologies. This means teachers should have the understanding of: (i) the subject-matter to be communicated to learners; (ii) how best to communicate the subject matter to the intended learners; (iii) the digital tools to be used to enhance the teaching and learning process of the subject-matter; (iv) how the three components could be integrated in an amicable way to achieve the best learning outcomes.

4. Research Designs

An interpretive qualitative research approach was used to gather and analyse data collected through focus group interviews and one-on-one in-depth interviews with subject advisors in the Western Cape. Interpretive methods were preferred so as to understand how the participants in the study perceive and experience the phenomenon under study.

4.1 Sampling and data collection

The WCED has eight education districts which are divided into circuits. Four of the districts serve the rural population and the other four serve the urban population. Two districts from rural segments and other two from urban areas were randomly selected for this study. Subject advisors from the districts were conveniently included in the study. Thus, three subject advisors from each of the randomly selected districts were conveniently asked to take part in the one-on-one in-depth interviews which lasted for 55 minutes on average. After the four one-on-one in-depth interviews, was the focus group interview took place; each of the groups consisted of five conveniently selected subject advisors. This process was replicated in all the four districts. Each of the four focus group interviews lasted for an hour and forty minutes on average. The participants were conveniently included in the study as those who were available at the district offices on the day of the interviews were ones asked to respond to the interview questions.

Twelve subject advisors took part in one-on-one in-depth interviews. Another 20 conveniently sampled subject advisors from the randomly picked district, participated in four focus group discussions for the study. The participating subject advisors from the four districts were those that had had received training from the WCED on how to use new technologies in education.

The two types of interviews were conducted to solicit data on the participants' perceptions and experiences of the training and how prepared they thought they were to assist teachers in their fields of specialisation. Examples of questions used during interviews were:-

1. To what extent has the training influenced you as a subject advisor to adopt ICTs for e-learning?
2. What has been the impact of training as a subject advisor on your computer efficacy and self-efficacy?
3. How has the training equipped you and other subject advisors to confidently assist teachers when teaching with the ICTs?
4. How has the training affected advisors' perceptions to adopt ICTs for e-learning
5. What did you like about the ICT training?
6. What ICT training weaknesses did you observe?
7. What do you think could be done to improve the ICT training for subject advisors to adopt and use e-learning in their work?

An important feature of successful teaching is to have control over a situation. Teachers are expected to deliver curriculum effectively. The interviews solicited data on changes in subject advisors' perceptions of their control over events in their lives as educators, and understand the extent to which "teaching with technologies" contributes to the control over the advisory situation. All the interviews were audio recorded and transcribed for data analysis. The recording of the conversations was done following the participants' consent to do so.

4.2 Trustworthiness

All interviews with subject advisors were audio-recorded following the consent from the participants. As indicated above, the audio-recorded interviews were then transcribed verbatim. To ensure the trustworthiness on the data collected, focus group interviews were triangulated with one-on-one interviews (Shenton, 2004). Again, triangulation was achieved through the use of a wide range of informants that included 32 participants from four different (both rural and urban) education districts. In order to enhance trustworthiness in the study, themes developed from the data collected were compared with a member on the project which this study is part of. The themes were compared until there was an agreement on the themes which best represented the data collected (Noble & Smith, 2015).

4.3 Data analysis

Qualitative data analysis was used while bearing in mind TPACK as a framework for the study; both inductive and deductive approaches were used. From the data, I was interested to understand the technological knowledge, technological content knowledge, technological pedagogical knowledge of the subject advisors. I was also interested in their capabilities to assist in-service teachers to integrate different technologies into their curriculum delivery. While ensuring not to miss the respondents' views in the data collected the constructs of the TPACK framework provided an explicit and transparent way for interpreting the interview responses. From the analysis, the following themes were identified:- Subject advisors technological knowledge; Subject advisors' use of ICTs in their work; and Subject advisors' perception of their ability to integrate ICT into pedagogy.

4.4 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 given the deserved consideration at all times (Cohen, Manion, and Morrison, 2007). Again, permission to record conversations with the participants was also obtained from each of the individuals taking part in the interviews. The participants were assured of anonymity when reporting the findings. Consequently, no identifications of the interviewees were used in the paper.

5. Findings And Discussions

An interpretive qualitative research approach was used to gather and analyse data collected through focus group interviews and one-on-one in-depth interviews with subject advisors in the Western Cape. Analysis of data collected shows that, despite undergoing training on how to use new technologies in education, most subject advisors still lack the complex knowledge needed to integrate information communication technologies effectively into curriculum delivery. They are not sure how to assist teachers to benefit fully from the connected classrooms in the province. The following themes were identified during analysis and are used to organise and present the findings of this study:

1. Subject advisors' technological knowledge
2. Subject advisors' use of ICTs in their work
3. Subject advisors' perception of their ability to integrate ICT into pedagogy

5.1 Subject advisors technological knowledge

The Western Cape Government (WCG) has invested considerable resources into digital inclusion issues for educators and learners in the province. The Education Department through the Khanya project equipped all public schools in the province with various types of information and communication technologies as well as training educators on how to use the ICTs for teaching and learning (Chigona, 2011). Many educators, including subject advisors, acquired technological skills on how to operate computers and other ICTs in education. However, there are some subject advisors who compared to their colleagues have higher computer self-efficacy (the judgment of one's capability to use a computer) (Compeau, & Higgins, 1995); and other advisors whose confidence to use the different technologies for teaching and learning is very low. One of the few confident subject advisors in the study said:

> *i am invited at school to assist with technology. Teachers often say, I have got a new white board, or I have this new technology, can you please show me and so on… I am able to help.*

However, meta-analysis of the data collected shows that, while there were some participants who confidently talk about their confidence to operate most of the technologies deployed in schools, their skill did not necessarily translate to teaching with the ICTs effectively. The fact is, many schools can access internet through tablets or PCs in their classrooms, yet some subject advisors lack the technological skills on how to use such ICTs for teaching. For instance, when asked if the ICT training that the subject advisors have received so far was enough to equip them to be able to advise teachers to teach with technologies available in schools, one respondent said,

> *as far as ICT training is concerned, not really. The technologies that I encounter in schools for instance, are the different white boards they have and very specific software and specific demands. You need to*

be able to use the smart software or the mimeo software, last week I was in a school with IQ software which was the very first time that I had to encounter that. That is the technology that are usually in schools… how to put them on or off…, those are the nitty gritty

This means such subject advisors could not to assist teachers and learners on how best to take advantage of the digital technologies available in schools. There is a need for the Department of Education to ensure that all subject advisors are adequately skilled to work with the technologies available in schools before they attempt to assist teachers accordingly.

5.2 Subject advisors' use of ICTs in their work

Subject advisors as educators need to work effectively in the 21st Century's teaching and learning environment, which is characterized by complex, information-rich and knowledge based. Subject advisors are therefore, required to competently work and use educational technologies. However, analysis of the data for this study shows that many subject advisors do not utilizing the Moodle platforms and other technologies available in the province for curriculum delivery. Subject advisors perceive themselves as incompetent to use the technologies for their job. It may be assumed that subject advisors are more competent than in-service teachers regarding integration of new technologies into the classrooms to enhance teaching and learning. But many subject advisors are not even using the ICTs to communicate and assist their teachers to teach effectively with and through the new technologies. They do not have enough confidence and skill to integrate the new technologies in their work despite some ICT training offered to them (Chigona 2015). Most of them are stuck in their old ways of communication and teaching. They are not willing to adopt and use new ways of teaching in which technology enhances teaching and learning processes. During data collection one subject advisors said:

As we speak people are being trained to use the digital classes, the problem is not the training but they have to change the mindset … because you can be trained and you are not willing to change your mindset then there is nothing that can be done. Most don't agree with me because of the harsh statement that I make I say if you are not prepared to use digital then we don't need you …

In line with the argument above, other authors such as Jung recommend that "to use these tools effectively and efficiently, educators need visions of the technologies' potential, opportunities to apply them, training and just-in-time support, and time to experiment; only then can educators be informed and confident in their use of new technologies" (Jung, 2005). This means that, although subject advisors may have access to computers and internet in their offices that cannot easily translate to communicating and assisting their teachers to adopt and effectively teach in connected classrooms. They need adequate and effective training on how to integrate the technologies into their advisory and teacher modelling job. They need TPACK to be able to assist teachers to teach with the technologies effectively. Subject advisors complained that the training they had received so far, was not adequate. Regarding the training they have received, most of the subject advisors stated like:

No, there I don't think so because 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.

Some are of the opinion that they need to be proactive to train themselves to teach and work with the technologies because the training they are receiving is not addressing their needs. For instance one advisor lamented like:

when I heard for the first time about Moodle, I was not that excited, simply because Moodle does not really allow collaboration the same way that a google doc does. My need at this stage is to work with a teacher together on the same document not to send it to and fro and have 500 versions of the same document.

This subject advisor claims she prefers working with the teachers using google docs and is not in favour of using Moodle which the Department of Education is training teachers to use for curriculum delivery. From narratives such as these, it can be deduced that some subject advisors are unable to appropriate connected classrooms effectively into their work because they have not been exposed to appropriate training which is in line with their needs as subject advisors and the needs of their teachers.

5.3 Subject advisors' perception of their ability to integrate ICT into pedagogy

Most subject advisors participating in this study perceived themselves having low computer self-efficacy which is negatively affecting on their confidence and abilities to assist teachers to teach with and through technologies available in their schools. According to some subject advisors, technologies have been sometimes deployed into schools without their knowledge. In such instances teachers may have been trained on how to use the ICTs but not modelled to teach with them effectively. The problem rise when such teachers need help from their subject advisors on how to teach with the technologies.

While subject advisors feel less competent to integrate technology in their teaching, most of them have the perception that they could have been in a better position to assist their teachers regarding teaching effectively with the ICTs if the training was not generic. Most of them stated:

> *I wish the training the department offered to us was subject specific as opposed to generic.*
>
> *It is sometimes frustration sitting in the training because individuals with different levels of competence in using the technology are grouped together, and so the needs of others are not addressed.*

Looking at the narratives above, subject advisors regret attending the training which focused on the operation of the technology and did not focus on how to integrate the technology into curriculum delivery. In this digital age, educators are expected to have the skill to judge when and where to use technology for effective teaching and learning outcomes. Teachers and their specialist subject advisors need to acquire TPACK to teach effectively with and through ICTs. Subject advisors need the skill to be able to assist their teachers who during their pre-service teacher education did not have a chance of being modelled on how to teach with and through technologies.

6. Conclusions

Subject advisors are expected to be the masters of pedagogy and content knowledge in curriculum delivery. They were made subject advisors because they have expertise in a particular subject matter. However, for many of the subject advisors, technology knowledge is not their everyday area of expert knowledge; they are still expected to assist teachers to do their job well within connected classrooms. Subject advisors need the support of the WCED in order to facilitate development of their skills and show teachers how to integrate digital technologies into curriculum delivery effectively (Anderson, 2013).

Analysis of this study has shown that most subject advisors perceive their complex knowledge of how to effectively integrate ICTs into curriculum delivery as inadequate. They are hesitant to advise teachers on effective technology integration into classrooms. Some subject advisors are not even using the technologies to communicate to their teachers. They are not in a position to take advantage of the Connected Schools environment so they cannot play their role of assisting teachers to integrate digital resources into the classroom. The under-preparedness of subject advisors is due to lack of proper and adequate training to use the connectivity for their work. From analysis of the data, it is evident that the subject advisors are experts in their content area as well as the pedagogy (PCK) for delivering the content in a non-digital classroom. However, subject advisors need to acquire knowledge on how to integrate technology with their PCK so they can effectively assist teachers to teach with and through the technologies available in classrooms. In order to assist teachers embrace the technologies, besides PCK, subject advisors need to acquire other knowledge domains which include TPK, TCK TPACK. They need to understand how technology affects teaching and learning outcomes. They need to be aware of pedagogical affordances and constraints when using technologies for teaching. They need to acquire TPK. Subject advisors also need TCK to understand and use specific technologies that can enhance presentation of particular content in class. Subject advisors need to know how to integrate the three knowledge domains – PCK, TPK and TCK; this is what they need to be able to assist their teachers to embrace and use the connected classrooms effectively.

The Education Department needs to ensure that subject advisors are well enough trained to support and advise teachers on how best to participate in connected schools environment. The training on how to integrate ICTs into pedagogy should not be delivered as a generic course to subject advisors but should be subject specific. Thus, the training for subject advisors regarding ICT integration into pedagogy should be

offered while focusing on how to teach specific subjects. Elliot (2010:2) shows that "ICTs should not stand alone in course delivery, but rather be connected to the wider issue of learning for the knowledge age, and to broader issues of education quality and standards and learning outcomes". Trainers should have adequate knowledge of the content, pedagogies of the specific subjects and how technology can be integrated for effective teaching and learning.

As long as subject advisors are inadequately trained on how to integrate the technologies into curriculum delivery, they are not able to assist teachers on how best to take advantage of the connected classrooms. This results in teachers and learners not being able to realise the benefits o''f the connectivity in their classrooms.

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