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The use of ICT resources to transform teaching at secondary schools in the Bojanala district, Northwest province

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In the study reported on here I investigated how teachers used available information and communications technology (ICT) resources to transform teaching and learning in the Bojanala district in the Northwest province of South Africa. The Technological Pedagogical Content Knowledge (TPACK) framework enabled understanding of how the use of available ICT resources transforms teaching and learning. I adopted a qualitative, multiple case study research design which was grounded in the interpretive paradigm. Eight teachers were purposefully sampled – 6 men and 2 women. Semi-structured interviews, non-participant observation and document analysis were the data collection strategies. Data analysis was done according to Creswell's 4 pillars of data analysis. Ethics was maintained using voluntary participation, informed consent, confidentiality, and anonymity. The results reveal limited use of ICT resources to transform teaching. It is recommended that ongoing, in-service training on using ICT resources should be done to assist teachers to transform their lesson delivery. Again, schools should be provided with ICT policies to guide them on how to transform teaching using ICT resources.

Keywords: Bojanala district; ICT resources; information and communications technology; learning; Northwest province; secondary schools; teachers; teaching; transformation

Introduction and Background

Teaching and learning in the 21st century is no longer confined to the four walls of a classroom; the use of information and communications technology (ICT) allows teachers to venture into real-life situations and transform teaching and learning to meet learners' diverse needs. Basic ICT knowledge and skills have become an integral part of the enhancement of teaching (Jones, 2011), therefore, ongoing training and professional support for teachers to use ICT resources to transform their approach to teaching and learning are essential (Jones, 2011). Teachers should be knowledgeable and skilled in employing different ICT resources to transform their teaching and learning. The use of ICT may stimulate learners' interest and attention when a new way of delivering subject content is implemented.

Teachers play an essential role in preparing and shaping learners' career paths (Ghavifekr & Rosdy, 2015). The role of a teacher in an ICT environment would be to "guide on the side" (Gunter & Gunter, 2015), which means shifting from being the dispenser of knowledge to being the facilitator of learning. The use of ICT resources enables teachers to be more responsive to learners' diverse needs and to expose them to ICT resources that accommodate their needs (Aktaruzzaman, Shamim & Clement, 2011). Prensky (2012) emphasises that digital natives need to be equipped with digital skills that they can use to deal with the challenges and opportunities of the 21st-century digital world.

The effective adoption and use of ICT resources for teaching in schools are primarily dependant on the availability and accessibility of such resources (Asabere & Ahmed, 2013). Gunter and Gunter (2015) state that if teachers do not gain access to ICT resources, they will be unlikely to use them in their classroom activities. Aktaruzzaman et al. (2011) maintain that the growth of ICT tools, their ease of navigation, and the power and diversity of information disseminated allow teachers to access a world beyond the classroom environment. Gunter and Gunter (2015) also allege that the overall goal of transforming the education system is to produce learners who are equipped with ICT knowledge, skills and expertise they can apply in postsecondary education. The focus of this study was on how teachers can use ICT resources to transform content delivery and their pedagogical practices.

Statement of the Problem

Within the context of this study, the transformation of subject content delivery implies using the appropriate ICT tools together with the appropriate teaching approach to facilitate teaching and learning. A transformative pedagogical stance, according to Tarling and Ng'ambi (2016), holds that teachers' roles should change from transmitting information to learners to guiding and facilitating learning. The primary responsibility of teachers is to transform their traditional modes of content delivery into new modes of delivery (Assan & Thomas, 2012). Teachers are to be more creative in customising and adapting new teaching strategies, which use ICT resources (Fu, 2013a). In the district where this study was conducted, teachers were not familiar with using the ICT resources available in their schools. As reported above, scholars indicate that teachers should be persuaded to understand that, in the Fourth Industrial Revolution (4IR) era, the yardstick to transforming teaching rests on the use of ICT resources. The situation was aggravated further by the fact that several schools had limited ICT resources; nevertheless, the current situation does not mean that the delivery of content cannot be transformed. Additionally, some schools had ICT devices, but teachers were reluctant to use them. The reason might have

been a lack of interest in technological knowledge, or technophobia.

Moreover, teachers in the selected secondary schools used computers mainly for administrative purposes. They created learners' performance reports using a word processor and recorded learners' marks on Excel spreadsheets. According to Jones (2011), using application programs introduces teachers to basic ICT skills, thereby enabling them to become computer literate. Essentially, they acquire the ability to perform basic technological tasks using computers (Gunter & Gunter, 2015), although they do not necessarily transform their teaching. The gap identified through this study relates to poor or no use of ICT resources in the classroom environment. The following question assisted in addressing the phenomenon under study: How do secondary school teachers use ICT resources to transform teaching? This article emanated from a major study that focused on teachers' ICT competency and skills.

Literature Review

Teachers, as professional employees, must be provided with ICT resources that will enable them to transform their subject content delivery. The rapid advancement of ICT tools to communicate, create, disseminate, store, manage and search for information in the 21st century supports teachers to face challenging tasks, more so than in the 20th century (Ratheeswari, 2018). Teachers must be provided with laptop and desktop computers, data projectors, fully equipped computer laboratories, interactive digital whiteboards, and tablets, to transform their delivery of content.

ICT is changing the role of teachers in terms of encouraging them to adopt better pedagogical practices. Fu (2013b) identified several benefits of using ICT in education, including that teachers can:

- assist learners in accessing a considerable amount of information;
- support learner-centred and self-directed learning;
- assist learners to be creative in the learning environment; and
- offer more opportunities to develop learners' critical-thinking skills.

Over and above these benefits, ICT devices provide learners with access to the internet, which enables them to search through a wide variety of information on their school subjects. Learners in the 21st century are exposed to a variety of ICT devices, including computers, digital mobile devices and online games (Alhawiti, 2013). Alhawiti (2013) states that most learners are well versed in using ICT devices for, for example, surfing the internet, participating in social networks, sending electronic mails (emails) and exchanging images and videos.

As more learners begin to access ICT resources and develop an interest in ICT usage, teachers are compelled to review their subject

content delivery approach to make learning exciting and meaningful to 21st-century learners. Ghavifekr and Rosdy (2015) maintain that learners who are familiar with ICT usage will learn better in a technology-based environment, which makes the issue of ICT integration in schools, specifically in the classroom, vital.

Assan and Thomas (2012) express concern about the opportunities and challenges experienced by teachers in their use of ICT devices. Their research reveals that there are disparities in terms of ICT accessibility. In addition, they found that teachers could not use ICT resources to transform teaching and learning, because they were not skilled in using these devices.

The South African education system is going through a transformation that is characterised by the continued implementation of ICT. The education sector in South Africa, like in most other countries, wishes to see its teachers competing with their counterparts in technologically well-resourced environments. Padayachee's (2017) research into the use of ICT in South African schools revealed teachers' uncertainty about using ICT tools in education due to poor infrastructure and their lack of ICT skills. Padayachee (2017) also reports that ICT resources are being used in the classroom, but that more in-depth knowledge is required to understand the categories and how these facilitate pedagogy and content knowledge. Mingaine (2013) states that the important role that ICT plays in education leads to demands to train teachers in ICT skills to enable them to deliver an ICT-based curriculum effectively. Teachers should not only master ICT skills but should also be equipped for the 21st-century workforce, which requires the utilisation of ICT as a meaningful pedagogical tool to accomplish effective integration as creators of learning environments (Fu, 2013a).

The Nigerian National Policy on Education, for example, recognises the role that ICT plays in the modern world (Adomi & Kpangban, 2010). The Nigerian government supplied schools with ICT resources and training on how to use technology in teaching and learning. Despite all the efforts by the government regarding ICT usage, the comfort of using chalkboards and textbooks continued to dominate Nigerian classroom activities. It is evidently important that teachers should attend training courses to learn about incorporating ICT into teaching and learning processes.

Skilled teachers can assist and guide other teachers who have limited skills in using ICT resources to prepare technology-integrated lessons (Ghavifekr & Rosdy, 2015). Salehi and Salehi (2012) found that numerous schools struggled with internet connectivity because of budget constraints. Gunter and Gunter (2015) emphasise that internet accessibility opens doors to new learning resources and opportunities and allows information and

knowledge sharing like never before.

Regardless of the affordability of ICT, teachers who are not technologically savvy and who lack ICT experience are not keen to embrace the integration of ICT into teaching and learning. The studies provide evidence of the use of ICT tools to transform teaching and learning, with a focus on the integration of ICT into teaching and learning (Aktaruzzaman et al., 2011; Ghavifekr & Rosdy, 2015; Lin, Wang & Lin, 2012). However, little is known about the impact of available ICT resources that can assist in transforming teaching and

learning. Teachers must understand that using available ICT resources in teaching does not necessarily mean the availability of a well-resourced ICT environment, but that they can employ available ICT resources, such as a data projector and any type of computer to transform teaching and learning into a meaningful process.

Theoretical Framework

Figure 1 illustrates the knowledge components of the Technological Pedagogical and Content Knowledge (TPACK) framework.

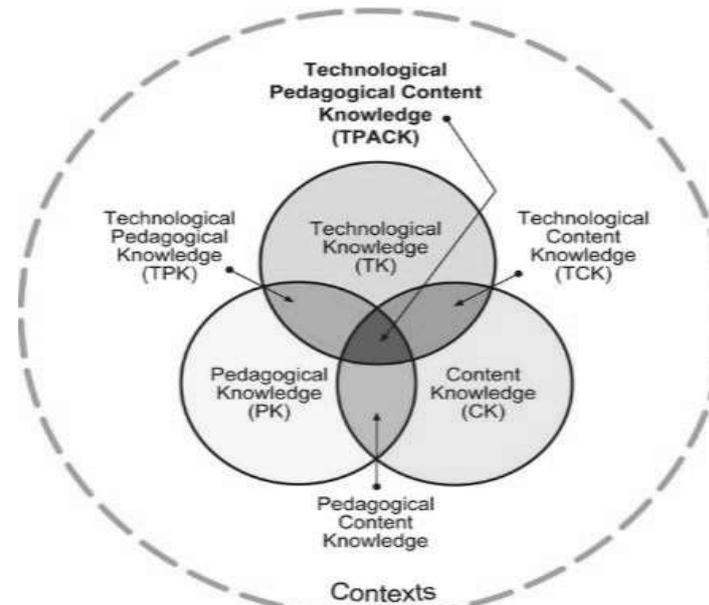


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Figure 1 The TPACK framework (Koehler, 2012)

For this study, the TPACK framework (Mishra & Koehler, 2006) was applied as a lens through which to understand how the participants used ICT resources to enhance their delivery of lessons. The TPACK components overlap to produce the unique knowledge required by teachers to deliver subject lessons effectively (Koehler, Mishra & Yahya, 2007). Mishra and Koehler (2006) emphasise that the effective integration of ICT into teaching and learning depends on the interweaving of the components. They also highlight that this framework is central to the development and delivery of quality subject lessons. Teachers should be made familiar with this framework, because it can assist them in designing and delivering meaningful technology-integrated lessons. The three components, namely technological knowledge (TK), technological pedagogical knowledge (TPK) and technological content knowledge (TCK), should not be treated separately, as they serve as the foundation on which to design quality lessons that integrate the use of ICT resources (Mishra & Koehler, 2006).

In the TPACK framework, TK is the in-depth knowledge that teachers should possess about various ICT resources that can be appropriately selected and employed in the delivery of lessons (Koehler et al., 2007). TK, in this study, entailed the ability of the participants to select the appropriate available ICT resources and use them to transform teaching and learning. Ideally, TK not only involves the selection of an appropriate ICT device, but also modelling expertise in integrating it into classroom activities. For Ghavifekr and Rosdy (2015), an integration approach is about using relevant ICT resources to augment learners' understanding of complex concepts.

TCK relates to understanding of the impact of ICT on specific content or in a subject (Koehler et al., 2007; Mishra & Koehler, 2006). In this study, it was assumed that participants had acquired content knowledge at teacher training institutions and were, therefore, specialists on their subject content. Teachers' in-depth knowledge of content guides them to select appropriate ICT resources for lesson delivery as it is their content expertise that informs

the choice of appropriate ICT devices. In addition, the choice of an appropriate ICT device assists teachers to deliver their content in a meaningful manner.

TPK relates to how ICT can enhance teaching methods and how the delivery of content can be transformed with a specific ICT device (Mishra & Koehler, 2006). The participants in this study were expected to demonstrate how they could manipulate subject content using ICT. When using ICT resources, participants were expected to change their teaching approach from being teacher-centred to learner-centred. The latter approach implies engaging learners in meaningful learning and not denying them the opportunity to participate in their own learning.

Methodology

For this study I adopted an interpretive paradigm that was aimed at investigating how teachers used ICT resources to transform teaching. A qualitative multiple case research design was used to provide a rich description of how teachers use ICT resources to deliver their subject content. Creswell (2007) explains that qualitative research is conducted in a natural setting to make sense of personal perspectives and the meaning of the phenomenon under study. The natural settings in our study were four selected secondary schools where the participants shared their lived experiences of and meaning making in relation to their use of ICT resources to transform delivery of content.

Participants and Settings

Table 1 Description of eight participants' biographical characteristics

Pseudonyms	Gender	Age
A	M	31
B	M	40
C	M	35
D	F	30
E	F	30
F	M	40
G	M	30
H	M	31

The participants were purposively sampled using the criteria of their knowledge and experience of integrating ICT resources in teaching and learning. The participants were two women and six men aged between 30 and 40 years. The principals of the selected secondary schools provided me with a list of teachers who used ICT in teaching and learning. Every third teacher on the list stood a chance to participate in the study.

Data Collection and Procedure

To provide rich and insightful information about how secondary school teachers used ICT resources to transform the delivery of content, a qualitative research approach was used. The primary purpose

of using a qualitative data research approach is to make sense of reality (Creswell, 2007). In this study, semi-structured interviews, non-participant observation and document analysis were used to obtain data about the reality of using ICT resources. A set of guiding, open-ended questions was used for the semi-structured interviews to access the participants' lived experiences of using ICT resources in teaching. Probing was done when there was a need to obtain more in-depth data. All discussions were audio-recorded as a way to capture the discussions during the interviews; consent to record the discussions was obtained from the interviewees. All the interviews lasted about 45 minutes each and depended on the participants' deliberations.

With regard to the non-participant observations, a checklist was prepared and used to gather the participants' delivery of content using ICT resources. The checklist comprised lesson outcomes, assessment standards, scenarios, teaching strategies and the incorporation of ICT resources in delivering lessons. The focal point was the participants' TK of selecting the appropriate ICT resources to transform their lesson delivery. Navigating the functionality of the ICT devices was crucial, as this would aid in investigating their usage. Observation of pedagogical practices was necessary to establish whether the ICT resources used encouraged teachers to use the learner-centred teaching approach.

In terms of document analysis, the following documents were requested from the schools' principals: the ICT policy and the minutes of staff meetings. It was also determined whether the schools had access to the White Paper on e-education (Department of Education [DoE], 2004) ICT policy. Furthermore, the White Paper on e-education was essential to determine whether the use of ICT resources in schools was guided by a policy. The availability of the school ICT policy serves as a road map to achieving the implementation goal, as guided by the government policy (Vanderlinde, Van Braak & Dexter, 2012). Additionally, there was a need to establish whether the school principals and staff members discussed the use of ICT resources in their staff meetings. A checklist assisted in the gathering of data. Three data collection strategies were used in this study for triangulating (Babbie & Mouton, 2012) the data collected in the natural settings, thereby corroborating the findings and increasing the credibility of the study.

Ethical Considerations

Ethical considerations were upheld through voluntary participation, informed consent, confidentiality and anonymity. For teachers to make informed decision, information about the purpose of the study was thoroughly explained, as

were their roles as participants in the study. Their acceptance necessitated the signing of informed consent forms. The participants were also informed that they were free to withdraw from the study at any point. Participant confidentiality and anonymity were guaranteed, and pseudonyms (A to H and schools A to D) were used to refer to the participants and schools. Permission to gain entry into the four identified secondary schools was sought from the Bojanala district office manager and the schools' principals in order to interact face to face with the participants. The ethics application was approved by the Unisa College of Education Ethics Research Committee.

Data Analysis

Data analysis was done according to Creswell and Poth's (2018) data analysis spiral which consists of five steps, namely, managing and organising the data, reading and memoing emergent ideas, describing and classifying codes into themes, developing and assessing interpretations and representing and visualising the data.

The data analysis spiral kicked off immediately after data collection was completed. This was followed by management and organisation of the data, which necessitated the proper arrangement of data to ease the reading process and making meaning out of it. The memoing of emergent ideas assisted in deriving meanings from the raw data. Categories were established, classified, colour-coded and then consolidated into themes. The interpretation, representation and visualising of data was done. The same process was repeated with the other data collection strategies.

Similarly, in terms of the non-participant observations, the data gathered from the checklists were managed and organised to make sense thereof; the focus was on the delivery of lessons using ICT resources aligned to the TPACK framework. The inclusion of the following elements in participants' lesson plans was considered a necessity: lesson outcomes, incorporation of ICT, assessment

standards, a scenario, teaching strategy, and teaching and learning activities.

Equally important was the analysis of the documents. The documents and information pertaining to ICT policies and the minutes of schools' staff meetings were tabulated. The remainder of the data were coded. The focus was on intersections within the coded data. The patterns were noted and are presented in the discussion of the findings.

Issues relating to trustworthiness were addressed through credibility (Babbie & Mouton, 2012). Firstly, methodological triangulation was used to increase credibility in the study. To put it differently, the three data collection strategies were used to ensure that the findings were comprehensive. Secondly, member checking was employed to enhance credibility in the study. For instance, the semi-structured transcripts were member-checked to ensure agreement between the collected fieldwork data and the capturing of participants' opinions and experiences of the phenomenon.

Research Findings and Discussion

The findings and discussions are reported concurrently based on this question: How do secondary school teachers use ICT resources to transform teaching and learning? The themes that emerged from the semi-structured interview data explain the participants' use of ICT resources in their schools. These themes include the unequal distribution of ICT resources, a meaningful learning environment, and unfamiliarity with social networking tools. Each is discussed in more detail below. The data obtained from the non-participant observations and document analysis are discussed subsequently.

Semi-structured Interview Data Analysis

Unequal distribution of ICT resources

In response to the question on the ICT resources at their schools, the findings reveal an unequal distribution of such resources. The table below illustrates the findings.

Table 2 Availability of ICT resources in the selected secondary schools

School A	School B	School C	School D
Computer laboratory	Computer laboratory	Three computer laboratories	Two computer laboratories
Laptop	Two laptops	Two laptops	Laptop
Three data projectors	Data projector	Data projector	Data projector

The findings in Table 2 reveal that all the selected secondary schools had computer laboratories. The participants at Schools A and B indicated that their schools had one computer laboratory, whereas School C had three computer laboratories and School D two. Despite the availability of computer laboratories at the schools, the transformation of the delivery of content remained a challenge. In a study conducted by

Ghavifekr and Rosdy (2015), the findings indicate that success in technology-based delivery of lessons is dependent on well-equipped teaching environments with ICT resources.

Another key finding (cf. Table 1) is that computers were available in all the selected secondary schools under study. However, the use thereof was highly unlikely. Teachers' use of ICT resources to transform content delivery plays an

essential role in learning. Sheikh Abdullah (2016) emphasises the need for teachers to be creative in transforming and improvising lesson delivery in order to meet the learners' learning needs. The following excerpt has reference. Participant H: *"Unfortunately, we live in the information age, and you cannot go anywhere without computers. You just cannot. Everyone needs to learn at least to a certain degree how to use a computer, especially teachers."*

Furthermore, the findings show the availability of laptops at all schools. The participants at Schools A and D indicated that they had one laptop and those in Schools B and C reported that they both had two laptops. Participant A said: *"Currently, all educators have access to laptops in our heads of departments' offices, so as to type anything we take the laptop from them."*

Notably the comment above shows reluctance to use ICT devices by some staff members. There is a need to demonstrate to teachers how powerful ICT resources are for transforming teaching and learning environments. In addition, teachers should be motivated to use ICT devices in teaching and learning, as the teacher participants in this study seemed demotivated, even when ICT devices were available. Karsenti and Collin (2011) found that teachers used laptops more for social and recreational purposes than for education. Advisably, in the TPACK framework, TK emphasises being able to select the appropriate ICT tool for lesson presentation and displaying the skill of integrating it into teaching and learning (Mishra & Koehler, 2006). This skill was found lacking in our study as some teachers were not interested in using ICT resources to deliver their lessons.

The findings also reveal that School A had three data projectors, while schools B, C and D had one data projector each. The following excerpt by Participant B bears reference: *"We've got a computer laboratory fitted with old computers, but some of them are still working, around 30 at the moment, and we've got three data projectors."*

In the study conducted by Padayachee (2017) it was evident that the data projector was the ICT tool most used by teachers in South Africa. Projectors enable teachers to present highly organised slides in a teaching and learning environment and are, therefore, valuable ICT devices.

The participants unanimously indicated that their schools had internet connectivity. However, while all the schools had this facility, data for such connection had to be purchased, which was unfeasible. Participant B said: *"Our problem is the*

financial position we have to buy data bundles ourselves."

The internet is a valuable and critical source of information in an education system. This finding points to the internet challenges faced by the participants at their schools, in other words, they had an internet accessibility problem, which led to limited information literacy. Gunter and Gunter (2015) define information literacy as the ability to surf the internet and analyse and synthesise information to enhance delivery of content. Searching for information enriches teachers' TCK (Koehler et al., 2007; Mishra & Koehler, 2006). Financial constraints prevented the participants from using internet services such as search engines to look for information on their subjects, collaborate with their colleagues to share information and skills related to their subject content, and use email to seek advice from colleagues and/or educational specialists. It is important to use the available ICT resources to transform the delivery of lessons.

Meaningful learning environment

When the participants were asked about the benefits of using technology, they unanimously agreed that technology offered them various opportunities to create a meaningful learning environment. The participants pointed out that ICT devices made subjects easier for learners and empowered them for lifelong learning. These comments offer evidence of the benefits: *"Yes, because there's no way we can run away from this new technology, so the only way to go is to use it in teaching and learning"* (Participant F) and *"Yes, ICT makes lessons easier for learners"* (Participant E). The benefits mentioned by the participants show that ICT devices are indispensable in the teaching environment. However, the key to transforming teaching is understanding ICT and how it can assist teachers to meet the needs of 21st-century learners. Yap (2016) attests that multimedia technology can be used to transform the teaching environment to attract learners' attention, increase motivation, and improve their retention rate.

Unfamiliarity with social networking tools

The participants were asked how they used social networking tools for teaching and learning. To ease the sharing of information, the participants were provided with examples of social networking tools, namely, Twitter, Facebook, Mixit, Chat, WhatsApp, blogs, Wikis, mailing lists and the Thutong portal. The findings show limited knowledge of such platforms.

Table 3 The result of the use of social networking platforms

Platforms	A	B	C	D	E	F	G	H
Twitter	X	X	X	X	X	X	X	X
Facebook	X	X	X	X	X	X	X	X
Mixit	X	X	X	X	X	X	X	X
Chat	X	X	X	X	X	X	X	X
WhatsApp	X	X	X	X	X	X	X	X
Blogs	X	X	X	X	X	X	X	X
Wikis	X	X	X	X	X	X	X	X
Mailing list	X	X	X	X	X	X	X	X
Thutong portal	X	Y	X	Y	Y	X	X	X

Note. The letter X represents none and Y yes.

The information in Table 3 shows that only three participants of the eight used the Thutong portal (Y) to download educational resources for their subjects. The goal of the Thutong portal is to assist South African teachers to access and download material for their subjects (Isaacs, 2007). The following excerpts provide evidence of the use of the Thutong portal:

We frequently use it, like searching for question papers (Participant B).

Download questions from an item bank to get support material (Participant D).

The availability of ICT devices at the selected schools indicates that the schools supported the use of technology, as some of the teachers used the Thutong portal, which enriched their content knowledge. The findings of a study by Stanciu, Mihai and Aleca (2012) reveal that social networking platforms have become very popular virtual learning environments among learners and might be considered as valuable platforms for teaching and learning.

Non-participant observation

The non-participant observation of the participants was done as they delivered their lessons using various ICT devices. They were expected to select the appropriate ICT resources for their subjects and demonstrate their ICT expertise in their subject content delivery. As lesson presentations unfolded, I also read and studied the lesson plans. As mentioned previously, I was cognisant of the inclusion of learning outcomes, assessment standards, scenarios, teaching strategies, and teaching and learning activities.

The findings reveal that not all the participants' lesson plans included learning outcomes. It is the teachers' responsibility to develop learning outcomes that are curriculum compliant. According to Allais (2012), the learning outcomes are increasingly dominating education

policy nationally, and they assist in improving education quality and should be shared at the beginning of a lesson. Furthermore, none of the participants included assessment standards and scenarios in their lesson plans. The assessment standards in a lesson reflect the expected behaviour or actions that learners should demonstrate to confirm their understanding of the content. Maba (2017) attests that assessment is regarded as one of the important aspects of a lesson plan.

Including the scenario in a lesson immerses learners in a real-life situation and enables them to gather skills and information (Bran, 2017). Furthermore, the findings show that neither teaching strategies nor teaching and learning activities were included in the participants' lesson plans. A teaching strategy can inspire learning practices to meet learners' diverse needs. Ruys, Van Keer and Aelterman (2012) emphasise the inclusion of a teaching strategy in a lesson plan and that teachers should be capacitated on the use of different teaching strategies.

The inclusion of teaching and learning activities is crucial as part of lesson planning. A teacher must maintain balance between the two as they provide learners with deep learning opportunities (Fautley & Savage, 2013).

It is without a doubt that the delivery of content is a necessary product of a fruitful lesson plan. Nesari and Heidari (2014), in their study on the important role of lesson planning, found that teachers should be trained on how to develop a lesson plan. An equally significant aspect of lesson planning is emphasised by McGhie-Richmond and Sung (2013) whose study reveals that a lesson plan should accommodate learners' diverse backgrounds and encompass correct instructional roles and teaching and learning activities.

The above-mentioned lesson plan elements form part of the unique knowledge emphasised by Koehler et al. (2007) and are required by teachers to effectively deliver an ICT-integrated lesson. Inclusion of these lesson elements enables a logical flow for lesson delivery. Fautley and Savage (2013) confirm this logical flow as an unfolding combination of lesson elements, giving rise to a constructive way of delivering an ICT-integrated lesson.

Document Analysis

The focal point of the document analysis was the perusal of schools' ICT policies and minutes of staff meetings. Figure 2 indicates ICT policies at schools. The findings show communality in that none of the schools had either the government ICT policy or school ICT policies in their possession.

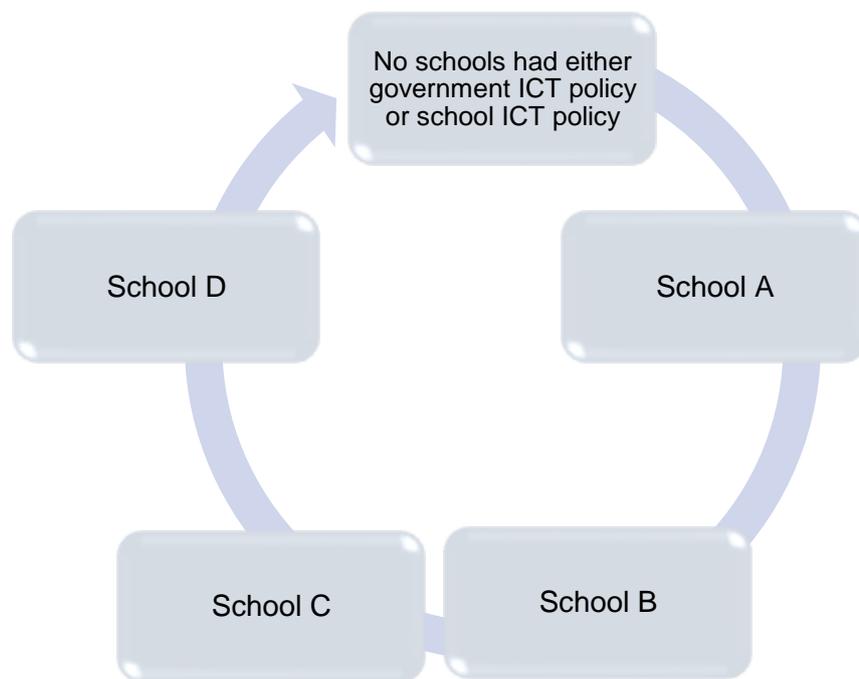


Figure 2 Secondary schools' ICT policies

Vanderlinde et al. (2012) acknowledge the importance of developing school-based ICT policies, however, not much is known on how to develop and establish a policy plan. Notably, the development of ICT policy by the Nepalese government stresses the need to develop ICT competencies, which suggests that a learner-centred approach is an approach that would transform teachers' pedagogical practices (Rana, Greenwood, Fox-Turnbull & Wise, 2018). In the South African context, the White Paper on e-education (DoE, 2004) emphasises that all learners in South Africa were expected to be technologically savvy by 2013. As such, the selected secondary schools were expected to have implemented ICT in teaching and learning, but they did not have the national policy document to guide them in such implementation. The unavailability of ICT policies at schools played a detrimental role in the selected secondary schools, as ICT policies could have provided guidelines on ICT usage as a mechanism to transform teaching.

The staff meeting minutes show that all the schools discussed the use of ICT in teaching and learning. The principals of all the selected schools encouraged teachers in staff meetings to use ICT resources to transform their teaching and learning. Information in the minutes also reveal requests and motivations from the schools' principals for the teachers to attend ICT workshops organised by the circuit office. Stephens, Cruz, Waters and Zhu (2017) state that persistent conversations involving ICT in meetings positively impact frequency of use of ICT in an organisation.

In triangulating the findings of the three data collection strategies, it was noted that there was a

need to transform teaching using ICT resources. Despite all the efforts provided by education stakeholders in the selected secondary schools, the lack of participation compromises the transformation of content delivery using ICT resources.

Conclusion

With this study I investigated how the use of ICT resources in secondary schools can transform teaching. Although teachers were provided with various ICT resources at schools, it was clear from the findings that the tools were not used optimally. The semi-structured interview results show the availability of ICT resources which could have been incorporated to transform the delivery of content. Teachers should be confident about integrating available ICT resources in their lessons, and it is important to note that teaching using ICT devices does not necessarily depend on a rich technological environment. In essence, knowledge about how to use available ICT resources can empower teachers with the ability to use basic devices to achieve learning outcomes, which means that they do not always need the most up-to-date devices and resources.

The findings from the non-participant observation indicate that the participants could select an appropriate ICT tool for their lesson delivery, but navigating such ICT device to convey messages to learners was a challenge. The TPACK framework emphasises TK, which includes navigation of ICT resources. The absence of lesson plan elements in the participants' lesson plans raised concern, because they play an essential role

and ensure that lessons are effective and efficient.

The document analysis results indicate the unavailability of ICT policies in schools and that schools lacked guidance in terms of awareness of the use of ICT resources and the potential role that ICT can play in enhancing the achievement of learning outcomes.

In the final analysis it could be agreed that there is a need to transform teaching using ICT resources, nonetheless, the unfamiliarity or the participants' lack of technological skills hindered the use thereof. Ideally, transforming content using ICT resources enables innovative strategies, active collaboration of learners and acquisition of TK. Teachers' knowledge of using resources to transform content delivery would place teachers in a better position to assist learners to develop technological skills. It is recommended that ongoing, in-service training on using ICT resources should be done to assist teachers to transform their lesson delivery. Also, schools should be provided with ICT policies to guide them on how to transform teaching using ICT resources.

Notes

- i. Published under a Creative Commons Attribution Licence.
- ii. DATES: Received: 19 August 2020; Revised: 18 November 2022; Accepted: 31 December 2022; Published: 31 December 2022.

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