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Teacher Professional Development in the Integration of Digital Technologies for Teaching and Learning at Selected SouthAfrican Schools

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Abstract: The use of digital technologies for pedagogical purposes is a major factor for the enhancement of teaching and learning practices in the digitalized world. The purpose of this study was to investigate teacher professional development (TPD) in the integration of digital technologies for teaching and learning. Qualitative approach was used in this study. Participants were 91 teachers from public secondary schools in Tshwane South District 4 in Gauteng, South Africa. Data was collected by means of individual interviews. Data were analyzed manually using patterns, categories, codes and themes. Findings revealed that there was evidence of inadequate digital technology teacher professional development programs (DTTPDPs) received by teachers. There was lack of time; lack of support; and lack of effective planning for DTTPDPs particularly on the integration of digital technology in the curriculum. Results also shows that 75 (89%) of the teachers indicated that they would like to attend more of pedagogical DTTPDP related to the subjects that they teach. It is evident that despite having had several initiatives relating to digital technology teacher professional development (DTTPD in the district, there is still need for more effective such development for most teachers. Based on the findings, the researchers recommend that the Department of Basic Education (DBE) develop and implement effective DTTPDP strategies to urgently address the current lack of meaningful and effective DTTPDs.

Keywords: Teachers, digital technologies, teacher professional development programs, teaching, learning,

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1. Introduction

Digital technologies are electronic tools, systems, devices and resources that generate store or process data. These include social media, online games and applications, multimedia, productivity applications, cloud computing, interoperable systems and mobile devices. This is an expanded notion of technologies that recognises their development from mere information delivery systems and also clarifies their role in classrooms in contrast to their wider use across schools and learning centres Cambridge International Examination (CIE), 2015).

Digital technologymay be referred to as an extensionof Informationand Communication Technologies (ICT) which encompass a range of hardware; software applications and information systems**.** Thus, the introduction of digital technology in education is expected to penetrate and transform teaching and learning across the curriculum (Hennessy, Ruthven & Brindley, 2013). The significant usage of these technologies is expected to be considered in the classrooms on daily basis. However, this is a concern to the Department of Basic Education (DBE) that its goal has not yet been achieved and that the White Paper on e-Education is still relevant (Mnisi, 2014). With that regard, the policy goal of the then Department of Education (DoE) (2004) states that every South African learner in the General and Further Education and Training (GET) bands will be ICT capable by 2013 (that is, use Information and Communication Technology (ICT) confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community).

However, a disparity exists between the current availability and utilization of digital technology resources for teaching purposes in the classrooms in South Africa. Although schools rapidly acquired ICT hardware and infrastructure, teachers still complain and have a challenge about the quality of training provided to support the use of these tools (Moila & Makgato, 2014). The study emerged out of a need to investigate the current digital technology teacher development statuses in relation to use of digital technologies for teaching and learning at the eight schools. This study aimed at coming up with recommendations on more effective digital technology teacher professional development programmes (DTTPDPs) that could make a positive impact on how teachers use these resources to facilitate teaching and learning.

2. Challenges of digital technology in education

There is a consensus view from a substantial body of research that teachers have pedagogical challenges in the use of digital technology teaching and learning activities (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Almekhlafi & Almeqdadi, 2010; Goktas, Yildirim & Yildirim, 2009; Hutchison & Reinking, 2011; Tezci, 2011). These challenges include low-bandwidth technology which can be unreliable and break down at any given moment, and can be an obstacle for accessing the Internet (Lemke, Coughlin & Reifsneider, 2009). It is also argued that most teachers have been slow to transform the ways they teach, despite the influx of new technology into their classrooms; and despite the desired outcome of the technological progress in schools, the implementation remains a major challenge (Herold, 2016). It is also noted that schools are underfunded and teachers are undertrained, facing environments where the technologies they use are not always reliable (Smith, 2015). Furthermore, the results revealed some of the major digital technology challenges as the limited budget; inadequate professional training; teachers' resistant to change; inadequate network infrastructure; unreliable device and software; no systems to use technology for curriculum; and that education districts did not see immediate need for more digital technology integration in teaching and learning (ibid).

Digital technology by itself is not likely to bring about reforms in schools, but can be a powerful tool for teachers and learners if it is made part of a comprehensive and systemic effort to change education (Lemke et al., 2009). In this regard, digital technology is most likely to be widely adopted by teachers and schools if firstly, it supports already existing practices and helps to solve problems or address challenges. Secondly, it is part of a systemic, organization-wide initiative. Finally, teachers have access to ample professional development and ongoing support. Currently, educational researchers

collectively agree that merely introducing technology to the classroom without proper understanding of the underlying theoretical frameworks is not productive (Koehler & Mishra, 2009; Angeli &Valanides, 2009). Contextual lit to own study

The schools involved in this study seemingly face similar challenges as those noted in Safdar (2011) that digital technology integration is derailed due to various challenges which could include: inadequate appointment of technical support staff, lack of sufficient time for teachers to prepare for digital technology-mediated lessons, insufficient collaboration among teachers in preparing digital technology-mediated lessons, lack of support provided by school

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leaders in addressing teachers' digital technology concerns and insufficient training, demonstrations or advice for teachers on how to incorporate these tools into classroom instruction. It is in this regard that the researchers embarked on this study in order give recommendations that would enhance the use of digital technologies at these schools.

3. Digital technology teacher professional development

The importance of the adoption and use of technology in school education should not be underestimated if teachers need to meet the 21st century skills. Shepherd and Mullane (2010) stated that teachers are failing to integrate technology into their classrooms in meaningful and appropriate ways. In this case, teachers are progressively required to integrate digital technologies in their teaching and learning environments. However, it was noted that educational departments, national professional organizations, and teacher education bodies have voiced the need to prepare teachers to integrate technology into their teaching for decades (Wachira & Keengwe, 2010).

In the context of this study, although DBE is currently rolling out digital technology resources to schools, this alone has not lead to high-quality outcomes since teachers seemingly lack ongoing opportunities to attain and refine the highly specialized skills needed to teach in innovative ways demanded by technology and a competency-based curriculum (Fayad, 2012). As a result, teachers, who are the change-drivers, cannot successfully deliver high-quality, interactive, and outcome-based teaching that is responsive and adaptive to the changing needs of our learners, our country, and our world. There is a lack of systemic technology-related initiatives, and current DTTPDPs do not provide teachers with ways to apply new learning directly to their teaching. Facilitation of TPD at these schools entails one-shot workshops with little direct connection to the classroom or follow-up have minimal impact on teachers as indicated in (Jaquith & McLaughlin, 2010). It is in this regard that this study investigates the challenges that the schools face in relation to teacher professional development in the integration of digital technologies for teaching and learning in order to give recommendation for more effective TPD.

4. Research question

The study was informed by the following research question: How is teacher professional development in the integration of digital technologies in public school implemented?

5. Methodology

Research methodologyis the systematic process of collecting and logically analyzing data for a given purpose (McMillan & Schumacher, 2001). This case study employed qualitative method. Cases are bounded by time and activity, and researchers collect detailed information procedures over a sustained period of time (Yin, 2014). Qualitative data was collected by the use of individual interviews. The interview consisted of five semi-structured questions. Purposive and convenience sampling techniques were used to select the participants. Participants were 91 (13.5%) teachers from 8 public secondary schools in Tshwane South District 4 in Gauteng, South Africa. In this regard, 24 teachers 3 from each school were purposively selected for face-to-face interviews. Qualitative data from the interviews were analyzed by reading repeatedly the transcripts in order to identify the patterns, categories and themes using relevant codes.

The researcher made an effort to conserve the original language and sentence structure of each noteworthy statement. Three sources of category nomination were engaged including in vivo coding (using participants' exact words), descriptive coding (coding based on the researcher's interpretation of actual events and emotions displayed by participants), and deductive coding based on theory) (Miles & Huberman, 1994). Each code was constantly compared with previous codes to ensure uniformity in the coding process. In the third step, meanings were formulated by specifying the meaning of each significant statement (unit). In the fourth step, based on the summative formulated meanings, units or codes that contained statements that were corresponding in content were grouped together to form emergent themes (McMillan & Schumacher, 2001). In order to minimize prejudice while undertaking the iterative procedure of theme development, the researcher made cognisant effort to bracket any epoch or preconceptions held regarding participants' perceptions of factors that influence DTTPD (Moustakas, 1994). The final step involved classifying the emergent themes into priori meta-themes, which were then presented and discussed in a narrative way together with some verbatim. **6. Results and discussion**

The study explored the teachers'perceptions under the following themes which emerged from their responses:

i. Teachers'levels of digital technology proficiency

The teachers were asked to elucidate their levels of digital technology expertise. Findings revealed that some of the teachers know how to use digital technologies and rated themselves as 8/10. Other participants revealed that they use mobile technologies and other technologies but they do not have experience of using it in teaching and learning. Some of the teachers'views presented below show that they did not have experience of using digital technology:

- "I *can use digital technologies but not interactive white board for teaching. I can rate myself 8/10"* • *'Yes I do, 6/10. There is still room improvement"*
- "*I only use my personal cell phone and laptop but not for teaching*"
- "*Yes I do, I am satisfactory because I still need to learn. I don't know how to prepare lessons on interactive whiteboard*".
- "*No, I don't have that experience with teaching and learning. I need to be developed*"

With reference to the above findings, it is clear that the teachers at these schools are not ready to meet the challenges of teaching, learning, and working in a hyper-connected, collaborative, creative, and information-rich world as indicated in (Fayad, 2012). This researcher further maintains that teachers need ongoing opportunities to attain and refine the highly specialized skills needed to teach in innovative ways demanded by technology and a competency-based curriculum. These results indicated that teachers lack digital technology skills for teaching, and this result is also echoed in literature that teachers are undertrained, not trained or not properly trained to use digital technologies in their teaching practices (Smith, 2015).

ii. Teachers'access to DTTPD facilitation

Teachers were requested to indicate whether they received some form of DTTPD. The findings show mixed feelings from the participants as others indicated that they did receive professional development in the use of digital technology but others did not. Though other teachers received training they emphasised that it was ineffective and inadequate. Other teachers have never received digital technology professional development. In this regard, the following are some of the responses from the interviews:

- "*As far as I know, before the introduction of digital technology in Grade 12, there was a workshop during the school holidays, however after that, I never heard of any training and no one ever came to the school to train or support teachers on the use of digital technology for teaching and learning"*
- "*There was some kind of training for five days. It was inadequate as I still need to be equipped on the use of digital technology"*
- "*There was some kind of training which still needs to be improved on. It was just for a short time"*
- "*Yes, we have, but it was not that effective as it took only 3 days, it was inadequate. We want an intensive teacher professional development. They were focusing theoretically on how to prepare using interactive whiteboard without practically being hands-on. Since we stayed for a long time before they installed interactive whiteboard in Grade 12 classrooms, we had forgotten how to use interactive whiteboard by the time they installed them in the classrooms*"
- "*Firstly, we have never received any training. Secondly, we have never received any digital technology resources. There are no interactive whiteboards in grade 12 classrooms. Teachers and learners are still using chalk, talk and textbooks for teaching and learning*"
- "*Last year (2016), training was offered but support from DBE is still needed. Teachers from old school would not have grasped all the digital technology skills in that short time of training. We still need an intensive teacher professional development"*.

It may be seen from the findings that digital technology on its own is not likely to bring about reformation in schools, but it could be a powerful tool for teachers and learners (Lemke *et al*., 2009). Teachers are failing to integrate technology into their classrooms in meaningful and appropriate ways due to lack of adequate teacher professional development; although they are progressively required to integrate digital technologies in their teaching and learning environments (Shepherd *et al.*, 2010). Digital technologies are likely to be widely adopted by teachers and schools if could be used to support already existing practices and help to solve problems or address challenges, Furthermore, teachers require to have

access to continuous professional development. The findings suggest that teachers should be developed in the use of TPD for DT; however effective TPD should not stop at DT literacy, but should model effective teaching practices. Oneworkshops with little direct connection to the teaching and learning or follow-up have minimal impact on teachers (Jaquith *et al*., 2010).

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3. DT integration with teaching and learning activities

Teachers were requested to elucidate on their current statuses on their integration of digital technology in teaching and learning. Findings revealed that digital technologies in most of the schools exist but are not being used. About this matter the following are some of the responses captured from the interviews with the concerned teachers:

- "*Tools are not being used, no cell phones for learners are allowed in class, computer labs not used, classrooms not well structured for digital technology usage in teaching and learning*"
- "*Yes, only Grade 12 classes use digital technology, the rest are still using chalkboard and text books*" ・ "*Minimally used by some teachers*"
- "*I think younger teachers are, but the older teachers are refusing to move away from old way of teaching because they are not well equipped*"
- "*Not all of us since some of the subjects are excluded, for example Sepedi, Setswana and other African languages do not have writing tools on the interactive whiteboard. Not all 11 official languages are taken care of by the digital technology initiatives*".

It may be argued that there is a need for the Department of Basic Education (DBE) to prepare all teachers to integrate technology into their teaching for decades (Wachira *et al*. 2010). It is crucial for teachers to be equipped and supported in order to successfully integrate technology in teaching and learning.

4. DT challenges in teaching and learning environments

Teachers were asked to state and clarify perceived deterrents that they encountered in the use of digital technology for teaching and learning. Most of the participants revealed that the major challenge is the limited access to resources. Participants also indicated that in most schools only grade 12 classrooms are equipped with digital technology. In most cases, these school are no school fees paying, therefore they rely heavily on the government of the DBE. Concerning this, the following responses from the teachers involved in this study were noted:

- "*Facilities supplied are limited, only three classes access digital technology yet we have 30 classes*"
- "*The process of rolling out digital technology is gradual. Only grade 12 classes accesses these resources. We are not yet there*"
- "*We are a no fee paying school, we rely on DBE to roll out digital technology. It has been more than two years waiting for them to roll out these technologies for grade 11 classes. Only grade 12 classes have digital technology*"
- "*The government is not taking responsibility to equitably roll out digital technology to schools, hence our lack of resources. We also do not have adequate digital infrastructure*"
- "*The roll out of digital technology is the MEC's initiative, however it is too slow*" ・ "*The government has a long way to go; only grade 12 classes have DT access*".

It may be observed from these findings that most of the schools have a challenge of limited access to resources as only grade 12 classes have digital technology. Also it is clear from the findings that the schools rely on the government and the DBE to support them with necessary equipment to integrate technology in their teaching practices. Research shows that schools are underfunded and inadequate trained teachers in the use of digital technology (Smith, 2015).

5. Suggestions for effective DTTPD

Teachers were asked to provide recommendations for effective DTTPDP as well as for their digital technology skills to be improved. In this case, the participants mentioned effective and continuous professional development. In this regard, the following are the highlights from some of the teachers'responses:

- "*More training and follow up still is required, there are a lot of things we still cannot access*"
- "*All teachers should receive teacher professional development since digital technology is here to stay; teacher professional development that was offered was not enough*"
- "*I believe monitored after school DTTPDPs at an equipped venue (maybe twice in a term); should improve our skills*"
- "*More time is required. They must not train too many teachers at once in a single session. We need to be hands-on with digital technology for teacher professional development to be effective*"
- "*Digital technology should be introduced in the curriculum. The two are currently divorced; they should be linked. They must also train us at school but not during school hours*".

It is clear from the findings that teachers recommend more professional development in order for them to be able to use and integrate digital technology in their teaching practices. Some of the participants felt that relevant teacher development in the use of digital technology should intensive if these resources are to be integrated in the curriculum effectively. This is supported in Shepherd *et al.*, (2010) who argue that teachers are failing to integrate technology into their classrooms in meaningful and appropriate ways due to their inability to select and use appropriate digital technology for classroom activities as expected of the 21st century teachers.

7. Conclusion and recommendations

It may be concluded from this study that teachers have received some kind of teacher professional development. However, this still needs to be improved on if effective teaching and learning using digital technology is to be realized. It is evident that despite having had several DTTPD initiatives in the district, it has not been adequate to equip teachers with relevant skills to confidently use these resources for teaching. This study recommended that the DBE should develop and implement effective DTTPDP strategies to urgently address current lack of time for meaningful and effective DTTPDs. If the DBE wish to see success in the effective usage of digital technologies in schools, they need to fast track the installation, provide access to necessary resource and ensure the continuous professional development of the teachers. It is important that teachers are empowered on how digital technology can be integrated in the curriculum.

The teachers need to be trained on how to develop a technology-enhanced lesson plans that will indicate exactly the technology-enhanced teaching strategies to be used for a particular lesson, as well as the relevant technologies learning activities and assessments. This will assist teachers to achieve the outcomes of the lesson. By so doing the focus will not be on the digital technology but on the teaching and learning. If these recommendations are effectively implemented by all stakeholders, then as expectation of the 21st century's goals, teachers will access high-quality teacher professional development and support so that students receive a high-quality education. It is therefore imperative for the researchers to recommend further in-depth research at a wider scale, to investigate the status DTTPDPs. However, this case study is only bounded on eight public secondary schools at the Atteridgeville in Tshwane South District 4 in Gauteng Province of the Republic of South Africa. The findings of this study cannot be generalized to any other public secondary schools in the district. Yet, it could be used in another context.

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