AUTHOR:
Bongumusa W S Gubevu[1]
Vusi Mncube[1]

AFFILIATION:
[1]University of Fort Hare, Alice, South Africa

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Chronicling participants' understanding and experiences of integrating ICT into the teaching of geography in South African schools

Abstract

This article examines geography teachers', parents' and learners' understanding and experiences of the integration of Information and Communication Technologies (ICTs) in the teaching of that subject. The study was guided by the TPACK-SAMR model, which proved to be a reliable tool for measuring the extent of ICT integration. The purposive sampling technique that was employed enabled the researchers to identify participants for the research study related to the importance of integrating ICTs into the teaching and learning of geography. The article draws its purpose from the integration of technologies into the teaching of geography as a means of preparing and equipping learners who take this subject with the type of skills required in the 21st-century job market. Surprisingly, the research findings revealed that some teachers still do not feel comfortable to integrate diverse technologies into their teaching of geography, perceiving it as time consuming. Their unwillingness to become digital citizens and conform to the demands of the Fourth Industrial Revolution (4IR) is a drawback, as are learners' inappropriate use of ICTs (visiting irrelevant, unwanted sites instead of downloading subject-related content). To empower learners to adopt and use ICTs as valuable tools and solutions on their learning journey drastic changes are required, particularly on the part of curriculum planners in geography.

Keywords: *academic performance scores, buddy system, digital gadgets, digital natives, ICT integration, Internet of Things, navigators, paperless society, video flipped learning*

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1. Introduction

In the voices of Fleischmann and Van der Westhuizen (2019), integrating Information and Communication Technologies (ICTs) helps to improve learners' academic performance. In the same breath, Seedat (2019), concedes that ICTs have been welcomed by geography teachers. He further argues that ICTs serve as invaluable tools for enhancing learners' understanding of geospatial concepts,

resolving issues that affect citizens both locally and on a global scale (Seedat, 2019). Worryingly, Tarisayi (2022), reports a varied uptake of ICT integration by geography teachers between the global and African countries. For instance, some of the world countries have the following uptake: Singapore, 10%, and in Turkey, 82% teachers are not using it, India is represented by 2%, while 33% of German educators have integrated ICT into the teaching of geography. In the same vein, Fleischmann and Van der Westhuizen (2018) assert that senior geography teachers seem reluctant to integrate ICTs into their teaching. Within the South African context, Mzuza and Van der Westhuizen (2019) assert that the introduction of the Interactive GIS Tutor (I-GIS-T) as a programme and tool to facilitate geography mapwork teaching, for instance, yielded positive results in terms of improving learners' subject-related knowledge, especially when it came to applying theory into practice. However, in a qualitative study conducted by Cele (2022), the findings reveal a myriad of challenges faced by South African teachers in integrating ICTs into the teaching of geography. He further indicates challenges such as the lack of pedagogical knowledge and support that hinders their ICT integration uptake. Similarly, Clark *et al.* (2020) concede that geography teachers may assist learners to upload applications (Apps) such as scanners and google earth (GE) onto their digital devices. They further argue that this facilitates learner engagement during geography excursions (Clark *et al.*, 2020). However, researchers observed that teaching strategies that fail to accommodate the context in which learning is taking place do more harm than good and fail to prepare learners adequately for the future. Furthermore, they are of the opinion that, in a rapidly changing world characterised by the Fourth Industrial Revolution (4IR), the use of ICTs is imperative in teaching and learning, yet ICTs alone cannot help learners to master the content deemed suitable for their grade – such tools must be both relevant and appropriately used. Similarly, Stojsic, Ivkov-Dzigurski and Maricic (2019) affirm that integrating ICTs into geography lessons promotes learner participation, facilitates the understanding of challenging concepts, and motivates learners to learn. Thus, learners require guidance from their teachers on how to take advantage of the technology available in their learning space.

The article draws on the imperative of integrating ICT into the teaching of geography, as proposed by Seedat (2019), Clark *et al*. (2020) and France *et al.* (2021), who advocate that the teachers of this subject accept and adopt such technologies as tools to facilitate teaching. To empower learners to adopt diverse technologies as viable solutions to facilitating their learning in their academic journey, drastic changes are required, and curriculum planners in geography should focus on the integration thereof. Thus, this article seeks to highlight several of the digital devices that qualify to be classified as ICT tools that are relevant for geography classrooms. The intention is also to use the study participants' experiences as a springboard for guiding researchers, geography teachers and curriculum designers alike in preparing and assessing content that is befitting of 21st-century requirements and expectations.

2. Literature review

2.1 ICT Integration in the teaching of FET-phase geography

Recent studies indicate that integrating ICTs into 21st-century classrooms can no longer be delayed (Constance & Musarurwa, 2018; Stojsic *et al*., 2019). For instance, Hogan (2020) asserts that geographers study geospatial relations regarding a range of human and physical phenomena occurring on the Earth's surface by means of tools and platforms such as Q-GIS, ARCGIS, YouTube, Facebook, Twitter, WhatsApp, Google Earth and the internet. Similarly,

studies by Stojsic *et al*. (2019), Clark (2020) and Hogan (2020) found that adopting and implementing ICTs in the teaching of geography boosted learners' confidence and their academic performance scores (APSs).

Worryingly, a study by Fleischmann and Van der Westhuizen (2019) found that although many African countries have started using related platforms (and South Africa is no exception), the process is not without its challenges. South Africa's White Paper 7 (RSA, 2004) seeks to connect teachers and learners digitally (i.e., through e-education), to facilitate the processes of teaching and learning, but as Hogan (2020) and Hlatywayo (2021) point out, only a handful of schools have integrated ICTs into the curriculum, with some strongly opposed to the implementation of the policy, as it could aggravate the digital divide between the haves and the have-nots.

As such, the unwillingness of some teachers to adopt ICTs qualifies them as barriers to ICT integration in geography. Adarkwah (2020) concur that lifelong learning will only be realised via the integration of ICTs, thereby ensuring that the sustainable Millennium goal number 4 (allowing equitable access to learning) is realised. Chawanji (2018), Mkhongi and Musakwa (2020) affirm that geography learners and teachers will only manage to integrate ICTs if such tools and platforms are accessible to them, but if schools do not budget for the procurement of the appropriate technologies, any policy which advocates ICT integration will look good on paper, without being applied and implemented in the classroom.

Like many, countries, South Africa crafted ICT policies such as White Paper 7, on e-education Tshimanika (2023) which emphasises that the integration of ICTs in teaching and learning should be inclusive of all learners, irrespective of their capabilities, to grant them an opportunity to fully participate in, and benefit from the learning process (Constance & Musarurwa, 2018; Hogan, 2020) confirm that digital resources improve learner understanding of reality as well as boost their APSs.

Furthermore, it is envisaged that, having acquired 21st-century skills, learners will become the generators of solutions (as opposed to merely receiving information from their teachers), and will be exposed to independent learning and be capacitated to learn at their own pace (Hogan, 2020; Clark *et al*., 2020). Using a variety of ICT tools, geography teachers can move their learners from rote to inquiry-based learning (IBL). Chiyokura, Nakamura and Matshuhashi (2017) and Lembani *et al.* (2023) concede that this goal can only be realised if self-directed learning (SDL) is promoted and implemented. Digital tools, according to Chiyokura *et al*. (2017) and France *et al*. (2021), will allow geography teachers to expose their learners to projects which require of them to apply collaborative and interpersonal skills, enquiry and teamwork to resolve geospatial issues. In addition to that, Chiyokura *et al*. (2017) posit that teachers not only have to expose learners to ICT interactive tools such as Google Earth and Google Maps, but also to guide them on how to conduct research on spatial issues to capacitate them for problem-based learning (PBL). However, Chawanji (2018) and Hogan (2020) caution against schools that craft policies that outlaw the use of digital devices to facilitate teaching and learning of geography; thus, depriving learners of access to realise their potential in terms of nurturing their skills in self-directed learning.

2.2 Teachers' experiences on ICT integration in the teaching of geography

Globally, scholars highlight the rewards of integrating ICTs into the teaching of geography. For instance, Stojsic *et al.* (2019) concede that geography learners in Serbia get excited whenever their teachers integrate ICTs into their teaching. In the African context, this view is supported by Constance and Musaruwa (2018), who argue that tech-savvy learners have little difficulty learning those ICT-related skills that will help them to participate in ICT-mediated lessons. They further confirm that Seychelles geography learners end up benefiting from the buddy system, in which highflyers team up with struggling learners in a collaborative endeavour that sees both parties benefiting from the process (Constance & Musaruwa, 2018). Similarly, within the South African context, Mzuza and Van der Westhuizen (2023) assert that it is vital for geography teachers to integrate ICTs into their teaching.

Hogan (2020) highlights that integrating various ICTs into the teaching of geography improves the working relationship between learners and teachers, such that there is mutual learning in using certain tools. Another advantage is that learners who struggle to master concepts in class can turn to their fellow classmates (as more knowledgeable others) for assistance (Vygotsky, 1978). Not only does the educational context stands to benefit, as Clark *et al*. (2020) argue, but through ICT implementation, geography teachers can create maps using Q-GIS tools, and from there, such information might add value to the work of researchers and municipalities, for instance, allowing environmental risks to be minimised and thereby making an invaluable contribution towards improving citizens' lives. In this regard, Chiyokura *et al*. (2017) propose that learners be tasked with the responsibility of designing a map displaying areas that are prone to flooding, for instance, where habitations are located below the flood-line, thereby assisting local municipalities in minimising risks associated with natural disasters such as floods. Such a platform will help to motivate geography teachers and learners to share their ideas, successes and failures, and to come up with innovative ways of contributing towards hazard mitigation and adaptation as well as societal challenges.

Guo *et al*. (2020) and Chiyokura *et al*. (2017) concur that integrating ICTs and other multi-media technologies (MTs) during the Covid-19 pandemic into the teaching of geography (and other subjects) stimulated innovation amongst participants, serving as an enabler in motivating learners to work in teams to complete their research projects. This could be achieved by having learners collect, interpret, manipulate and analyse data. The activities should mostly be learner-centred by nature, with the teacher serving as a facilitator. Ultimately, it is envisaged that learners will become proficient in their use of a range of ICTs and, without coercion, learn to forge relationships with their fellow geography learners, locally and globally, thereby increasing their social and academic networks. In so doing they will gain vicarious experience, verbally (e.g. via voice notes) or via images (e.g. screen grabs, videos), which they obtain from their friends without needing to physically displace themselves.

However, Hlatywayo (2021) concedes that seasoned geography teachers seem to resist adopting new technologies in their pedagogies. In the same breath, Fleischmann and Van der Westhuizen (2020) caution about the inequalities in terms of the provision of ICT infrastructure between the rich and the poor countries. This then leads to a digital divide and creates digital exclusion. South Africa is a unique case, as the digital exclusion occurs within the same Department of Education, where, on the one hand, some schools are well resourced and

on the other hand of the continuum stand schools with inadequate infrastructure. The latter struggle to implement ICT integration in geography; thus, depriving the millennials' chances to enhance their ICT skills, which have become life skills in the 21st century.

2.3 Theoretical framework

The study lensed was by the TPACK-AMR (Technological, Pedagogical and Content Knowledge – Substitution, Augmentation, Modification and Redefinition) framework, as amended by Puentedura (see Drugova *et al*., 2021). See Figure 1.1 below.

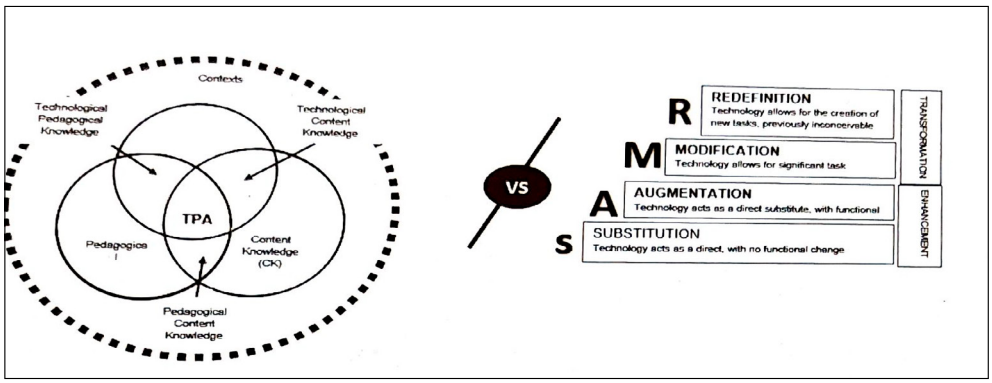

Figure 1.1 TPACK-SAMR model

Originally described by Mishra and Koehler (2006), the TPACK model advocates ICT integration in educational contexts. In addition to that, Fleishmann and Van der Westhuizen (2018) came up with the TPACK-GIS model for the under-resourced schools that teach geography. Drugova *et al*. (2021) posit that digital content must be made up of cloud-based platforms characterised by digital exercises that are interactive by nature, such as videos, audio, pictures, gifs, tests and animations. One such success story is Skying (skyengschool.com) – an online school in Europe that offers more than 3 000 lessons and tasks that can be checked automatically, enabling teachers to monitor learner progress and task completion. In their virtual classrooms, teachers assign different tasks/activities to learners, thereby individualising learning. Such platforms can be accessed both in class and from home. Study material takes the form of interactive videos, which allow learners to receive real-time feedback from the platform without having to wait for the teacher to give feedback in class. Learning thus happens at anytime and anywhere, if a learner has access to a computer, tablet or mobile phone.

Drugova *et al*. (2021) explain that, combining the TPACK with SAMR allows numerous permutations: pedagogical knowledge (PK), when linked with substitution, relates to teaching methods being uploaded onto a platform, which allows for listening or reading, for instance, enabling the teacher to assess the learners' strengths and weaknesses; and PK, when linked with augmentation, involves homework activities in the classroom being discontinued, and student-centred methods being given priority. PK, when linked with redefinition, allows teachers to play a mentorship role while learners choose their own material, plan for such and determine the frequency of their activities, guided by continuous feedback from the online platform.

Drugova *et al*. (2021) also propose combining content knowledge (CK) with substitution, where analogous content is replaced by digital material (either partially or completely). CK is paired with augmentation, so that existing content is complemented by various contents and homework is given and controlled by the teacher, with assignments on the online platforms where teachers monitor learner progress. If CK is combined with modification, interactive ICTs are used to provide learners with digital content which improves the learning experience, and where CK is paired with redefinition, both the teacher and the learner have a role to play in generating digital content.

2.4 Statement of the problem and research question

Worryingly, Constance and Musarurwa (2018) and Hlatywayo (2021) acknowledge the low and varied uptake of ICT integration on the part of seasoned teachers who teach geography – a challenge which has been identified in various teaching and learning-related discourses (Seedat, 2019; Bengel & Peter, 2021). This reluctance deprives geography learners of the opportunity to be exposed to a wealth of domain-based resources and the view of experts who are active or available online, irrespective of either party's geographic location. The question addressed here is, "What are the geography teachers understanding and experiences with ICT integration, and what makes it challenging for them to assimilate such technologies into their teaching, in order to effectively equip their learners with valuable problem-solving skills?"

2.5 Research objective

The objectives of the study were to:

- identify teachers, parents and learners' understanding and experiences of ICT integration in the teaching of Grade 12 geography;
- investigate the role of ICTs in assisting struggling learners to master challenging geography concepts in Grade 12;
- investigate the role of ICT integration in the teaching of map skills, GIS and integrating mapwork with theory in Grade 12 geography; and
- evaluate the impact of integrating ICTs into the teaching of Grade 12 geography.

3. Research methodology

The researchers employed a constructivist/interpretivist research paradigm. According to Lotz-Sisitka, Fine and Ketlhoilwe (2013), this paradigm relates to the researchers' beliefs about the world around him/her, as those relate to the construction of knowledge. According to this paradigm, reality exists in the human mind and is conditional upon human experiences and interpretation. In other words, it is not independent but subjective and socially constructed, and can have varied meanings (Lotz-Sisitka *et al*., 2013). In this regard, the researchers sought to allow participants to make a meaningful contribution by making their voices heard. The constructivist approach is grounded in the fundamentals of qualitative research. McMillan and Schumacher (2010) assert that it focuses on the voices and perceptions of the study participants, on how they view and interpret reality. This enabled the researchers to be in the shoes of the participants to gain their lived experiences through critical discourse analysis. As McMillan and Schumacher (2010) explain, the qualitative approach allows the researcher to arrive at an in-depth understanding of the phenomenon under study – in this case, how teachers perceive technology and integrate ICTs into the geography lessons they present at

South African schools, how parents perceive such integration, and to probe learners' views on this matter, since research that is qualitative by nature accommodates and reflects the voices of the participants in respect of how they perceive reality. This study employed the qualitative approach to garner the participants' views on the strategies they used, or were cognisant of, in their personal capacity and context in respect of the adoption and use of ICTs in geography lessons. This was achieved by allowing participants to use voice notes (VNs) to respond to questions posed to them regarding ICT integration into the geography classroom, and to reflect on their personal experiences. Purposive sampling enabled the teacher participants to be custodians of the research study. It also permitted participating parents to take ownership of their children's scholastic progress. To this end, semi-structured interviews, observations and document reviews were used as data-collection tools.

3.1 Research design

A case-study design was employed. As confirmed by Yin (2018), to a significant extent, the findings reported are the product of case studies. Case studies allow researchers to attach meaning to concepts used in their study participants' context. This occurs where the *how* and the *why* questions need to be answered, as participants' understanding of such concepts cannot be measured (Yin, 2018). Thus, the researchers used case studies to access the participants' views, experiences and understanding of ICT integration in the teaching of geography in their unique contexts.

3.2 Data-collection methods

The researchers used observation to verify whether Grade 12 teachers and learners adhered to ICT policies of banning smartphones during teaching and learning in the deep rural setting of the uMzinyathi District in KwaZulu-Natal. Furthermore, Grade 11 teachers and learners participated in semi-structured interviews to solicit information on how they understand and experience the role of ICT in geography classrooms (Coombs, 2021). Interviews were used, as they allow for interaction between the interviewer and the interviewee. Observation was also used, as it highlights content gaps teachers may not be aware of when they present their lessons practically. The other data-collection method used in this instance was document analysis, which revealed whether the contents of lesson plans matched the participants' practice.

In keeping with the requirement for an ethical study, the following issues of privacy, consent and approval were addressed. Privacy entailed that details about the participants or the institutions of learning involved would remain confidential. To address consent, prior to the interviews, the researchers obtained the participants' consent as well as permission with clearance number MNC071SGUB01, to conduct the study from the relevant education authorities. Lastly, for approval to conduct research in schools, permission was sought from the provincial Department of Education in the province of KwaZulu-Natal. Furthermore, school principals gave us permission to gain access to schools as research sites.

4. Research findings and discussion

Yin (2018) contends that the use of participants' voices in research is a very powerful tool, and for this reason the transcripts of the interviews are reflected verbatim to ensure that those voices are heard, regardless of whether they advocate ICT integration in the teaching of geography or believe such tools have limited value in the teaching of the subject.

The interview outcomes and discussions are presented under the following themes:

- ICT integration: A complementary tool for learning geography
- ICT integration in the teaching of geography as a time saver
- ICT integration in the teaching of geography as an exclusionary measure

4.1 ICT integration: A complementary tool to learning Grade 12 geography

In the view of Fleischman and Van der Westhuizen (2019), the uptake of I-GIS-T in geography teaching offers a means of reshaping education from a teacher to a learner-centred approach, allowing learners to communicate better and cooperate with one another as well as with their teachers. This statement was confirmed by one learner participant:

> *The hard lockdown in 2020, because of the Covid-19 pandemic [gave] me the opportunity to reassess the role that my smartphone can play [in] my life. Previously, I had challenges with my parents whenever I requested money to buy data bundles, as my parents felt that the smartphone [would] not add value to my studies. Fortunately, the 2020 academic year … brought about dramatic changes in my schooling career. I saw my parents emphasising the use of digital platforms, to access education. They even allowed me to use the mobile phone during my geography online studies, which was not permitted before the onset of the Covid-19 pandemic. This implies that what used to be [a] distractor [from] my studies, ha[s] now turned out to be [an] indispensable tool to complement learning. This happens when my teachers communicate with me and my parents through … digital devices, facilitat[ing] learning by making use of [a] digital gadget as a visual tool to access geography lessons.*

The worldwide impact of the Coronavirus changed opinions about the educational value of hand-held devices in online classes, when social distancing left parents with no other option but to embrace technology if they wished their children to continue their education despite the lockdown restrictions. Another geography learner had this to say on the appeal and usefulness of subject-specific online platforms:

Online geography learning turned out to be the missing link as a supporting tool for my studies. I happened to use the digital gadgets to access visual images for what has been taught in class by my geography teacher. ICT integration … provides me with an opportunity to be alone, and do things individually before I can ask for help from my teacher. There are times where I manage[d] to [gain a] better understanding of concepts from my digital gadgets, since such concepts [show] colour and dimensions that would have given my geography teacher … difficult times when asked to present the concept in question. Before the hard lockdown, I used to fail to submit tasks to my teachers and they [were] not … in a position to reprimand me [for] doing that. Now that there are smartphones that can even send e-mails, my parents are … in a position to check the progress of my studies, by communicating directly with my subject teachers, instead of asking me.

A participating geography teacher asserted,

> *ICTs such as Google Earth can deliver and display content in a multitude of ways, within a short space of time and in real time. I manage to display content using diagrams to visual learners. ICT allows me to introduce topics using videos. I use ICT to assist learners who find it difficult to understand lessons, by sending them voice notes on their gadgets for them to play repeatedly, to clarify concepts instantly. I am able to present content both in a digital manner and by using hard copies. There are concepts that can be easily explained by … word of mouth. There are those concepts that [require] real pictures, to be better understood by learners … I have also realised that ICT integration … provides an alternative in terms of the environment and space in which learners find themselves learning. ICT has proven to be valuable, as it provides an alternative in terms of a learning space that is vibrant and … transcends the four walls of the classroom. I have discovered that learners learn easily when they work with digital gadgets, as they are in control of the learning tools. ICT allows for differentiation to take place, as my learners can ask questions [from] the comfort of their homes, as they learn at their own pace. The WhatsApp mobile learning boosts … social interaction and social presence amongst my learners. It is through ICT integration that my learners develop the skills of sharing knowledge.*

As these research participants revealed, ICT integration enabled teachers and learners alike to view different devices as useful tools for making the process of learning geography more meaningful and enjoyable. The findings further highlighted the fact that integration of technology is the missing link in the realisation of a paperless society. Drugova *et al*. (2021) support this notion, indicating that, for effective technology integration to occur, there must be an interwoven relationship between all the prongs of the TPACK framework, as described by Mishra and Koehler (2006), requiring of teachers to know the latest technologies (technological knowledge, TK) and master them if they are to use them effectively. They must also be familiar with, and adept at effecting the pedagogical knowledge (PK, i.e., knowledge of assessment techniques that truly assess learner capabilities. For Chiyokura *et al*. (2017) and Guo *et al*. (2020), multi-level integration has established a more flexible learning environment, such that both struggling learners and high achievers are able to participate in the learning process. In essence, technology implementation serves as an enabler, in ensuring that learners with different capabilities share the same space and can benefit from lessons. To that end, various technological devices can help geography teachers to clarify the learning content for their learners, by means of colourful images, accessed using Google Earth and Google Maps. As confirmed by the participants, had it not been for ICTs, geography teachers would not have been able to present lessons during the hard lockdown, or to help learners complete the 2020/21 academic year.

4.2 ICT integration in the teaching of Grade 12 geography as a time saver

Integrating a range of technologies when teaching geography was found to enable the exchange of information in the teaching and learning process, amongst others, using tele and video conferencing as well as PowerPoint presentations (Lembani *et al*., 2020; Hogan, 2020). Participants in the present study identified a variety of time-saving tools, including digital notes and videos that serve to clarify difficult concepts which would otherwise require significant simplification for the learners. Seedat (2019) posits that geography teachers can easily retrieve data from their devices if these are arranged in files; they can also easily log onto the internet and access search engines such as Google Scholar to expose learners to current issues in their discipline. In respect of the timesaving benefits of ICT integration, one young participant had this to say,

> *During the hard lockdown, I spent three months away from school, but with the introduction of WhatsApp learning in geography teaching, I managed to cover all the work that our teachers wanted us to do for the year. [Without] ICTs … our 2020 academic year was going to be a wasted year. Our teachers managed to send us activities to our smartphones, which we managed to submit within a specified time. They even ensured that we access[ed] the remedial work for the activities we submitted. Our teachers used WhatsApp and emails to assist us with geography lessons.*

A participating geography teacher asserted,

> *Digital devices allow me to easily communicate with parents using social media platforms, and to create examination banks from previous question papers focusing on challenging concepts as part of the set-pieces. This motivated my learners to continue using their "Walking Companions" [a summary of clarified concepts that can be uploaded onto learners' digital devices].*

Another geography teacher remarked,

> *Using different resources such as videos, VNs, images and digital notes, allows me to access … several learners. This, in turn, limits the challenges I face in class, as most of my learners strongly believe in the Internet of Things. This happens whenever you give them challenges; they quickly go on Google and search for answers. This enables my learners to be centre stage [in] their own learning. In the presence of ICT integration, my learners [are] exposed to the Internet of Things.*

As the research participants revealed, technology uptake allowed teachers and learners to perceive different devices as useful tools for making the geography learning process smoother and more meaningful. Chiyokura *et al*. (2017) point out that using a computer-supported collaborative learning space (CSCL) enables learners to use Google Earth to access distant places via computer and to rely on their collaborative skills to collect data virtually. They might design projects as a team, using a problem-solving learning approach. In respect of teachers honing their skills, Drugova *et al*. (2021) advise that combining TPACK with SAMR is critical in achieving sustained capacity development. By implementing CSCL, teachers can work to ensure that struggling learners do not give up if the work given to them requires digital skills that are too demanding. Further, Drugova *et al*. (2021) argue that, in the TPACK-SAMR model, knowledge of content (CK) can be modified, such that learners are exposed to interactive ICTs to give them digital content that will help improve their APSs.

4.3 ICT integration in the teaching of Grade 12 geography as an exclusionary measure

Piper *et al*. (2020) state that, in the absence of monitoring, the implementation of ICT-related integration policies will always have the difficult task of addressing the inequalities between learners in rural, semi-urban and urban areas. This finding is echoed by the statements below.

As the parent of a geography learner commented on the digital divide,

> *The Covid-19 pandemic has, in a way, made ICT integration … compulsory in all schools that are offering this subject [geography]. I personally feel that the Department of Basic Education must pass a policy of making ICT integration … compulsory in all schools. This will lighten … the load on our shoulders, as that will mean that government will automatically finance its implementation. This is because not all learners are privileged enough to own digital gadgets, let alone to maintain them. The hard lockdown has put a lot of pressure on us, as parents, because we were forced to try to purchase such*

> *gadgets, even if it meant we go to bed on [an] empty stomach. Other geography teachers prefer to get their submissions done via email, and that makes my life difficult, as there is no laptop or … smart phone at home, let alone the money for buying … data bundles. This makes me feel that I am not part of the 'new normal' [post-Covid].*

A participating geography teacher asserted,

> *ICT integration is not incentivised. Once a teacher gets the qualification at the tertiary institution, there are no incentives in place to motivate them, other than the CPTD (Continuous Professional Teacher Development) programme that has no monetary value, and does not lead to promotions. ICT integration is also not monitored, as some teachers still submit mark-lists that are in the digital format while others are not reprimanded [for] submitting handwritten ones.*

From these statements, it is evident that this parent participant appreciated the value technology brings in advancing the education of his/her child. Many, however, felt that as parents and teachers they failed their children by being unable to assist them in accessing online learning during the times when those children needed it most. This happened during the restrictions imposed in 2020, when learners were prohibited from attending school on a full-time basis. Some schools used a rotational model of attendance during the lockdown, with learners attending for a few days, and then staying home to allow other groups of learners to attend class, in keeping with the Covid-19 protocols on social distancing. Even pre-Covid, Johnson *et al*. (2016) found that schools offering geography were faced with numerous challenges, such as a failure to access different devices, and that ICT-related education was largely absent from school timetables. Most of these issues remain problematic. Attempts at integration admittedly exclude some learners, especially where the policy of 'one laptop, one teacher' or 'one tablet, one learner' is not yet implemented. If put into effect, these policies will ensure that both teachers and learners have technology at their disposal, which will enrich the teaching of geography for all parties concerned.

As Bengel and Peter (2021) posit, ICTs allow users to put a global positioning system (GPS) (navigator) to use when conducting spatial analyses, while remote sensing can be used to capture data by means of satellites from distant places without any physical contact. The use of geographical information systems (GISs) in geography map skills is expected to take over the use of paper maps, as is the case in the applied sciences (Bengel & Peter, 2021) – a development which emphasises the need for this discipline to move with the times.

5. Conclusion and recommendations

The study focused on participants' understandings and experiences of ICT integration in the teaching and learning of geography. The results indicated that such integration serves as a tool to close the gap between the school and the parents by promoting interaction between geography learners, teachers and the parents whose children take this subject. The results further reveal that most participants perceived ICT integration in the teaching of geography to be a vital tool for ensuring that digital learning takes place, with learners and teachers becoming co-learners in the process.

Some participants viewed the uptake of technology in geography classrooms as an exclusionary measure, widening the urban–rural/rich–poor divide in terms of access to and the use of digital devices. Based on the participants' understandings, the researcher defined ICT integration as imperative for the teaching and learning of geography as a subject, requiring buy-in from learners, teachers and parents.

As noted, for ICT integration in the teaching of geography to be successfully implemented, more education on the importance of technologies in the curriculum is required – not only for technophiles, but also those who are averse to, or reluctant to implement modern technology. At present, the researchers observe a myriad of emerging challenges are confronting the education system, ICT policy implementation not being monitored, and relevant geography-related ICT infrastructure being lacking (which serves to widen the digital divide). It is recommended that, as a start, geography teachers who are poorly capacitated in terms of the required technology-integration skills transform their smartphones' operating systems into handy educational tools.

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