



Using online formative assessment tools in grade 6 social sciences during the COVID-19 pandemic

**Authors:**

Marnelda de Beer¹ 
Geoffrey V. Lautenbach¹ 

Affiliations:

¹Department of Science and Technology Education, Faculty of Education, University of Johannesburg, Johannesburg, South Africa

Corresponding author:

Geoffrey Lautenbach,
geoffl@uj.ac.za

Dates:

Received: 04 Oct. 2023
Accepted: 09 Apr. 2024
Published: 02 July 2024

How to cite this article:

De Beer, M. & Lautenbach, G.V., 2024, 'Using online formative assessment tools in grade 6 social sciences during the COVID-19 pandemic', *South African Journal of Childhood Education* 14(1), a1438. <https://doi.org/10.4102/sajce.v14i1.1438>

Copyright:

© 2024. The Authors.
Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

Background: Formative assessment is an essential element for improving teaching and learning in the classroom. During the COVID-19 pandemic and national lockdown, educators were confronted with the need to adapt to online assessment. South African educators also experienced challenges that made online formative assessment difficult.

Aim: This study explores the experiences of intermediate-phase educators using online tools to enact formative assessment in the teaching and learning of social sciences. This research included a narrow spectrum of socioeconomically diverse schools.

Setting: Data were obtained through interviews with a sample of six diverse intermediate-phase educators teaching social sciences from one district in the Gauteng North province.

Methods: This research adopted a generic qualitative approach. Themes were derived from the data and five subthemes were identified to report the findings.

Results: The results of this study identified factors that prevented the implementation of online formative assessment in the intermediate phase. The data also identified online tools that educators used for online assessment in their classrooms and some barriers. These barriers hindered the participants' ability to provide an interactive and stimulating learning experience for their students.

Conclusion: Despite challenges, which included a lack of training and support, as well as a lack of trust in their abilities, the participants demonstrated a willingness to incorporate technology in their teaching and assessment. The study highlights the need for ongoing professional development and improved infrastructure and accessibility to support the use of information and communications technology (ICT) in education.

Contribution: Based on educators' perceived willingness to make use of ICTs for formative assessments, and their ability to even identify some useful tools themselves, findings contribute to the field of policy implementation related to teaching with technology at this level.

Keywords: online; formative assessment; teachers; intermediate phase; social sciences; ICT; technology.

Introduction

Assessment is indispensable to the education process. Within this process, educators worldwide use different forms of assessment to monitor student learning, improve academic programmes, and enhance teaching and learning (Morris et al. 2021). The use of assessment to provide feedback to learners and educators is called formative assessment. This information gained through informal (formative) assessments provides opportunities for educators to assess their methodology effectiveness. Most teachers still follow traditional methods of questioning and engagement, where they ask questions to the whole class and only a few students raise their hands to respond (Kanjee 2020).

As a result of the rapid rate of technological evolution and development, educators need to change their assessment methodologies to adapt to a digitally native generation (Remmi & Hashim 2021). Modern learners rely more on information and communication technologies (ICT) than previous generations. This exposure to technology has the potential to develop the critical thinking mindset of learners depending on the use of ICT in teaching and learning Hashim (2021). Educators can no longer ignore this application of technology in assessment and teaching because technology is no longer an accessory to life, but rather a way of life for learners (Remmi & Hashim 2021). The incorporation of ICT in initial teacher education (ITE) is crucial for preparing 21st-century

Read online:

Scan this QR code with your smart phone or mobile device to read online.

teachers. Building upon this premise, the White Paper on e-Education (Department of Education 2004) emphasises the necessity of integrating ICT as a versatile toolkit for both teaching and learning in ITE programmes and ongoing professional development for teachers (Mlotshwa et al. 2022). Modern-day educators face severe challenges in adapting to the use of more effective tools to measure learners' progress. This generic qualitative study explores primary school social sciences educators' experiences of the use of online formative assessment.

Assessment is a fundamental part of learning and teaching and can be described as a systematic and continuous collection of information about educational programmes and services with the aim to improve teaching and learning practices. During the lockdown, primary school educators were largely obliged to conduct online lessons and online assessments. Padayachee indicates that there exists an urgent imperative for academic institutions and governmental bodies to enhance the ICT facets within pedagogical frameworks to proficiently equip educators through training endeavours (Padayachee 2017). Numerous ICT interventions encounter setbacks when beneficiaries encounter difficulties in maintaining the tools implemented and utilised throughout the initiative. Among the factors contributing to such setbacks, it has been contended, are inadequacies in alignment between the ICTs and the requirements of the users (Avgerou 2008). The author's observation, as a teacher with over 20 years of experience in a rural primary school, reveals that there is low utilisation of ICT in public primary schools. In the researcher's daily conversations with educators as well as providing professional development to these educators, it is evident that the integration of online assessments is not easily adopted. Online teaching and assessment are not common in many primary schools, and educators primarily use ICT in their classrooms for administration purposes or to observe the learners' daily progress (Lieberman, Levin & Luna-Bazaldua 2020). Many research studies have been done in higher and further education, but information about the experiences of primary school educators using online assessments has not yet been thoroughly documented. Furthermore, primary school learners need guidance when attending online lessons, primarily when online assessments are used (Lieberman et al. 2020).

Review of the literature

The literature highlighting changes in the South African educational sector includes the introduction of the *National Qualifications Framework (NQF) Act 67 of 2008* and the *National Qualifications Framework Amendment Act 12 of 2019*, as presented by the South African Qualifications Authority (SAQA) at saqa.org.za. South African Qualifications Authority is the oversight body of the NQF and the custodian of its values and quality character and a new curriculum framework for schools based on outcomes-based education (OBE) concepts. The implementation of these frameworks has, unfortunately, been hindered by a lack of training and

support in South Africa, but this is not a unique problem. According to Young (2009), all countries implementing national qualifications frameworks have faced problems. Reasons for this phenomenon are often related to the inability of governments to see the inherent implications of the changes that they propose. The lack of government support is often given as an explanation of implementation difficulties by the new qualifications authorities themselves (Young 2009), and this is also true for SAQA. The addition of ICTs into the mix for teaching and assessment adds further complexity to the situation.

There are many challenges in using ICT for online teaching and assessment in the social sciences. The Curriculum and Assessment Policy Statement (CAPS) describes social sciences as a subject that combines various disciplines such as history, geography, political science, economics, sociology, anthropology, law, art and literature to give a new insight into social life as a whole. It focuses on the study of human relationships and humans' development through the ages. The aim of this subject is to prepare learners for wholesome social living, and it provides them with soft skills to deal with real-life situations. It also encourages commitment to action and enables the learners to be informed citizens in their community. The CAPS also proposes daily formative assessment (Department of Basic Education 2011) which is intended to help educators and learners to make the necessary adjustments that could potentially improve progress within the intended learning outcomes. Moreover, online formative assessment has the potential to allow teachers to share feedback continuously in real time.

Historically, since 1994, South Africa has experienced notable transformations with regard to ICTs in education. In parallel, the information and communication sector has also issued numerous White Papers pertaining to telecommunications, broadcasting and postal services. However, these policy directives were formulated independently and lacked integration. The 2004 White Paper on e-Education aimed to have every learner in the country capable of using ICT by 2013, but implementation was once again hindered by a lack of training and support (Department of Education 2004). The National Integrated ICT Policy White Paper, gazetted on 03 October 2016 also set out specific steps and targets to achieve the South African National Development Plan (NDP) which aims to eliminate poverty and reduce inequality in South Africa by 2030. One of the main challenges standing in the way of this aim is the general lack of access to technology and Internet connectivity that persists. Furthermore, many middle schools are in rural or low-income areas where access to technology is restricted (Waller & Maxwell 2017). Additionally, many students still do not have access to the necessary equipment to participate in online learning. This has led to a digital divide between students who have access to technology and those who do not, which can also impact on their learning experiences and outcomes (Warschauer & Matuchniak 2010).

The challenge of the lack of teacher training and support for online teaching and assessment is also a pertinent issue (Coman et al. 2020). Numerous educators found themselves ill-equipped for this transition and encountered significant obstacles in delivering high-quality instruction through the online format (Francom, Lee & Pinkney 2021). Some also did not have the necessary skills or knowledge to effectively design and deliver online teaching or to use technology for formative assessment (Manca & Meluzzi 2020). As mentioned previously, the diverse outcomes of the Social Sciences field can make it difficult for teachers to provide effective online instruction and assessment, which can also negatively impact student learning (Saleh Mahdi & Sa'ad Al-Dera 2013). The use of technology in education is important, but the role of a good teacher is also essential for a functional educational environment (Saleh Mahdi & Sa'ad Al-Dera 2013).

Other studies have shown a significant difference in the use of technology based on the age and experience of educators (Zyad 2016). For example, Kuskaya Mumcu and Kocak Usluel (2010) examined educators within Turkish vocational and technical institutions, revealing a positive correlation between younger age cohorts of teachers and their increased utilisation of ICT tools. They found that younger educators tend to use more technology and have more resources, whereas some educators struggle with the abrupt shift to online teaching because of a lack of adequate digital skills, resulting in variations in the quality of online education. Another study found that to support educators in online teaching and learning, good institutional support, and a broad scope of factors, including context, culture and innovation, need to be considered (Scherer et al. 2021). To make things more interesting, accounts of online teaching and assessment are not common in primary schools where educators primarily use ICT in their classrooms for administration purposes or to observe the learners' daily progress (Liberman et al. 2020). Many research studies have been done in higher and further education, but the experiences of primary school educators with online assessments have not yet been thoroughly documented.

In this study, the question we aim to address is *'What are intermediate phase educators' experiences of using tools for formative assessment while teaching social sciences online?'*

The following objectives have been set to help answer the question above:

- To identify online tools that the participating educators use for teaching and assessment purposes.
- To analyse the educators' experiences with different online teaching and formative assessment tools.

Research methods and design

The chosen research design for this study is a qualitative case study approach, selected for its ability to delve deeply into the research problem and generate novel insights. By

employing this method, the study aims to comprehensively understand the intricacies of the phenomenon under investigation. This approach involves gathering and analysing non-numerical data through various means such as interviews, focus groups, observations and surveys with open-ended questions. Qualitative research, unlike quantitative methods, prioritises understanding the 'why' and 'how' behind human behaviour within their natural contexts. This methodology enables the researchers to explore the subject matter in detail, employing individual interviews with carefully chosen participants. Moreover, the flexibility inherent in qualitative designs allows for the integration of various strengths without being bound by specific philosophical assumptions. Thus, the qualitative case study approach is deemed appropriate for this study as it offers the depth and flexibility necessary to address the research questions effectively while ensuring the credibility of the gathered qualitative data.

Setting

This study involved six diverse educators teaching social sciences in primary schools located in South Africa's Gauteng province. The schools, situated in various towns 20 km–60 km apart, were chosen from one district in the region. Each school was located in a different city or town, with some smaller towns having only one or two schools.

Study population and sampling strategy

In qualitative research, population and sampling can focus on a small number of participants who can provide insight into their experiences and/or understanding related to the research questions (Asiamah, Mensah & Oteng-Abayie 2017). This study utilises an accessible population to derive a sample, focusing on educators teaching social sciences in the intermediate phase within Gauteng Tshwane North District 1.

The findings in this study have been derived from responses by participants from different quintile schools. In South Africa, schools are grouped into different 'quintile' categories based on socio-economic status, as determined by a few factors such as poverty levels, parent education levels and more. The quintile system is used to determine the level of funding and support that schools receive from the government. It is worth noting that the quintile system is not a perfect measure of a school's socioeconomic status, and many other factors can impact a school's performance and the education of its students. Participants included Grade 6 educators who were identified by school principals who were willing to participate and are experienced teachers in the subject social sciences. Coronavirus disease 2019 (COVID-19) constraints necessitated online research via recorded WhatsApp or telephone interviews. Principals of the selected schools identified the Grade 6 educators at the researcher's request. Participants were allowed to refuse participation without penalty.

The selected participants were educators teaching one or two subjects in the intermediate phase. The participants were also responsible for teaching social sciences to Grade 6 learners. The social science subject comprises two components, namely geography and history and most educators teach both components. Only one of the participants teaches one component. Two participants are educators at private schools, one of which is situated in a rural area. The population consisted of two male and four female educators. Because of privacy and confidentiality, the actual names of participants were replaced by pseudonyms. Schools' names were replaced by numbering (Table 1).

Data collection

Primary data were collected through individual online interviews. Because of COVID-19 restrictions, research was conducted online, using recorded WhatsApp or telephone calls. In qualitative research, interviews are the most critical aspect of data collection. Most of the data in this study was collected through interviews. The interviews attempted to access the thoughts and feelings of the participants (Sutton & Austin 2015). A semi-structured interview format was used to enable the researcher to initiate a discussion around the topic and to create a safe environment for the educator. The first question was broken down into 10 sub-questions used as a checklist as participants responded, and only two broad questions were utilised to elicit those responses. Instead of only using closed questions, the decision was made to initiate a conversation in this way (Percy, Kostere & Kostere 2015). Through this strategy, we aimed to expose educators' experiences of different online teaching and formative assessment tools.

Data analysis

Coding is the labelling and organising of qualitative data to identify themes and sub-themes. This process of coding enables the orderly categorising of sections in qualitative data. It identifies topics, issues, similarities and differences identified by the researcher during the interviews (Sutton & Austin 2015). Strauss and Corbin's three-step process was used, starting with open coding, followed by axial coding (Scott and Medaugh 2017) and ending with theoretical or selective coding (Strauss & Corbin 1998).

In data analysis, Level 1 open coding is the initial step where concepts and categories are identified and defined. This process helps researchers break down the data and explore

theoretical possibilities. Table 2 illustrates the connection between open coding categories and themes.

Axial coding is a method of connecting and relating categories from open coding, providing a framework for organising and synthesising data. Table 2 illustrates the connection between open coding categories and themes. Axial coding, a level 2 method, was then used to connect and relate categories from open coding, providing a framework for organising and synthesising data. Level 3, selective coding, was the last step in selecting the core categories. New theories or concepts from the data were extracted, and sub-themes were identified. Table 2 shows the categories sorted into the different sub-themes that were identified. This selective coding prevents preconceived theories from determining the outcome of the research.

Ethical considerations

Physical harm is a serious concern in research, including discomfort, pain, injury or damage from the side effects of drugs. However, in this research study, the participants were protected from physical harm by being interviewed through a WhatsApp call or Zoom meeting. Psychological harm, which can manifest as undesired changes in thought processes and emotions, was also considered. All care and consideration were ensured, and participants were not exposed to a manipulative environment during the interviews. The questions were straightforward, and the researcher refrained from making biased comments or opinions.

Invasion of privacy and social and economic harms were also addressed. All interviews were kept confidential, and participants were anonymous throughout the research process. Virtual meeting platforms, such as Zoom or Microsoft Teams, were used for the interviews, and the content of the meetings was made available to the participants before the information was used.

Associated risks to a research study include the following:

Ethical approval (Sem 2 – 2021 – 068) for this study was obtained from the University of Johannesburg on 19 August 2021. Approval to conduct the interviews was obtained from the Department of Education and an official document 8/4/4/1/2 was issued on 18 March 2022. All principals of the participating schools were informed about the interviews and a consent letter was sent to them.

Results

During data analysis, 90 codes were assigned using ATLAS.ti to document the process. Continuous analysis was used at each level of coding to refine the data until themes and sub-themes emerged. Figure 1 illustrates the hierarchical relationship between the five identified themes and their eleven sub-themes. The subsequent paragraph section headers indicate the themes and emerging sub-themes.

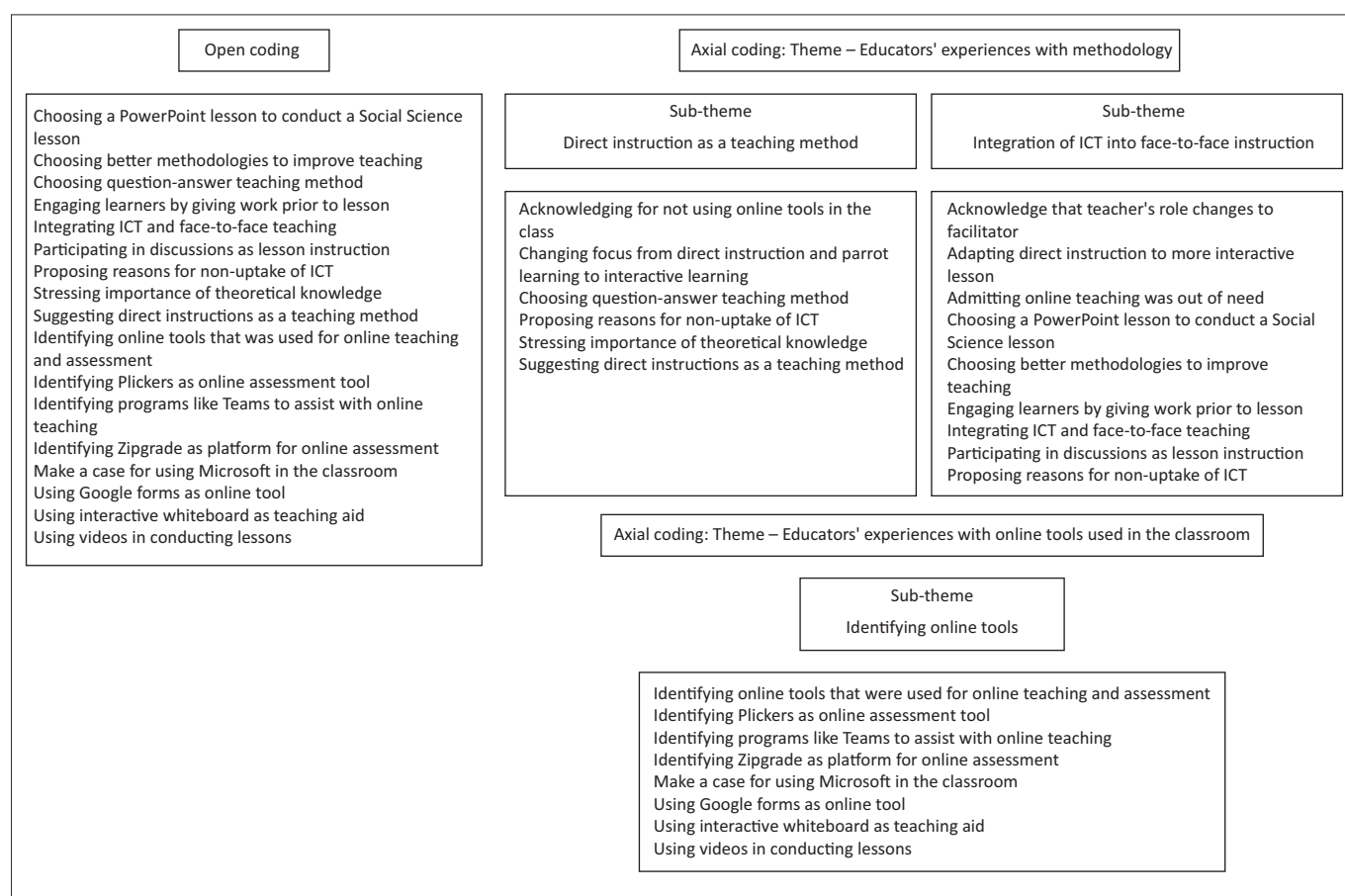
TABLE 1: Participants.

Educator (pseudonym)	Gender	Age	School (numbered)
Mr. de Klerk	Male	48	School 1 quintile 5
Mrs. le Grange	Female	54	School 2 quintile 4
Mrs. Nkwe	Female	46	School 3 quintile 2
Mrs. Steyn	Female	47	School 4 private school
Mrs. Kuhn	Female	38	School 5 quintile 4
Mr. Smith	Male	29	School 5 private school

TABLE 2: Themes identified through the three-step process of Strauss and Corbin (1998).

Open coding	Axial coding: Theme - Educators' competency with the use of ICT		
<p>Acknowledging improvement in ICT use Admitting not an expert on blended learning Admitting not knowing the term flipped classroom, blended learning and hybrid learning Admitting to not attend any professional development Claiming to have experiences with flipped classroom Claiming to use technology in conducting lessons. Confirming knowledge of own technological skills Confirming training on formative online assessment Getting support from franchise in professional development Learning new skills before COVID-19 Motivated intrinsic to develop skills Painting picture of professional development training Participating in professional development by outsource companies Participating in professional development provided by the Department of Education Receiving no development form Department of Education Receiving support from peers Showing good knowledge of Hybrid learning Showing knowledge about the use of a flipped classroom in conducting a lesson Showing lack of knowledge in Hybrid learning Showing no knowledge of any online tools Showing some knowledge of the term blended learning Acknowledge that self-directed learning was not established Acknowledge using online teaching during lockdown Acknowledge using online teaching over short period Admitting not using online teaching in Social Science Admitting online teaching is fun for the learners Admitting online teaching teach life skills too Admitting that privileged learners have more opportunities Admitting to currently not using online teaching Choosing a suitable platform was a challenge Choosing platforms to use in collaboration with staff Claiming resistance from management early on Claiming that learners have inadequate resources Discouraged by lack of interaction between teacher and learner in online lesson Exposing barriers for learners to participate Exposing discomfort with not seeing the learners' faces during online learning Exposing financial constraints to fund online teaching and assessment Exposing more demands from students Highlighting correlation with real-life experiences in lesson Identifying experiences with online teaching Identifying lack of manners of learners during online teaching Making a case for the use of ICT Making claim that online teaching inhibits effective teaching Suggesting ways to help learners without internet Admitting to using online assessment Choosing online formative assessment as revision before summative assessment Claiming that learners have access to ICT Claiming that online assessment can be a helpful tool Decreasing workload of teacher using online tools Engaging learners by using ICT in formative assessment Exposing barriers for formative online assessment Exposing security measures that took place to enable online assessment Feeling discouraged that parents help with online assessments Highlighting the use of online assessment as benchmark Identifying the lack of electricity in using ICT Acknowledge that teacher's role changes to facilitator Acknowledging for not using online tools in the class Adapting direct instruction to more interactive lesson Admitting online teaching was out of need Changing focus from direct instruction and parrot learning to interactive learning</p>	<p>Sub-theme Educators' first experiences with technology</p>	<p>Sub-theme Educators' experiences with professional development</p>	
	<p>Admitting not knowing the term flipped classroom, blended learning, and hybrid learning Acknowledge using online teaching during lockdown Admitting not using online teaching in Social Science Admitting online teaching is fun for the learners Admitting online teaching teach life skills too Admitting that privileged learners have more opportunities Admitting to currently not using online teaching Identifying experiences with online teaching Making a case for the use of ICT Making claim that online teaching inhibits effective teaching</p>	<p>Confirming training on formative online assessment Getting support from franchise in professional development Learning new skills before COVID-19 Motivated intrinsic to develop skills Painting picture of professional development training Participating in professional development by outsource companies Participating in professional development provided by Department of Education Receiving no development form Department of Education Receiving support from peers Admitting to not attend any professional development</p>	
	Axial coding: Theme - Online		
	<p>Sub-theme Educators' experiences with online teaching</p>	<p>Sub-theme Educators' experiences with barriers to online teaching</p>	<p>Sub-theme Educators' experiences with challenges facing online teaching.</p>
	<p>Acknowledge that self-directed learning was not established Acknowledge using online teaching during lockdown Acknowledge using online teaching over short period Admitting not using online teaching in Social Science Admitting online teaching is fun for the learners Admitting online teaching teach life skills too Admitting that privileged learners have more opportunities Admitting to currently not using online teaching Identifying experiences with online teaching Making a case for the use of ICT Making claim that online teaching inhibits effective teaching</p>	<p>Admitting that privileged learners have more opportunities Claiming resistance from management early on Claiming that learners have inadequate resources Exposing barriers for learners to participate Exposing financial constraints to fund online teaching and assessment</p>	<p>Admitting online teaching teach life skills too Choosing a suitable platform was a challenge Choosing platforms to use in collaboration with staff Discouraged by lack of interaction between teacher and learner in online lesson Exposing discomfort with not seeing the learners' faces during online learning Exposing more demands from students Highlighting correlation with real-life experiences in lesson Identifying lack of manners of learners during online teaching Suggesting ways to help learners without internet</p>
	Axial coding: Theme - Online formative assessment		
	<p>Sub-theme Educators' experiences with online formative assessment</p>	<p>Sub-theme Educators' experiences with barriers to online formative assessment</p>	<p>Sub-theme Educators' experiences with challenges facing online formative assessment</p>
	<p>Admitting to using online assessment Choosing online formative assessment as revision before summative assessment Claiming that learners have access to ICT Claiming that online assessment can be a helpful tool Decreasing workload of teacher using online tools Engaging learners by using ICT in formative assessment Highlighting the use of online assessment as benchmark Identifying the lack of electricity in using ICT Acknowledge that teacher's role changes to facilitator Acknowledging for not using online tools in the class Adapting direct instruction to more interactive lesson Admitting online teaching was out of need Changing focus from direct instruction and parrot learning to interactive learning</p>	<p>Exposing barriers for formative online assessment Identifying the lack of electricity in using ICT</p>	<p>Exposing security measures that took place to enable online assessment Feeling discouraged that parents help with online assessments</p>

Table 2 continues on the next page →

TABLE 2: Themes identified through the three-step process of Strauss and Corbin (1998).

Source: Codes and emergent themes from data analysis

Educators' information and communication technology competency

The new development strategy for South Africa, the National Development Plan or NDP (Vision 2030) aims to improve the quality of education, develop the skills of learners and educators, and promote innovation ('National Development Plan 2030: Our future – make it work' 2012). Several other policies were also introduced to develop these skills. In understanding educators' experiences with online assessment, it is essential to determine their initial technological skills and the level of training. The following two sub-themes were identified: Educators' first experiences with technology and Educators' experiences with professional development. All participants confirmed that they were computer-literate and made use of online programmes. This provided a solid foundation for using ICT in the classroom.

Educators' technological skills and professional development are two factors that influence a teacher's competency (Manca & Meluzzi 2020). Educators' competencies influence their experiences in using online tools and that can have a positive or negative effect in the classroom. When participants were asked if they knew the meaning of 'Blended learning', 'Flipped classroom' and 'Hybrid learning' to establish their pedagogical and technical vocabulary, only half of them identified the concepts:

... Mrs. Le Grange: 'Ok, now I do not understand those terms. Flipped classroom is where the educators rotate. No, I do not know it. Maybe I know it but do not know the term.' (Age 54, quintile 4 school)

Blended models should not be mistaken for the hybrid model of education, which combines components of both face-to-face and distance learning. Over the past few years, numerous conventional face-to-face institutions have integrated a distance learning component into their educational approaches (Roberts & Roberts 2019). The participants in the study, who were all intermediate phase educators teaching social sciences in South African primary schools, revealed their use of the flipped classroom approach in their teaching methods. They also reported receiving ongoing professional development from their school's management, with one participant from a rural school receiving a one-time training from the Department of Education for operating laptops and tablets for online assessment. However, some participants expressed a lack of experience with professional development from the Department of Education. The degree of preparedness among educators to incorporate educational technology into instructional practices is contingent upon their perspectives and competencies in this domain (Anoba & Cahapay 2020). Quality professional development allows teachers sufficient time for learning, practising, implementing and reflecting on new strategies, leading to meaningful changes in their teaching. Numerous investigations have

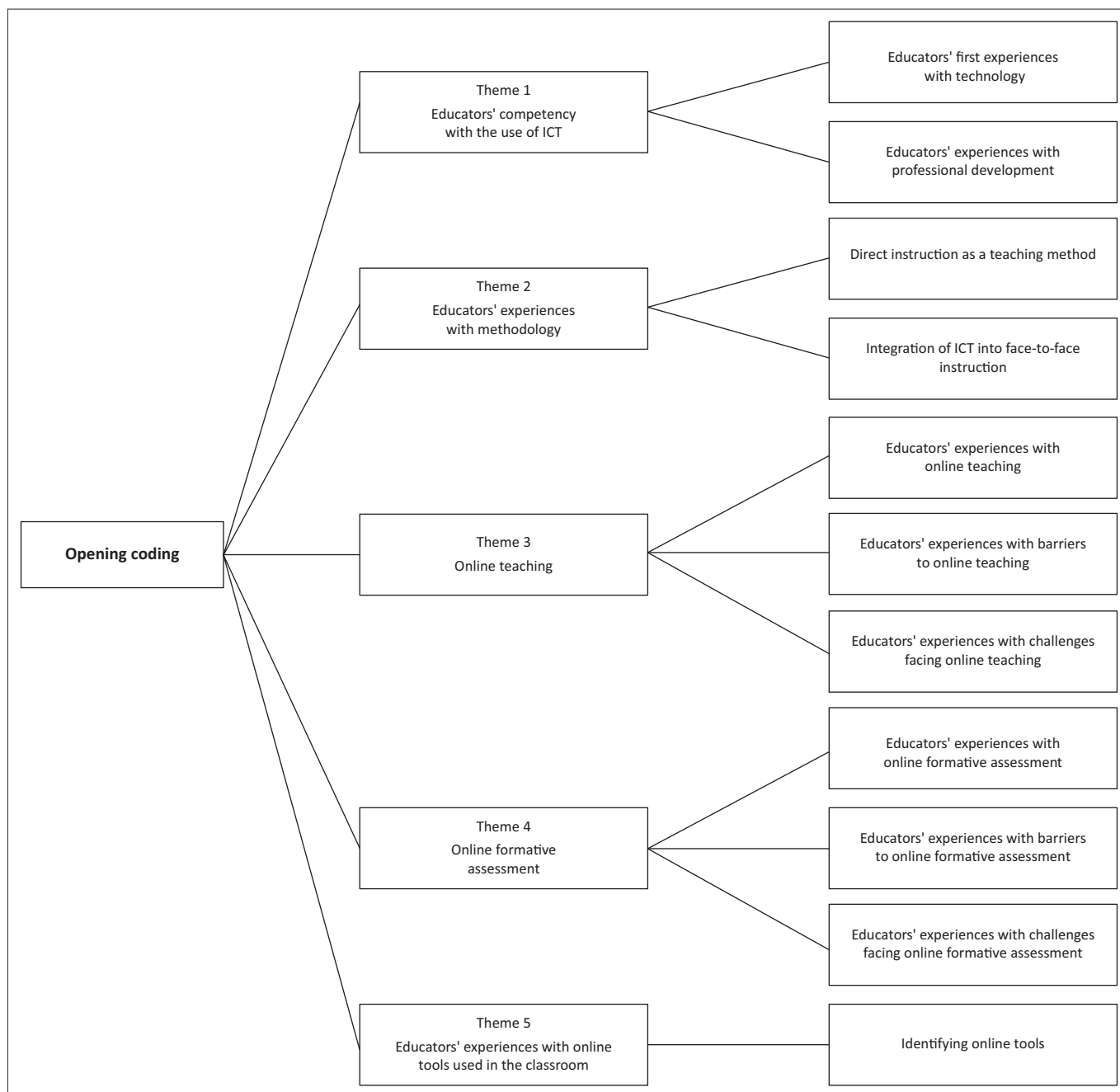


FIGURE 1: The hierarchical relationship between the five identified themes and their eleven sub-themes.

proposed that assessing the preparedness of educators is imperative for the efficacy of various modalities of technology integration (Brooks & Grajek 2020; DiBella, Williams & Glover 2015; Markle 2016; Zamir & Thomas 2019). Strong initiatives involve extended learning periods spanning weeks, months or even years, as opposed to brief workshops (Darling-Hammond, Hylar & Gardner 2017).

Educators' experiences with methodology

All the participants described a direct instruction method to conduct a social science lesson. It is evident through the interviews that most of the participants use a 'Teacher-centred instruction' approach. This approach gives the teacher primary responsibility within the learning

environment. Two participants used an 'Inquiry-based learning method' to conduct their lessons. This method got the learners more involved in the lesson by asking critical thinking questions:

... Mr. Smith: 'Thirdly, I identify critical thinking questions to get the learners more involved. Fourthly, I determine which e-learning platforms I will use to enhance the content taught. Fifthly, I start the lesson with a small introduction; learners answer the critical thinking questions, content being discussed etc.' (Age 29, private school)

Participants' experiences with implementing ICT in their lessons were limited. Only half of the participants used ICT to aid their lessons in their classrooms. Two participants used videos and a PowerPoint lesson with lots of visuals to

enhance their lessons. One participant made use of videos to explain certain aspects of the vocabulary used in the subject and for the learners to understand the meaning of the words in context:

... Mr. de Klerk: 'I use videos to explain things better, and the interactive whiteboard is quite useful in conducting that.' (Age 48, quintile 5 school)

The participants' experiences with different methodologies led to their experiences with online teaching.

Online teaching

All the participants, except one, expressed that they used online teaching during the COVID-19 pandemic, especially when the level 5 lockdown occurred. These participants also admitted that they were not exposed to or used to online teaching before the COVID-19 lockdown. One of the participating schools had all the technological requirements ready when the lockdown occurred and used online teaching to continue educational practices and conduct lessons with their learners. One of these participants acknowledged that he enjoyed the experience of online teaching, and he noticed that the learners were more involved in the learning process:

... Mr. Smith: 'I experience the learners to be more involved when we move the focus from more traditional learning to e-learning.' (Age 29, private school)

Two other participants admitted that they used online teaching during the lockdown period out of necessity and did not choose this teaching method. Most of the participants experienced barriers to online teaching. These barriers prevented educators from using online platforms to convey their lessons to learners. Some barriers prevented the learners from participating even if the platform was suitable and the teacher was prepared. All participants teaching at a public school claimed that many of their learners did not have accessibility to the Internet because they did not have access to Wi-Fi:

... Mrs. Nkwe: 'The accessibility of the internet was a problem for many of my learners. Many of my learners do not have adequate access to data, so that was a problem.' (Age 46, quintile 2 school)

One participant admitted that the management of her school prevented them from using any online tools to enhance the lesson. Another major barrier was the lack of electricity because of load-shedding and other causes that prevented them from using online teaching.

Although some participants experienced barriers that prevented them from using online teaching, other participants faced different challenges. Three participants had difficulty deciding on the right platform or program for online teaching. One participant confirmed that the available platforms were not so user-friendly.

Participants at a private school use online tools daily for teaching, assessment and communication. They primarily use Microsoft programs and identified Kahoot, Google, YouTube, One Note, TEAMS, and Google FORMS as helpful platforms. Others only used online tools such as Zoom, PowerPoint and WhatsApp during the lockdown. One participant continues to use online tools for formative assessment and to enhance lessons. They have adopted a blended learning approach post-lockdown, using tablets for reflection. One participant could not imagine teaching without One Note.

Online assessment

A few participants used online formative assessments to determine prior knowledge about a specific topic. Some participants used online formative assessment to understand the level of the learners' progress or assess their level of teaching. A few participants found that online teaching also reduces the administrative burden because tests can be marked online. The assessment process facilitates specific programs' functionality that makes it possible to pull statistics and data (Hus & Matjašič 2017).

Only half of the participants have used online formative assessments to determine the quality of online teaching. The same three participants acknowledge that they used online assessments as a benchmark test to provide information that can be used to guide the teaching and learning process:

... Mrs. Steyn: 'Just to see where our learners were at that stage and if they actually worked through the lessons that we send.' (Age 47, private school)

These benchmark tests served as one of the types of assessments required by the National Assessment Policy in Social Sciences (Department of Basic Education 2011). One participant acknowledged that he used online formative assessments for revision purposes. He used the online assessment as a teaching method to get learners more involved and interested in class discussions:

... Mr. De Klerk: 'Informal assessments are done through various online assessment platforms. Revision is done through programs such as Kahoot to ensure the learners are more involved and interested in the class discussions.' (Age 48, quintile 5 school)

Another participant said that he used an online formative assessment tool as a method for revision before a summative assessment. He would do an online assessment in the classroom as a blended approach, which served as a diagnostic test to revise the work that had been done. Another participant had the same experience with online formative assessments and added that she would use this type of assessment as a gamification method to help learners learn specific definitions and concepts. She admitted that choosing online assessment practices forces educators to change teaching and assessment methods. She used online assessment programmes to deviate from direct instruction and parrot learning to interactive classroom discussions through online assessment questionnaires. The participants

admitted that online assessments helped with educators' extensive administrative duties when marking tests. All the platforms available have the capability to mark the assessments automatically.

Educators experienced different barriers and challenges to not using online formative assessments. They mentioned that they experienced technical difficulties. Some participants cited that the lack of electricity, access to the Internet and financial constraints prevented them from using online assessment tools. One of the biggest challenges was that the results of the online test were not reliable. A participant at School Six explained how they would use several cell phone cameras to ensure the trustworthiness of online test results:

... Mr. Smith: 'They had to switch on their camera and had phones all over the place where they were watching with the camera and phone camera on the phone when they wrote their formative assessments.' (Age 29, private school)

A participant at another school supported this argument and complained that some of the learners' parents helped them with the online assessments. These security challenges put the reliability and validity of an assessment tool in jeopardy. Assessment tools should be reliable because it is necessary to constantly measure learning accurately (*Validity and Reliability in assessments* | Huneety, no date).

Two participants found that identifying the right platforms to use as online assessment tools was challenging. The participants felt that choosing 'user-friendly platforms' was a challenge. Another challenge experienced by Participant Six is that the wording of questions in the online assessment platforms was difficult. Learners had to use self-directed learning to answer questions and did not have the opportunity for repetitive questioning. Learners would initially be taught how to answer questions on the online assessment platforms in writing before they could use these platforms:

... Mrs. Steyn: 'Wording your questions/instructions in such a way that the learners found it easy to complete without a teacher present to re-explain. Teach the children how to answer a question through the online platform instead of writing the answer on a paper/sheet was also a challenge.' (Age 47, private school)

All participants who used online formative assessment tools acknowledged that online assessment could be a helpful tool but struggled with implementing the tools.

Educators' experiences of the use of online tools in the classroom

Choosing the right platforms for online assessment and teaching can be challenging. The validity of these platforms is crucial to ensure that the assessment tools are measuring what they are designed to measure (Darr 2005). In this study, participating educators used a variety of online tools to suit their schools' budgets and purposes of assessment. For example, educators at a private school used One Note and

Microsoft Teams to communicate with their students and parents, while educators at public schools used WhatsApp. However, one participant expressed disappointment that they were not allowed to use WhatsApp in their school, as they were accused of having conversations with friends and colleagues during class.

... Mrs Nkwe: 'When they caught us using the gadget, they would say that we are not respecting the learners and not chatting in the classroom.' (Age 46, quintile 2 school)

Additionally, some educators used Zipgrade and Plickers for formative online assessments, while others used Google and Google FORMS. The participants at the private school incorporated online tools into their daily teaching and assessment, using programs such as Kahoot, Google, YouTube, One Note, TEAMS, and Google FORMS. Other participants, however, only used online tools such as Zoom, PowerPoint and WhatsApp during the lockdown period.

Overall, all participants acknowledged that they used online tools for assessment and learning purposes with the acceleration of ICT use during the lockdown. Some participants had environments that fully accommodated the use of ICT in the classroom, while others did not have the opportunity to explore the use of ICT as a method of instruction. Despite these challenges, the participants were eager to adopt new technology to enhance their teaching and assessment.

The participants teaching at the private school incorporate online tools every day at their school. They used several programs for teaching, assessment and communication with both learners and parents. They used Microsoft programs as the online platform. They also identified *Kahoot*, *Google*, *YouTube*, *One Note*, *TEAMS* and *Google FORMS* as online platforms that helped them with online assessment and teaching. Other participants acknowledge that they only used online tools such as *Zoom*, *PowerPoint* and *WhatsApp* for announcements, teaching and assessment during the lockdown period. One participant admitted that he is still using online tools for formative assessment purposes and to enhance his lessons.

The participants at the private school continued using online tools after the lockdown ended. They have adopted a blended learning approach, and learners use tablets to reflect on their learning. One participant acknowledged that she could not think what teaching was like before they started using the program *One Note*:

... Mr. Smith: 'Their workbook is digitally available in One Note we wanted to use that before Covid, and then Covid made us use it more, and now I cannot think my life without One Note.' (Age 29, private school)

All participants acknowledged that they used online tools for assessment and learning purposes with the acceleration of ICT use during the lockdown. Some participants'

environments accommodated the full use of ICT in the classroom, and others did not get the opportunity to explore the use of ICT as a method of instruction.

Key findings

This study explored the experiences of six educators teaching social sciences in the intermediate phase. The findings identified some level of ICT knowledge in all participants. The participants showed a need for ongoing professional development and the support of their managers to develop their ICT skills. Only half of the participants used online tools for formative assessment and pointed out the challenges and barriers that they experienced. These participants list the online tools and programs that they used to enhance the learning experience.

Discussion of key findings

Education can only move forward and transform positively if South African educators are adequately trained and equipped to meet the ever-evolving needs and challenges that face the world (Steyn 2008). In this study, four participants did not have adequate technological vocabulary or knowledge of basic online concepts. The Continuing Professional Teacher Development (CPTD) system is argued to have the potential to address this void in the development of educators. In this way, learning is experienced as a way of being in the social world rather than coming to know about it (Wenger-Trayner & Trayner-Trayner 2015). Most participant educators admitted that they had not yet attended any training provided by the Department of Education and all participants acknowledged that the Department of Education has not yet rolled out any training in their district.

Two participants received training from an external company as they did not have any opportunities to attend any training from the Department of Education. Such opportunistic communities of practice are necessary for collective learning as teachers exhibit accelerated improvement rates when operating within school environments characterised by collaborative practices (Ronfeldt et al. 2015). The same two participants from a private institution still make time to attend ongoing effective professional development at their school. This practice supports Guskey's statement that 'Effective professional development requires considerable time, and that time must be well organized, carefully structured, purposefully directed, and focused on content or pedagogy or both' (Guskey & Yoon 2009).

This study's results emphasised that ongoing professional development is needed to ensure that educators have the power to bring about the necessary change needed in their classrooms which supports findings by Darling-Hammond et al. (2017). It is clear from the interviews that most of the participants were not trained to use technology in the classroom (compare Brooks & Grajek 2020; DiBella et al. 2015;

Markle 2016; Zamir & Thomas 2019). Their technical skills and vocabulary are sparse because of not receiving professional development, which is a factor that influences ICT use in the classroom for teaching and assessment.

Social science's content is of such a nature that it inherently enables educators to use different methods to conduct lessons. Each discipline requires various methods to ensure that content is covered and that a set of skills is acquired. For this reason, different teaching methods and the innovative use of available technologies should ensure learner success in the classroom. In this study, participants unfortunately acknowledged that they mostly used direct instruction as a teaching method. Furthermore, some participants admitted to using textbooks as their only resource.

One of the noticeable differences between the participants is that those who had the necessary technical skills and vocabulary were the same participants who used different teaching methods which support findings by Scherer et al. (2021). They were also the participants who made use of ICT in their classrooms and understood the importance of using technology to get learners more involved in the learning process. These educators acted as facilitators and learners were able to learn the content in depth and retain it better. By using these methods, learners take ownership of their learning process through various methods such as viewing videos and reading educational material. The participants acknowledged that they discussed the content in small groups during contact lessons and gave learners individual attention as needed. This method of ICT integration within the pedagogic space supports the literature which states that blended learning is not only about doing homework in class but can also be viewed as a pedagogical method that aims to emphasise the importance of learning rather than mere content delivery (Wang et al. 2014).

In this study, participants discussed their experiences using online tools for teaching and assessing social sciences during the COVID-19 pandemic and national lockdown. Before the pandemic, none of the participants had used online tools for teaching, but half of them began using them during the lockdown. Many participants reported not having received any training in using online tools before the pandemic which led to greater challenges for them compared to those who had prior experience. Participants also highlighted several barriers to online teaching, such as a lack of support from school management and a lack of trust in the manager-employee relationship, which hindered their ability to use online tools effectively (Krot & Lewicka 2012). This highlights the importance of providing teachers with training and opportunities for skills development to effectively implement online tools in the classroom.

The most significant challenge, that prevented or hindered all participants from online teaching, was access to the Internet and data. Some participants noted that not all

learners had access to these services within their immediate household environments, causing no online teaching to take place at all. Other participants had challenges with the availability of electricity, caused either by load-shedding or a complete lack of electrical infrastructure within the area. One participant commented that only privileged households and learners could participate in online teaching and assessment. This barrier supports the literature stating that 88% of school-age children living in rural South African communities are not connected to the Internet (Thompson 2020).

Participants encountered difficulties selecting an appropriate online teaching platform. Balancing the enhancement of teaching methodologies with affordability posed a challenge. The platform's suitability for learners aged 10 to 12 was crucial. Maintaining attention during lessons proved taxing. A lack of face-to-face interaction impeded engagement, compounded by familial distractions and background noise. Yet, with established guidelines and learner adaptation, the online environment became favourable. One participant noted its contribution to a dynamic learning process.

Participants demonstrated reluctance towards online formative assessment tools, with only three utilising them for 'Assessment for learning' purposes. Despite the potential for quicker results and feedback provision, adoption remained limited. Educators leveraged online assessment data to gauge learning progression and tailor lesson pacing. Additionally, three participants employed online tools for benchmark assessment, using accumulated data to evaluate lesson comprehension and inform subsequent teaching strategies. Notably, this adoption surged during the COVID-19 pandemic and lockdown, marking a shift from prior reliance on traditional assessment methods.

Another participant used the online assessment method for revision during a social science lesson. This assessment method helped him revise content with his learners before they had to write a summative assessment. Participants commented that choosing the correct vocabulary in online assessment tests was challenging because learners in the intermediate phase often still need help answering questions. Some of the participating educators had trouble assessing learners on paragraph writing because of a lack of suitable platforms. Another participant supported this statement, and he mentioned that he did not use online assessment when assessing history content. One other participant used gamification as a method of online formative assessment. This form of assessment helped relieve some of the stress and tension that younger learners experienced when writing tests.

All participants who used online tools for formative assessment agree that it was a challenge because of the various security measures that need to be implemented. Participants felt that the test results were unreliable because family members helped the learners during their tests. One participant commented on the extra measures that had to be put in place to prevent siblings and parents from helping the learner.

Another challenge that participants experienced was their lack of knowledge, which prevented them from using these online programs or applications. This statement supports the literature that training educators is a necessity that should be conducted continuously and not only once off. Educators are not exposed to the possibilities of online tools that can assist them in conducting a formative assessment (Mashau & Nyawo 2021). Choosing an appropriate program or platform to use can be challenging. Participants complained that some programs' full functionality was costly and had financial implications on their schools' budgets. All participants acknowledged that online assessment helped with educators' administrative load.

Barriers to online teaching, such as the lack of access to certain tools and the lack of support from school management, were also identified. The participants identified specific programs and applications that they used for online teaching and assessment, such as *WhatsApp*, *Zoom*, *Microsoft*, *Kahoot*, *Google Forms* and *Plickers* (Figure 2). Some participants noted that they had come to rely on certain tools and could not imagine teaching without them. However, one participant was prevented from using certain tools by their school management.

Strengths and limitations of this study

Even though the research methodology and design may be thoroughly carried out, most research studies have limitations. The main limitation of this study was interviewing six educators from only one district, in one province in South Africa. A qualitative approach was used to gather information through the means of interviews that deliberately steer the conversation to examine the experiences of intermediate phase educators using online tools for formative assessment and teaching. This research also included a narrow spectrum of socioeconomically diverse schools which may impact the findings.

Another limitation of this study is the lack of literature on educators' experiences of using online tools for formative assessment in the intermediate phase. Most of the research done previously focuses on senior learners and students.

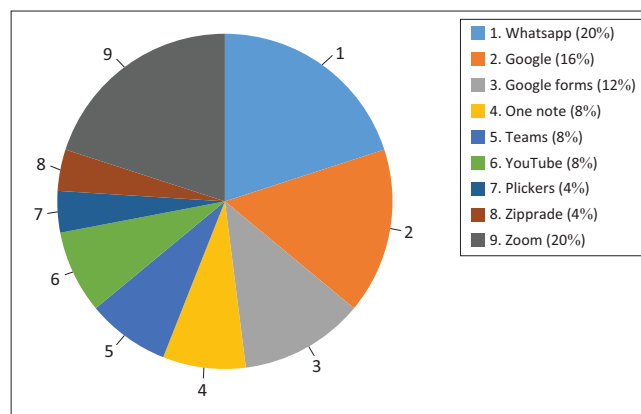


FIGURE 2: Identified tools and applications used by participants.

Recommendations for further research

Based on the findings of this research and the limitations of other research done on the topic, further research is recommended on the experiences of educators teaching in the intermediate phase in similar contexts. A quantitative approach could present hard facts and figures from statistical analysis to support or refute the findings of this qualitative study. To ensure a larger sample, several more districts could be included in the research, and the sample could be widened to include more educators. Expanding the population is necessary to present a more accurate view of the experience and challenges of educators using online tools for formative assessment and teaching in the social sciences.

A broader investigation into educators' ICT skills within the social sciences is recommended. In support of this, an investigation into the technical capabilities of the intermediate phase learner when completing online assessments is proposed. In support of these ideas, it is pertinent to note the observation of one participant that these learners are still adapting after exiting the foundation phase, and self-directed learning is still underdeveloped.

Conclusion

In this study, participants discussed their experiences using online tools for teaching social sciences during the COVID-19 pandemic and the national lockdown. Before the pandemic, none of the participants had used online tools in their teaching, but during the lockdown, half of them began using them. The participants identified several programs and applications they used, including WhatsApp for communication and Zoom for online teaching. However, many participants experienced barriers and challenges to using online tools, such as a lack of prior training and resistance from school management. These barriers hindered the participants' ability to provide an interactive and stimulating learning experience for their students. Despite these challenges, the participants demonstrated a willingness to incorporate technology in their teaching and assessment. The study highlights the need for ongoing professional development and improved infrastructure and accessibility to support the use of ICT in education.

Acknowledgements

This article is based on the author's thesis entitled 'Intermediate phase educators' experiences of the use of online tools to enact formative assessment in social sciences teaching and learning' towards the degree of MEd ICTs in Education in the Department of Science and Technology Education, University of Johannesburg, South Africa, September 2022, with supervisor Prof G.V. Lautenbach. It is available here: <https://tinyurl.com/ytkwjncb>.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

M.D.B. is the main author of this article. G.V.L. is the supervisor of M.D.B. who contributed to the conceptualisation, choice of methodology, editing of drafts and final edits of this study, and approved the final version of the draft for submission.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author, G.V.L., upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency, or that of the publisher. The authors are responsible for this article's results, findings, and content.

References

- Anoba, J.L.D. & Cahapay, M.B., 2020, 'The readiness of teachers on blended learning transition for post-COVID-19 period: An assessment using parallel mixed method', *PUPIL: International Journal of Teaching, Education and Learning* 4(2), 295–316. <https://doi.org/10.20319/pijtel.2020.42.295316>
- Asiamah, N., Mensah, H.K. & Oteng-Abayie, E.F., 2017, 'General, target, and accessible population: Demystifying the concepts for effective sampling', *The Qualitative Report* 22(6), 1607–1621. <https://doi.org/10.46743/2160-3715/2017.2674>
- Avgerou, C., 2008, 'Information systems in developing countries: A critical research review', *Journal of Information Technology* 23(3), 133–146. <https://doi.org/10.1057/palgrave.jit.2000136>
- Brooks, D.C. & Grajek, S., 2020, *Students' readiness to adopt fully remote learning*, viewed from <https://er.educause.edu/blogs/>.
- Coman, C., Țiru, L.G., Meseșan-Schmitz, L., Stanciu, C. & Bularca, M.C., 2020, 'Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective', *Sustainability* 12(24), 10367. <https://doi.org/10.3390/su122410367>
- Darling-Hammond, L., Hylar, M.E. & Gardner, M., 2017, *Effective teacher professional development*, Learning Policy Institute, Palo Alto, CA.
- Darr, C., 2005, 'Reliability and validity / concepts / working with data / using evidence for learning / home – assessment', *NCZER Magazine*, viewed 27 January <https://assessment.tki.org.nz/Using-evidence-for-learning/Working-with-data/Concepts/Reliability-and-validity>.
- Department of Education (DoE), 2004, *White paper on e-Education. Transforming learning and teaching through Information and Communication Technologies (ICTs)*, Notice 1869 of 2004, published on page 3 of Government Gazette No. 26734 of 26 August 2004, Government Printer, Pretoria.
- Department of Basic Education, 2011, *Curriculum and assessment policy statement intermediate phase grades 4–6 social sciences*, Department of Basic Education, Government Printing Works, viewed 03 March 2023, from <http://www.education.gov.za>.
- DiBella, K.S., Williams, K.G. & Glover, L.C., 2015, 'Improving pre-service teachers readiness to integrate technology with cross-curricular adaptations', *Journal of Education and Human Development* 4(2), 84–97. https://doi.org/10.15640/jehd.v4n2_1a9
- Francom, G.M., Lee, S.J. & Pinkney, H., 2021, 'Technologies, challenges and needs of K-12 teachers in the transition to distance learning during the COVID-19 pandemic', *TechTrends* 65, 589–601. <https://doi.org/10.1007/s11528-021-00625-5>
- Guskey, T.R. & Yoon, K.S., 2009, 'What works in professional development?', *Phi Delta Kappan* 90(7), 495–500. <https://doi.org/10.1177/003172170909000709>
- Hus, V. & Matjašič, J., 2017, 'Evaluation and assessment in early social science', *Universal Journal of Educational Research* 5(4), 664–670. <https://doi.org/10.13189/ujer.2017.050415>

- Kanjee, A., 2020, 'Exploring primary school teachers' use of formative assessment across fee and no-fee schools', *South African Journal of Childhood Education* 10(1), 13–18. <https://doi.org/10.4102/sajce.v10i1.824>
- Krot, K. & Lewicka, D., 2012, 'The importance of trust in manager-employee relationships', *International Journal of Electronic Business Management* 10, 224–233.
- Kuskaya Mumcu, F. & Kocak Usluel, Y., 2010, 'ICT in vocational and technical schools: Teachers' instructional, managerial and personal use matters', *Turkish Online Journal of Educational Technology – TOJET* 9(1), 98–106.
- Lieberman, J., Levin, V. & Luna-Bazaldua, D., 2020, 'Are students still learning during COVID-19? Formative assessment can provide the answer', *World Bank Blogs*, p. 27, viewed 22 April 2024, from <https://blogs.worldbank.org/en/education/are-students-still-learning-during-covid-19-formative-assessment-can-provide-answer>.
- Manca, F. & Meluzzi, F., 2020, *Strengthening online learning when schools are closed – The role of families and teachers in supporting students during the COVID-19 crisis*, Decd, viewed 23 April 2024, from https://read.oecd-ilibrary.org/view/?ref=136_136615-o13x4bkowa&title=Strengthening-online-learning-when-schools-are-closed.
- Markle, R.S., 2016, *Exploring teacher readiness: What features of professional development enhance motivation to implement technology innovations?*, Doctoral dissertation, viewed from <https://scholarcommons.sc.edu/etd/>.
- Mashau, P. & Nyawo, J., 2021, 'The use of an online learning platform: A step towards e-learning', *South African Journal of Higher Education* 35(2), 123–143. <https://doi.org/10.20853/35-2-3985>
- Mlotshwa, H.F., Ndlovu, N.S. & Nyandoro, B., 2022, 'The effect of teacher professional development in the adoption of ICT in teacher practices in Gauteng province', in J.P. Makonye & N.S. Ndlovu (eds.), *Innovations in online teaching and learning: Case studies of teacher educators from South Africa during the COVID-19 era*, AOSIS Books, Cape Town.
- Morris, R., Perry, T. & Wardle, L., 2021, 'Formative assessment and feedback for learning in higher education: A systematic review', *Review of Education* 9(3). <https://doi.org/10.1002/rev3.3292>
- Padayachee, K., 2017, 'A snapshot survey of ICT integration in South African schools', *South African Computer Journal* 29(2), 36–65. <https://doi.org/10.18489/sacj.v29i2.463>
- Percy, W.H., Kostere, K. & Kostere, S., 2015, 'Generic qualitative research in psychology', *The Qualitative Report* 20(2), 76–85. <https://doi.org/10.46743/2160-3715/2015.2097>
- Remmi, F. & Hashim, H., 2021, 'Primary school teachers' usage and perception of online formative assessment tools in language assessment', *International Journal of Academic Research in Progressive Education and Development* 10(1), 290–303. <https://doi.org/10.6007/IJARPEd/v10-i1/8846>
- Roberts, J.J. & Roberts, J., 2019, 'Online learning as a form of distance education: Linking formation learning in theology to the theories of distance education', *HTS Theological Studies / Theological Studies* 75(1), 9. <https://doi.org/10.4102/hts.v75i1.5345>
- Ronfeldt, M., Farmer, S.O., McQueen, K. & Grissom, J.A., 2015, 'Teacher collaboration in instructional teams and student achievement', *American Educational Research Journal* 52(3), 475–514. <https://doi.org/10.3102/0002831215585562>
- Saleh Mahdi, H. & Sa'ad Al-Dera, A., 2013, 'The impact of teachers' age, gender and experience on the use of information and communication technology in EFL teaching', *English Language Teaching* 6(6), 57. <https://doi.org/10.5539/elt.v6n6p57>
- Scherer, R., Howard, S.K., Tondeur, J. & Siddiq, F., 2021, 'Profiling teachers' readiness for online teaching and learning in higher education: Who's ready?', *Computers in Human Behavior* 118, 106675. <https://doi.org/10.1016/j.chb.2020.106675>
- Scott, C.W. & Medaugh, M.R. 2017, 'Axial coding', in J. Matthes, C. Davis & R. Potter (eds.), *The international encyclopedia of communication research methods*, pp. 1–2, John Wiley & Sons, Inc., Hoboken, NJ.
- Steyn, G.M., 2008, 'Continuing professional development for teachers in South Africa and social learning systems: Conflicting conceptual frameworks of learning', *Koers* 73(1), 15–31. <https://doi.org/10.4102/koers.v73i1.151>
- Strauss, A. & Corbin, J., 1998, *Basics of qualitative research: Techniques and procedures for developing grounded theory*, Sage, Thousand Oaks, CA.
- Sutton, J. & Austin, Z., 2015, 'Qualitative research: Data collection, analysis, and management', *The Canadian Journal of Hospital Pharmacy* 68(3), 226–232. <https://doi.org/10.4212/cjhp.v68i3.1456>
- Thompson, G., 2020, *Two-thirds of the world's school-age children have no internet access at home, a new UNICEF-ITU report says*, UINICEF, viewed 06 February 2022, from <https://www.unicef.org/press-releases/two-thirds-worlds-school-age-children-have-no-internet-access-home-new-unicef-itu>.
- Validity and Reliability in Assessments, *Huneety*, viewed 18 February 2024, from <https://www.huneety.com/en/blog/validity-and-reliability-in-assessments>.
- Wang, S., Hsu, H., Campbell, T., Coster, D.C. & Longhurst, M., 2014, 'An investigation of middle school science teachers and students use of tech', *Educational Technology Research and Development* 62(6), 637–662.
- Waller, P.P. & Maxwell, K.L.H., 2017, 'Mathematics teachers' perceptions of resources and curriculum availability in post-apartheid schooling', *International Journal of Science and Mathematics Education* 15(4), 741–757. <https://doi.org/10.1007/s10763-016-9713-2>
- Warschauer, M. & Matuchniak, T., 2010, 'New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes', *Review of Research in Education* 34(1), 179–225. <https://doi.org/10.3102/0091732X09349791>
- Wenger-Trayner, E. & Trayner-Trayner, B., 2015, *Introduction to communities of practice*, Wenger-Trayner, viewed 23 April 2024, from <https://www.wenger-trayner.com/introduction-to-communities-of-practice/%0A>.
- Young, M.F., 2009, 'Implementing national qualifications frameworks: Problems and possibilities', in R. Maclean & D. Wilson (eds.), *International handbook of education for the changing world of work*, Springer, Dordrecht.
- Zamir, S. & Thomas, M., 2019, 'The effects of university teachers' perception, attitude and motivation on their readiness for the integration of ICT in classroom teaching', *Journal of Education and Educational Development* 6(2), 308–326. <https://doi.org/10.22555/joeeed.v6i2.2712>
- Zyad, H., 2016, 'Integrating computers in the classroom: Barriers and teachers' attitudes', *International Journal of Instruction* 9(1), 65–78. <https://doi.org/10.12973/iji.2016.916a>