The effectiveness of smartboards in enhancing technology teachers' creativity

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Abstract

In the classroom, creativity is crucial because it forces learners to focus intently on the material being taught. Hence, the purpose of this study was to explore the effectiveness of a smartboard in enhancing Grade 6 Technology teachers' creativity at Nkomazi East Circuit in Mpumalanga Province. The theory of creativity was used as a lens in the study, and the 9E instructional model was used to guide and understand classroom activities. The qualitative research approach and the case study design were used to gather and analyse data. Data collection involved both non-participant observations and semi-structured interviews. Four schools with smartboards were purposively sampled. The participants of the study included four Technology teachers. All four teachers were interviewed and observed while teaching using the smartboards. This study used deductive content analysis to analyse data. The findings of the study revealed that smartboards are effective in enhancing teachers' creativity, as they were able to make their lessons more interesting, exciting and effective, and developed learners' creative thinking skills. The teachers could access the internet to search for online resources which include but are not limited to diagrams, pictures, online quizzes and YouTube videos to creatively present their lessons in the classroom. Different smartboard programmes such as the smart notebook, animation, PowerPoint presentations, as well as the show-and-hide features were also used to enhance creativity. With the help of the smartboard, teachers were also able to use a variety of teaching methods to correct learners' misconceptions and subsequently develop their creative thinking skills. The study recommends that smartboards be constantly used as a tool to enhance teachers' creativity, which ultimately develops learners' creative thinking skills. Future research may focus on investigating the extent to which smartboard features improve learners' creative thinking skills and understanding of various topics.

Keywords: Creative teaching, Creative thinking, Smartboard, Teachers, Technology

Introduction

Creative teaching is a strategic teaching of a specific content in different ways (Cheng, 2018). Wood and Ashfield (2008) view this strategic teaching as teaching creatively and teaching for creativity. Arguably, these are sides of the same coin. Creativity in the class is now a subject of great interest to teachers in many schools in the world (Hashimi, Muwali & Zaki, 2019). Most importantly, Technology classroom which deals with various built environment expertise, needs creative teaching. Patricia, Isaac and Manto (2023) have already entertained the idea of creativity in a Technology classroom with special focus onto teachers when engaged with hands-on activities. They stressed the importance of advocating for creativity in classrooms as the teaching paradigms evolve by day. Also, Chien and Hui (2010) proved that teachers in the Chinese societies are the prime influencers of creativity and that is why we see more creative innovations coming from young people. It therefore follows that whenever we need to see creativity among learners, we must quickly evaluate the actions of our Technology teachers in schools, thus this current study.

Henriksen, Richardson and Mehta (2017) highlighted that the teachers are wrestling with thinking creatively about instructive issues of

practice. Mtshal (2023) avers that we need to push more on metacognitive exercises in order to uplift teachers' ability to use resources before them to enhance creativity. Moreover, Nikolopoulou (2018) indicates that it is essential for teachers to adopt various educational technologies appropriate to embrace innovations and enhance creativity within educational institutions. Thus, this study explores the effectiveness of the smartboard in enhancing Technology teachers' creativity in the classroom.

Problem Statement

In the past years, the Department of Basic Education (DBE) provided smartboards to most to most schools focusing on Maths, Science and Technology (MST) subjects. This was so that teachers could invoke any creativity they so wish in their classrooms. Hence, the smartboards were installed in the Grade 6 classrooms for teaching Mathematics, Science and the Technology subjects to enhance effective teaching and learning in Grade 6, while preparing the learners for high school. However, Khoza, Kekana, and Dlamini (2019) report that these smartboards were rarely used by the teachers, partly because they were not sure of their benefits in teaching and learning. Some teachers thought that the smartboards were a replacement to their teaching as the authoritative sources of information (Oriji & Amadi, 2016). Mroz and Ocetkiewicz (2021) further states that the lack of awareness and motivation to use educational resources could be befitting as a motive behind the use of smartboards in the classrooms leading only School Management Team as users for administrative purposes than teaching and learning (Van Niekerk, 2015).

Based on feasibility study, it emerged that smartboards are not used for teaching and learning Technology, while if used adequately, they could be a great tool for creativity. For instance, in one school which was selected for feasibility study, the researchers observed that most teachers were not using the smartboard to teach, and this was further confirmed by the other teachers in the other schools. Besides, we learned from Sibiya, Mtshali and Ramaligela (2023) that technology teachers, to a great extent, cannot integrate augmented reality tools during the teaching and learning of graphical communication and graphic techniques. Hence, we saw a need to study the prevalence of this problem in Nkomazi district schools. We were further motivated by Oigara and Wallace (2012) who stated that most teachers did not use the smartboards unless there was an extra ordinary push to use it, which turned to be an entertainment exercise than education.

Based on the above, we were cohabitant to the hypothesis that very few teachers in the schools us educational technologies to become creative in their lessons. Researchers such as Ghavifekr, Kunjappan, Ramasamy and Anthony (2016) argue that the lack of teachers who engage using ICT tools in their classroom practice may further result in the lack of opportunities for greater creativity in the classrooms. Hence, it was important to examine effectiveness of smartboards in enhancing Technology teachers' creativity in the classroom.

Literature review

Teachers' perceptions of the use of Smartboards

The teachers' perceptions and beliefs are key in ensuring that the Information Communication and Technology (ICT) operation is effective (Albugami & Ahmed, 2015). The effective coordination of the ICT classrooms depends on the teachers' mentalities and convictions in relation to technology (Khan, Hasan & Clement 2012). The teachers' attempt to use different teaching methods to meet their learners' needs and all is possible through the use of the smartboard (Bdiwi, Runz, Faiz & Cherif, 2019). In addition, Eksi and Yesilyurt (2018) report that the smartboards can stimulate creativity by allowing the teachers to present visual material that is supported by audios and animation.

Moreover, Mustapha (2018) reports that the teachers who have computer skills show an uplifting outlook towards the utilisation of the smartboards. Even though some teachers demonstrated positive perceptions towards the use of smartboard, most of the teachers lack the skills of integrating the smartboard, therefore, training opportunities need to be provided. On the same footing, Lindberg, Olofsson, and Fransson (2017) report that the teachers feel that they lack knowledge on how to use technology tools in the classrooms, which makes them shun being creative during the classroom teaching and learning process.

Teachers' use of smartboards to enhance creativity in the classroom.

According to Nikolopoulou (2018), the promotion and improvement of creativity can be achieved by integrating new technologies, provided that there is a comprehension of their potential and ample opportunities for learners to engage in various creative processes. Similarly, Page and Thorsteinsson (2017) as supported by Mnisi et al. (2024) comment that the connection between technology and creativity is a key issue to be considered in the 21st century's educational system. Hence, innovative tools like smartboards hold significant potential in fostering creative collaboration. For example, they enable the development of new applications for creating and sharing content, including videos, audios, images, and websites. Platforms like YouTube provide a space for diverse creators to share their content, as highlighted by Nikolopoulou (2018). It was reported by Nonthamand (2020) that the learners can exchange opinions and summarise content through a video conference. The boards allowed the presentation of content in a visual form, thereby making concepts clearer (Tsayang, Batane & Majuta, 2020).

Maher, Phelps, Urane and Lee (2012) found that the software that is connected on the smartboards is specifically considered for teaching and learning, thereby allowing the teachers to link text, images and videos for later reference. It states that the information can be presented to the learner in a way that allows recording. Interactive smartboards help to present content more easily, and they increase student engagement, reduce the workload, and use time more efficiently, while planning and organising lessons becomes better (Ahmad et al., 2021). In addition, teachers teach creatively by being creative in choosing and using resources to make the lessons more interesting and engaging through the use of the smartboards (Wood & Ashfield, 2008). Therefore, the study sought to explore the effectiveness of the smartboard in enhancing the teachers' creativity in the Technology classroom.

Theory of creativity and the 9e instructional model

The study adopted the theory of creativity developed by the National Advisory Committee on Creative and Cultural Education (NACCCE) in 1999. This theory views creativity from two perspectives: creative teaching and teaching for creativity. Creative teaching involves employing innovative approaches to make learning interesting, exciting, and effective, while teaching for creativity focuses on developing learners' creative thinking skills. The smartboard serves as a tool that can facilitate both creative teaching and teaching for creativity. The 9E instructional model, encompassing various stages of lesson presentation, provides a framework to understand teachers' creativity in the Technology classroom.

To enhance teachers' creativity in Technology classroom the study has also adapted the 9E instructional model which was developed by Ramaligela, Ogonnaya and Mji (2019) as a classroom activity model. According to Ramaligela et al., (2019) the 9E instructional model is a model that provides different stages that can be followed in the presentation of a lesson in the classroom, it includes, elicit phase, Elaboration phase, Evaluation phase, Enclosure phase, Enlightening phase, Engagement phase and Exchange phase.

In this study, the elicit phase refers to how the teachers creatively used the smartboard features to develop interesting questions that draw learner's previous knowledge. The elaboration phase involved how the teachers used the smartboard to access interesting online educational resources to build on the learners existing knowledge. The explanation phase involved how the teachers used the smartboard to effectively explain specific concepts using different online resources or programs. The exploration phase involved how the teachers used the smartboard programs to interestingly introduce new concepts to the learners. The evaluation phase involved how the teachers used the smartboard to design assessments that develop the learners' creative thinking skill. The enclosure phase involved how the teachers used the smartboard for summarising concepts in an effective way for clear understanding. The enlightening phase involved how the teachers used the smartboard to access exciting online resources or programs for describing a complex idea in a simple way. The engagement phase involved how the teachers used the smartboard to continuously engage the learners throughout the learning and teaching process, thereby developing their creative thinking skills. The exchange phase involved how the teachers

used the smartboard programs together with the learners' ideas to correct misconceptions in a way that develop the learners creative thinking skills.

Research questions

1. What are the teachers' perception towards the use of smartboard?

2. How can a smartboard enhance creativity in the classroom?

Research methodology

Research approach and design

Research approach

In this study, the qualitative research approach was employed. The purpose of using this approach was to gather comprehensive descriptive data concerning specific phenomena to gain a deeper understanding of the subject being investigated or observed (Merriam & Grenier, 2019).

Research Design

A case study design was used to explore the effectiveness of the smartboard in enhancing Technology teachers' creativity in the classroom. Using case studies, the researcher can explore the motives behind specific actions of participants, thus providing proof and findings (Rauch, van Doorn & Hulsink, 2014).

Population and sampling

The targeted population for the proposed study was the entire Technology teachers from the primary schools around Nkomazi East circuit, in Mpumalanga province.

The purposive sampling technique was employed in the study since it allowed the researcher to select participants for this study (Guarte & Barrios, 2006). This was to ensure that only Technology teachers with the knowledge of using smartboard can participate in the study. Only four Technology teachers were selected for the study from three schools in Nkomazi East circuit.

Data collection

Since the study was qualitative, therefore, the semi-structured interviews and non-participatory observations were all conducted in the participants' schools. The researcher started by conducting the semi-structured interviews with

Technology teachers, then observing the teachers when teaching through Smartboard. All the four teachers were interviewed and observed while teaching through Smartboard in the Technology classroom. The tape recorder was used to record the interviews and the observation schedule was used to collect data from the non-participants' observation.

Data analysis

To analyse the observation and semi structured interviews, a deductive content analysis was used. This is a content analysis method which is used when there are existing perspectives, prior research results, theories, or conceptual frameworks concerning the phenomenon of interest available (Mayring, 2014). The information that was obtained from the semi-structured interviews was transcribed from the voice recorder into a word document and it was stored it in a computer file for analysis. The researcher was quoting exactly what the participants said. The data from both interviews and observations were coded into themes and categories and analyzed based on the purpose of the study. The themes were derived from the theory of creativity and the categories from the 9E instructional model. Literature was used to support the findings.

Findings

As a reminder, the purpose of this study was to explore the effectiveness of smartboards in enhancing Technology teachers' creativity. When analyzing the collected data from the semi - structured interviews and the non-participant observations, the study found that there's plentiful of opportunities that smartboard offers to enhance Technology teachers' creativity.

Based on theory of creativity, teachers creative teaching was examined which involved looking at how teachers made a lesson more interesting, exciting, effective, and develop learners' creative thinking skills. The study found that Technology teachers were able to present lessons which were interesting, exciting, effective, and developed learners' creative thinking skills through the use of the smartboard. They displayed diagrams, pictures, YouTube videos, animations, PowerPoints presentations, free hand drawings, practical tasks, online quizzes, and class activities using the smart notebook.

Firstly, to make the lesson more interesting during the elicit phase, the teachers used diagrams and PowerPoint presentations to draw leaners' prior knowledge. During the elaboration phase, the teachers used diagrams, pictures and YouTube videos to build on the learners existing knowledge. During the exploration phase, the teachers were demonstrating the circuit board, PowerPoint presentations with diagrams, images or pictures, YouTube videos and free hand drawing using the smart notebook that was found from smartboard to introduce new concepts. Secondly, to make a lesson exciting through the use of smartboards in the enlightening phase, the teachers used animation, diagrams, pictures and YouTube videos to clarify and describe various concepts. Thirdly, to make a lesson effective during the explanation phase, the teachers used diagrams, YouTube videos, PowerPoint presentations and smart notebook for explaining concepts in an effective way. During the enclosure phase, teachers used YouTube videos and PowerPoint presentations to summarise or enclose a lesson.

Lastly, to develop learners' creative thinking skills, teachers used smartboard to design practical tasks and quizzes. During the evaluation phase, teachers used practical activities and a quiz. During the engagement phase, teachers used YouTube videos, quizzes, and the question-and-answer method with the show and hide feature to engage the learners in the learning and teaching process. During the exchange phase, teachers exchanged thoughts with learners throughout the teaching and learning process and this enhanced their creative thinking skills by giving them activities and allowing them to interact with the board as they were writing feedback. Also exchange phase assisted the teachers to correct the learners' misconceptions through the use of different teaching strategies.

Findings and Discussion

As a reminder, the purpose of this study was to explore the effectiveness of smartboards in enhancing Technology teachers' creativity. When analyzing the collected data from the semi - structured interviews and the non-participant observations, the study found that there's plentiful of opportunities that smartboard offers to enhance Technology teachers' creativity. In fact, Yang et al. (2016) posits that creativity is the root of providing innovative solutions for technological advancement and economic development. Hence, promoting learner creativity has been one of the important goals in education.

Based on theory of creativity, teachers creative teaching was examined which involved looking at how teachers made a lesson more interesting, exciting, effective, and develop learners' creative thinking skills.

According to Kanai et al. (2017) in order to make lessons more interesting, teachers should first identify learners' social interest and find ways on how those social interest could be linked to what is taught in classes. Of course, most learners nowadays are digital citizens and enjoy watching animated realities. So, as part of observing creative teaching, we were interested to see how teachers used educational technologies that will synchronize with learners' social interest.

This study found that Technology teachers were able to present lessons which were interesting, exciting, effective, and developed learners' creative thinking skills through the use of the smartboard. They displayed diagrams, pictures, YouTube videos, animations, PowerPoints presentations, free hand drawings, practical tasks, online quizzes, and class activities using the smart notebook. It is not surprising that lessons the technology teachers' lessons were interesting. In a study by Bingimlas (2015) it was discovered that smartboards do make lessons interesting especially for drawing lessons just as it happens in a Technology classroom.

When looking at how teachers used smartboards to elicit learners' prior knowledge, drawings, pictorial diagrams and PowerPoint presentations were used to capture learners existing knowledge about orthographic views. According to Mtshal (2023) it is generally difficult for learners to adequately extract orthographic views from isometric drawings. So, with the help from smartboards which assist to display different shades of colours to differentiate views from a single object, it becomes easy for learners to identify different orthographic views.

The role of smartboards could also be seen during the elaboration phase where teachers used diagrams, pictures, and YouTube videos to build on the learners existing knowledge. Teachers could easily rotate views in a 3D format for

learners to have a complete picture of the drawing concepts presented to them. Most interestingly, even when learners were taught electric circuits, smartboard demonstrated to learners by means of short clip videos how connections were done to bring-out the light in the circuit diagram. This aligns well with assertions by Vinodhini et al. (2021) that smartboard has the ability to kindle the interest in learners when they learn complicated engineering-based concepts.

To make a lesson more exciting, smartboards were used to enlighten learners how houses get electrified and how can people avoid electric shocks when they are near to stoves and fridges. This was another way of creating context to learners' concepts. According to Ramaboea et al. (2023) it is important to teach technology subject using context that are familiar to learners' reality or surrounding communities. So, the YouTube videos played to learners helped to bring context to the concepts presented and clarify things that a teacher may unconsciously omit.

To make a lesson effective during the explanation phase, the teachers used diagrams, YouTube videos, PowerPoint presentations and smart notebooks for explaining concepts in an effective way. As part of the effective teaching traits in technology, Mtshali and Msimango (2023) state that technology teachers should demonstrate digital competency to deliver lessons that are based on industrial expertise. To effectively teach learners about electric circuits, teachers need to have some level of industrial exposure.

In order to develop learners' creative thinking skills, teachers used smartboards to design practical tasks and quizzes. During the evaluation phase, teachers used practical activities and a quiz. This teaching phenomenon is supported by Zhao (2019) who indicated that an interactive quiz is a learning evaluation medium that is used by many teachers and researchers to tap into learners' creative thoughts. This quiz was also used to open an opportunity for teachers and learners to engage on the calculations of voltage, current and ammeters. Learners were also keen to find out how other learners used Ohm's law ($V = I \times R$) to make R a subject of the formulae. This exercise was quick as teachers had demonstrations and correct answers prepared on the smartboard. Hughes et al. (2020) favours the use of such quiz

in a classroom saying that it assist learners to work as teams and promote positive learning spaces.

Conclusion

Before we conclude, it is important to remind readers that we were concerned with exploring the effectiveness of the smartboard in enhancing Technology teachers' creativity. The study was guided by the theory of creativity as a lens through which to look at the study and the 9E Instructional model that was used as an activity guide to understand the study. The themes were drawn from the theory and the categories were drawn from the 9E instructional model. The study found that the smartboard was effective in enhancing the Technology teachers' creativity. The findings revealed that the smartboard features were able to assist the teachers to successfully make their lessons more interesting, exciting, effective, and developed the learners' creative thinking skills. the study found that most teachers were using diagrams and YouTube videos in all the themes to enhance their creativity. Therefore, it was proven that smartboards can indeed enhance the teachers' creativity compared to the chalk or whiteboard. We thus on a premise that without a smartboard, it is almost impossible for teachers to make a lesson more interesting, exciting, effective, and develop the learners' creative thinking skills. The findings of this study are a call for teachers, subject advisors, experts and teacher sponsors to consider and encourage the use of smartboards in schools as it is a good tool for enhancing teachers' creativity.

Recommendations and future research

Looking at the study's findings, the smartboards were successful in making Technology teachers' lessons more interesting, exciting, effective, and developing the learners' creative thinking skills. Therefore, it is recommended that teachers use smartboards for all lesson kinds due to their interactive nature and the access to the internet which widens creative lesson possibilities. We also call upon the Mpumalanga Department of Basic Education to provide more smartboards to schools.

The curriculum developers should ensure that the teachers are provided with e-content that can be presented using the smartboards and they must organise workshops or trainings for the teachers to learn more about the smartboard

programs to improve their creative skills. Therefore, the study recommends that the smartboard be utilised as a greater tool for enhancing the teachers' creativity which ultimately develop learners 'creative thinking skills. Future research may focus on investigating the extent to which the smartboard features improve learners creative thinking skills and understanding of various topics.

Future research should also focus on other circuits and provinces, as this study was conducted at the Nkomazi East circuit in the Mpumalanga Province. Future research should be conducted in other grades since this study focused on Grade 6 Technology classrooms. This study employed qualitative research, so future research studies could use both the qualitative and the quantitative methods. The teachers who are teaching other subjects should also be considered as participants in future studies that are related to creativity through the use of smartboards.

Limitations

This study was limited to Technology teachers from the Nkomazi East Circuit schools in Mpumalanga province. With this limitation, the was a restriction in the generalizability of the findings to a larger population. Future studies should include a larger and more diverse participant pool to enhance the representativeness of the results. Additionally, the study only explored the perspectives of Technology teachers, neglecting the insights of other subject teachers. To gain a comprehensive understanding of the impact of smartboards on creativity, future research should involve participants from different grades and solicit input from teachers of various subjects. The study relied on a small sample size of four Technology teachers. Including more participants may have led to different outcomes. It is recommended that future research includes teachers from other subjects to examine creativity facilitated by smartboards. Lastly, while this study employed qualitative research method, future research could benefit from incorporating both qualitative and quantitative approaches.

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