EXPLORING EDUCATOR EXPERIENCES WITH MOBILE LEARNING SOFTWARE: UNDERSTANDING THE INTERPLAY OF THEMES

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ABSTRACT

Mobile technologies illustrate a positive effect when used in mathematics learning. However, user experience evaluations are mostly quantitative. The study adopted a qualitative case study approach using semi-structured interviews to examine the experiences of educators at a special needs school in the Western Cape, South Africa.
Thematic analysis of the interview data was performed using an inductive approach. The data revealed five themes, and the connections between these themes shed light on the educators' experiences with Siyavula.

KEYWORDS

Mobile Learning, Siyavula, Special Education, Educator Experiences, Qualitative Research, Theme Relationships

1. INTRODUCTION

Siyavula, a South African educational organization, prioritizes increasing access to education by utilizing open educational resources (OERs) and digital materials. Siyavula optimizes its resources for mobile accessibility by seamlessly integrating with mobile technologies, ensuring learners and educators can easily access their responsive website and digital materials. This is consistent with the widespread use of mobile devices for educational purposes. Siyavula has received recognition for its potential to support mathematics learning. Siyavula's approach to mobile learning is multifaceted, encompassing adaptability, interactivity, accessibility, and real-time assessment. By incorporating these features, the software emerges as a powerful tool for advancing mathematics education, catering to the diverse needs of South African learners and educators.

Using mobile learning software is becoming more popular, with an increased interest in its effectiveness in specific subjects and special needs education contexts (Crompton et al., 2017; Crompton & Burke, 2017; Svela et al., 2019). Research shows that there is an interest in the experiences that users with special needs have when interacting with mobile technology (Barbareschi et al., 2019; Jahan et al., 2020).

User experience evaluation studies illustrate that mobile technologies effectively support mathematics learning for learners with special needs (Benavides-Varela et al., 2020; Chelkowski et al., 2019; Pitchford et al., 2018). However, user experience studies on the use of mobile technologies within education focus on usability and are mainly quantitative (Maia & Furtado, 2016; Nur et al., 2021).

While quantitative research is proper for testing hypotheses, making predictions, and determining cause-and-effect relationships (Apuke, 2017; Eyesi, 2016), qualitative research is better suited for studying subjective experiences and perspectives which can be challenging to understand when using quantitative measurements (Strydom & Bezuidenhout, 2021).

A variety of research designs are used in qualitative research. Phenomenological, narrative, grounded theory, ethnographic, and case study designs are the most used qualitative designs for understanding people's subjective experiences (Asenahabi, 2019; Creswell & Poth, 2018). The nature of the data and research design guides the analysis process in qualitative research (Miles et al., 2020; Yin, 2018).

This paper focuses on the theme that emerged during data analysis to investigate educators' experiences with Siyavula when teaching mathematics to learners with special educational needs. The observed gaps in the effectiveness of mobile learning technology in special needs settings and the call for additional qualitative studies in user experience evaluation motivated this choice.

2. THEMATIC ANALYSIS AND THEMES

Thematic analysis is a popular method for analysing qualitative data (Gibbs, 2018; Miles et al., 2020). Braun and Clarke (2022:224) point out that it works well for research attempting to understand people's subjective experiences. Braun and Clarke have consistently emphasized the importance of understanding themes as complex and meaningful patterns, rather than just simple summaries of the data, throughout their research since 2006 (Braun et al., 2016; Braun & Clarke, 2022; Terry et al., 2017). Themes provide insights into the participants' experiences, perspectives, and beliefs, allowing for a more in-depth understanding of the research problem (Maguire & Delahunt, 2017; Miles et al., 2020).

Both Braun and Clarke (2022) and Miles et al. (2020) acknowledge that effective thematic analysis necessitates a thorough understanding of the data, research context, and theoretical framework. They stress the importance of paying close attention to the nuances of the data, the relationships between themes, and the implications of the interpretations.

Adu (2019a:158) also emphasized the significance of investigating the relationships between themes to adequately address the research questions. (Adu, 2019a) points out that these relationships are formed by comparing one theme to the other in terms of meaning, what the theme represents, and the empirical indicators and codes to which it is linked. Furthermore, once a link is established between two themes, the relationship between the two themes is then determined (Adu, 2019a).

Adu (2019a) employs various types of relationships discussed by Dey (1993:77-200) to determine the connection between themes, which can be:

Table 1. Definitions of the relationships among themes (adapted from Adu, 2019a:159-160)

Causal	"Two concepts have a causal relationship if the existence of or change in a concept leads or contributes to the emergence or adjustment of another."
Chronological	"Two concepts have a chronological relationship if one concept precedes or follows the other."
Concurrent	"Two concepts have a concurrent relationship if they exist, happen, change, or impact at the same time."
Embedded	"Two concepts have an embedded relationship if the entire characteristics of one concept are completely shared with a portion of another concept's features in terms of explaining a phenomenon, influencing another concept, or representing a process, behaviour or an event."
Explanatory	"Two concepts have an explanatory relationship if one concept plays the role of clarifying, elaborating or exemplifying another."
Overlapping	"Two concepts have an overlapping relationship if they have aspects of their characteristics in common in terms of explaining a phenomenon, influencing another concept or representing a concept, process, behaviour or an event."

These connections add to the richness of qualitative analysis. Some themes may complement or reinforce one another, resulting in a more complex understanding of a phenomenon or they may contrast or diverge, revealing contradictions or variations within the data (Braun & Clarke, 2022; Miles et al., 2020). Recognizing these relationships helps to provide a more complete interpretation of the underlying meanings, shedding light on the complexities of the subject under investigation (Gibbs, 2018; Saldana, 2021).

3. METHODOLOGY

To investigate the experiences of educators at a special needs school in the Western Cape, South Africa, who use Siyavula to teach mathematics, a qualitative case study design was chosen. The study included four senior-phase mathematics educators. Two of the educators have extensive experience, having taught mathematics for over 25 years and using Siyavula for the past six years. The third educator has been using Siyavula for two years and has six years of teaching experience. The fourth educator is new to the field, having taught mathematics for two years and using Siyavula for two months.

Semi-structured interviews were used to collect data, which was then analysed using thematic analysis. Thematic analysis is useful for capturing rich and contextually meaningful insights (Guest et al., 2020).

Data from interview transcripts were coded using interpretation-focused coding to better understand the educators' experiences using the Siyavula software to teach mathematics. The main characteristic of interpretation-focused coding is meaning creation, which entails locating significant information in the data and developing a code that represents our understanding of the data (Adu, 2019b). The interpretation-focused coding strategy successfully structured and simplified the data from the interviews, transforming it into meaningful and manageable codes, categories, and themes.

4. THEMES IDENTIFIED

Themes identified from the data, included technical challenges, ease of use, progress tracking, teaching and usage background, and learner perceptions. Technical challenges were one of the core themes that was identified from the data analysis. The theme encompasses the difficulties that educators encounter when using the software. It focuses on identifying and understanding specific technical difficulties faced when using Siyavula. These challenges encompass software glitches, repetitive content, numerous tabs, complex entry methods, content overload, and limitations in customisation.

The "Ease of Use" theme focuses on how educators use Siyavula and interact with its features and functionalities. It includes educators' experiences with the software's user interface, accessibility, and overall usability. This theme highlights the immediate feedback that learners get about their answers. It also shows that educators appreciate being able to track learner progress, the alignment of questions with the curriculum, and the flexibility of learning allowed by the software. Furthermore, educators found the leaderboard feature (P02) as one of the positive aspects as it motivates learners.

P02: Ya, I particularly like it because I can use it. You know, there are some programs that I'm useless at manoeuvring through, but this is very easy and intuitive. So, I like it from that standpoint. I like it from the standpoint of having a view of what the kids are doing, checking that leaderboard, and just checking the number of assignments that they're doing, it tells me something about their motivation, so I like it from that standpoint.

The progress-tracking theme centres on how educators use Siyavula for assessing and monitoring learner progress. Educators highlighted the progress tracking feature as one of the features they found most engaging (P01). Being able to track assignments, view learner performance data, and monitor engagement, provides critical insights into the learning process.

P01: One of the benefits that I see is the instantaneous feedback that the kids get if their answer is right, or the answer is wrong, and it allows them a second stab at the answer to correct their thinking. So, it doesn't just mark it wrong. It says, "Are you sure? Remember, you've got to do this and this before you can get to your answer, and then they get a second chance at the answer. So, I think in other software that I've used, it's either right or wrong. Siyavula is nice in the sense that it gives you that second chance at answering the question again because you may have made a careless mistake in your calculations the first time around. Then from a teacher's point of view, the feedback that we get, we can instantaneously see specific areas that are trouble areas.

The Teaching and Usage Background theme includes educators' years of teaching experience and familiarity with Siyavula. It investigates how educators' prior exposure to the software and their teaching background influence their interactions and experiences with Siyavula, shedding light on the role of expertise in the context of using the software.

P01: So, I've been teaching math for the last 25 years, and have been using Siyavula over the last five to six years.

P03: Mm, I've been in class for four years. I'm teaching math for two years and I have been using Siyavula only for like the past two months.

The Learner Perception theme is concerned with understanding the interaction between educators and students in terms of how the students perceive Siyavula (P01). It gathers insights from learners on their experiences, challenges, and overall feelings toward the software. This theme provides a crucial perspective from the end-users of the software.

5. RELATIONSHIPS BETWEEN THEMES

The findings illustrated several relationships between the themes (figure. 1). One of the key findings is the concurrent relationship between "Technical Challenges" and "Ease of Use." Educators frequently encounter both positive and negative aspects of using Siyavula simultaneously. Technical challenges, such as software

glitches and cluttered interface, have a direct impact on educators' perceptions of ease of use. When technical challenges are resolved, educators find the software more user-friendly, while unresolved issues lead to frustration and hampered experiences.

In addition, an explanatory relationship exists between the theme of "Technical Challenges" and the theme of "Teaching and Usage Background." Educators' extensive teaching experience and familiarity with Siyavula have a significant impact on how they engage with technical challenges and navigate the platform. More seasoned educators exhibit greater adaptability in handling technical challenges and swiftly acquaint themselves with the software's functionalities.
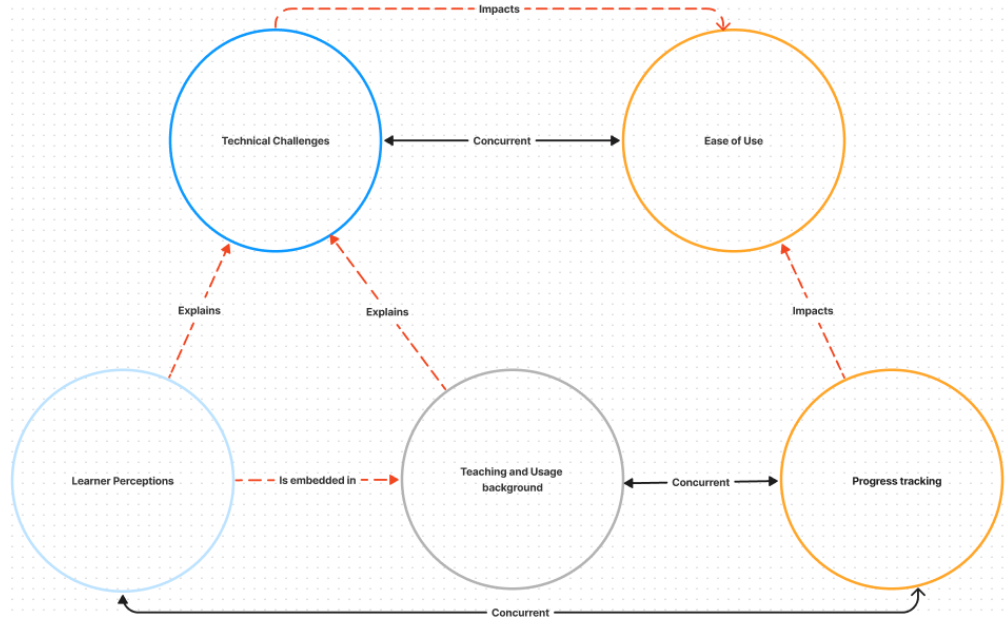

Figure 1. Relationships exist between the themes.

Another concurrent relationship emerges between "Ease of Use" and "Teaching and Usage Background." The teaching experience and adoption of Siyavula by educators influence their perceptions of the software's ease of use, with experienced educators finding the software more user-friendly. The themes "Educators' teaching and usage background" and "progress-tracking" are also concurrent. This is because educators value the ability to track learner progress, which aligns with their interest in understanding learner motivation and engagement. Another concurrent relationship is also apparent between the themes of "Learner Perceptions" and "Progress Tracking." When learners use Siyavula consistently and enjoy the motivating feature of "Are you sure", educators can track their performance and improvements.

A causal relationship is evident between "Ease of Use" and "Progress Tracking." The user-friendliness of Siyavula improves educators' abilities to navigate and use the progress-tracking feature, which contributes to their positive perceptions of the software's effectiveness. An explanatory relationship is observed between "Learner Perceptions" and "Technical Challenges," as learners' feedback helps understand specific technical difficulties encountered by educators.

Lastly, an embedded relationship emerged between "Learner Perception" and "Teaching and Usage Background." Effective use of the software by educators influences perceptions, shaping their feedback and facilitating a more tailored approach to teaching.

6. CONCLUSION

In conclusion, the connection between these themes highlights the importance of continuous improvement and user support in mobile learning platforms, particularly in special education. A more positive and impactful learning experience can be created for both educators and learners by improving personalisation, reducing content repetition and overload, and providing robust technical support.

Recognizing relationships between themes, as emphasised by Braun and Clarke (2022), Miles et al. (2020), and Adu (2019a), contributes to a more comprehensive interpretation of underlying meanings. The acknowledgement that themes can complement, reinforce, contrast, or diverge aligns with the proposed enhancements for a more impactful learning experience in the context of special education (Gibbs, 2018; Saldana, 2021). This study contributes significantly by emphasising the significance of these relationships and their implications in the context of mobile technology integration in special education.

As the study was based on a single case, the findings' generalizability may be limited. Furthermore, because the study is qualitative, the results are context-specific and may not be directly transferable to other settings. Despite the study's sample size being small, it allowed for a detailed exploration of educators' experiences with Siyavula within a specific context. This level of comprehension could be useful for future studies that aim to replicate or extend these findings in larger and more diverse settings.

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