

Primary Mathematics Teachers' Use of Interactive Whiteboards in Single-sex Classes in Saudi Arabia

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Abstract: This research proposal investigates the integration of Interactive Whiteboards (IWBs) in primary mathematics education in Saudi Arabia, specifically within single-sex classrooms for Years 1-3. The study aims to understand how factors such as gender, teaching experience, and training influence teachers' use of IWBs, particularly considering recent educational reforms like the "childhood programme." This reform, which introduced boys being taught by female teachers, offers a unique opportunity to examine the adaptation of teaching practices in this context. Prior research on IWB usage in Saudi Arabia has been broad and general, with limited focus on specific subjects like mathematics. By concentrating on how IWBs support math instruction, this proposal fills an important gap, providing insight into the practical outcomes of technological integration in Saudi primary classrooms. Furthermore, this research will address how gender dynamics shape IWB usage, especially under the new policy shift. The study will adopt a mixed-methods approach. Quantitative surveys will be distributed to around 300 mathematics teachers in Arar city, exploring patterns in attitudes, training, and perceived barriers. To deepen these insights, qualitative semi-structured interviews with 10 teachers (5 male, 5 female) and classroom observations of 4 teachers will be conducted. Special attention will be given to how female teachers manage classrooms with both genders. Additionally, the study will consider emerging technologies such as Augmented Reality (AR), which can complement IWBs by enhancing student engagement and understanding in mathematics lessons. This research proposal aims to offer recommendations for improving technology integration in primary classrooms, guiding both practitioners and policymakers in their efforts to enhance learning outcomes in Saudi Arabia's evolving educational landscape.

Keywords: interactive whiteboards; primary mathematics; Saudi Arabia; single-sex classes; teacher attitudes.

Introduction

Significance of the Study

The study evaluates the technical skills of Saudi mathematics teachers in primary schools concerning the integration of technology, particularly IWBs. It aims to provide insights that guide educational leaders and policymakers in enhancing technology use in education. The integration of IWBs in the classroom represents a significant shift in educational practices, offering the potential to enhance student

engagement, motivation, and learning outcomes (Chao et al., 2016). This research is timely, given the increasing emphasis on digital literacy and the need for innovative teaching strategies to meet the demands of the 21st-century classroom. By focusing on single-sex classrooms in Saudi Arabia, this study also contributes to the broader discourse on gender and education, providing valuable insights into how technology can be leveraged to support diverse learning needs.

Objectives of the Study

The objectives include examining how teachers incorporate IWBs in single-sex primary classrooms, evaluating the effectiveness of these tools in improving student engagement and learning outcomes, and understanding teachers' attitudes towards IWB usage. Additionally, the study seeks to identify the challenges and barriers faced by teachers in implementing IWBs and to develop recommendations for effective integration. Understanding these dynamics is crucial for informing teacher training programs and policy decisions aimed at enhancing the quality of education through the use of technology. The findings from this research will be particularly valuable for educational stakeholders in Saudi Arabia and other regions with similar educational contexts (Dockendorff & Zaccarelli, 2024).

Research Questions

The research questions focus on the effectiveness of current IWB policies and practices, teachers' perspectives on IWBs, and how teachers' qualifications, gender, experience, and training influence their views and practices. Specifically, the study aims to address the following questions:

- 1- How effective are current policies and practices around IWB use in Saudi Arabia, and to what extent are they implemented in single-sex primary classrooms?
- 2- What are the perspectives and opinions of primary mathematics teachers on the use of IWBs, and how do these vary by gender and teaching experience?
- 3- What are the perceived challenges and barriers to the effective use of IWBs in primary mathematics education, and how can these be addressed?

This paper presents a research proposal that aims to explore and address the research questions in detail.

Saudi Context

Education in Saudi Arabia

Saudi Arabia has made significant strides in its education system over the past few decades, with substantial investments aimed at improving educational infrastructure and outcomes. The Ministry of Education in Saudi Arabia has prioritised the integration of technology in schools as part of its Vision 2030 initiative, which aims to diversify the economy and develop a more digitally literate workforce (Saudi Vision 2030, 2020). The country's education system is characterised by gender-segregated schools, which has implications for how technology, such as IWBs, is adopted and utilised.

Structure of Schools in Saudi Arabia

The Saudi education system is structured into several levels: kindergarten, primary, intermediate, and secondary education. Primary education, which is the focus of this study, typically includes grades 1 through 6 and caters to children aged 6 to 12 years. Following primary education, students progress to intermediate education (grades 7 to 9) and then to secondary education (grades 10 to 12). The education system is segregated by gender, with boys and girls attending separate schools. This segregation extends to the use of technology in the classroom, including IWBs.

Childhood Program in Saudi Arabia

In 2019, the Ministry of Education began the implementation of the early childhood programme and assigned qualified female teachers to it, making it easier for children to transition from kindergarten to primary school, both emotionally and educationally. Because many female teachers were mothers before becoming teachers, they are better prepared to understand and address the needs of young children, which facilitates a smoother transition. The decision to combine the first three grades of primary school (first, second and third) was part of the Ministry of Education's plan to enhance childhood education as part of Vision 2030 (Ministry of Education, 2019). According to the Ministry of Finance (2023), a major achievement in the education sector was the expansion of early childhood classes, which involved adding 275 new attribution schools. In these schools, female teachers are responsible for teaching the same subjects to both boys and girls, though in separate, gender-specific classes. Additionally, they teach students from different grade levels on the same day.

Criteria for Obtaining a Teacher's License in Saudi Arabia

Teachers must hold a bachelor's degree in their field, pass a professional exam, and pay a fee. The license is valid for five years, and the exam covers general education and subject-specific mathematics topics. Renewal requires meeting the initial criteria again (Education and Training Evaluation Commission, 2019).

Literature Review

Interactive Whiteboards (IWBs) in Education

Interactive Whiteboards (IWBs) are digital tools that allow teachers to display and interact with content in a dynamic and engaging way. The findings of Drigas and Papanastasiou (2014), who examined the influence of IWBs on improving mathematics lessons for preschool and primary students in Greece. The data demonstrates that IWBs significantly increase student interest and engagement by providing interactive and visual features that aid in understanding mathematics concepts. IWBs support various teaching styles and can be used to display multimedia content, annotate text, and involve students in hands-on activities. The use of IWBs has been associated with increased student motivation and participation, as well as improved academic performance (Smith, Higgins, Wall, & Miller, 2005).

Use of Digital Technology in Mathematics Education

Digital technology has transformed educational resources, enhancing access and engagement in mathematics learning. Studies indicate that tools like IWBs can significantly improve student motivation and understanding (Chao et al., 2016). For instance, research has shown that interactive tools visually can make abstract mathematical concepts more concrete, facilitating better comprehension and retention. Additionally, digital resources such as educational apps, online tutorials, and virtual manipulatives offer diverse ways for students to engage with mathematical content, catering to different learning styles and preferences.

Integrating digital technology in mathematics education fosters critical 21st-century skills like problem-solving, collaboration, and digital literacy (Marpa, 2021). It also offers real-time feedback and personalised learning, allowing teachers to better address individual student needs.

Enhancing Mathematics Education through AR Integration

Augmented Reality (AR) in education can create immersive learning experiences, increasing student engagement and comprehension, particularly in subjects like mathematics. AR can bring abstract mathematical concepts to life by overlaying digital information onto the physical world, making learning more interactive and engaging. For example, AR applications can allow students to visualize geometric shapes in 3D, explore mathematical graphs dynamically, and interact with virtual objects to understand complex concepts better (Dockendorff & Zaccarelli, 2024).

Studies have shown that AR can enhance spatial reasoning, critical thinking, and problem-solving skills, which are crucial for success in mathematics. Additionally, AR can provide a hands-on learning experience that is both engaging and effective, particularly for students who struggle with traditional teaching methods. By making learning more interactive and fun, AR can also increase students' motivation and interest in mathematics, leading to improved academic outcomes (Chao et al., 2016).

Sustainable Education During the Pandemic

The COVID-19 pandemic enhanced the adoption of digital technology in education, emphasizing the need for technology literacy and adaptable teaching methods (Marpa, 2021). It revealed both the benefits and challenges of digital learning, highlighting disparities in access to resources and the importance of bridging the digital divide. The shift to online platforms has prompted innovation in teaching practices, paving the way for more personalised and flexible learning opportunities beyond the pandemic (Dockendorff & Zaccarelli, 2024).

Teachers' Attitudes Towards IWBs

Teachers generally hold positive attitudes towards IWBs, seeing them as tools that enhance engagement and understanding in mathematics. However, challenges such as lack of training and technical support can hinder effective integration (Chao et al., 2016). Professional development programs that provide ongoing support and training are essential for helping teachers develop the skills and confidence needed to use IWBs effectively.

Teachers also need access to high-quality digital resources and technical support to ensure that IWBs are used to their full potential. Schools and educational authorities must invest in the necessary infrastructure and support systems to facilitate the successful integration of IWBs. Additionally, fostering a positive school culture that values innovation and technology can encourage teachers to experiment with new teaching methods and tools (Dockendorff & Zaccarelli, 2024).

Gender Differences in IWB Usage

The study anticipates finding that female teachers teaching both sexes and boys being taught by both male and female teachers will show different attitudes and practices towards IWB usage. These differences are influenced by training, experience, and the gender of the students. Understanding these gender dynamics is crucial for developing targeted strategies that support all teachers in integrating IWBs effectively (Marpa, 2021).

Research suggests that female teachers may be more likely to adopt collaborative and student-centred approaches when using technology, while male teachers may focus more on content delivery. These differences can impact how IWBs are used in the classroom and the types of learning experiences students receive. By recognizing and addressing these differences, educational stakeholders can develop more inclusive and effective strategies for integrating IWBs (Chao et al., 2016).

Proposed Methodology

Research Design

The study proposes to employ a mixed methods approach to gather comprehensive data from primary schools in Arar city, Saudi Arabia. It will use both qualitative and quantitative methods to analyse the data. This approach allows for a more nuanced understanding of the research problem, combining the strengths of both methods to provide a comprehensive analysis (Creswell & Plano Clark, 2018).

Quantitative data will be collected through surveys administered to a representative sample of primary mathematics teachers. The surveys will include questions on teachers' demographics, experience with IWBs, attitudes towards technology, and perceived barriers to IWB integration. The quantitative data will be analysed using statistical methods to identify trends and patterns (Creswell, 2014).

Conclusion and Recommendations

Summary of Expected Findings

The study expects to conclude that IWBs have the potential to significantly enhance primary mathematics education in Saudi Arabia. However, successful integration will require addressing challenges related to training and support. Providing teachers with the necessary skills, resources, and support is essential for ensuring that IWBs are used effectively to enhance teaching and learning (Dockendorff & Zaccarelli, 2024).

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