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TOWARDS THE COHORT OF DISCIPLINED LEARNERS: HOW GLOBAL DIGITAL TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE CAN ACCELERATE SAFE SCHOOLS IN SOUTH AFRICA

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ABSTRACT

This study investigates the role of global digital technologies and artificial intelligence (AI) in accelerating safety and discipline in South African schools. The research focuses on how AI and digital tools can contribute to creating inclusive, safe, and secure learning environments in line with the principles of the global digital Compact and the Pact for the Future. Leveraging and drawing on Self-Determination Theory (SDT), this research explores how the effective management of teaching and learning, facilitated by digital technologies, can foster a cohort of disciplined learners. A systematic review methodology was employed to synthesise existing literature bias to global south on digital technology and AI's role in school safety and discipline. Findings suggest that AI tools and digital platforms contribute to creating safer and more disciplined environments by offering personalized learning experiences, real-time feedback, and predictive analytics for behavioural management. The study highlights how integrating these technologies, alongside a focus on the innate psychological needs of learners, can drive positive outcomes in student behavior and academic performance. The findings also highlight the potential of digital education and AI in promoting safety and discipline, and academic excellence.

KEYWORDS

Global Digital Technologies, Artificial Intelligence, Safe Schools, Disciplined Learners, Self-Determination Theory

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1. Introduction

In the evolving educational landscape, the integration of digital technologies and artificial intelligence (AI) presents both challenges and opportunities for schools worldwide. The Global Digital Compact, adopted as an annex to the Pact for the Future, envisions a world where digital tools can help solve critical global issues, including safety and security in schools. South Africa, grappling with significant challenges in the educational sector, stands to benefit from these technological advancements in creating a safer and more disciplined environment for both learners and educators.

This study aims to investigate how global digital technologies and AI can contribute to promoting discipline and enhancing school safety in South Africa. By examining existing practices, policies, and research from the Global South, the study seeks to offer practical insights into how these technologies can help shape a more inclusive, secure, and manageable learning environment.

2. Research Design and Methodology

This study employs a mixed-methods approach that integrates qualitative and quantitative data analysis techniques. While no physical data collection (such as surveys, interviews, or focus groups) was conducted in

this research, the study relies on secondary data sources, including existing literature, reports, and publicly available data on digital technologies, AI, safety, and discipline in South African schools. The research design focuses on synthesizing data from a variety of sources to provide comprehensive insights into the potential of digital technologies and AI in enhancing school safety and discipline, in alignment with the Self-Determination Theory (SDT) framework.

2.1 Desk-Based Research (Secondary Data Analysis)

Given that this study avoids physical data collection, desk-based research was employed to gather and analyze secondary data. This included.

Academic Literature: Peer-reviewed journal articles, conference papers, and academic books that focus on the role of digital technologies and AI in education, discipline management, and school safety were analysed (e.g., Garrison & Kanuka, 2004; Baker, 2016).

Reports and Whitepapers: Research reports from educational organizations, government publications, and international organizations such as UNESCO and the World Economic Forum were examined to gather data on the current state of digital technologies in South African schools and other parts of the Global South (e.g., UNESCO, 2019).

Case Studies: Case studies from regions with similar socio-economic contexts (such as other African countries, parts of Southeast Asia, and Latin America) were reviewed to understand how AI and digital tools have been successfully implemented to enhance safety and discipline (e.g., Liu, Liang, & Liao, 2017).

Existing Datasets: Secondary datasets on school safety, discipline metrics, digital technology adoption in education, and AI applications in schools were analysed to identify patterns, challenges, and trends (e.g., Mncube, 2018).

2.2 Systematic Literature Review (SLR)

The primary methodology used for data collection was a Systematic Literature Review (SLR), which is a structured and transparent approach to synthesizing existing research on a specific topic. The SLR process involved:

The main research questions guiding the review included:

1. How do global digital technologies and AI contribute to promoting safety and discipline in schools?
2. What are the impacts of AI and digital technologies on learner engagement, autonomy, and behavioural outcomes in schools?
3. How can digital tools be integrated into South African schools to foster a safe and disciplined learning environment?

Search Strategy: Databases such as Google Scholar, ERIC, JSTOR, and Scopus were used to find relevant academic articles, books, and grey literature. Search terms included combinations of keywords like "digital technologies in education," "AI in schools," "school discipline," "South African school safety," and "Global South education technology" (e.g., Van der Westhuizen, 2020).

Inclusion and Exclusion Criteria: Only articles and reports published between 2010 and 2024 were included to ensure the data was current. Articles were included if they discussed the role of digital technologies and AI in education, school safety, or learner discipline in either the Global South or South Africa specifically. Excluded were articles that did not specifically address these themes or those that were outdated (e.g., Reeve, 2012).

Data Extraction: Key information, including study findings, methodologies, contexts, and implications, were systematically extracted from the included articles. This data was categorized under themes such as "AI in Education," "Safety and Discipline," and "Digital Citizenship" (e.g., Baker, 2016).

2.3 Thematic Analysis

Once the literature was gathered, a thematic analysis was employed to identify recurring themes and patterns. This allowed for a synthesis of the findings across different contexts, identifying commonalities and discrepancies in the application of AI and digital technologies for school discipline and safety. Key themes that emerged from the analysis included:

1. Impact of Digital Tools on Student Behavior: Many studies emphasized the role of digital tools (such as learning management systems, AI-powered feedback platforms, and behavior tracking systems) in helping teachers manage classroom behavior and provide personalized interventions (e.g., Anderson, 2016; Grolnick & Ryan, 1989).

2. Barriers to Implementation: Common challenges identified in the literature included issues of infrastructure, teacher digital literacy, and resistance to technology adoption. These barriers were particularly relevant in South African schools where resources may be limited (e.g., Mncube, 2018; Vansteenkiste et al., 2006).

3. Digital Citizenship and Online Safety: The importance of teaching digital citizenship to students was highlighted, with a focus on ensuring students understand the ethical use of technology and how to behave responsibly online (e.g., Ribble, 2015).

2.4 Meta-Synthesis of Case Studies

A meta-synthesis of case studies was conducted to understand how AI and digital technologies have been implemented in school systems similar to South Africa's context. The case studies focused on regions such as Sub-Saharan Africa, Southeast Asia, and Latin America. These case studies provided valuable insights into:

1. Contextual Factors: How local conditions, such as economic challenges, teacher training, and infrastructure, affected the successful implementation of AI tools in schools (e.g., Liu, Liang, & Liao, 2017).

2. Innovative Practices: Successful examples of AI applications in school settings, such as the use of facial recognition for safety or AI-powered learning tools that promote student engagement and self-regulation (e.g., Tegmark, 2017).

2.5 Comparative Analysis

The research also involved a comparative analysis between the Global South and South African contexts. The aim was to compare how AI and digital technologies have been utilized in other parts of the world (especially in similar socio-economic settings) and to determine which strategies might be effectively applied to South African schools. This comparative approach enabled the identification of best practices, lessons learned, and potential pitfalls to avoid (e.g., Luckin et al., 2016).

Expert Opinions and Thought Leadership:

While the study does not involve primary data collection through interviews or surveys, insights were gathered from expert opinions and thought leadership in the field of educational technology. This was done by analysing.

Published opinions from education technology experts, policymakers, and leaders in the Global South (e.g., UNESCO, 2019).

White papers and position statements from international organizations like UNESCO and the World Economic Forum that focus on the role of digital technologies in education and safe learning environments (e.g., World Economic Forum, 2020).

2.6 Data Analysis Techniques

Quantitative Analysis: For datasets on school safety, learner discipline, and technology adoption, statistical techniques such as descriptive statistics were applied to identify trends and correlations (e.g., Marzano, 2003).

Qualitative Analysis: The qualitative data from literature was analysed thematically to identify key insights regarding the role of digital technologies and AI in enhancing safety and discipline in schools (e.g., Garrison & Kanuka, 2004).

3. Literature Review

The integration of artificial intelligence (AI) and digital technologies in education is transforming schools worldwide, particularly in the context of promoting discipline and ensuring safety. The Global South, including South Africa and its provinces, faces distinct challenges in adopting these technologies. This review synthesizes recent studies on the role of AI and digital tools in education, focusing on global, continental, SADC region, national (South Africa), and local (KwaZulu-Natal) perspectives.

3.1 International Overview: AI and Digital Technologies in Education

Globally, AI and digital technologies have begun to reshape educational practices, including those aimed at promoting student discipline and safety. According to Zawacki-Richter et al. (2022), AI-powered tools, such as learning management systems, behavior prediction models, and virtual assistants, have become integral to educational institutions seeking to create secure, managed, and supportive learning environments. These technologies offer personalized learning experiences, track student behavior, and even detect incidents like bullying or aggression using facial recognition and sentiment analysis.

Williams et al. (2023) demonstrate how AI systems are used in schools across Europe and the United States to manage large student populations, enhancing both academic and behavioural outcomes. Their research indicates that AI's ability to predict behavioural issues, such as chronic absenteeism or the likelihood of disruptive behavior, has been crucial in creating interventions that prevent further escalation.

Recent developments highlight the growing role of AI in student welfare, such as the integration of AI-powered digital platforms that assess both academic and behavioural data in real time. Stern et al. (2024) describe how such systems allow for quick interventions in large educational systems, providing a mechanism for scaling discipline management without compromising individualized attention. However, the use of AI also raises concerns about the over-surveillance of students, especially in countries with high privacy standards like the European Union.

3.2 Continental Overview: AI in African Education

Across the African continent, digital technology adoption in education has been gaining momentum, particularly in enhancing security and discipline. According to Odiaka et al. (2022), AI tools have been incorporated into educational settings in Kenya and Nigeria to improve student monitoring and classroom management. AI systems in these countries monitor student behavior, including detecting early signs of bullying and offering data-driven recommendations to educators. These tools have been particularly effective in overcrowded classrooms where traditional disciplinary measures may be insufficient.

Ajayi and Abdullahi (2023) argue that AI's role in educational systems within Africa, particularly in the context of safety, should be seen as a long-term investment in the continent's future. Their study indicates that while AI can potentially revolutionize discipline management, a lack of infrastructure and teacher training remains significant barriers to its success. In particular, teachers in many African countries are not adequately prepared to integrate AI into their pedagogical practices, limiting the full potential of these tools.

Pugh et al. (2023) examine AI implementations in African countries such as Ghana, Senegal, and South Africa. They observe that, while AI technologies show promise for promoting safer and more disciplined school environments, challenges such as unequal access to digital infrastructure and regional disparities in technology adoption continue to hinder their full potential.

3.3 SADC Region: The Role of AI and Digital Technologies in Education

In the Southern African Development Community (SADC) region, digital education solutions are becoming increasingly important in addressing both discipline and safety issues. Mafuleka et al. (2022) discuss how SADC countries are leveraging AI for school safety, particularly through AI-driven surveillance and behavioural analytics. Countries like Zambia and Botswana have begun to experiment with AI systems that track student behavior and intervene when students engage in problematic actions such as bullying or violent behavior.

Ramathoka et al. (2023) further explore AI systems that collect data from school environments, including both academic performance and behavioral patterns. They find that, in several SADC countries, AI tools are helping educators identify at-risk students and provide timely support before issues escalate. These tools have been particularly useful in contexts where teacher-student ratios are high, and personalized attention is often limited.

In terms of challenges, Mlambo et al. (2023) point out that in the SADC region, the adoption of AI in education remains uneven. While urban schools in countries like Zimbabwe and South Africa are more likely to adopt AI-based solutions, rural schools face significant obstacles due to limited internet access, lack of electricity, and insufficient digital literacy among both students and educators.

3.4 National Overview: South Africa's Integration of AI and Digital Technologies in Schools

At the national level, South Africa has made strides in incorporating AI and digital technologies into its educational system. The Department of Basic Education (DBE) in South Africa has developed several initiatives, such as the Integrated ICT in Education Policy (2022), to promote the use of technology in classrooms. However, the integration of AI into discipline management and school safety remains in its infancy.

Van der Westhuizen (2023) explores how AI applications like facial recognition and behavior tracking software are beginning to be used in South African schools to improve safety. These technologies can monitor students' emotional responses and behavioral trends, enabling early detection of bullying or potential violence. In a study conducted in several urban schools in Cape Town, AI tools were found to significantly reduce instances of school violence by providing real-time alerts and suggesting interventions.

A 2023 report by Nkosi et al. (2023) from the University of South Africa further highlights the role of AI in creating safer school environments by identifying patterns in student behavior, especially in schools facing socio-economic challenges. However, the research also acknowledges the challenges related to the unequal distribution of technology in rural versus urban schools.

Moreover, Louw (2024) discusses how AI in South Africa can also address broader issues like student absenteeism, which often correlates with behavioral problems. The study points out that predictive analytics can be used to flag students at risk, allowing schools to intervene early and provide targeted support.

3.5 KwaZulu-Natal Province: Local Adaptations and Challenges

KwaZulu-Natal (KZN), as one of South Africa's most populous provinces, has been at the forefront of testing AI-powered solutions in schools. Dlamini (2022) outlines a pilot project in Durban, where AI tools were implemented in secondary schools to manage student discipline and ensure safety. This initiative, though in its early stages, has shown promise in improving attendance rates and reducing violence on school grounds by monitoring students' physical and emotional well-being.

Jansen (2023) further explores the use of digital technologies in KZN, particularly focusing on AI tools that monitor student behavior both inside and outside the classroom. Schools in the province, especially in urban areas, have seen a decrease in bullying incidents due to the deployment of AI-powered anti-bullying applications, which analyze student interactions in digital spaces.

However, challenges remain in the form of infrastructural issues. Mthethwa and Ngcobo (2024) examine the barriers faced by KZN schools in implementing AI technologies. They report that, despite pilot projects showing success, many schools in rural parts of the province lack access to the necessary technology and training to integrate AI effectively into their discipline systems.

Vilakazi and Mkhize (2024) argue that for AI to truly succeed in promoting discipline and safety in KwaZulu-Natal schools, it must be part of a broader strategy that includes teacher training, community involvement, and equitable access to digital tools across all schools, regardless of location.

4. Theoretical Framework

Theoretical Framework: Self-Determination Theory (SDT)

Self-Determination Theory (SDT), developed by Deci and Ryan (2000), suggests that human motivation is driven by three fundamental psychological needs: autonomy, competence, and relatedness. SDT posits that when these needs are met, individuals are more likely to engage in behaviours that foster growth and well-being, including disciplined behavior in educational settings.

Autonomy: The ability to make independent choices is central to SDT. In educational settings, autonomy can be fostered through digital learning environments where students have more control over their learning paths and are encouraged to set personal academic goals (Grolnick & Ryan, 1989).

Competence: SDT suggests that students are more motivated when they feel competent and capable. Digital technologies, particularly AI-powered

platforms, can provide personalized learning experiences that help students build their skills at an individualized pace (Luckin et al., 2016).

Relatedness: The need to feel connected to others is also a core tenet of SDT. In the classroom, this need can be met through collaborative tools and social learning platforms, where students feel supported by their teachers and peers (Reeve, 2012).

Findings: Studies have shown that the use of technology that supports autonomy and competence can enhance students' intrinsic motivation, leading to more disciplined behaviours (Vansteenkiste et al., 2006). AI tools that provide personalized feedback and adaptive learning environments are aligned with SDT's principles, fostering a sense of mastery and self-direction in students.

Educational technologies should be designed with a focus on increasing student autonomy, providing opportunities for personalized learning, and fostering a sense of relatedness through collaborative platforms.

Schools should ensure that AI systems are used to support these psychological needs, which can ultimately lead to more disciplined and engaged learners.

4.1 Efficacy of Effective Management of Teaching and Learning

Effective classroom management is essential in fostering discipline and safety. Research suggests that technology can enhance classroom management by offering teachers tools to monitor student performance, provide timely interventions, and maintain an organized and engaging classroom environment (Marzano, 2003).

Digital Tools: Platforms like Google Classroom and Microsoft Teams allow teachers to manage assignments, track student progress, and intervene when necessary. AI-based systems also help in behavior tracking and performance predictions, which allows for proactive management (Baker et al., 2009).

Findings: Studies show that when digital tools are used to effectively manage student behavior and learning, student engagement increases, and disruptive behaviours decrease (Meyer et al., 2018). AI-based learning systems that give real-time feedback have been linked to improved academic outcomes and a reduction in behavioural issues (Hollands & Tirthali, 2014).

Schools should invest in AI-powered classroom management tools that offer real-time data on student behavior, enabling teachers to intervene early.

Ongoing professional development for teachers on how to leverage digital tools to manage behavior and support learning should be a priority.

4.2 Global Digital Technologies in Education

Global digital technologies, ranging from learning management systems (LMS) to mobile apps, have revolutionized education by enhancing learning experiences and facilitating safer school environments. According to Kozma (2008), these technologies offer unprecedented opportunities for innovation in teaching and learning.

Smart Classrooms: Technologies like smartboards, student response systems, and AI-powered analytics can monitor students' understanding and engagement levels in real-time, providing insights that allow for quick interventions.

Findings: In studies across Europe and Asia, digital technologies have proven effective in improving both safety and discipline by streamlining communication, providing data for early warning systems, and enabling more structured learning environments (Liu et al., 2017).

Schools should embrace smart classroom technologies that provide real-time feedback to students and teachers.

Policymakers should prioritize digital infrastructure investments to ensure equitable access to these technologies.

4.3 Artificial Intelligence in Education

AI offers unique capabilities in education by providing personalized learning experiences, automating administrative tasks, and offering tools for behavioural analysis. Baker (2016) highlights that AI's potential for individualized learning pathways and predictive analytics can revolutionize education.

Behavioural Analytics: AI can analyze student behavior patterns, predict potential discipline problems, and recommend personalized interventions (Baker et al., 2009).

Findings: AI systems in education, such as Knewton and Cognitively Adaptive Systems, have shown positive effects on student discipline by detecting early signs of disengagement or problematic behavior, and suggesting individualized plans for improvement (Tegmark, 2017).

Schools should explore AI applications for real-time behavioural analysis to pre-emptively address discipline issues.

Investment in teacher training on how to use AI to monitor and improve student behavior is crucial.

4.4 Safety and Discipline in South African Schools

Safety and discipline remain significant challenges in South African schools. According to Mncube (2018), issues such as bullying, violence, and substance abuse affect both the learning environment and student well-being.

AI and School Safety: AI tools such as surveillance cameras with facial recognition, predictive behavior analytics, and attendance tracking systems can improve school safety by identifying and addressing threats early.

Findings: In South African schools, the use of AI for monitoring has been shown to reduce incidents of bullying and violence when combined with early intervention systems (Van der Westhuizen, 2020).

Schools in South Africa should pilot AI-based safety systems, focusing on early warning systems that alert educators to potential threats.

Schools must ensure these technologies are used responsibly, with a focus on student privacy and ethical concerns.

Digital Citizenship and Online Safety

With the rise of digital technologies, it is essential to teach students about digital citizenship, which includes responsible online behavior, cybersecurity, and ethical use of technology (Ribble, 2015).

Online Behavior Management: AI can be used to monitor students' online interactions, flag inappropriate content, and provide instant feedback.

Findings: Programs like Common Sense Media in the US have successfully implemented digital citizenship curricula, resulting in better online behavior among students (Ribble, 2015).

Schools should incorporate digital citizenship training into their curricula.

AI tools that promote online safety, such as filtering systems and digital interaction monitoring, should be integrated into digital learning environments.

Teacher Professional Development and Digital Literacy

The effective integration of digital technologies requires teachers to possess digital literacy and pedagogical skills to leverage these tools successfully (Koehler & Mishra, 2009).

Professional Development: Training programs focused on integrating AI and digital tools into teaching practices can enhance teacher competence and confidence in managing classrooms effectively.

Findings: Research shows that teachers who receive ongoing professional development in digital tools are better equipped to engage students, manage classroom behavior, and improve overall student outcomes (Ertmer, 2020).

Develop mandatory professional development programs focusing on AI tools for managing discipline and safety.

Encourage collaboration between educators and tech experts to ensure effective technology integration.

4.5 Parental Involvement and Digital Technologies

Parental involvement plays a crucial role in student discipline. Digital technologies provide platforms for parents to monitor their children's behavior and academic progress.

Communication Platforms: AI-driven apps can enable real-time communication between parents and teachers, fostering collaboration on student behavior and performance.

Findings: Studies have shown that schools using platforms like ClassDojo have seen improvements in student behavior due to increased parent-teacher collaboration (Fletcher & Topping, 2017).

Schools should encourage the use of digital platforms that facilitate communication and collaboration with parents regarding discipline and student well-being.

Policymakers should support initiatives that ensure all families have access to these technologies.

4.6 Digital Technologies and Learner Engagement

Digital technologies have the potential to increase learner engagement and motivation, both of which are critical in fostering discipline (Garrison & Kanuka, 2004).

Gamification and Interactive Learning: AI-powered platforms that use gamification and interactive learning can increase student engagement, which is often linked to improved discipline.

Findings: Gamified learning experiences have been shown to increase student motivation and engagement, reducing disruptive behavior in schools (Anderson, 2016).

Integrate gamification into digital platforms to enhance student engagement and discipline.

5. Findings

The systematic review of literature reveals several key findings regarding the role of AI and digital technologies in promoting school safety and discipline in South Africa:

AI-Driven Behavioural Insights: AI-powered behavioural monitoring systems can analyze patterns of student conduct and predict potential disciplinary issues. This allows educators to intervene early, offering support to students before problems escalate.

Digital Tools for Anti-Bullying and Harassment Prevention: AI-based platforms that analyze social interactions and detect bullying behaviours through text or image recognition have been shown to reduce instances of bullying in schools globally. These tools can be adapted to South Africa's context to address violence and harassment.

Increased Engagement and Accountability: Digital learning platforms that track student progress and behavior provide both students and teachers with clear accountability measures, which can foster self-discipline and enhance student-teacher relationships.

Challenges with Infrastructure and Training: While the potential of AI and digital technologies is clear, their implementation in South Africa is hindered by issues of infrastructure, particularly in rural and underserved areas. Moreover, teacher readiness and digital literacy remain significant barriers to the widespread adoption of these tools.

6. Recommendations

Strengthen Infrastructure and Access: The South African government should invest in improving digital infrastructure in schools, especially in rural areas, to ensure that all learners have access to the tools necessary for safe and effective learning environments.

Integrate AI in Teacher Training Programs: Professional development initiatives should include AI literacy and the use of digital technologies for classroom management and safety. Teachers must be trained not only to use digital tools but also to interpret the data they generate to make informed decisions.

Develop Context-Specific AI Solutions: Digital solutions should be tailored to the unique challenges faced by South African schools, with local input from educators, students, and community stakeholders. This will ensure that AI technologies address local needs effectively and equitably.

Promote Policy and Regulatory Frameworks: Policies that govern the ethical use of AI and digital technologies in schools should be developed, ensuring privacy, data security, and the responsible use of AI in student monitoring and behavior management.

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