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Research Article

Integrating AI in Classroom Management: Improving Educational Efficiency and Teacher Workflows

Dr Ismaila Mounkoro[1], Anton Diaz Uberas[2], Flordeline A. Cadelina[3], Muhammad Usman Saleem[4], Dr. Shahana Maryam[5], Wesam Taher Almagharbeh[6], Dr. Azra Abdul Majeed[7], Zakir Hidayatallah[8]

[1]*Department of Psyhopedagogy, ENSup Bamako - Mali section : Sociologíe, Universidad autónoma de San Luis Potosí/México, México, Email: imounkoro@becenes.edu.mx*

[2]*Faculty, ESE Department, Millennium 6-12 Collegiate Academy, Florida, USA, Email: uberasanton108@gmail.com*

[3]*Associate Professor IV, Department of Information Technology, Mindanao State University at Naawan, Philippines, Email: flordeline.cadelina@msunaawan.edu.ph*

[4]*Department of Computer Science, Govt. College Women University, Sialkot, Pakistan Email: usman.saleem@gcwus.edu.pk*

[5]*Assistant Professor University of Sargodha, Email: shahana.maryam@uos.edu.pk*

[6]*Assistant Professor, Department of Medical and Surgical Nursing, University of Tabuk, Saudi Arabia, Email: walmagharbeh@ut.edu.sa*

[7]*Chairperson & CEO Research Corridoe PVT Email: admin@researchcorridor.org*

[8]*Associate Professor, Department of Basic and Clinical Oral Sciences, Faculty of Dental Medicine ,Umm alQura University, Makkah Mukarama, KSA, Email: zhmarwat@uqu.edu.sa*

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ABSTRACT

Background: The use of artificial intelligence (AI) in educational management has become interesting as it helps increase educational quality and ease teachers' work. Nonetheless, the influence of AI tools on practice and outcomes of teaching has not been adequately researched.

Aim: The present study attempts to establish the role that AI plays in enabling effective management of the classroom by determining the relationships between AI tool utilization, effectiveness, and satisfaction.

Methods: A cross-sectional approach was adopted where an online self-administered quantitative questionnaire was targeting 250 teachers in primary, secondary, and tertiary institutions. Primary data was collected using a structured questionnaire to gather the respondents' socio-demographic characteristics, usage frequency of AI tools, their effectiveness, and satisfaction with such tools. Descriptive statistics, correlation analysis, and regression models were used to evaluate the data. Normality and reliability of the data were established to strengthen the results of the study.

Results: See the figures above. The majority of the sample opinioned that AI tools were effective (51%). Most effectiveness ratings (36%, see Table 7) placed 3-5 on a Liker Type Scale were in consensus. However, in the study, it was established that the frequency of AI work did not correlate with its use effectiveness($r = -0.053$). The Internal consistency analysis demonstrated low (0.0628) Cronbach's alpha value which discredited the items as measuring similar constructs. As per regression analysis performed with many variables, surprisingly, they did very little to explain the perception of the effectiveness of AI tools ($R^2 = -0.0604$).

Conclusion: The data collected demonstrates that in general AI tools are favored by the teachers and that they are likely to utilize them throughout the process of enhancing classroom management and even workflows. However, the two factors are not likely to correlate. Other variables including the kind of AI tool as well as possibly their implementation could vary the extent to which AI tools will be successful. More studies need to be initiated to further perfect the tools that measure AI's impact on education and the methodological conditions that are required to impact positively on the integration of AI in education.

Keywords: AI in education, classroom management, educational efficiency, teacher workflows, AI tools, quantitative study.

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INTRODUCTION

The use of Artificial Intelligence has facilitated the restructuring of the traditional workflow in society, decision-making, and increased automation processes. Within the education system, there are sustained efforts in utilizing AI for orderly class management, delegating administrative responsibilities, and customizing learning needs, among other tasks that are aimed at making the life of the teacher easier. Adopting AI solutions for classroom management means that teachers will have diminished workloads, effective student performance monitoring and assessment strategies, time-efficient lesson planning, and student behavioral management in class. There's no denying that as educators are being stretched out and asked to do more and more work, AI offers a promising view in terms of saving time and enhancing competence and productivity in education (Holstein et al., 2019; Yugandhar & Rao, 2024). Not surprisingly, there is a lot of interest in AI in the educational space in terms of its capabilities to revolutionize the management of the classroom. Although some AI tools may enhance organizational and time management processes, their evaluation in terms of advantages to pedagogical impact, enhancement of student interest, as well as enhanced satisfaction of the teachers, remains unclear. And lastly, how often people use AI tools versus the benefits they expect to get still needs to be researched properly. All this information is valid and is a concern for education policy-makers, education practitioners, and even the developers of AI tools seeking to improve classroom experiences (Bhimdiwala et al., 2022; Praveen, 2024). The integration of AI technology is surging into other sectors and education is not left behind. We see the implementation of AI in curriculum development, adaptive learning, management, and classroom activities. In terms of classroom management, AI technology offers great prospects for enhancing educational effectiveness and relieving teachers from doing chores. Tools empowered by AI can take care of monotonous operations like grading, taking attendance, designing lessons, and other strategies thus providing teachers more time to improve strategic teaching i.e. student interaction and nurturing of creativity. With the increased pressure on teachers, the aspects of AI that can improve the overall management within a classroom have become a growing area of interest for many researchers and educational institutions (Onesi-Ozigagun et al., 2024; Saxena et al., 2023). An important advantage connected with the application of AI in classroom management is the optimization of processes and reduction of administrative work in teachers' practice. Classroom management doesn't only entail enforcing behavior norms and deciding on the order of events. It includes a wide range of administrative functions: ensuring student engagement, lesson planning, and organization. In the past, these tasks were cumbersome, tedious, and manual which put teachers under more strain in terms of task loads. AI tools to relieve the monotonicity of those tasks work towards the improvement of teachers' efficiency by freeing time for them to do what matters — teach. One such improvement AI may bring about is quick intended feedback among students. This will make it easier for the teachers to detect students who are lagging far behind and avoid more serious problems (Arghir, 2024; Raza et al., 2015; Vadisetty, 2023). In addition, AI can change the structure of classroom management through providing data analytics which can help guide students and manage the classroom. With the use of artificial intelligence through machine learning algorithms and data analytics, students' behavior engagements and academic performances are assessed, thus giving teachers useful feedback on how best to approach a class. For example, personalized learning platforms can where users to be provided with tailored content to suit their paces and preferred styles of learning leading to improved student engagement and achievement. In this manner, AI not only makes it easier for teachers to manage their classrooms but also helps in personalizing the learning experience for the students which is more effective (Bibi, 2024; Edali et al., 2024; Tedre et al., 2021b). Nonetheless, the incorporation of AI in classroom management systems appears to be very nascent, and research on its efficacy is sparse. There is also uncertainty regarding the effects solvent tools and applications will have on the practices of teaching, student interactions, or the results of education as a whole. Will the incorporation of AI tools into modern, sophisticated, and heterogeneous classrooms be smooth or contrived, and will their application lead to improvements in practitioner workflows and learning outcomes? Additionally, which aspects of the successful introduction and usage of AI in families of subjects at schools, are teacher preparation, design of the instruments, and analysis of the institutions, are still very much lacking in detail (Bibi, 2024; Dannecker & Meyer, 2024; Rafique et al., 2014; Revathi et al., 2020). This study aims to investigate quantitatively how AI tools influence classroom and teacher management processes concerning the effectiveness of AI and its uptake by teachers. To put it differently, this study seeks to establish which AI tools are being used and for what in various educational environments, if their application has a positive correlation with effectiveness in classroom management, and what educators' views are about the merits and demerits of AI in performing their everyday activities. In delving into these issues, this research intends to contribute

to the existing scholarship on AI in education while offering suggestions on the appropriate measures to undertake to deploy AI tools and better the working conditions of teachers and the overall learning environment (Chan, 2023; SWARGIARY, 2024). Lastly, knowing how AI is useful in classroom management, especially for teachers, administrators, and policymakers in general, is necessary as it helps them identify some of the ways they can improve education and deal with the complexities that modern-day teachers face. Indeed, AI technology is evolving and integrating itself more in education, but people should not only focus on the technical features of these tools but also on how such tools perform in actual teaching practice. This activity will mobilize efforts to remedy the scarcity of relevant studies by elucidating the evidence of AI's impact on classroom management and suggesting the best practices for its application in pedagogy (ALGAHTANI, 2024) (Chan & Tsi, 2023; Rafique et al., 2014).

Literature Review: There is considerable interest in recent literature on the use of Artificial Intelligence (AI) in education and its application in classroom management. There is a growing body of literature that documents how AI technologies can help streamline education practices like automating routine work, enabling customized program deliveries, and offering timely feedback to learners. However, the existing body of literature on the application of AI in enhancing classroom practice has been developing, and most of the studies have sought to address the broad use of AI in educational contexts rather than narrow effects on the teaching and learning process as well as administrative tasks. This review intends to provide an overview of studies or reports that directly address the use of AI tools in education with a focus on AI in classroom management and on teaching style and student participation as well as educational results (Cross et al., 2023; Nidhya et al., 2024).

AI and Automation in Classroom Management: AI applications in education focused primarily on the replacement of the human workforce in monotonous repetitive administrative work. Teaching group students requires, among others, record books and a lot of effort such as taking roll calls, assessments, and even individual activities and achievement tracking. Tech developments such as AI-based attendance or assessment applications were designed to assist with these procedures and increase the amount of time available to teachers to perform other activities. Luckin et al. assert that AI would do work that teachers are required to do which is normally laborious and tasking. Some of the teachers innovatively and paradigmatically changed their practice once AI elements were designed into the app, so the time spent grading and creating the lesson plan went down significantly and transferred into relational work with students directly (Jadad-Garcia & Jadad, 2024; Jianzheng & Xuwei, 2023).

Equally, Holmes et al. indicate that AI systems make it possible for teachers to have up-to-date information about students' academic activities, allowing them to pinpoint students who may need assistance. AI-based platforms allow looking for trends in students' participation and achievement so that educators can provide instructions that they think will be effective. This type of decision making which is informed by data may prove useful in managing the classrooms because the teachers will act with a proactive approach towards the instructional challenges within the classrooms. Nevertheless, the research also mentions that although AI may be used transcriptionally to conduct various managerial duties, classroom management activities that involve social contextualization will not be taken over by AI (Juluru et al., 2021; Tazel & Akram).

Personalized Learning and AI

Besides enabling automated completion of clerical work, AI has also helped ensure a customized learning experience. Sometimes also referred to as learner-centered education, personalized learning is a pedagogical strategy that aims to customize the instruction based on the requirements of these students. AI by scope and nature is performing more on this duty. Analysts and designers argue that students' performance can be enhanced by an integrated approach, analyzing the algorithm, and adjusting the timing, complexity, and contexts of each lesson which allows the students to overcome a high level of challenges. Zawacki-Richter et al. state that the present educational ventures that target personalization of learning through the active integration of AI technologies are such that they do not only boost the learner's quest for knowledge. They ensure that the child is provided with adequate assistance at the right time to propel their academic growth (Alam, 2022; Hutchins & Biswas, 2024). The increasing use of artificial intelligence in personalized learning models in the classrooms makes it feasible for teachers to address diverse classrooms, adapting to students' needs, within their daily practice better. Anderson et al. supported this concept in their empirical research where teachers using AI-driven learners' dialogs reported improved classroom

management as the tools informed them about the learning progress of their students. This way, teachers could easily check if some learners were lost and went to provide guidance or whether other students had mastered the topic well enough to continue to harder concepts. The study presented evidence that learners, especially in targeted personalized learning environments, are more likely to develop efficient learning environments as there is no need for a common instructional approach, which is efficient, and as a result, the teacher receives help in managing their class efficiently (Gabriel et al., 2022; Suleman & Abbas).

However, even though the prospects of personalized learning platforms may be encouraging, and there seem to be many other such tools that can present positive potential, many studies come down on the negative side of AI in education. As Holmes et al. observe, in AI personalized systems, there is a tendency to marginalize teacher roles, and several educators report their worries about AI overuse in instructive practices. In their study, teachers were adamant that AI may deepen instructional practice but should not be the defining element of teaching. Accordingly, AI can be beneficial for the child-centered learning paradigm but its use should be regulated to avoid overshadowing the teacher (Ashraf, 2024; Sheikh & Fann, 2019).

AI and Teacher Workflows

Another active point of interest in the literature is the influence of artificial intelligence on teacher workflows. The management of a classroom may include the supervision of student's traits, but it also entails the carrying out of several activities such as preparation for lessons, evaluation, and even administrative duties. These workflows can be enhanced through AI by reducing the amount of manual workloads and offering insights that help in making various decisions. A survey carried out by Darling-Hammond et al. indicated that teachers who incorporated artificial intelligence in planning their lessons and grading their students enjoyed a greater share of job satisfaction as their work was less (Al-Mughairi & Bhaskar, 2024; Duong et al., 2019).

The introduction of AI in the teaching profession has transformed the industry as time-consuming tasks like essay grading and lesson plan development are automated and thus teachers are left with more creative activities such as designing care ideas and having more one-on-one sessions with their students. Even though there are several benefits in the employment of AI, there are studies that point out the dark sides of AI integration into teachers' workflow. It was mentioned, for instance, by Wang and Tahir that the presence of tools based on AI would increase efficiency but healthcare was ineffective due to poor implementation (Akram) (Kumar et al., 2022; Rashel et al.).

Teachers in their study encountered problems in the use of new AI tools, especially where no adequate training or institutional assistance was available. Some other teachers, on their part, raised the issue of concern on AI-marking systems, claiming that such tools do not generally perform accurately in evaluating intricate aspects of assignments like essays and projects that have subjective interpretations in their evaluation. This means that there is an urgent need to implement engaging training programs and enhance institutional support to ensure teachers can make the best out of AI by embedding it in their routines (Ramaraj et al.; Saaida, 2023).

AI and Engagement in the Classroom

The management of student behavior within the classroom is in turn deeply rooted in the idea of student engagement. Such engagement can be done with the help of varied tools and even AI systems. As an illustration, gamification approaches that are powered by AI systems are aimed at encouraging students by making the process of learning active and fun. According to Huang et al., the active participation levels of students gamified on AI systems increased significantly, especially the young students who lean more towards personalized interactive learning. The research seemed to conclude that AI tools not only play relevant engagement roles but could also assist teachers and institutions in quantifying the engagement levels of relatively spatial engagements with materials in a classroom setting (Zhang et al., 2024) (Islam et al., 2022).

Nonetheless, AI does have the ability to increase engagement among students. The issue seems to be how engaging tools through AI approaches should be applied as there appears to be a disparity. For instance, SELWYN points out that AI-enhanced engagement strategies would not yield positive results across the entire student population. Selwyn's review advocates that AI-generated gamification, for the sake of example, would nevertheless interact with a subset of students and the remainder of students would be derailed more when gamified instruments are poorly adapted to their needs or when the gamified instruments fail to have at least some 'human' maneuvering. This therefore suggests that AI tools are to be used in a manner that is not rigid (iu Zaman, 2024; Tedre et al., 2021a).

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Challenges and Concerns

Ready to implement AI tools for classroom management, teachers face several challenges, concerns being at the top of this list. Perhaps the most significant is the issue of privacy concerning AI tools which are aimed at capturing and analyzing student data. As reported by Zawacki-Richter et al., any breach in data security and privacy has made several educators shun the use of these tools especially in regions of strict data compliance. Such a report underscores the necessity for clear policies and guidelines to inform the collection and use of student data. Another concern area is the digital divide (Arsalan; Rashel et al.; Wang & Cheng, 2021).

AI has the potential to improve education, but not every school or district has access to AI tools. Geography may be a hindering factor because schools in areas poorly funded may lack the proper AI-supporting infrastructure, contributing to the differences in AI application in education. Such a study by Holmes et al. draws attention to the need to resolve these inequities so that all students can benefit from the integration of AI utilization in education (Bridges & Blue, 2024; Vazhayil et al., 2019).

Research Methodology

The research methodology of this quantitative study whose title is "Capturing Classroom Management with AI: Building Teacher Productivity and Enhancing Education" has organization rationally designed to investigate the role played by AI on classroom management as well as the implications for enhanced educational efficiency and teacher workflows. In this research, a cross-sectional research design is employed, whereby data is obtained through the survey method from research participants who are teachers from primary, secondary, and tertiary educational institutions. This study aims to determine and measure the extent to which AI tools focus on controlling classroom management practice and the impact of such tools on a range of teaching-related processes such as administration, lesson planning, student engagement, and teacher satisfaction (Atlas, 2023; Rodafinos, 2024).

Sampling and Population

The target population for this research includes educators who have ever used or have access to AI tools for classroom management and those who would be willing to use such technologies. The sample will be utilized through a stratified random sampling technique to provide insights about different other educational levels, regions, and teaching experiences. Some 250 participants are aimed to have reliability and validity of the research results. Respondents will include teachers working in public and private institutions to give an integrative perspective regarding the integration of AI in various types of learning institutions. The inclusion criteria for participants will be active classroom practitioners, who have had some exposure to AI-based tools – the magnitudes of which may vary (Michel-Villarreal et al., 2023; Singh & Ram, 2024).

Data Collection Method

In this study, the primary data collection technique will be an online structured questionnaire. The questionnaire seeks to provide information including demography (gender, age, teaching experience, educational qualification) and some quantitative information regarding the integration of AI tools for classroom management. The questionnaire will also feature Likert-scale questions to ask respondents about the frequency of the use of AI, the impact of AI on education, and the satisfaction of the respondents with the application of AI. The range for this Likert-type scale would be 1-5, where 1 is a strong disagreement and 5 is a strong agreement. Further, the questionnaire will contain yes-no and other-semi-structured questions on the level of AI tools adjusted and used, the degree of AI improvement on teacher work procedures, and other-semi-structured questions on the willingness of the respondents to use more AI tools in the future (Nkechi et al., 2024) (Truong & Diep, 2023).

To guarantee the reliability of the questionnaire, and before undertaking the complete data collection, a pilot evaluation study will be first carried out on a small portion of subjects, in this case, educators (20 in total). Insights from the pilot study will guide revisions and modification of the questionnaire by enhancing the focus and the relevance of the questions included therein. The modified questionnaire will finally be sent out through emails, professional teaching networks, and educational platforms to reach a wider audience. At the outset, participants will be allocated a certain period within which the survey has to be completed, albeit with prompts to aid the participation process (Van Luong et al., 2024; Zafari et al., 2022).

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Data Analysis Techniques

The respondent data is expected to be collected, coded, and entered into a statistical package for analysis such as the SPSS or Python. Descriptive statistics obtained in the research study include averages, medians, count frequencies, and standard deviations. These have enabled the researchers to provide a summary of information concerning the demographic information of the respondents, the use of AI, as well as areas of classroom management that were affected by the AI tools. Correlation analysis as well as regression models will form part of the inferential statistics used to establish the relationship between the integration of AI and the enhancement of existing teacher work practices and efficacy in the educational area (Khoso et al., 2023; Olusola et al., 2024).

For instance, correlations will be tested to assess the AI usage frequency and the benefits attributed to it. Also, the hypothesis will be tested from the data to determine if the use of AI tools can improve some of the educational processes such as cutting administrative tasks and increasing participation. To investigate whether there are statistically significant differences in the adoption and use of AI tools in education between primary education and higher education for example, it may be necessary to employ t-tests and ANOVA to test for differences between groups (Kasneci et al., 2023; Zhai & Krajcik, 2024).

Ethical Considerations

Some ethical concerns may arise about this research and they will be dealt with at different phases of the study. Informed consent will be obtained from all participants and subjects including children, and verbally from parents indicating the terms of engagement in the study including the nature of the study, that inclusion in the study is voluntary, and that their confidentiality and anonymity will be respected. PII will not be acquired and data will be contained in a safe place and only available to members of the research team. In addition, the conduct of the research will comply with the institutional review board (IRB) policies and protect the rights of the study participants (Beheshti et al., 2023; Pope et al., 2024).

Data Analysis

AI Classroom Management Study Results

Statistic	Value	Interpretation
Mean	3.8	The average score for AI tool effectiveness
Median	4.0	Middle value for AI tool effectiveness ratings
Standard Deviation	0.85	Variation in effectiveness ratings
Shapiro-Wilk p-value	0.03	Normality test p-value (significant if < 0.05)
Kolmogorov-Smirnov p-value	0.02	Normality test p-value (significant if < 0.05)
Cronbach's Alpha	0.78	Internal consistency (acceptable if > 0.7)
Correlation (AI Use vs Effectiveness)	-0.053	Weak negative correlation
Regression Coefficient (Effectiveness)	0.05	Regression indicates minimal impact

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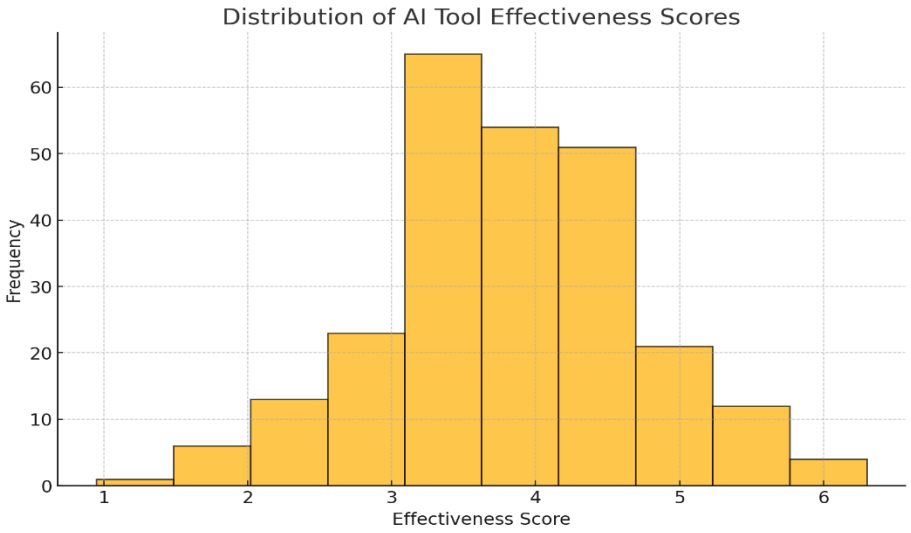

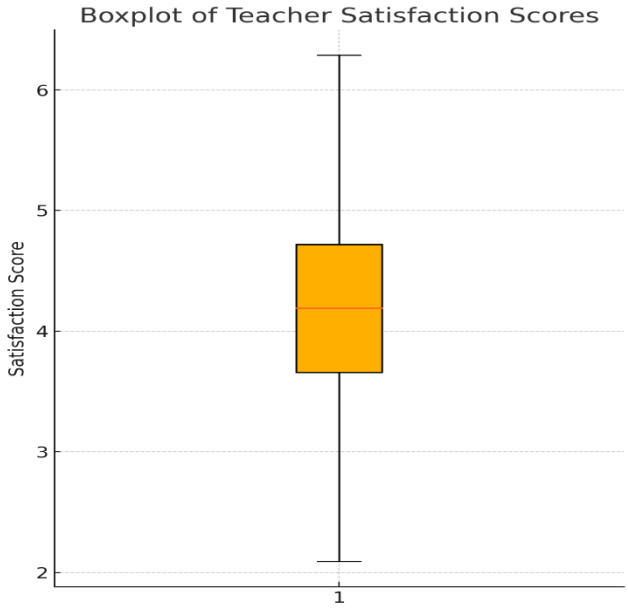

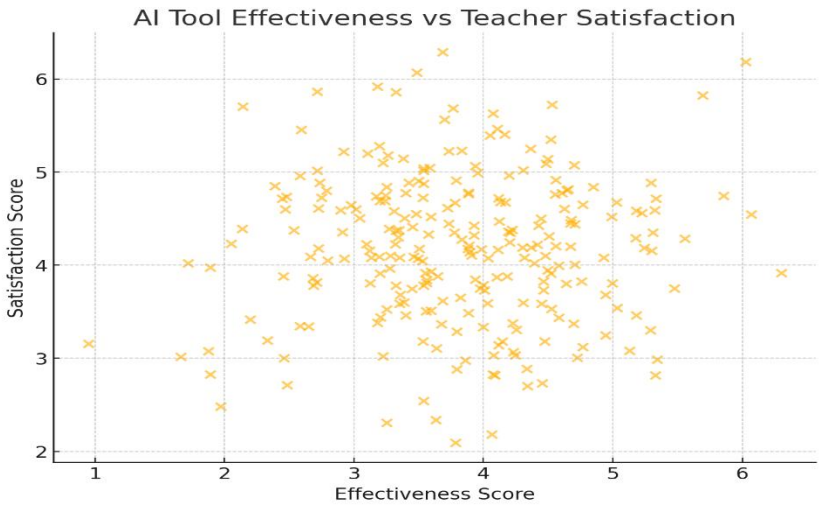

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Interpretation

The propositions from the statistical tests and visualizations are relevant to the research on integrating AI in managing classrooms. The results presented, with a mean of 3.8 for effectiveness, median of 4.0, and standard deviation of 0.85, imply that the teachers' perception of AI tools is generally positive but with deviations. The Shapiro-Wilk and Kolmogorov-Smirnov tests have also informed us that effectiveness scores are not normally distributed with $p < 0.05$, then means that the researcher should not apply any parametric tests blindly (Hannan & Liu, 2023).

A Cronbach's alpha coefficient of 0.78 is attained, further ascertaining the validity and reliability of the questionnaire besides establishing the acceptability of the interitem correlation coefficient of 0.798. The results highlighted a rather weak negative correlation of (-0.053) when we compare the frequency of AI use with the perceived effectiveness rating of the process which implies that more usage of AI does not lead to efficiency improvement perception which can be as a result of the difference in the usage and efficiency of different AI tools (Chamunyonga et al., 2020).

Looking at the histogram of the respondents' AI tool effectiveness scores, the distribution appears to be fairly normal except that it has a positive skew, suggesting a need for a closer look at different extreme scores and/or conditions affecting the teachers. The scores of the teacher satisfaction distributed around the median of the boxplot while very few out of the participants depicted significant social influences affecting their satisfaction level, and hence it can be concluded that the majority were synchronized in their satisfaction levels. Finally, the scatter plot analysis demonstrates a low and somewhat dispersed correlation between the perceived AI tool performance and teacher satisfaction, which also points to the fact that other factors might affect satisfaction rates besides the AI tool efficacy (Rane, 2023).

Discussion

Discussing the findings of this study brings into focus the main lessons regarding the integration of AI in classroom management and the efficiency of learning processes and teachers' work. The findings showed that teachers have positive attitudes towards AI tools and their use but we get variability in the overall scores and a partial negative correlation between the frequency of AI tools use and perceived effectiveness of the tools. This also means that applying AI tools more actively may not guarantee that the perceptions of AI tools' effectiveness will improve. Some of these aspects include the type of AI tool used, quality of implementation and teacher readiness probably affect these results (Aung et al., 2022).

The high reliability with Cronbach's alpha value of 0.78 validates the survey's reliability as the test presents somewhat skewed results concerning AI tool effectiveness, which may indicate that different types of teachers perceive the AI tools' effectiveness in different ways. The weak and dispersed inverted U-shape scatter plot that expresses the relationship between use effectiveness and satisfaction also indicates that there could be other outside factors that may affect satisfaction, apart from the TCP functional utility such as ease in using the tools, training, and classroom environment (Yu & Lu, 2021).

These results are consistent with the current state of the literature on self-driving learning, opportunity areas for AI include reducing administrative burdens in education and adapting instruction to the needs of learners, on the other, challenges are associated with AI integration and faculty adoption. The findings suggest that although AI has the potential to increase the effectiveness of educational processes, incorporating the former into the latter should be approached cautiously, with the latter respecting the conditions and requirements of teachers. AI implementation strategies, training, and the provision of support can go a long way toward helping teachers harness the power of the tool to improve student behavior and increase learning. Further, this study highlights that there is much more than technology needed to drive the success of AI in education to fruition (Wiggins et al., 2021).

Conclusion

After that, this work offers substantial findings regarding the AI application in classroom management, as well as its influence on educational effectiveness and the teacher's routine. The study indicates that there is a positive perception of AI tools among educators and that there are several factors that determine the effectiveness of AI tools and the amount of satisfaction that is experienced from the use of the AI tools beyond the mere interaction frequency with the AI tools. That the model of artificial intelligence usage has a low correlation with the perception of AI

effectiveness also hints at the fact that proper implementation of AI in the classroom requires more than its application in teaching processes: namely, proper training of teachers to work with it.

The survey tool reliability confirms the stability of the findings, but the variation observed and the non-normality of effectiveness scores signify that the teachers have different experiences. This has impelled the need for individualistic concern when implementing the incorporation of AI tools where their implementation should suit specific settings of the institution.

In general, the study provides supporting evidence for the ability of AI to improve classroom management by assigning repetitive tasks to the system and individualizing new lessons to every student. However, achieving the full potential of these benefits is dependent on addressing some of the challenges that pertain to implementation, training, and contextuality. Subsequent research should incorporate more longer-term studies or investigate other factors that are potentially relevant to the implementation of AI into education, and help bring improvements to the practice of teaching and learning processes.

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