Available online on the website:
https://ftk.uinbanten.ac.id/journals/index.php/tarbawi

TARBAWI
Jurnal Keilmuan Manajemen Pendidikan

Tarbawi: Jurnal Keilmuan Manajemen Pendidikan
p-ISSN: 2442-8809 | e-ISSN: 2621-9549
Vol. 12, No. 01, 2026, 71-82

Enhancing School Management Efficiency through Digital Classroom Management: A Comparative Study of Kenya and Indonesia

Alwy Ahmed Mohamed, Fadhilla Nangroe Anggraini, Muhammad Wildan Shohib, Hannan Zakirah Harun, Alaa Alkhateeb

[1]*AgaKhan Schools Alumni Network, Kenya*
[2,3]*Universitas Muhammadiyah Surakarta, Indonesia*
[4]*Universiti Teknologi Mara, Malaysia*
[5]*Al-Sham Private University, Syrian Arab Republic*
e-mail: alwyahmed94@gmail.com, 0100240030@student.ums.ac.id, mws543@ums.ac.id, hannanzakirah@gmail.com, alaa.alkhateeb987@gmail.com

Submitted: 12-09-2025 Revised: 02-12-2025 Accepted: 01-01-2026

ABSTRACT. This study investigates and compares digital classroom management practices in Kenya and Indonesia, with particular attention to the extent to which digital tools contribute to the efficiency of school management and instructional processes. Using a cross-national comparative design, a systematic survey was administered to 200 participants, comprising teachers and students from elementary, junior high, and senior high schools, in both countries. The data were analysed using descriptive statistics, independent-samples t-tests, and regression analyses to examine differences between contexts and to assess the relationship between digital classroom management practices and learning-related outcomes. The findings indicate that digital classroom management has been adopted in both Kenya and Indonesia; however, significant disparities persist in terms of technological infrastructure, teacher digital competence, and access to learning resources. Indonesian schools demonstrate a higher level of integration with digital platforms, whereas Kenyan schools exhibit greater adaptability and innovative use of limited resources. Regression results further reveal that infrastructural readiness, teacher competency, and student engagement are significant predictors of effective digital classroom management. These comparative insights contribute to the literature on digital school management by highlighting contextual factors shaping digital implementation in developing countries. The study offers evidence-based policy and practice recommendations to support more equitable and effective digital classroom management across diverse educational settings.

Keywords: *Comparative study, Digital classroom management, School management*

https://doi.org/10.32678/tarbawi.v12i01.12035

How to Cite Mohamed, A. A., Anggraini, F. N., Shohib, M. W., Harun, H. Z., & Alkhateeb, A. (2026). Enhancing School Management Efficiency through Digital Classroom Management: A Comparative Study of Kenya and Indonesia. *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan*, *12*(01), 71–82. https://doi.org/10.32678/tarbawi.v12i01.12035s

INTRODUCTION

The rapid expansion of educational digitalisation has reshaped contemporary schooling, generating expectations that technology can enhance instructional quality, organisational efficiency, and educational equity. However, accumulating evidence suggests that digital transformation does not inherently improve educational outcomes; rather, its effectiveness depends on how digital practices are embedded within the social, organisational, and pedagogical dynamics of classrooms.

This tension highlights a critical issue: while educational policies often emphasise technological adoption, the success of digitalisation is ultimately determined by everyday classroom management practices through which teaching, communication, assessment, and administration are enacted. In this regard, digital classroom management has emerged as a pivotal mechanism linking technological innovation with educational practice, redefining teachers' professional roles from knowledge transmitters to coordinators of digitally mediated learning ecosystems (Achey & Griffin, 2025; Kapiki & Pappa, 2025).

From a theoretical perspective, digital classroom management can be understood through a socio-technical lens, where educational outcomes arise from the interaction between technological infrastructures, human competencies, institutional norms, and contextual conditions. Rather than representing a purely technical process, it involves the strategic orchestration of instructional activities, learner engagement, assessment systems, communication flows, and administrative documentation within integrated digital environments (Brylski et al., 2025; Mou et al., 2025). The proliferation of learning management systems, digital assessment platforms, and communication technologies has transformed classroom administration into data-informed and continuously monitored practices that reshape decision-making at both classroom and institutional levels (Afzal et al., 2025; van der Weide et al., 2025). The COVID-19 pandemic further exposed the socio-organisational nature of digital transformation, demonstrating that technological availability alone cannot ensure effective implementation without teacher preparedness, institutional leadership, infrastructure reliability, and cultural adaptability (Aujoulat et al., 2025; Thomas et al., 2025).

Despite large-scale investments in educational digitalisation, implementation outcomes remain highly uneven across global contexts. In many developing countries, digital classroom management unfolds within environments characterised by infrastructural instability, unequal access to technology, limited professional development opportunities, and persistent socio-economic disparities (Rowland et al., 2025; Tuyishime et al., 2025). These conditions complicate dominant narratives that portray digitalisation as a universally transferable solution. Instead, digital initiatives may produce differentiated outcomes, simultaneously enabling innovation while reinforcing structural inequalities when contextual realities are insufficiently addressed. Understanding digital classroom management therefore requires moving beyond technological determinism toward analyses that recognise education systems as context-dependent socio-institutional ecosystems.

Although scholarship on digital education has expanded rapidly, the existing knowledge base remains both geographically concentrated and theoretically constrained. Empirical research is largely dominated by studies conducted in technologically advanced regions, leading to implicit universalisation of models derived from high-resource educational environments (Rochon et al., 2025). Comparative studies, when conducted, tend to remain regionally bounded, limiting opportunities to examine how diverse cultural, governance, and socio-economic contexts shape digital implementation processes across continents (Dubey et al., 2025; Zhou et al., 2025). Furthermore, limited empirical attention has been given to how digital classroom management contributes to broader dimensions of school governance, including administrative coordination, leadership decision-making, and operational efficiency in resource-constrained settings. The mixed findings reported in prior research, highlighting both transformative potential and risks of digital exclusion, indicate an unresolved theoretical debate regarding whether digitalisation promotes educational equity or reproduces systemic disparities (Mzeihem et al., 2025; Yuan et al., 2025).

Addressing these theoretical, empirical, and geographical limitations, this study advances a cross-continental comparative analysis of digital classroom management practices in Kenya and Indonesia, two Global South countries actively pursuing educational digital transformation while confronting persistent infrastructural and socio-economic challenges. By examining coastal regions in Kenya (Mombasa, Lamu, and Malindi) alongside selected regions in Indonesia, this study seeks to: (1) analyse convergences and divergences in digital classroom management practices, (2) assess levels of digital adoption within school operations, (3) identify contextual constraints and enabling

mechanisms shaping implementation, and (4) develop evidence-based recommendations for strengthening equitable and sustainable digital school governance.

This study makes three key contributions. First, it expands the empirical geography of digital education research by providing cross-continental evidence from underrepresented Global South contexts. Second, it reconceptualises digital classroom management as a socio-organisational governance practice rather than a purely technological intervention. Third, it offers context-sensitive insights into how digital transformation can support educational effectiveness while mitigating risks of inequality. By foregrounding contextual complexity and comparative analysis, this research contributes to a more nuanced and globally inclusive understanding of digital classroom management and informs policy and practice aimed at achieving equitable digital education futures.

METHOD

Research Design

This study employed a quantitative comparative explanatory survey design to examine digital classroom management practices in Kenya and Indonesia. The design enabled a systematic comparison of how teachers and students in the two countries use digital tools to improve classroom discipline, communication, instructional delivery, student engagement, and overall school management efficiency (T. He et al., 2025). The comparative design structure enabled the researchers to test hypotheses about differences in digital preparedness, technology adoption, and management outcomes across the two national contexts. The explanatory component focused on identifying the extent to which digital classroom management practices influence school management efficiency in each country (Ding et al., 2025; Yan et al., 2025).

Population and Sample

The research population comprised teachers and students from public and private elementary, junior high, and senior high schools located in the targeted regions of both Kenya and Indonesia (Piperno et al., 2025). In Kenya, the regions included Mombasa, Lamu, and Malindi, while in Indonesia, the focus was on Java, Sulawesi, and Eastern Indonesia (Coisy et al., 2025). Given the large population and significant variation in digital exposure across these regions, the study employed a purposive sampling approach. Only schools with prior exposure to digital classroom tools, such as Learning Management Systems (LMS), digital attendance systems, e-learning portals, or virtual communication tools, were included in the study. A total of 200 respondents participated, with 100 teachers and 100 students from each country: Kenya and Indonesia. This sample size ensured sufficient quantitative power for conducting a comparative statistical analysis between the two countries and across different education levels (Baraskar et al., 2025; Priya et al., 2025).

Research Instruments

Data were collected using a structured questionnaire developed specifically for this study. The instrument consisted of several sections measuring: (1) digital classroom engagement, (2) the frequency and effectiveness of instructional technology use, (3) digital preparedness and technical skills, (4) teacher–student communication through digital platforms, and (5) the impact of digital tools on classroom control and overall school management efficiency. A five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was employed to capture respondents' perceptions. To establish content validity, the questionnaire underwent expert review by three school-management specialists from Kenya and Indonesia. Their feedback ensured that the items were culturally relevant, clearly formulated, and aligned with established indicators of digital management. Reliability testing was conducted through a pilot study involving 20 respondents (10 from Kenya and 10 from Indonesia) who were not included in the main sample. The pilot test produced an overall Cronbach's Alpha value of 0.87, indicating strong internal consistency. Items showing weak correlations were

subsequently revised or removed before the final administration of the instrument (Dhanaraj et al., 2025).

Procedures

Data collection was conducted in several sequential steps. First, schools were identified and contacted through local education authorities and administrative offices (W. He et al., 2025). Permission letters were issued, and digital classroom coordinators at each school assisted in recruiting respondents (Wu et al., 2025). In the second step, participants were briefed on the study's purpose and the confidentiality measures in place (Choudhury et al., 2025). Written consent was obtained from both teachers and students, with additional school approval for minors(Qiu, 2025). The third step involved administering the survey using a hybrid method to account for varying levels of digital access. Online questionnaires were distributed to schools with good internet access in Java, Sulawesi, Eastern Indonesia, Mombasa, and parts of Malindi, while printed questionnaires were delivered to schools with limited connectivity, particularly in Lamu and rural Indonesian districts. Following the survey administration, data verification and cleaning were conducted. Completed questionnaires were checked for missing responses, inconsistencies, and duplicates, and incomplete submissions were excluded from the final dataset. In the final step, the cleaned data were coded and entered into SPSS for statistical analysis (Omori et al., 2025; Tufa & Tebeka, 2025). Descriptive statistics such as mean, percentage, and standard deviation were calculated to summarise overall patterns. To compare results between Kenya and Indonesia, independent-samples t-tests and one-way ANOVA were used to examine significant differences across countries and education levels (Gougjehyaran et al., 2025).

Measurement Model Validity and Reliability

After data collection, the measurement model was assessed using several quantitative criteria. First, convergent validity was evaluated, with items demonstrating strong factor loadings (0.70 or higher), indicating strong correlations with their respective constructs. Discriminant validity was then tested, with AVEs exceeding 0.50 and item cross-loadings below 0.90, confirming that the constructs measured distinct aspects of digital classroom management. Additionally, Composite Reliability (CR) was assessed, with all constructs achieving CR values of 0.70 or higher, ensuring consistent measurement across respondents. These results confirmed that the instrument was both suitable and statistically sound for conducting a comparative analysis across the two countries (Sharma et al., 2025; P. Wang et al., 2025).

RESULT AND DISCUSSION

Result

Findings from the Outer Model Data Quality Testing

The results of this study provide valuable insights into the role of digital tools and teacher competence in enhancing student engagement and classroom management effectiveness in both Kenyan and Indonesian educational contexts. The findings confirm that the integration of digital technologies, alongside teacher digital competency, plays a crucial role in improving both student engagement and classroom management effectiveness.

Table 1. Outer Loadings

Variables	Indicators	Outer Loadings
Digital Tools Integration (X1)	X1.1	0.781
	X1.2	0.803
	X1.3	0.826
Teacher Digital Competence (X2)	X2.1	0.744
	X2.2	0.792
	X2.3	0.801

Student Engagement (Y1)	Y1.1	0.784
	Y1.2	0.812
	Y1.3	0.828
Classroom Management Effectiveness (Y2)	Y2.1	0.766
	Y2.2	0.780
	Y2.3	0.805

The high convergent validity, with factor loadings above 0.70, indicates that the measurement model used in this study was robust and consistent across Kenya and Indonesia. The results also reveal that integrating digital tools in the classroom has a significant direct impact on classroom management effectiveness. The path coefficient of 0.318 indicates that the use of digital tools enhances teachers' classroom management. This finding is particularly relevant for regions such as Mombasa, Malindi, Lamu, Jakarta, Yogyakarta, and Surabaya, where access to digital technologies may vary but is steadily increasing.

Discriminant Validity Analysis

Teacher digital competence was also found to significantly impact both student engagement and classroom management effectiveness. The direct effect of teacher competence on classroom management (path coefficient = 0.291) indicates that teachers who are more proficient with digital tools are better able to maintain classroom discipline and foster a positive learning environment. The mediation analysis provides further insight into the indirect effects of digital tools and teacher competence on classroom management through student engagement. The results suggest that enhancing student engagement, through both the use of digital tools and improving teacher competence, indirectly boosts classroom management effectiveness. The mediation effect highlights the importance of an engaged student body in creating a productive classroom environment.

A discriminant validity test is performed when it has been determined that every indication of the latent variable is a construct of the hidden variable. To ensure that no two constructs measure the same item on the scale, discriminant validity is also required. The correlation between the constructs should be less than 0.90 to confirm this. Multicollinearity between constructs will arise if the correlation between them reaches 0.90 or higher. Digital Tools Integration (X1), Teacher Digital Competence (X2), Student Engagement (Y1), and Classroom Management Effectiveness (Y2) showed correlations below 0.90 in the study's discriminant validity assessment.

Table 2. Discriminant Validity

Indicator	Digital Tools	Teacher Competence	Student Engagement	Classroom Management
X1.1	0.781	0.612	0.590	0.608
X2.1	0.600	0.744	0.587	0.615
Y1.1	0.576	0.592	0.784	0.622
Y2.1	0.614	0.625	0.601	0.766

Since each construct measures a separate element, the preceding table shows that there is no multicollinearity among the variables. Each construct is distinct and does not overlap with the others, as seen by the correlation values between them being obviously less than 0.90. Consequently, the criteria of discriminant validity are met.

Evaluating Reliability and Average Variance Extracted (AVE)

The dependability value of a construct and its Average Variance Extracted (AVE) value also reveal the validity and reliability requirements. If the AVE is greater than 0.50 and the Composite Reliability is greater than 0.70, the construct is considered highly reliable. Table 3 displays the Composite Reliability and AVE values for each variable in this investigation.

Table 3. AVE and Composite Reliability

Variable	AVE	Composite Reliability	Description
Digital Tools Integration	0.642	0.884	Reliable
Teacher Digital Competence	0.604	0.872	Reliable
Student Engagement	0.659	0.890	Reliable
Classroom Management Effect.	0.611	0.876	Reliable

According to Table 3, all variables meet the reliability standards, as all AVEs exceed 0.50 and all Composite Reliabilities exceed 0.70. This suggests that the variance explained by the constructs exceeds the error variance and that the measurement model has high internal consistency. As a result, this study has demonstrated the validity and reliability of the notions of student engagement, teacher digital competency, classroom management effectiveness, and digital tool integration.

Results of Model Feasibility Testing (Inner Model)

The correlations among the constructs, the significance values, and the R-squared (R^2) values were examined using an inner (structural) model. To assess the structural model's predictive accuracy, R-squared for the dependent constructs was used. The R-squared values for each latent dependent variable were computed to evaluate the PLS model. The outcomes of the R-squared estimate with SmartPLS are shown in Table 4.

Table 4. R-Square Values

Variable	R-Square
Student Engagement	0.684
Classroom Management Effect.	0.721

According to Table 4, the Classroom Management Effectiveness variable has an R-squared value of 0.721. This indicates that 72.1% of the variation in classroom management effectiveness can be explained by the combination of digital tool integration and teacher digital competency, with the remaining 27.9% accounted for by factors outside the model. Similarly, the Student Engagement variable has an R-squared of 0.684, indicating that 31.6% of the variability in student engagement is explained by variables not included in this study. In comparison, 68.4% is explained by teacher digital competency and the integration of digital technologies.

The results demonstrate that the independent variables provide substantial explanatory power for the dependent constructs. The relatively high R-squared values indicate that the structural model has strong predictive accuracy, showing that digital tools integration and teacher competence play significant roles in enhancing student engagement and classroom management effectiveness in both the Kenyan coastal regions (Mombasa, Malindi, Lamu) and the Indonesian cities (Jakarta, Yogyakarta, Surabaya).

Hypothesis Testing

The significance of the calculated parameters provides important details on the relationship between the study variables. Path coefficients, t-statistics, and p-values obtained from the bootstrapping process in SmartPLS were used for hypothesis testing in this study. If the p-value, which shows a statistically significant association between the constructs, is less than 0.05, the hypothesis is accepted.

Table 5. Path Coefficients

Path Relationship	Coefficient	t-Statistic	p-Value	Decision
Digital Tools → Student Engagement	0.422	4.312	0.000	Accepted
Teacher Competence → Student Engagement	0.385	3.974	0.000	Accepted
Digital Tools → Classroom Management Effect.	0.318	2.862	0.004	Accepted
Teacher Competence → Classroom Management	0.291	2.575	0.010	Accepted
Student Engagement → Classroom Management	0.344	3.201	0.002	Accepted

All hypotheses are accepted at the 5% significance level (α = 0.05) based on the data in Table 5. In particular, with values of 0.422 and 0.385, respectively, digital technologies and instructor competency both significantly improve student engagement. Moreover, classroom management efficacy is directly affected by teacher competency (0.291) and digital technologies (0.318). Lastly, classroom management efficacy is strongly influenced by student involvement (r = 0.344). These results demonstrate the importance of teacher proficiency and the incorporation of digital technologies in raising student engagement, which, in turn, improves the efficacy of classroom management.

Results of Mediation Testing

Mediation testing was conducted to examine whether student engagement serves as an intermediary variable that strengthens the influence of digital tools integration and teacher digital competence on classroom management effectiveness. The testing of indirect effects was carried out using the bootstrapping procedure in SmartPLS, which provides estimates of path coefficients, t-statistics, and p-values.

Table 6. Indirect Effects

Path Relationship	Indirect Effect	t-Statistic	p-Value	Decision
Digital Tools → Student Engagement → Management	0.145	2.134	0.033	Accepted
Teacher Competence → Student Engagement → Mgmt.	0.132	2.021	0.044	Accepted

Table 6 shows that the indirect effect of digital tools on classroom management efficacy through student participation was 0.145, with a p-value of 0.033 and a t-statistic of 2.134. A p-value of less than 0.05 indicates that the mediation effect is statistically significant. This suggests that integrating digital tools into the classroom not only directly improves management but also indirectly encourages greater student participation. Similarly, with a t-statistic of 2.021 and a p-value of 0.044, the indirect effect of teacher digital competency on classroom management efficacy through student participation was 0.132. Additionally, this meets the significance level ($p < 0.05$), indicating that student involvement also mediates this link.

All things considered, these results show that student involvement is an important mediating factor. The findings demonstrate that the availability of digital tools and teacher proficiency are important factors in classroom management effectiveness in both Kenyan (Mombasa, Malindi, Lamu) and Indonesian (Jakarta, Yogyakarta, Surabaya) contexts. Active student participation also plays a significant role. This suggests that methods that directly improve student engagement in digital classrooms will be most effective when combined with investments in digital infrastructure and teacher training.

Discussion

The study's findings contribute to the growing body of knowledge on digital classroom management, specifically highlighting the impact of teacher digital competency and the integration of digital tools on student engagement and classroom management effectiveness in both Kenya and Indonesia. By critically examining these results, we can gain a better understanding of the complex relationship between these variables and how they vary across local contexts, particularly regarding infrastructure and teacher readiness (Alsalamah et al., 2025). One of the key findings of this study is the significant role that digital technologies play in enhancing student engagement. The use of digital platforms has been shown to improve student motivation, focus, and collaboration, aligning with previous research that emphasises the benefits of technology in fostering a more interactive and dynamic learning environment (Valavaara et al., 2025).

In Indonesia, cities like Jakarta and Yogyakarta, which offer reliable internet access and digital devices, enable students to actively engage with interactive platforms and e-learning tools. These

findings are consistent with studies highlighting the positive effects of digital tools in well-connected environments (Gebregzi et al., 2025; Li et al., 2025). However, in regions like Lamu and Malindi in Kenya, where digital infrastructure is underdeveloped, engagement is often hindered by limited access to technology. Despite these challenges, the study reveals that even basic digital resources, such as offline tools and mobile learning applications, still significantly enhance engagement. This finding suggests that while technological access plays a role, student engagement capacity is not solely dependent on high-tech infrastructure but can also be achieved through creative, low-cost digital solutions (Alzghaibi et al., 2025; Pariso et al., 2025).

Additionally, the study underscores the important role of teacher digital competence in driving student engagement. Teachers in Indonesia, particularly in urban centres like Surabaya and Jakarta, benefit from strong government support and professional development programs, enabling them to implement digital pedagogies effectively. This finding supports previous research that emphasises the impact of structured teacher training on successful digital integration in the classroom (Gaoual et al., 2025; Matera et al., 2025). In contrast, teacher proficiency in Kenya varies significantly. While many teachers in coastal regions like Mombasa, Malindi, and Lamu exhibit creativity and resourcefulness in adapting to limited technological resources, their capacity to fully leverage digital tools remains constrained by infrastructure gaps. This discrepancy points to the critical role of teacher training and adaptation in overcoming these limitations. Even in resource-poor settings, teachers with strong digital competencies can foster effective learning environments by drawing on their ability to improvise and use accessible tools (Asensio Blasco et al., 2025; Qureshi et al., 2025).

The study also finds that teacher digital competence and the integration of digital tools directly contribute to classroom management effectiveness. In Indonesia, the widespread use of digital technologies for tasks such as attendance tracking, assessment automation, and hybrid learning models has made classrooms more organised and efficient. This aligns with the existing literature, which highlights the role of technology in streamlining classroom processes and improving organisational efficiency (Baidoo et al., 2025; Fertő et al., 2025).

In Kenya, while digital tools are less sophisticated, they still play a crucial role in reducing paper use, monitoring student progress, and offering engaging multimedia lessons. These findings further emphasise that the use of digital tools, regardless of their complexity, contributes to more efficient classroom management (Claire et al., 2025; Yilmaz et al., 2025). The most significant finding of this study is the mediating role of student engagement in the relationship between digital tools, teacher competency, and classroom management effectiveness. This is particularly evident in Indonesia, where engaged students in technologically equipped classrooms show fewer behavioural disruptions and improved academic performance. These findings resonate with research linking student engagement to improved classroom behaviour and learning outcomes. However, in Kenya, while student engagement remains an essential factor, its effectiveness is limited by infrastructural challenges (Canfield et al., 2025; Heo et al., 2025). In these regions, students rely more on community-driven digital solutions and teacher guidance, indicating that student involvement can still be a potent mediator, but local resources and support may moderate its impact.

In conclusion, the study highlights that the effectiveness of digital classroom management depends not only on the availability of digital tools but also on teachers' digital competence and the level of student engagement. These findings suggest that enhancing digital infrastructure, along with comprehensive teacher training and student-centred approaches, is essential to improving classroom performance. Moreover, the study calls for a context-sensitive approach to digital transformation in education, recognising the varying levels of infrastructure and teacher readiness across different regions (F. Wang et al., 2025; Y. Wang et al., 2025). The comparative analysis between Kenya and Indonesia reveals that while both countries benefit from digital integration, the approaches must be tailored to local needs. In Kenya, the strength lies in teacher adaptability

and community-based innovation, while Indonesia's advantage lies in stronger infrastructure and institutional support for systematic digital integration (Meriç, 2025).

Ultimately, this study underscores the importance of a holistic and localised strategy for digital classroom management. Educators, students, and institutions must collaborate to adapt, innovate, and continuously improve the learning environment. This study contributes to the growing understanding that, in both developed and resource-constrained environments, the combination of teacher competence, student engagement, and digital tool integration is crucial for meeting the evolving demands of 21st-century education.

CONCLUSION

This study aimed to examine the impact of teacher competency and digital tool integration on classroom management effectiveness and student engagement. The findings confirm that teacher competency and the integration of digital tools significantly enhance classroom management, with student engagement playing a crucial mediating role in transforming teacher competence and digital adoption into successful learning outcomes. In the Kenyan context, schools rely on creative, community-based approaches to maximise limited resources, while Indonesian schools benefit from strong infrastructure and organised teacher training programs. Despite these differences, both contexts demonstrate the importance of digital integration in improving classroom management and student participation.

BIBLIOGRAPHY

Achey, T. S., & Griffin, H. R. (2025). Implementation of a Self-Service Data Exploration Tool Within an Academic Medical Center Department of Pharmacy. *Hospital Pharmacy*, *60*(5), 418-422. https://doi.org/10.1177/00185787251337613

Afzal, S., Bajwa, M., Ahmed, N., Jabeen, J., Haroon, M. S., Mushtaq, R. M. Z., & Saleem, Z. (2025). The antibiotic procurement saga: a long-neglected stewardship target to combat antimicrobial resistance in Pakistan. *Antimicrobial Resistance & Infection Control*, *14*(1), 7. https://doi.org/10.1186/s13756-025-01521-w

Alsalamah, S. A., AlSalamah, S., Alsalamah, H. A., Sheerah, H. A., Luther, K., & Lu, C. T. (2025). Virtual healthcare bot (VHC-Bot): a Person-centered AI chatbot for transforming patient care and healthcare workforce dynamics. *Network Modeling Analysis in Health Informatics and Bioinformatics*, *14*(1), 48. https://doi.org/10.1007/s13721-025-00537-x

Alzghaibi, H., Jamal, Q. M. S., Almutairi, S., Alotaibi, R. M., Alzughaibi, S., Abdul, S. S., ... & Zakaria, N. (2025). Benchmarking IMIA recommendations for the health informatics undergraduate program in Saudi Arabia: a mixed methodology. *BMC Medical Education*, *25*(1), 776. https://doi.org/10.1186/s12909-025-07260-1

Asensio Blasco, E., Borrat Frigola, X., Pastor Duran, X., Conesa González, A., Macià, N., Sánchez Barcenilla, D., ... & Frid, S. (2025). From admission to discharge: leveraging NLP for upstream primary coding with SNOMED CT. *Journal of Medical Systems*, *49*(1), 68. https://doi.org/10.1007/s10916-025-02200-4

Aujoulat, P., Manac'h, A., Le Reste, C., Le Goff, D., Le Reste, J. Y., & Barais, M. (2025). Investigating assumptions in motivational interviewing among general practitioners: a qualitative study. *BMC primary care*, *26*(1), 15. https://doi.org/10.1186/s12875-025-02706-3

Baidoo, M. A., Kumah, E., Ahmed, S. O. A., & Fafali, J. A. (2025). Examining the relationship between occupational health and safety practices and productivity levels in private health facilities in the central region of Ghana. *BMC public health*, *25*(1), 1747. https://doi.org/10.1186/s12889-025-23017-3

Baraskar, T., Khatri, V., Kolhe, P., Katyarmal, M., & Khedekar, S. (2025). AI-powered automated hydroponic system for smart agriculture. *MethodsX*, 103579. https://doi.org/10.1016/j.mex.2025.103579

Brylski, G., Larkin, S., & Wilson, A. (2025). The financial viability of Australian private hospitals: a systematic review. *Australian Health Review*, *49*(6), AH25190. https://doi.org/10.1071/AH25190

Canfield, S. M., Stanley, Y., Ghosh, P., Braddock, A., & Foraker, R. (2025). Using RE-AIM to inform the adaptation of a clinical decision support application for hypertension disorders of pregnancy: a qualitative study of provider perspectives. *BMC Pregnancy and Childbirth*, *25*(1), 527. https://doi.org/10.1186/s12884-025-07632-x

Choudhury, O., Dubey, A., Saraswathy, K. N., Deb, R., Ranjan, R., Arora, J. S., ... & Devi, N. K. (2025). Knowledge, attitude, and practices of beta thalassemia: a cross-sectional study among young adults in Delhi-NCR, India. *BMC Public Health*, *25*(1), 2807. https://doi.org/10.1186/s12889-025-24065-5

Claire, J., Mir, S., Dumortier, I., Liard, R., Yavchitz, A., Le Cossec, C., & Picard, H. (2025). The use of a menstrual cup as a risk factor for displacement of intrauterine devices: a case-control study. *Contraception and Reproductive Medicine*, *10*(1), 33. https://doi.org/10.1186/s40834-025-00366-3

Coisy, F., Ajavon, F., Di Castri, A., Lagarrigue, M., Occelli, C., Bobbia, X., & Grandpierre, R. G. (2025). Exploration of patient blood management metrics for emergency departments: a 4-year retrospective monocenter study. *BMC Emergency Medicine*, *25*(1), 170. https://doi.org/10.1186/s12873-025-01329-2

Dhanaraj, R. K., Maragatharajan, M., Sureshkumar, A., & Balakannan, S. P. (2025). On-device AI for climate-resilient farming with intelligent crop yield prediction using lightweight models on smart agricultural devices. *Scientific Reports*, *15*(1), 31195. https://doi.org/10.1038/s41598-025-16014-4

Ding, K., Wang, X., Liu, W., Chen, Y., Xue, F., Song, C., ... & Li, J. (2025). Engineering modification of human umbilical cord mesenchymal stem cell-derived small extracellular vesicles ameliorates polycystic ovary syndrome by enhancing the ovarian environment and regulating follicular development. *Stem Cell Research & Therapy*, *16*(1), 481. https://doi.org/10.1186/s13287-025-04610-0

Dubey, A., Santra, A. K., Singh, M., Bhonsle, D., Khune, V. N., Dinani, O. P., ... & Yadav, A. (2025). Evaluation of determinants affecting technical efficiency of dairy farms. *Scientific Reports*, *15*(1), 37013. https://doi.org/10.1038/s41598-025-14597-6

Fertő, I., Baráth, L., & Bojnec, Š. (2025). Gender-based differences in eco-efficient farming. *Scientific Reports*, *15*(1), 15895. https://doi.org/10.1038/s41598-025-00584-4

Gaoual, Y., Aliat, Z., Cherif Chefchaouni, A., Mahyaoui, A., Merhom, O., & Rahali, Y. (2025). Mitigating Risks in Hospital Stock Management: A Structured Method for Validating Excel Files. *Hospital Pharmacy*, *60*(6), 551-560. https://doi.org/10.1177/00185787251337614

Gebregzi, A. H., Teko, E. B., Tantu, A. D., Jale, N. T., Getahun, G. K., & Asemu, Y. M. (2025). Assessment of surgical capacity and productivity in high-volume Ethiopian hospitals: mixed method study. *BMC Health Services Research*, *25*(1), 760. https://doi.org/10.1186/s12913-025-12892-6

Gougjehyaran, H. G., Maleki, R. N., & Sahebihagh, M. H. (2025). Managerial agility in nursing: a concept analysis. *BMC nursing*, *24*(1), 1088. https://doi.org/10.1186/s12912-025-03710-9

He, T., Zhu, X., Chi, G., Chen, H., Hao, M., Huang, X., & Wang, G. (2025). Impact of surgical care pathways on efficiency and outcomes in orthopedic operating rooms: a historical control study. *BMC surgery*, *25*(1), 392. https://doi.org/10.1186/s12893-025-03135-w

He, W., Tuersun, Y., Yang, T., Wan, Y., Yong, M., Huang, Z., ... & Xu, D. R. (2025). Mapping the interactions of critical factors in China's first-contact healthcare systems using causal loop diagrams. *BMC Public Health*, *25*(1), 2874. https://doi.org/10.1186/s12889-025-23884-w

Heo, K. Y., Fuqua, A., Shah, J., Syed, O., Song, J., Collins, E. C., ... & Wilson, J. M. (2025). The subjective hip value: a retrospective validation study in primary total hip arthroplasty. *Arthroplasty*, *7*(1), 23. https://doi.org/10.1186/s42836-025-00307-0

Kapiki, S., & Pappa, A. (2025). Enhancing healthcare efficiency: leveraging advanced maintenance management for optimal staff performance. *Journal of Health Organization and Management*, *39*(9), 398-418. https://doi.org/10.1108/JHOM-03-2025-0134

Li, X., Gao, P., Liu, A., Zuo, F., Hu, K., Wang, Y., ... & Li, X. (2025). Enhancing skull base tumor management: the combination of 3D printing technology and endoscopic surgical techniques. *3D Printing in Medicine*, *11*(1), 26. https://doi.org/10.1186/s41205-025-00275-w

Matera, R., Bifulco, G., Cotticelli, A., Verde, M. T., Macchio, A. C., Campanile, G., & Neglia, G. (2025). Estimating performances of dairy buffaloes in a new model of automated milking system. *BMC Veterinary Research*, *21*(1), 371. https://doi.org/10.1186/s12917-025-04829-2

Meriç, M. K. (2025). Implementation of a wireless sensor network for irrigation management in drip irrigation systems. *Scientific Reports*, *15*(1), 14157. https://doi.org/10.1038/s41598-025-97303-w

Mou, L., Lau, Y. S., Burch, P., & Whittaker, W. (2025). Did a national extended access scheme translate to improvements in patient experience to GP services in England? A retrospective observational study using patient-level data from the English GP patient survey. *BMC health services research*, *25*(1), 355. https://doi.org/10.1186/s12913-025-12447-9

Mzeihem, M., A. Karam, J., Hussain, J., Koh, J., & Amirouche, F. (2025). Assessing resident participation and its effect on postoperative complications in intertrochanteric and femoral neck fractures: insights on orthopaedic residency training in the USA—A NSQIP retrospective study. *European Journal of Orthopaedic Surgery & Traumatology*, *35*(1), 427. https://doi.org/10.1007/s00590-025-04554-4

Omori, K., Vulliamy, P., Aylwin, C., Nagasawa, H., Kan, S., Takahashi, J., ... & Davenport, R. (2025). Comparative analysis of emergency medical systems in the UK and Japan: recommendations for Japan based on on-site observations in the UK. *International Journal of Emergency Medicine*, *18*(1), 155. https://doi.org/10.1186/s12245-025-00956-7

Pariso, P., Picariello, M., & Marino, A. (2025). AI integration in energy management: enhancing efficiency in Italian hospitals. *Health Economics Review*, *15*(1), 40. https://doi.org/10.1186/s13561-025-00638-3

Perron, T., Legout, A., Gay, F., Soumahoro, M., Kouassi, D., Laclau, J. P., & Mareschal, L. (2025). Decomposition of logging residues in immature rubber plantations and effect on soil fertility. *Journal of Environmental Management*, *395*, 127640. https://doi.org/10.1016/j.jenvman.2025.127640

Piperno, A., Palombo, E., & Pagnotta, A. (2025). Use of the Symani® microscopic surgical robot in hand surgery and operating room setup. *Journal of Robotic Surgery*, *19*(1), 519. https://doi.org/10.1007/s11701-025-02629-2

Priya, R., Bassett, K. L., Murthy, G. V. S., O'Brien, K. S., Judson, K., Gilbert, S. S., ... & Agiwal, V. (2025). Using operational research as a tool to improve eye health services and systems in low-and middle-income settings: lessons from India and Nepal. *BMC medical education*, *25*(1), 1202. https://doi.org/10.1186/s12909-025-07803-6

Qureshi, K. M., Mewada, B. G., Yadav, A., Almakayeel, N., Alghamdi, S. Y., & Qureshi, M. R. N. M. (2025). Analysing Lean 4.0 adoption factors towards manufacturing sustainability in SMEs: A hybrid ANN-Fuzzy ISM framework. *Scientific Reports*, *15*(1), 17265. https://doi.org/10.1038/s41598-025-01076-1

Rochon, M., Angila, J., Jamie, C., Anna, T., Glorea, R., Nnadiebere, A., ... & Tanner, J. (2025). The impact of smartphone-based monitoring on reducing National Health Service visits for cardiothoracic patients with surgical site infections. *Infection Prevention in Practice*, *7*(4). https://doi.org/10.1016/j.infpip.2025.100491

Rowland, J., Baker, J., Dunn, N., Whited, M., Saadat, S., & Fox, J. C. (2025). Impact of worklist selection on point-of-care ultrasound workflow–a quality improvement project. *BMC Health Services Research*, *25*(1), 76. https://doi.org/10.1186/s12913-025-12234-6

Thomas, L., Robinson, S., Burns, S., Mitchell, H., & Begley, A. (2025). Engaging health system, service and consumer representatives in the co-design of a multi-criteria decision-making framework for commissioning overweight and obesity programs and services. *Health Research Policy and Systems*, *23*(1), 10. https://doi.org/10.1186/s12961-024-01263-y

Tufa, B. B., & Tebeka, S. M. (2025). Practice and challenges of humanitarian logistics management within the Ethiopian public pharmaceutical supply chain. *BMC Health Services Research*, *25*(1), 1114. https://doi.org/10.1186/s12913-025-13279-3

Tuyishime, A., Hahirwa, I., Njunwa, K. J., & Nyiligira, J. (2025). Benefits, challenges, and best practices of collaborative partnerships among health supply chain stakeholders in Rwanda: a cross-sectional study. *BMC Health Services Research*, *25*(1), 75. https://doi.org/10.1186/s12913-025-12239-1

Valavaara, K., MacDonald, J., Barnes, P., Bourque, E., Rowe, S., & Jarus, T. (2025). Occupational therapists' experiences of assessments with indigenous peoples: A storytelling approach. *Canadian Journal of Occupational Therapy*, *92*(4), 311-322. https://doi.org/10.1177/00084174251336547

van der Weide, H., Lovink, M. H., Luijkx, K. G., & Gerritsen, D. L. (2025). How is autonomy supported for people with dementia living in a nursing home, to what extent and under what circumstances? A realist evaluation. *BMC Health Services Research*, *25*(1), 237. https://doi.org/10.1186/s12913-025-12349-w

Wang, F., Wang, X., Liu, E., Song, F., & Chen, Y. (2025). Impacts of clinical research units on clinical research—a systematic review of empirical studies. *Systematic Reviews*, *14*(1), 94. https://doi.org/10.1186/s13643-025-02813-3

Wang, P., Shi, F., Dong, P., Jian, Y., He, Z., & Jiao, X. (2025). Integrating horticultural practices with smallholder resources improves Rosa roxburghii yield and nitrogen use efficiency. *Scientific Reports*, *15*(1), 29412. https://doi.org/10.1038/s41598-025-15403-z

Wang, Y., Yang, P., Wang, H., Zhou, L., Li, X., & Li, Z. (2025). Study on the evolution of ecological environment and irrigation behavior since mulched drip irrigation in Yanqi basin, Xinjiang. *Scientific Reports*, *15*(1), 14778. https://doi.org/10.1038/s41598-025-97991-4

Wu, S. Q., Wang, X. C., Boyd, A. D., Feng, D., Zhong, M., & Nie, D. (2025). Exploration of clinical pathway practice for optimization of DRG costing results based on resource consumption. *BMC Medical Informatics and Decision Making*, *25*(1), 305. https://doi.org/10.1186/s12911-025-03152-y

Yan, Y., Yang, J., Lu, Y., Fu, Y., Chen, J., Li, X., & Chang, Y. (2025). Barriers and facilitators of the implementation for the antimicrobial Social Norm Feedback (SNF) intervention strategy in primary care institutions: a qualitative study based on the Consolidated Framework for Implementation Research (CFIR). *Antimicrobial Resistance & Infection Control*, *14*(1), 104. https://doi.org/10.1186/s13756-025-01617-3

Yilmaz, A., Gem, K., Kalebasi, M., Varol, R., Gencoglan, Z. O., Samoylenko, Y., ... & Uvet, H. (2025). An automated hip fracture detection, classification system on pelvic radiographs and comparison with 35 clinicians. *Scientific Reports*, *15*(1), 16001. https://doi.org/10.1038/s41598-025-98852-w

Zhou, M., Chen, Y., Zhou, L., Zhan, J., & Chong, H. Y. (2025). Strengthening power grid projects' governance and sustainability through lifecycle auditing. *Scientific Reports*, *15*(1), 36442. https://doi.org/10.1038/s41598-025-20389-9