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Research Article

Integrating Digital Tools for Health Professional Education: A Case Study from the University of Peradeniya

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ABSTRACT

Background: The integration of digital tools into medical education has accelerated in recent years, but their effective use remains uneven across contexts. **Objective:** To examine usage patterns, student perceptions, and challenges related to digital learning tools among undergraduate medical students at the University of Peradeniya. **Methods:** A mixed-method case study design was used. Quantitative data from a structured Google Form survey (n = 100) provided numerical trends on tool usage and perceived effectiveness. Qualitative data from informal interviews were analysed thematically to explain and elaborate on the survey findings. The two datasets were integrated during interpretation, where qualitative insights were used to clarify and contextualise the quantitative results. **Results:** Findings showed that while tools like Moodle, Zoom, WhatsApp, and YouTube are widely used, student engagement was mostly passive. Only a minority used interactive tools such as online quizzes or gamified apps. Over 70% of students reported that digital tools support their understanding and engagement. Major challenges included poor internet access, lack of awareness, and minimal faculty support. **Conclusion:** Although digital tools are common, their pedagogical potential remains underutilized. Improved infrastructure, awareness, and integration are needed to optimize their impact in medical education.

Keywords: blended learning, digital learning, medical education, Sri Lanka, student perceptions

1. Introduction

The rapid evolution of digital technologies has transformed education in the health professions, where effective teaching is crucial for developing both theoretical knowledge and practical skills. In medical education, digital platforms, such as Learning Management Systems, video conferencing tools, and interactive apps, have reshaped traditional pedagogy, enabling flexible, learner-centered, and technology-enhanced learning. These innovations support collaborative learning and improve access to quality education for 21st-century medical students worldwide.

At the University of Peradeniya, one of Sri Lanka's leading institutions for medical education, digital learning tools such as Moodle, Zoom, and Google Classroom were introduced, especially during the COVID-19 pandemic. These tools initially served as emergency remote teaching solutions but have since remained part of the educational infrastructure. However, their effective integration and sustained use in day-to-day medical education remain underexplored. While some faculties in other disciplines have advanced in using educational technologies, ranging from online quizzes and collaborative platforms to gamified learning, medical students continue to rely heavily on traditional content delivery, with minimal exposure to innovative digital learning strategies.

Studies have shown that digital tools can enhance students' learning experiences, motivation, and performance, particularly when aligned with pedagogically sound approaches [1,2]. Despite this potential, factors such as lack of training, poor infrastructure, unfamiliarity with apps, and institutional inertia hinder their optimal implementation. Moreover, little is known about how medical undergraduates at Peradeniya perceive these tools, use them in practice, and experience challenges in their academic journey.

This research seeks to address this gap by systematically investigating the current use, perceptions, effectiveness, and challenges associated with digital tools in the medical curriculum at the University of Peradeniya. By combining survey responses from 100 undergraduate medical students with qualitative insights from interviews, this study aims to provide a comprehensive view of digital learning integration in health professional education. The findings are intended to inform policy, curriculum development, and technological support mechanisms to enhance digital learning in Sri Lankan medical faculties and similar settings.

The specific objectives of the study are:

1. To examine the current use of digital tools in the medical curriculum at the University of Peradeniya.
2. To explore medical students' perceptions of the effectiveness of these digital tools in supporting their learning and engagement.
3. To identify the challenges faced by medical students in integrating digital tools into medical education.
4. To assess the impact of digital tool integration on students' academic performance and learning experiences.
5. To provide recommendations for improving the use and integration of digital platforms in health professional education at the University of Peradeniya.

2. Methods

2.1 Research Design

This study adopted a mixed-method case study design to comprehensively explore the integration of digital tools within undergraduate medical education at the University of Peradeniya. The rationale for using a mixed-methods approach lies in its ability to combine the strengths of both quantitative and qualitative research paradigms. Quantitative data provided measurable insights into patterns of tool usage and student perceptions, while qualitative data enriched the findings by offering contextual understanding of students' experiences. This methodological triangulation enabled a more holistic interpretation of the research problem, enhancing both the validity and depth of the study [3].

2.2 Participants

The study involved 100 undergraduate medical students from the Faculty of Medicine, University of Peradeniya, representing all five academic years. Participants were recruited through voluntary response sampling, with the survey link distributed via official student mailing lists and WhatsApp groups. This method was chosen because it allowed rapid and convenient access to students across different years, especially given the online nature of the study and the limited availability for in-person recruitment.

However, voluntary sampling carries the risk of selection bias, as students who are more motivated, digitally active, or already interested in technology-enhanced learning may be more likely to participate. Consequently, the sample may not perfectly represent the views of the entire undergraduate cohort. This limitation is acknowledged, and the findings should be interpreted within this context.

2.3 Data Collection Instruments

For the qualitative component, 10 informal interviews were conducted with undergraduate medical students. Participants were selected using purposive sampling to ensure representation across different academic years and varying levels of digital tool usage. This approach allowed the researcher to capture diverse perspectives and obtain deeper insights that complemented the survey findings. Each interview lasted approximately 15–20 minutes and was documented through field notes.

2.4 Data Collection Procedure

Data collection was carried out over two weeks in February 2025. Students were informed about the objectives and scope of the study prior to participation. Ethical considerations, including informed consent and the voluntary nature of participation, were emphasized. Survey responses were collected anonymously to ensure confidentiality and to promote honest feedback. The informal interviews were conducted either in person or online via Zoom, based on the availability and preference of the participants. Each interview lasted approximately 15–20 minutes and was documented in the form of field notes.

2.5 Data Analysis

The analysis involved both quantitative and qualitative techniques. Quantitative data derived from the survey were analyzed using descriptive statistical methods. Frequency distributions and percentage calculations were employed to examine key variables such as the types of digital tools used (e.g., Moodle, Google Classroom, Zoom, Kahoot), the frequency of usage, and perceived challenges. Visual representations such as tables and bar charts were generated to illustrate major trends. For the qualitative component, data from interview notes and open-ended survey responses were analyzed using thematic analysis following the six-phase framework proposed by Braun and Clarke [4]. This involved familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final narrative. The themes that emerged were used to contextualize and deepen the interpretation of the quantitative results presented in the study.

3. Results

3.1 Participant Demographics

The study involved 100 undergraduate medical students from the University of Peradeniya, representing all five academic years. Among them, the majority were from the 1st and 2nd years, reflecting early exposure to formal medical education. Gender distribution was balanced, though slightly more responses were recorded from female students. This diversity ensured a broad perspective across different stages of the undergraduate medical journey.

3.2 Usage of Digital Tools in Medical Education

Analysis of student responses revealed a predominant reliance on Moodle, used primarily for accessing lecture slides and reading materials. Other widely used platforms included YouTube channels and WhatsApp groups, although their frequency of use varied by year and level of exposure. As shown in Figure 1. Usage of digital platforms by medical students. Moodle and YouTube were the most frequently accessed for academic content, while WhatsApp was primarily used for peer communication. Google Classroom and Zoom saw limited use, with Zoom usage peaking during the COVID-19 pandemic.

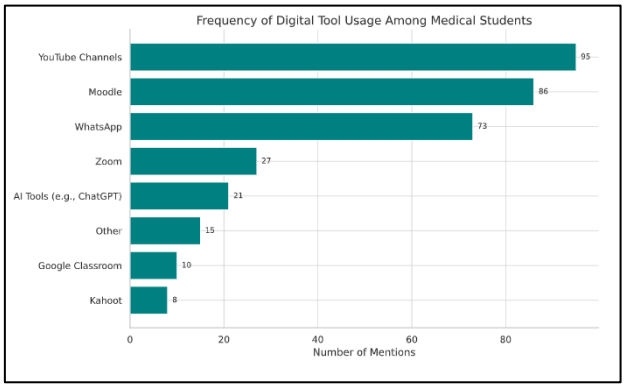

Figure 1. Frequency of Digital Platform Use among Medical Students

The interviews further revealed that students were not aware of advanced or gamified educational tools like Kahoot. Some students indicated surprise when introduced to tools like Kahoot, expressing interest in having such platforms incorporated into their curriculum for revision and self-assessment. *"We only use Moodle to download PDFs, and WhatsApp to ask friends for help. I didn't know apps like Kahoot existed for medicine,"* – 2nd year student.

3.3 Frequency and Purpose of Platform Usage

Survey data showed that over 60% of students used digital platforms on a daily or weekly basis, though this was mostly limited to passive engagement, such as downloading lecture notes or reading messages. (Figure 2) The main academic uses of digital tools included:

- Accessing lecture content (92%)
- Attending recorded or live sessions during lockdowns (60%)
- Group communication and coordination via WhatsApp (85%)
- Self-learning via general YouTube content (38%)

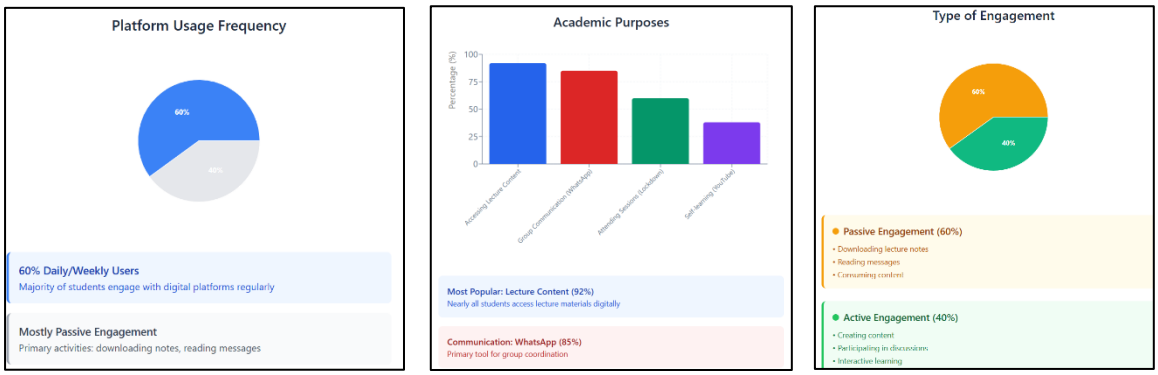

Figure 2. (a) Distribution of platform usage frequency; (b) Distribution of academic purposes for digital platform use; (c) Distribution of engagement types among medical students.

However, less than 25% of students reported interactive use, such as participating in online quizzes, collaborative assignments, and peer discussions via forums. This reveals a gap between potential and actual usage, suggesting that digital tools are not yet being leveraged for active learning or student-centered pedagogies.

3.4 Perceived Effectiveness of Digital Tools

The majority of respondents expressed positive attitudes toward digital learning. Notably, 74% agreed or strongly agreed that digital tools help them understand complex medical concepts, 69% preferred blended learning, combining face-to-face and digital formats, and 61% agreed that platforms like online quizzes and gamified learning apps could enhance engagement and make revision more effective.

These findings were reinforced in the interviews, where students described their learning as "more interesting" when interactive elements were used, such as recorded video demonstrations or AI tools for self-practice. *"When we had recorded lectures during COVID, I could go back and listen again. That helped more than live classes sometimes."* – Final year student.

3.5 Digital Literacy and Training

Only around 50% of students reported receiving any formal training on how to use digital learning platforms. Students who entered during the pandemic had more exposure to digital learning tools and systems, while those in later years who began studies before COVID relied more on traditional classroom formats.

Despite the lack of training, students showed adaptability, often self-learning through trial and error or peer guidance. However, interview responses highlighted a missed opportunity by the faculty to formally introduce tools and support students in using them more effectively.

3.6 Challenges Encountered in Digital Learning

The challenges faced by students were significant and widespread. The most frequently reported issues included:

Table 1. Common challenges in using digital tools

Challenge Type	% of Students Reporting
Poor internet connectivity	68%
Lack of institutional training/support	43%
Low motivation/self-discipline	27%
Difficulty accessing recordings/videos	22%
Dependence on paid AI tools	18%

Connectivity issues were particularly prevalent in hostels and rural home settings, where mobile data access was unreliable. Furthermore, students expressed frustration over the absence of recorded lectures and limited digital support for practical sessions.

3.7 Demand for Increased Digital Integration and AI Tools

Despite the limitations faced in connectivity and training, a strong majority of students (over 85%) expressed that digital tools should be more actively integrated into the medical curriculum at the University of Peradeniya. Many called for improvements such as the ability to access recorded lectures for flexible, repeat learning, use of interactive learning platforms like Kahoot or Quizlet, video-based demonstrations of clinical or practical procedures, and faculty-led training sessions on using LMS and digital platforms effectively.

A particularly notable trend in the open-ended responses was the student-driven interest in artificial intelligence (AI) tools, including specific references to ChatGPT. At least 7% of students explicitly mentioned the value of incorporating AI-assisted learning into their academic activities. Key suggestions included: *"Motivate students to use AI in assisting with learning tasks", "Use AI tools to do lectures attractively and effectively", "AI-assisted learning with proper guidance", and "AI literacy programs for students should be introduced"*.

These responses indicate a growing awareness and enthusiasm among students for the educational potential of generative AI. Students expressed that such tools could help them self-evaluate, revise more efficiently, and personalize their learning. However, they also noted the absence of institutional support, with some depending on paid versions of AI tools out of pocket. This highlights a digital equity concern as well as a missed opportunity for formal curriculum innovation. *"We already use ChatGPT or AI apps for self-learning, but there's no proper training or approval. It would be good if the faculty guided us on how to use these properly."* – 1st year student. These findings suggest that students are not just passive consumers of digital content, but are eager to adopt emerging technologies if given the structure, literacy, and institutional backing to do so.

4. Discussion

This study examined the integration of digital tools in undergraduate medical education at the University of Peradeniya, highlighting the role of accessibility and institutional readiness. The findings show that while some digital platforms are widely adopted, gaps remain in infrastructure and faculty support. Student engagement with these tools also varied, reflecting differences in digital literacy, exposure, and pedagogical integration. The results emphasize the need for targeted training and curriculum strategies to maximize the educational benefits of digital technologies.

4.1 Alignment with Global Trends

The results align with global trends showing an increasing reliance on Learning Management Systems (LMS) like Moodle and communication tools such as Zoom and WhatsApp in higher education [1,2]. Students at Peradeniya demonstrated regular use of Moodle, primarily for passive learning activities such as downloading lecture materials. However, unlike institutions that have adopted blended and flipped learning models [5], interactive and student-centered features remain underutilized.

Despite this, students demonstrated openness to and enthusiasm for advanced digital platforms, particularly those that promote interactivity and self-paced learning. This reflects studies by George et al. [6], which show that medical students benefit significantly from digital quizzes and multimedia-based revision tools in reinforcing conceptual understanding. Research has also demonstrated the positive effects of gamified learning platforms like Kahoot in educational settings [10].

4.2 Challenges Hindering Effective Integration

One of the most prominent barriers identified was infrastructure limitations, particularly poor internet connectivity. Similar challenges have been noted in other South Asian contexts, where digital education policies often outpace the availability of technological resources [7]. Students also highlighted the lack of formal training in using these tools, pointing to a critical gap in institutional support. While the university provides access to platforms like Moodle, the absence of a structured onboarding process or digital literacy training limits students' ability to use them optimally. This challenge echoes findings from other low- and middle-income countries where the digital divide is not only about access, but also about meaningful usage [8].

4.3 A New Demand: Student-Driven AI Adoption

A notable and emergent theme from this study is the student-led interest in artificial intelligence (AI) tools like ChatGPT. Although not part of the official curriculum, students reported using AI for summarizing materials, clarifying concepts, and enhancing self-study, despite many relying on paid versions and without faculty support.

This mirrors global developments where AI is rapidly entering medical education, not only for learning but also for simulating clinical decision-making [9]. However, unlike in some Western institutions where AI tools are beginning to be piloted in formal instruction, students at Peradeniya are navigating this space independently. This highlights an opportunity for formal AI literacy programs and faculty development to responsibly integrate these tools. *"We already use ChatGPT or AI apps for self-learning, but there's no proper training or approval. It would be good if the faculty guided us on how to use these properly."* - 1st Year Student

4.4 Implications for Curriculum and Policy

The findings emphasize that digital tools in medical education must go beyond content delivery and instead support engagement, collaboration, and assessment. Several steps can be taken to institutionalize digital pedagogy training for both staff and students, develop blended learning strategies that combine in-person clinical training with asynchronous digital learning, enable recorded lecture access and video-based demonstrations for skill-based subjects, and introduce interactive learning apps and AI tools with faculty oversight and ethical guidelines. These steps are crucial for aligning with Sri Lanka's national education digitalization policies and for ensuring that medical graduates are equipped not only with clinical competence but also digital fluency.

4.5 Limitations

The study has a few limitations. First, while the sample size (N=100) is appropriate for a single-institution case study, generalizability to other universities may be limited. Second, the interviews were informal and not transcribed verbatim, which may limit the depth of qualitative analysis. However, the convergence between survey and interview data enhances the reliability of the findings.

5. Conclusion

This study highlights both the widespread adoption and the underutilization of digital tools in undergraduate medical education at the University of Peradeniya. While platforms like Moodle and WhatsApp are deeply integrated into students' daily academic routines, their use remains largely passive and limited to content access and communication. Interactive and engaging tools such as Kahoot and Quizlet are largely unknown or unused, reflecting a lack of structured digital pedagogy within the faculty.

Despite these limitations, medical students express strong support for further digital integration. Most students value the flexibility, accessibility, and enhanced understanding that digital tools can offer. The data also reveal a growing student-led trend in using AI-powered tools like ChatGPT for independent learning, signalling a shift toward more personalized and technology-enabled education.

However, persistent challenges, including poor internet infrastructure, lack of formal training, limited access to recorded lectures, and reliance on paid digital tools, must be addressed to ensure equitable and effective integration. These findings suggest a critical need for institutional strategies that go beyond platform provision to include digital literacy training, curricular innovation, and faculty development. By addressing these gaps, the University of Peradeniya and similar institutions in low-resource settings can reimagine medical education for the 21st century: inclusive, interactive, and intelligent.

6. Data Availability Statement

The dataset generated and analysed during the current study is available from the corresponding author upon reasonable request. Due to ethical considerations and the anonymized nature of student responses, direct public access is restricted.

7. Ethical Statement

All procedures performed in this study involving human participants were conducted according to the ethical standards of the University of Peradeniya. Informed consent was obtained from all individual participants included in the study. Participation was voluntary, and all responses were anonymized to ensure confidentiality. Ethical clearance was not required due to the non-invasive and academic nature of the study.

8. Author Contributions

The author was solely responsible for the conception and design of the study, data collection, analysis, interpretation of results, and writing of the manuscript.

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11. Conflict of Interest
The author declares that there is no conflict of interest regarding the publication of this paper.

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