The Journal of Medical Education Research 2025 Vol 5 No 1 pp 201-212, DOI: 10.5750/jmer.v5i1.2535

'DOING THE HOMEWORK': MEDICAL STUDENT RESOURCES

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ABSTRACT

Introduction: Effective study strategies are essential for success in medical education, particularly during the pre-clinical years. This study explored the use and perceived effectiveness of physical and digital learning resources among Year 1 and Year 2 medical students at the University of Buckingham.
Methodology: An electronic survey was distributed, gathering both qualitative and quantitative data on resource usage patterns. A total of 21 students responded, with 52% in Year 1 and 48% in Year 2. Participants reported their highest educational qualification and rated the frequency and manner (active, passive, neither) in which they used various digital and physical resources.
Results: Chi-squared statistical analysis revealed several significant findings related to the frequency of use of various resources and their association with perceived learning effectiveness. Among digital resources, the university's Moodle VLE ($\chi^2 = 35.29$, $p = 0.000001$) and online teaching videos ($\chi^2 = 13.57$, $p = 0.019$) were significantly associated with effective learning. While flashcards ($\chi^2 = 15.29$, $p = 0.09$) and question banks ($\chi^2 = 10.14$, $p = 0.071$) showed a positive trend, these did not reach statistical significance ($p > 0.05$). Among physical resources, written notes ($\chi^2 = 5.57$, $p = 0.035$) and group work ($\chi^2 = 5.57$, $p = 0.040$) were both significantly associated with improved learning outcomes. Interestingly, support from family members ($\chi^2 = 11.29$, $p = 0.046$) also showed a statistically significant association, suggesting the value of peer-teaching strategies. In contrast, passive use of physical resources literature ($\chi^2 = 8.43$, $p = 0.134$) and online textbooks ($\chi^2 = 5.00$, $p = 0.416$) appeared to have minimal impact on perceived learning effectiveness.
Discussion: While the study suggests that students tend to favour online resources to support their learning, limitations such as a small sample size and reliance on self-reported data highlight the need for further research to confirm this.
Conclusion: This study offers insight into the resource preferences of pre-clinical medical students, advocating for active engagement with both digital and traditional tools to promote academic success and professional development.

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Keywords: medical education, revision resources, digital resources, physical resources and study strategies

INTRODUCTION

The ability to learn efficiently is widely regarded as a cornerstone of academic success, particularly within medical education. The early, preclinical years of medical school present a significant challenge for students as they rapidly absorb foundational knowledge in anatomy, physiology, and pathology while simultaneously adapting to the demands of a demanding professional degree (Basukala and Chaudhary, 2021). Efficient revision techniques play a major role in maximising examination performance which in turn helps facilitates the development of the confidence, clinical judgment and versatility required for future medical practice.

Medical students are heterogeneous regarding how and what revision methods they choose employ. Students typically engage with various learning strategies—such as visual, auditory, physical and digital—in unique ways. Therefore, it is essential for medical educators to take note of diversity in cognitive processing and learning preferences by offering a wide range of education materials that can be swiftly adapted to differing learning modalities. Because of technological integration within medical education, digital resources are becoming increasingly more favoured when compared to traditional physical resources such as anatomy models and textbooks. Understanding how to create a supportive learning environment where students can engage with resources and develop critical thinking is essential for fostering their educational growth (Jaffe et al., 2019).

Cushcieri et al. (2020) highlights the importance of accessible, well-designed educational resources in promoting early competence in learning strategies. Such structured approaches may influence the students' motivation and reason for selecting specific revision aids.

Additionally, the learning environment not only shapes academic performance but also plays a key role in shaping a student's professional identity. As Harvey et al. (2021) notes, students often struggle with feeling disconnected from the process of becoming doctors—emphasising the need for learning resources that not only build confidence but instil a sense of purpose. This reveals the power of revision tools as not merely learning aids but their influence on how students view themselves within their professional journey.

Throughout the preclinical years of medical education, medical sciences form the core of the syllabus. Joshi et al. (2021) argues that "with advancements in both basic and clinical sciences, medical education must evolve accordingly." As teaching methods continue to shift to hybrid and asynchronous delivery, students are ever more left with the responsibility to manage their own learning, making the strategic selection and use of revision resources particularly important. As a result, both students and their learning resources need to progress, however little research exists examining what revision resources

medical students use and how they are used. Similarly, the Association of American Medical Colleges (AAMC) emphasises that with this advancement in clinical sciences, "research [in] medical education [needs] to advance the knowledge [and] skills…of medical students by understanding and evaluating educational ecosystems" (Atluru et al., 2015).

The aim of this study is to identify what learning resources medical students use and how they are used across their 1st and 2nd-year of study. It is hoped that through this examination, educational institutions can develop strategic actions to enhance academic and professional outcomes.

METHODS

A cross-sectional survey design was employed to provide a snapshot of revision material usage among preclinical medical students. The population consisted of 1st and 2nd-year MBChB students at the University of Buckingham, a UK private medical school with a condensed, four-and-a-half-year curriculum. The survey was distributed electronically via the university Moodle platform and student email list. Ethical approval was granted by the Faculty Ethics Committee prior to data collection.

The survey instrument consisted of an anonymised, self-administered questionnaire that included both closed and open-ended questions, enabling the collection of both quantitative and qualitative data. There were three formal sections to the survey:

1) Demographic Information – Participants were requested to specify their current study year (Year 1 or Year 2) and the highest academic degree obtained prior to medical school entry (e.g., high school diploma, undergraduate degree, Master's degree, or Doctorate).
2) Resource Frequency – Students rated how frequently they used various digital (e.g., online videos, Moodle VLE, apps) and physical (e.g., textbooks, flashcards, anatomy models) resources using a 5-point Likert scale (Never, Rarely, Sometimes, Often, Always).
3) Mode of Use – For each resource listed, students were also queried whether they typically used it actively (e.g., taking notes, working problems, testing themselves), passively (e.g., reading or watching without interacting), or not at all.

The survey was distributed over a two-week period, with two reminder emails sent to encourage maximum participation.

A total of 21 students responded to the survey—11 from Year 1 and 10 from Year 2—yielding a response rate of 24%. Statistical analysis was conducted using chi-squared (χ^2) tests to quantify correlations between student year and resource use, as well as between active and passive patterns of use. A p-value of < 0.05 was considered statistically significant.

Table 1. Association between different digital learning resources and perceived learning effectiveness among Year 1 and 2 MBChB students at the University of Buckingham, showing Chi-squared (χ^2) values, p-values, and significance levels.

Resource	Usage Type	Year Group(s)	χ^2	*p*-value	Significant
Moodle (VLE)	Active	Combined	35.29	0.000001	Yes
Online teaching videos	Active	Combined	13.57	0.019	Yes
Online textbooks	Passive	Combined	5.00	0.416	No
Flashcards	Active	Combined	15.29	0.09	No (trend)
Question banks	Active	Combined	10.14	0.071	No (trend)

RESULTS

Demographics: Of the 21 participants, 66.7% reported high school as their highest qualification upon entry into medical school. Another 23.8% had completed an undergraduate degree, while 9.5% held postgraduate qualifications, including one Master's degree and one Doctor of Philosophy holder. The distribution of Year 1 and Year 2 students was nearly even, ensuring a balanced representation of early preclinical learners. This demographic data is evident in the below pie charts with Figure 1A representing the respondent's cohort and Figure 1B representing the respondent's highest level of education.

DIGITAL RESOURCE USE

University Virtual Learning Environment (VLE – Moodle): The Moodle Virtual Learning Environment was the most frequently and actively used

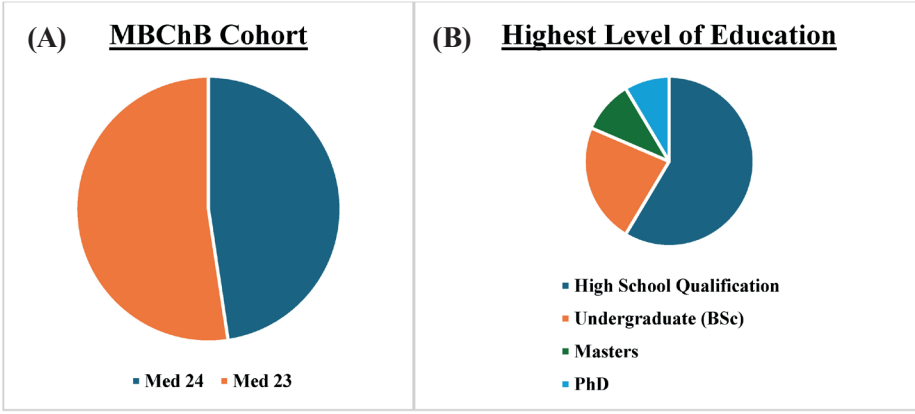

Figure 1. (A) The proportion of 1st- and 2nd-year MBChB students from the University of Buckingham who participated in the study. (B) The diversity of academic qualifications held by 1st- and 2nd-year MBChB students at the University of Buckingham who took part in the study.

digital resource among students. Approximately 70% reported engaging in activities such as reading lecture notes, participating in discussion forums, and completing formative tests. This level of engagement showed a highly statistically significant correlation with perceived effectiveness ($\chi^2 = 35.29$, $p < 0.000001$), making it the standout resource in terms of both usage and impact.

Online Instructional Videos: Instructional videos were actively used by 55% of students, many of whom cited platforms such as YouTube and Osmosis. These resources were valued for their visual explanations and bite-sized content, often used to clarify complex topics. Their effectiveness was also statistically significant ($\chi^2 = 13.57$, $p = 0.019$), suggesting a meaningful positive impact on student learning.

Online or Downloaded Question Banks: Question banks were heavily used, with 60% of students reporting active engagement, particularly with QuesMed and PassMedicine. While these were a popular choice for exam preparation and knowledge reinforcement, the association with perceived effectiveness was not statistically significant ($\chi^2 = 10.14$, $p = 0.071$). This may suggest variation in the way students use and benefit from these tools.

Interactive Online Materials: These included drag-and-drop quizzes, animations, or adaptive learning modules. They were used passively by 35% of students and actively by 40%, often in conjunction with other study tools. Despite moderate uptake, the effectiveness of interactive online materials did not reach statistical significance ($\chi^2 = 9.00$, $p = 0.109$).

Educational Apps: Apps—ranging from flashcard platforms to medical reference tools—were moderately used, with 35% of students indicating passive use and 40% active use. Although popular, there was no statistically significant correlation with perceived effectiveness ($\chi^2 = 5.57$, $p = 0.350$). Their usage was often supplementary rather than central.

Online Textbooks: These were among the least frequently and actively used digital resources. Students typically described using them passively (e.g., for quick referencing rather than deep study). Their use showed no significant link with perceived effectiveness ($\chi^2 = 5.00$, $p = 0.416$), possibly due to the static and dense nature of the format.

Watching Recorded Lectures: Students accessed pre-recorded lectures primarily to revisit missed content or clarify difficult topics. However, this was often done passively, such as playing them in the background. The relationship between this activity and perceived learning effectiveness was not statistically significant ($\chi^2 = 6.15$, $p = 0.298$).

Attending Lectures Online (Live): Live online lectures were the least engaged-with resource and largely rated as passive experiences. The statistical analysis showed no significant association with effectiveness ($\chi^2 = 5.00$, $p = 0.416$).

Flashcards: Flashcards demonstrated a strong association with perceived learning effectiveness ($\chi^2 = 15.29$, $p = 0.09$). Approximately 40% of students

reported actively using them, citing benefits in spaced repetition, memory recall, and portability for on-the-go revision

PHYSICAL RESOURCE USE

Written Notes: Written notes—both lecture-based and summary-based—were strongly correlated with perceived usefulness ($\chi^2 = 5.57$, $p = 0.035$). 60% of students used them actively, often to consolidate content post-lecture or to distil complex concepts into manageable formats.

Anatomy Models: Anatomy models were actively used by about 50% of students, primarily during practical sessions. While access was somewhat restricted to those timetabled events, their perceived effectiveness approached statistical significance ($\chi^2 = 9.57$, $p = 0.088$), suggesting a valuable if underutilised resource.

Group Work: Group-based learning activities, particularly clinical case discussions and peer expla nations, showed a strong correlation with effectiveness ($\chi^2 = 5.57$, $p = 0.040$). These were especially popular among Year 2 students.

Family Members: Surprisingly, interactions with family members revealed a noteworthy correlation with perceived learning benefit ($\chi^2 = 11.29$, $p = 0.046$). This may reflect the use of family to help students explain concepts aloud to reinforce their own understanding.

Medical Literature (Books): Despite their traditional role in medical education, textbooks and other printed reference material were used passively by most students (60%). They showed no significant association with perceived effectiveness ($\chi^2 = 8.43$, $p = 0.134$), perhaps due to their static format compared to more interactive resources.

Online Resource	P Value	Chi Squared Statistic
Attending lectures online	0.416	5.00
Watching lectures online	0.298	6.15
Watching online teaching videos	0.019	13.57
Online textbooks	0.416	5.00
Using online or downloaded question banks	0.071	10.14
Using interactive online materials	0.109	9.00
University VLE (Moodle)	0.000001	35.29
Using educational apps	0.350	5.57
Online Flashcards	0.009	15.29

Figure 2. P values and Chi-squared statistics showing the association between the frequency of use of various online study resources and perceived learning effectiveness among Year 1 Buckingham Medical students

Physical Resource	P Value	Chi Squared Statistic
Anatomy Model	0.088	9.57
Making Handwritten Notes	0.035	5.57
Consulting medical literature (physical books)	0.134	8.43
Family members	0.046	11.29
Group work	0.040	5.57

Figure 3. P values and Chi-squared statistics for different physical study resources used by 1st and 2nd year Buckingham Medical students.

PATTERNS OF USE

On the online resources graph (Figure 2), Moodle was utilised actively by 70%, whereas question banks were utilised by 50%. Teaching videos online accounted for 55% active user rate, whereas apps for education noted a combination of 40% active use and 35% passive use. On the physical resources graph (Figure 3), written notes were utilised actively by 60%, anatomy models by 50%, and flashcards by 40%. Consultation of medical literature was utilised passively by 60%, whereas family members were utilised actively by 30% of the students.

DISCUSSION

The findings of this study highlight how preclinical medical students employ a range of physical and digital resources to support their learning. The patterns of use, especially the higher prevalence of students actively using online resources raise important questions regarding the way resource design can influence not just knowledge acquisition but also the development of learning habits.

These results underscore the need for active engagement to facilitate educational effectiveness. The most effective resources were Moodle VLE, instructional videos, written notes, and flashcards. This result aligns with conventional educational principles that advocate for the importance of student engagement, active practice, and collaboration in the pathway toward achieving long-term retention and deeper understanding. Surprisingly, conventional resources such as medical literature and textbooks, though still used, were engaged with passively and were not perceived as particularly useful. This observation implies a change in learning tendencies across generations in favour of brief, visual, and interactive presentation against lengthy written content. This further highlights the importance to prioritise ease of use and accessibility in the design of educational content and resources.

Research by Thomas et al. (2021), has established that well-designed educational modules enhance student engagement with academic content,

reinforcing the notion that curriculum design is influential in determining students' learning strategies. Moreover, Cushcieri et al. (2020) advocates for well-designed and accessible resources, noting their value in guiding students toward higher-quality and more independent learning practices. These insights help contextualise the current study's findings: students may default to certain resource types not only due to convenience, but also due to the perceived clarity and usability of those tools.

Beyond academic performance, resource engagement also intersects with professional development. Harvey et al. (2021) highlighted how students may gain a sense of disconnection from their identity as medical professionals, particularly in disrupted learning contexts, such as during the COVID-19 pandemic. In this light, effective utilisation of revision resources could have an emotional and psychological role —helping students feel more competent and prepared for clinical life.

Group study and family explanations—often overlooked in formal curriculum planning—emerged as surprisingly valuable. These social learning approaches may help clarify complex concepts and foster collaborative problem-solving skills, which are vital in clinical practice. As Tebbett et al. (2021) suggests, medical education must increasingly value non-technical competencies such as communication, teamwork, and situational awareness. Group-based study sessions, interactive tools, and peer discussion platforms—though not the primary focus of this study—represent opportunities to foster these soft skills alongside academic learning. Students' preference for passive tools may limit such opportunities, suggesting a need for resources that integrate content mastery with interpersonal skill development.

Multiple direct and indirect variables potentially influenced the results—particularly the survey. Notably, student characteristics, such as prior knowledge, learning styles, and study habits, directly dictate how effectively students engage with physical and online resources.

This study had several limitations. Firstly, the small sample size of 21 responses reduces the reliability and generalisability of the findings. This limits the statistical power and increases the likelihood of false positive or false negative results. Additionally, the study relied on self-reported data, which may be subject to recall bias, as students may not accurately reflect their true engagement with revision resources. Finally, the study did not consider confounding factors such as student motivation, lecture attendance, or engagement, which could influence the effectiveness of certain revision materials.

To counter such limitations, future research could use a greater sample space to enhance findings in terms of reliability and statistically significant results. Moreover, confounding variables could also be measured since they play a pivotal role in the response or awareness of a student towards revision materials and learning styles. Finally, to avoid the limitation of self- reported data, a longitudinal randomised controlled trial can be done as this design involves the assignment of different students to different resources and is thus

an objective measurement of progress. In this case, such a study would facilitate awareness amongst medical schools, allowing them to tailor their resources more effectively to facilitate the success of pre-clinical medical students.

CONCLUSION

It was hoped that, in doing the 'homework' into what revision resources medical students use and how they are used, educational institutions would be able to develop strategic actions aimed at improving educational outcomes. Results indicated that effective revision materials were flashcards, written notes, and University Moodle VLE, whereas consultation of physical medical literature and online textbooks was less effective. Through actively engaging with these resources, students formulate strategies that purpurate lifelong learning, an essential trait for continuous professional practice. However, confounding factors pertaining to prior knowledge and individual revision habits, potentially influence engagement with said resources. Considering the limitations, medical education providers now have an insight into the importance of different resources and how they are used amongst pre-clinical medical students. A future longitudinal randomised controlled trial could better detail the effectiveness of active online resource use regarding student End of Term Assessment performance and adherence to the General Medical Council's graduate outcomes.

ACKNOWLEDGEMENTS

I would like to acknowledge Dr. Ian Kay, MedEd SSC Unit Lead, for his invaluable feedback as well as the University of Buckingham Medical School for providing the facilities necessary to conduct this study

DECLARATIONS

STATEMENT ABOUT CONSENT TO PARTICIPATE

Informed consent was obtained from all participants involved in the study.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AUTHORS' CONTRIBUTIONS

NB conceived the study, designed the data collection instruments, conducted the data analysis, and drafted the manuscript. IK contributed to the study design, provided critical feedback on the manuscript, and supervised the project. Both authors read and approved the final manuscript.

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