

The Impact of Google Classroom in Medical Education – Engaging Students to Build Competency – A Student-based Experimental Study

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Abstract

Background: Google Classroom is a free web service developed by Google for students and teachers that aims to make it simpler to construct, allocate, and rank assignments in a paperless way. The current study aims to compare the effectiveness of Google Classroom with traditional lecture methods in building medical students' competency in a tertiary teaching hospital. **Material and Methods:** An institution-based experimental study was conducted among 70 III MBBS students (Group A -35; Group B -35) of GTMCH. Group A students (35) were taught using the lecture method, and Group B students (35) were taught using Google Classroom (Nutritional Anaemia). Their knowledge was assessed using pre- and post-test scores comprising 20 MCQs. Then, a crossover design was applied for the second topic (Endemic Fluorosis), and students' knowledge was assessed similarly. Overall feedback regarding both TLM was obtained. **Results:** In both groups, students who attended the Lecture method of teaching scored slightly higher than those who attended the Google Classroom method. About 45.7% gave positive feedback on teaching using Google Classroom, while the majority, 54.3%, preferred the Lecture method. Girl students preferred Google Classroom to boy students. **Conclusion:** There was no significant difference between the two TLMs in assessment scores. Involvement in students varies from person to person, regardless of any TLM. Both TLMs have their own advantages and disadvantages.

Keywords: Google Classroom, Lecture, Teaching Learning Method, Competency-Based Medical Education.

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INTRODUCTION

The rapid development of digital learning environments has revolutionized medical education worldwide, particularly with the increased emphasis on Competency-Based Medical Education (CBME) and blended learning approaches. Among various Learning Management Systems (LMS), Google Classroom has already emerged as a freely accessible, scalable, and user-friendly platform that integrates content delivery, assignment management, communication, and learner tracking within a single ecosystem.^[1]

Google Classroom is a free web service developed by Google for students and teachers that aims to simplify the creation, distribution, and grading of assignments in a paperless way. Google Classroom combines Google Drive for creating assignments, distributing them to students as Google Docs, Sheets, and Slides for writing, Gmail for communication, and Google Calendar for scheduling. By using a private code, students can be invited to join a class. The students can also join the class automatically via import from the domain. Each class creates a separate folder in the corresponding user's drive, where students can submit assignments assigned by the respective teachers.^[2-4] Teachers can directly monitor each student's work, progress, comments, and doubts, and reply to them. Many tertiary teaching hospitals are using these online platforms to reform the medical curriculum.

The traditional lecture-based teaching method remains

dominant in medical education in India. Yet, it has been criticized for passive learning and limited reinforcement beyond classroom hours, creating a need to empirically assess whether digital platforms can effectively complement or outperform conventional methods. However, despite widespread adoption, evidence regarding the effectiveness of Google Classroom in developing measurable cognitive competencies among undergraduate medical students remains limited and inconsistent. The current study aimed to compare the effectiveness of Google Classroom with traditional lecture methods in building medical students' competency in a tertiary teaching hospital. Google Classroom was selected as the intervention model due to its alignment with adult learning principles, its facilitation of asynchronous access to learning resources, its ease of monitoring learner progress, and its minimal training requirements for both faculty and students. The present institution-based experimental study employed a crossover design among III MBBS students to

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compare Google Classroom-based instruction with traditional lectures across two Community Medicine topics.

Objectives:

1. To compare the effectiveness of Google Classroom with traditional lecture methods in building medical students' competency.
2. To measure the perception of students regarding the Google Classroom as a teaching and learning platform, respectively.

MATERIALS AND METHODS

Study Area: Government Theni Medical College Hospital (GTMCH), Theni.

Study Population: III MBBS students of GTMCH, Theni.

Study Period: 6 months duration from May 2019 to October 2019.

Study Design: Institution-based Experimental study

Sampling Design & Sample Size: 70

The study followed universal sampling, i.e., all students from 2 Clinical Batches (Group A & Group B) attending Community Medicine clinical postings were included.

Study Technique: The participants were already divided

into two equal groups of 35 students each, based on their clinical batches. In the first stage, Group A was taught using the conventional lecture method, including synchronous lectures with PowerPoint presentations. At the same time, Group B received teaching through Google Classroom on the topic of Nutritional Anaemia. Google Classroom was created before the class began. This intervention involved uploading structured learning resources such as educational videos in Google Drive, PowerPoint presentations, Word documents, PDF files, and relevant images to the online platform, enabling asynchronous learning and interaction. Students' knowledge acquisition was assessed using pre-test and post-test multiple-choice questions. (20 MCQs). Following completion of the first stage, a crossover design was implemented to minimize selection bias and inter-group variability. Group A was subsequently taught via Google Classroom, while Group B received conventional lectures on Endemic Fluorosis [Table 1]. Again, pre-test and post-test MCQs were administered to assess knowledge gain within each group. At the end of both intervention stages, students' perceptions regarding Google Classroom and the lecture method as a teaching-learning platform were collected using a structured feedback questionnaire.

Table 1: Study Technique

Topic	Nutritional Anaemia	Endemic Fluorosis
TLM	Group A (35) - Lecture method Group B (35) - Google Classroom	Group A (35) - Google Classroom Group B (35) - Lecture method

Statistical Analysis: All collected data were initially entered into Microsoft Excel 2010, and the resulting spreadsheets were subsequently utilized for data analysis. Statistical analysis was performed using Epi Info version 7.2 statistical software for Windows. Descriptive statistical measures were computed in terms of frequencies, percentages, mean with standard deviation, and median with interquartile range. Inferential statistics analysis included paired t-tests to compare pre- and post-test scores within groups and independent sample t-tests to compare post-test scores between the two teaching methods. The Shapiro-Wilk and Kolmogorov-Smirnov tests were applied to assess whether the data followed a normal distribution. For all statistical tests, a p-value of less than 0.05 was considered statistically significant, and the null hypothesis was rejected accordingly.

Ethical considerations: The objectives and methodology of the study were clearly explained to all participants, and informed consent was obtained from each participant before their inclusion and for the use of their responses in the study. The Institutional Ethics Committee at GTMCH, Theni, approved the study.

RESULTS

The study included 70 III MBBS students, with a slightly higher proportion of females (55.7%) compared to males (44.3%). Most participants were aged 22 years (42.9%), followed by 21 years (35.7%) and 20 years (21.4%). (Table 2). The mean age of the study participants was Mean ±

Standard deviation (SD) = 21.21±0.78.

An independent sample T-test was used to compare the groups. When comparing the effectiveness of teaching-learning methods, students taught through the traditional lecture method demonstrated marginally higher post-test scores than those taught using Google Classroom for both topics; however, these differences were not statistically significant. For Nutritional Anaemia, the mean post-test score was 15.06 in the lecture group compared to 14.89 in the Google Classroom group (p=0.53). Similarly, for Endemic Fluorosis, the lecture group scored a mean of 13.74 compared to 13.20 in the Google Classroom group (p=0.79).

Within-group comparisons using paired t-tests revealed a statistically significant improvement in knowledge from pre-test to post-test in both groups for both topics. In Group A, scores for Nutritional Anaemia increased from a mean of 6.14 to 15.06 (p=0.041), while in Group B they improved from 5.86 to 14.89 (p=0.45), with statistical significance observed in the Google Classroom group. For Endemic Fluorosis, pre-test scores improved from 5.51 to 13.20 in Group A (p=0.022) and from 5.69 to 13.74 in Group B (p=0.046), with both improvements being statistically significant. [Table 3]. Regarding learner perceptions, approximately 32 (45.7%) students expressed positive feedback about Google Classroom as a teaching-learning platform, whereas 38 (54.3%) preferred the traditional lecture method [Table 4]. Notably, female students showed a greater preference for Google Classroom-based learning activities (27, 69.2%) than male students (26, 83.9%), who preferred the traditional Lecture method [Table 5].

Table 2: Age and Gender Distribution (n=70)

S. No.	Characteristics	Frequency (%)
1	Age	
	20 years	15 (21.4%)
	21 years	25 (35.7%)
2	22 years	30 (42.9%)
	Gender	
	Male	31 (44.3%)
	Female	39 (55.7%)

Table 3: Pre and Post Test Scores Distribution (n=70)

S. No.	Topic	TLM	Group	Pre Test Score (Mean)	Post Test Score (Mean)
1	Nutritional Anaemia	Lecture	A	6.14	15.06
		Google Classroom	B	5.86	14.89
2	Endemic Fluorosis	Google Classroom	A	5.51	13.20
		Lecture	B	5.69	13.74

Table 4: Preferred TLM distribution (n=70)

S. No.	Characteristics	Frequency (%)
1	Preferred TLM	
	Lecture	38 (54.3%)
	Google Classroom	32 (45.7%)

Table 5: Gender perspective with respect to TLM (n=70)

S. No.	Gender	Preferred TLM		Total
		Lecture N (%)	Google Classroom N (%)	
	Male	26 (83.9%)	5 (16.1%)	31
	Female	12 (30.8%)	27 (69.2%)	39

DISCUSSION

In the present study, with respect to the demographic profile, most participants were aged 21-22 years, with 42.9% aged 22 years, 35.7% aged 21 years, and 21.4% aged 20 years. This age distribution is typical of III MBBS cohorts in India and is comparable to studies by Amandeep et al. 6 and Das et al. 7, in which most respondents were between 20 and 23 years of age. The similarity in age distribution across studies suggests that cognitive maturity and academic exposure were relatively homogeneous, thereby minimizing age-related bias in learning outcomes.

Regarding gender distribution, female students accounted for 55.7% of the study population, while males accounted for 44.3%. Interestingly, female students demonstrated greater engagement and communication on the Google Classroom platform than male students, as reflected in their feedback responses. This qualitative observation aligns with findings reported by Sheelavant et al,^[8] who found that female students showed higher levels of participation and perceived usefulness of asynchronous online platforms. Similarly, Olum et al,^[9] reported that female students exhibited a more positive attitude toward e-learning compared to their male counterparts, possibly due to greater self-regulation and adaptability to self-directed learning environments. These patterns suggest that gender-related differences in learning behaviour may influence engagement with digital platforms, even when overall knowledge outcomes remain comparable. Regarding knowledge outcomes, the present study demonstrated that both teaching methods resulted in significant improvements in post-test scores. These findings indicate that Google Classroom was nearly as effective as traditional lectures in achieving short-term cognitive learning

outcomes. Comparable results were reported by Badhe et al,^[10] who found that 89.62% of medical students perceived traditional classroom teaching as more effective, despite acknowledging the utility of online methods during the COVID-19 lockdown.

Within-group comparisons revealed statistically significant improvements in knowledge for both methods. These results are consistent with those of Bhimani et al,^[11] who reported effective learning outcomes using Google Classroom, with acceptable MCQ performance metrics and positive student feedback. Similarly, Kazi et al,^[12] observed that 72.2% of students felt that knowledge gained through Google Classroom could be retained and reproduced effectively, reinforcing the platform's role in cognitive reinforcement.

However, regarding the students' perceptions, only 45% of participants in the present study expressed a positive inclination toward Google Classroom, while 55% preferred the traditional lecture method. This contrasts with studies conducted during the COVID-19 pandemic, such as Das et al,^[7] and Amandeep et al,^[6] where most students favoured online or blended learning approaches. This discrepancy may be attributed to the timing of the present study (pre-COVID era), when online learning was supplementary rather than essential, and students were more accustomed to teacher-centered, face-to-face instructional models.

Studies from other low- and middle-income settings provide further context, such as Yarhere et al,^[13] who reported high familiarity (90.6%) but low actual usage (42.2%) of Google Classroom among Nigerian medical students, with internet availability significantly influencing engagement. Similarly, Rafi et al,^[14] observed that although students adapted to online teaching during the pandemic, only 28.3% favoured centralized online instruction, highlighting a persistent preference for traditional classroom interaction. A study by Tuma et al,^[15] also

revealed that only 33% of students perceived online education to be equivalent or superior to face-to-face learning, while a majority continued to favour conventional classroom instruction.

CONCLUSION

In conclusion, the present study demonstrates that both Google Classroom and the traditional lecture method can produce statistically significant gains in knowledge among third-year MBBS students. However, traditional lectures remained the preferred method for most students. Female students appeared to engage more positively with the Google Classroom platform. These findings support the interpretation that while Google Classroom is pedagogically effective, infrastructural readiness, prior exposure, and learning culture strongly influence acceptance. Future research should explore gender-stratified learning outcomes, long-term knowledge retention, skill-based competencies, and blended learning models integrating Google Classroom with face-to-face teaching to optimize competency-based medical education.

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Conflicts of interest

There are no conflicts of interest.

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