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**ORIGINAL ARTICLE****Comparison of a 'seven-pronged blended learning model for Indian medical graduates' versus traditional teaching in a competency based curriculum at rural medical college in Central India**

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**Abstract**

*Background:* Medical education in developing country like India is undergoing progressive changes in teaching modalities. Introduction of various new modalities of innovative teachings are considered to fulfil student's needs to make them lifelong learner. *Aim and Objectives:* To study the learning effectiveness of seven-pronged blended learning model versus traditional teaching in competency-based curriculum. *Material and Methods:* Entire batch of first year MBBS students participated in the study. The study included 74 participants in Group A, who underwent the seven-pronged blended learning model and 72 participants in Group B, who underwent traditional teaching methods. After the initial phase, groups were crossed over. Learning effectiveness were judged using theory and practical examination. *Results:* The results showed that the seven-pronged blended learning group had statistically significant higher mean scores for theory as compared to the traditional teaching group. The mean scores obtained for practical examination were similar in both the groups. *Conclusion:* These findings suggest that incorporating a blended learning approach can be beneficial in improving student's theoretical understanding, but it may not necessarily have a significant impact on their practical skills.

**Keywords:** Blended Teaching, Innovative Teaching Methods, Traditional Teaching Methods, Medical Education

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**Introduction**

Teaching and learning are the phenomena for carrying knowledge from one generation to other generation, which is essential for upliftment of society and mankind. Teaching is one of the main components in educational planning. Countries like India have undergone tremendous changes in medical education and its teaching modalities [1]. Before the pandemic, teaching used to be conducted completely face-to-face. However, the

Coronavirus pandemic had a worldwide impact on the closure of schools and universities, which compelled use of different innovative modalities for delivering education to ensure that students continue to receive education [2]. Face-to-face teaching was being replaced with online teaching in educational institutions ranging from schools to universities which was the need of the hour [3]. This combination of face-to-face and online

education is then called as "blended e-learning," which has become a popular approach to provide educational curriculum, where student-to-teacher and student-to-student interaction is live, and teachers respond in a timely fashion to student's questions and requests [4].

Various factors influence teaching and learning achievements, such as positive feedback or satisfaction with the presence of educators, abatement of student interactions, student identity, as well as support, interest in student learning attainment, and admiration for students and orderly feedback [5]. The need for online and offline activities for learning is considered important in learning pursuit for students [6].

Despite the importance of good teaching, the outcomes are far from ideal. The traditional mode of teaching, i.e., chalk and board, is still underused in medical colleges for teaching the theoretical portion of study [1]. The traditional teaching system consists of teacher-centred instruction, and the students' needs and interests are not generally considered. Now, for teaching the theoretical portion, new blended modalities are being tried, and the time has come to introspect the traditional versus newer teaching modalities. Upgraded technology in education have helped students to learn the basic and innovative ways, creating interest in the topic and help them to improve and enhance performance during their examinations [3,5].

Procter has defined blended learning in 2003 as "the effective amalgamation of different modes of delivery, models of teaching, and styles of learning" [7]. The blended model of curriculum delivery encloses face-to-face and virtual modes of instruction, and has been found to produce

favourable learning outcomes [8]. Instructor's perspectives, technical issues, and interaction with learners were found to be three important central components of education practice that determine students' satisfaction. In blended learning, the connection between instructors and students was required to continue inspiring them to be lifelong learners.

Lockdown measures in all countries forced educational institutions to search for alternatives for continuing their educational programs without compromising the safety of their students and teachers [9]. Medical education is changing, and the National Medical Council (NMC) has introduced the new pattern of study, Competency-based Medical Education (CBME). The goal of CBME is to ensure that all learners achieve desired patient-centred outcomes during their training. Competency-based medical education is an outcome-based approach to the design, implementation, and evaluation of education programs and to assess learners across the continuum by using various competencies.

It was need of the hour to introduce different modalities of innovative teaching and learning to consider students' requirements to make them lifelong learners [10]. To ensure student's commitment to a learning environment that will address all types of learning styles, flexibility of time, various opportunities which will provide an immersive experience to learners by engaging them intellectually are needed [11]. Considering these aspects, the present study was conducted in Datta Meghe Medical College (DMMC), Nagpur, with the objectives of evaluating the learning effectiveness of a seven-pronged blended learning model proposed by the group of teachers of Datta

Meghe Institute of Higher Education and Research (DMIHER) versus traditional teaching for Indian medical graduates in competency-based curriculum.

### Material and Methods

This study was conducted over a period of 1 year among 150 first year MBBS students except those who were unable to participate due to their illness, using complete enumeration sampling technique in the Department of Physiology at DMMC in Wanadongri, Nagpur. Institutional Ethics Committee approval (Ref No. DMIHER (DU)/IEC/2021/228) and informed consent were obtained, and teachers were sensitized before the study began. The classrooms were redesigned to accommodate social distancing guidelines, including rearranging furniture to maintain a distance of at least six feet between students, installing protective barriers, and providing hand sanitizer. The study had two groups: Group-A was the intervention group, consisting of participants from roll number 1-75 who stayed in the hostel in which 74 participants participated, and Group-B acted as the control group, consisting of participants from roll number 76-150 in which 72 participants participated who were allowed to attend the college. The intervention group received a seven-pronged blended learning model, which included virtual classrooms, virtual demonstration and webinars for lectures and face-to-face training, virtual demonstration and simulation for practical. Resolving queries for above topics and mentoring were done by senior teachers. The control group was taught using traditional teaching methods, including power

point presentations, chalk and board for both lectures and practical. A senior teacher was appointed for resolving queries related to above topics. After 12 weeks, groups were crossed over such that Group-A became the control group in which 72 participants participated, while Group-B became the intervention group in which 70 participants participated. The same above stated process was followed for the second phase of the study and an assessment of learning outcomes was done in both groups, at the end of the study.

During the entire study, both groups underwent a 12-week intervention, which included two lectures per month, of one hour each, for three months. There were two practical sessions of two hour each in the last month, as per the competency-based curriculum as shown in table 1 & 2. After the intervention period, both groups were assessed using two part completion test (PCT) examination. The first examination was conducted before the crossover, and the second examination was conducted after the crossover. The assessment process included a theory examination in the form of multiple-choice questions (MCQ) worth 10 marks and an oral examination conducted through an Objective structured viva voce sheet (OSVV) worth 10 marks. The theory exams were used to evaluate the knowledge retention of the participants. Additionally, a practical examination was conducted in the form of an objective structured practical examination (OSPE), which included two stations, each one worth 5 marks and totaling 10 marks. The practical exams were used to judge the psychomotor, communication, and attitude skills of the participants.

**Table 1: Depiction of lectures and teaching methods in intervention and control groups.**

<b>Sr No</b>	<b>Lecture (Competency) before cross over one hour each</b>	<b>Lecture (Competency) for cross over study one hour each</b>	<b>Teaching Method (Intervention Group)</b>	<b>Teaching Method (Control group)</b>
1	General Physiology- Resting membrane potential (1.8)	Gastrointestinal system- Swallowing and mastication (4. 3)	Seven prongs blended learning model incorporating video conferencing, virtual demonstrations.	Traditional method using PowerPoint presentation and chalk and board.
2	Blood-Anaemia (2.5)	Endocrine physiology-Thyroid gland ( 8.2)	Video conferencing, virtual demonstrations and discussion of signs and symptoms.	PowerPoint presentation. Discussion of signs and symptoms on patient.
3	Nerve Muscle Physiology- Neuromuscular junction (3.4)	Excretory system- Concentration and diluting mechanism of kidney (7.3)	Video conferencing, Virtual demonstrations with incorporation of animated videos.	Use of PowerPoint presentation and chalk and board.
4	Cardiovascular System- cardiac output (5.9)	Central nervous system-Descending tracts (10.4)	Webinar was conducted & animated videos were incorporated.	Use of PowerPoint presentation and chalk and board.
5	Respiratory System- hypoxia (6.6)	Special senses- Mechanism of hearing (10.15)	Webinar was conducted & animated videos were shown.	Traditional method using PowerPoint presentation and chalk and board.
6	Resolving queries for above topics	Resolving queries for above topics	Mentoring done by senior teacher.	Queries resolved by senior teacher.

**Table 2: Depiction of practical's and teaching methods in intervention and control groups.**

Sr No	Practical (Competency) before cross over two hour each	Practical (Competency) for cross over study two hour each	Teaching Method (Intervention Group)	Teaching Method (Control Group)
1	Cardiovascular System - examination of pulse (5.12)	Cardiovascular system- examination of blood pressure (5.12)	Seven prongs blended learning model incorporating -Virtual demonstrations using animated videos and face-to-face interactions. Simulation done using mannequins.	Traditional method - Using chalk and board. Demonstration done on subject.
2	Respiratory System- auscultation of breathe sounds (6.9)	Respiratory system- percussion of lungs (6.9)	Seven prongs blended learning model incorporating -Virtual demonstrations using animated videos and face-to-face interactions, simulation using mannequins.	Traditional method - Using chalk and board. Demonstration done on subject.

## Results

The study was carried out on entire first-year MBBS batch students, comparing the theory and practical marks between an intervention group and a control group. The study lasted for one year and utilized different statistical tests such as one-sample Kolmogorov-Smirnov test, Chi-square and unpaired 't' test. Microsoft excel 2010 was used for analysis. Different statistical analyses were performed using software version 4.0.2. A probability value of ( $p < 0.05$ ) was considered as significant. Table 3 depicts a comparison of theory and practical scores for the first part completion test examination in the intervention and control

groups. The mean scores of both groups were compared, and it was observed that the intervention group had a significantly higher mean score for MCQs (8.67) compared to the control group (7.84) ( $p < 0.05$ ). However, the mean scores for grand viva taken using OSVV were similar in both groups, with scores of (6.92) in the intervention group and (6.91) in the control group, and were not statistically significant ( $p > 0.05$ ). Similarly, the scores of practical taken by OSPE were also comparable, with scores of (7.30) in the intervention group and (7.23) in the control group, and were not statistically significant ( $p > 0.05$ ).

**Table 3: Comparison of theory and practical scores for the first part completion test examination in intervention and control groups**

Assessment Type	Intervention Group, N=74 (mean scores)	Control Group, N=72 (mean scores)	t-value	p-value
MCQs (theory)	8.67	7.84	2.06	0.046*S
OSVV (grand viva)	6.92	6.91	0.07	0.944 NS
OSPE (practical)	7.30	7.23	0.73	0.467 NS

Table 4 presents a comparison of theory and practical scores for the second part completion test examination in the intervention and control groups. It was observed that the mean scores of MCQs (8.02) and OSVV (7.89) were significantly higher in the intervention group compared to the control group, where the MCQ scores were (6.78) and OSVV (6.11) ( $p < 0.05$ ). However, the scores obtained in practical OSPE were almost the same in both groups, with scores of (7.09) in the intervention group and (7.67) in the control group,

and were not statistically significant ( $p > 0.05$ ). In conclusion, the intervention group had significantly higher mean scores for MCQs and OSVV compared to the control group. However, there was no statistically significant difference between the mean scores of practical OSPE in the intervention and control groups.

Table 5 shows specific demerits perceived by candidates with seven-pronged blended learning model.

**Table 4: Comparison of theory and practical scores for the second part completion test examination in intervention and control groups**

Assessment Type	Intervention Group, N=72 (mean scores)	Control Group, N=70 (mean scores)	t-value	p-value
MCQs (theory)	8.02	6.78	2.42	0.022* S
OSVV (grand viva)	7.89	6.11	1.15	0.256*NS
OSPE (practical)	7.09	7.67	-0.72	0.481 NS

NS-Not Significant, \*-significant at ( $p < 0.05$ ).

**Table 5: Specific demerits perceived by candidates due to seven-pronged blended learning model**

<b>Demerit</b>	<b>Description</b>
<b>Lack of direct contact with teacher</b>	Students expressed that they felt a lack of direct interaction and communication with their teachers.
<b>Technical knowledge issues</b>	Some students reported facing difficulties with technical aspects of online learning platforms and tools.
<b>Internet connectivity issues</b>	A number of students faced challenges related to unstable or limited internet connectivity during their online classes.
<b>Excess exposure to screen time</b>	Students commented on the increased screen time required for online learning, which they found overwhelming or detrimental to their well-being.

### Discussion

This study observed that using the seven-pronged blended learning model improved students' understanding of the topic compared to traditional teaching methods alone. In a study conducted by Meshram *et al.*, it was found that the face-to-face interactions and inter-linkage of students and teachers gave a human touch to the process, inspiring students to learn [9]. Atwa *et al.*, observed that virtual classroom allowed students to learn from anywhere, anytime, from anyone without any geographical barriers [12]. Videos on practical demonstrations and various animated videos made it easier and more interesting for students to understand concepts which was also seen in study done by Bidabadi [13].

Simulation with mannequins provided students with hands-on experience, enhancing their engagement and understanding. Webinars served as supplementary resources, offering additional information and mentorship from experienced teachers to help students discuss topics and overcome difficulties.

The study observed that the implementation of a seven-pronged blended learning model has resulted in improved learning outcomes for first-year MBBS students. These findings align with previous research conducted by Melton *et al.* in 2009, where they compared traditional teaching methods with a blended learning approach by evaluating course grades, learner satisfaction, and instructor feedback. The research demonstrated higher levels of learner satisfaction, increased retention rates, and improved examination scores following assessments. Although there were no significant differences observed in grades when comparing the two teaching modes, students in the blended learning group exhibited higher satisfaction levels [6]. Lopez-Perez *et al.* 2011 has also reported increased learner satisfaction with blended learning and reported that teaching modalities used in blended learning achieved higher retention rates and higher examination marks after assessments [7].

In relation to the blended learning model, students perceived specific demerits like, lack of substantial direct interaction with teachers, challenges related to technical knowledge, internet connectivity and apprehensions regarding excessive screen time which was also observed by Ananga *et al.* in 2017 [3]. In conclusion, the authors proposed that seven-pronged blended learning model can be an added advantage for the learning of physiology for first-year MBBS students. By utilizing cognitive, psychomotor, affective, and communication domains, it leads to a more effective understanding of the content of physiology.

### **Conclusion**

The effect of seven-pronged blended learning model was found to be better as compared to traditional teaching method alone in learning physiology. Improvement in cognition domain of intervention group was proven by scores obtained in theory exams which were statistically significant as compared to control group. Improvement in psychomotor, communication, and attitude skills of the participants was proved by scores obtained in practical exams which were statistically significant in the interventional group as compared control group. Thus, the results of our study state that learning by the seven-pronged blended learning model has an added advantage in making students learn and understand the subject of physiology better than by using traditional mode of teaching methods alone.

### **Limitation**

The only subject studied was physiology, but the seven-pronged integrated learning model strategy should have included other first-year MBBS subjects like anatomy and biochemistry. Using this approach, more instructional talks and practical ought to have been included.

### **Recommendation**

A more effective and enjoyable learning environment will be provided by the suggested integrated learning approach, which will contribute to the transformation of medical education. The seven-pronged blended learning approach can be used as an intervention with pre- and post-clinical subjects. The integration of educational modalities, with a thoughtful mixture of in-person and technology-enhanced learning, adheres to learning theories, makes the best use of teachers, and is generally accepted by tech-savvy generations. Additionally, the approach enables the student to develop skills for self-directed, lifelong learning.

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