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Original Research Article

Designing, Implementation and Assessment of Effectiveness of Physiology Electives in CBME Curriculum

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ABSTRACT

Background: Elective courses, a significant addition to the competency based medical education curriculum, were implemented for the first time in the MBBS 2019 batch nationwide. This study was formulated to assess whether the design and manner of implementation of elective modules in Physiology could provide the students with diverse learning experiences.

Materials and Methods: A cross-sectional study was conducted among 19 undergraduate students who completed electives in physiology at a private medical college in South India. The students enrolled in three electives in Exercise, Cardiovascular, and Sleep Physiology, each of which had a research component. Pre- and post-tests were used to assess knowledge levels in their selected topics and basics of biomedical research and a Likert scale survey was used to evaluate student perception of the electives. Pre-test and post-test scores were compared using a paired t test, and responses to survey questions were expressed in percentages using a diverging stacked bar chart.

Results: Mean knowledge scores were significantly improved after the electives ($p<0.05$). Overall, students had a positive perception of the design, implementation, and faculty knowledge of the electives. However, some of the students reflected that data collection procedures were hectic and the daily entries of log book activities were time consuming.

Conclusion: Well-designed and effectively implemented electives in physiology can provide students with valuable learning experiences, expand their knowledge, and equip them with relevant skills for their future careers. Incorporating ongoing student feedback and continuous evaluation can contribute to the refinement and improvement of future elective modules in physiology.

Keywords: Electives, Physiology, Medical Education, CBME, Logbook

INTRODUCTION

Medical education is essential for shaping future of healthcare professionals and ensuring high-quality healthcare services. To provide a well-rounded education, medical schools offer elective courses, which represent a significant departure from traditional medical training.[1] Physiology, a fundamental discipline in medicine, focuses on understanding the mechanisms and functions of the human body. While core topics in physiology are covered in medical curricula, there is increasing recognition of the value of specialized knowledge and practical experience in specific areas of physiology.

As a result, elective courses in physiology have emerged, allowing medical students to explore specific aspects of the field that align with their interests and career goals.

By engaging in elective courses, medical students can broaden their understanding of the intricacies of

physiological processes and mechanisms that underpin human health and disease. They have the opportunity to work closely with experienced faculty members and researchers, collaborating on ongoing projects or conducting their own research under supervision. This hands-on experience fosters critical thinking, problem-solving abilities, and an appreciation for the scientific method.

Electives in medical education is an age-old concept in the Western world, but they are a relatively new approach in the Indian scenario.[1] Recognizing the potential of electives, the National Medical Commission (NMC) in India has integrated electives into the Competency Based Medical Education (CBME) curriculum to provide students with diverse learning experiences. Elective courses are mandatory for MBBS undergraduates and has to be done after completion of third MBBS part I examination. Implementation of electives posting for the first batch differs from what is being followed now. At present, one month of elective posting is structured as two blocks of 15 days each.[2,3] Block 1 must be completed in preclinical, paraclinical, or other basic sciences laboratory or under the supervision of a researcher in an active research project. Block 2 shall be done in a clinical department (specialties, super specialties, intensive care units, blood bank, and casualty) in the institution or as a supervised learning experience at a rural or urban community clinic. To be eligible to appear for the final MBBS examination, electives must be completed successfully with a minimum of 75% attendance and a logbook submission. The institutions can predetermine the number and nature of electives, number of learners in each elective as per the available resources and faculty.[2]

Despite being aware of the positive effects of electives, the planning, implementation etc. becomes a daunting task. While planning physiology electives, there can be several difficulties that one may encounter. This study was formulated to assess whether the design and manner of implementation of the electives modules in physiology could provide students with diverse learning experiences. With the recent implementation of elective programs in medical colleges across the country in 2023, we anticipate that the findings of our study will facilitate necessary modifications and improvements in the design and implementation of elective modules in the future.

MATERIALS AND METHODS

This cross-sectional study was conducted in a private medical college in South India among undergraduate students from the MBBS 2019 batch who chose electives in Physiology. Out of 20 students, 19 who met the minimum attendance requirement of 75% were included in the study. One student who did not meet the attendance requirement was excluded. Ethical approval was obtained from the Institutional Ethics Committee, and participants were provided with an information sheet and gave informed consent.

Designing of the Elective modules

The physiology department conducted a brainstorming session to identify topics that were not typically covered in the standard medical education curriculum but would enhance students understanding of basic physiology. The focus areas selected were exercise, cardiovascular, and sleep physiology. Three electives were developed based on these topics, following the guidelines provided by the NMC. Learning objectives were defined for each elective, and internal preceptor were assigned. The 15-day elective training period was carefully planned, including lectures, small group discussions, journal clubs, and self-directed learning sessions.

Research opportunities were also included in each elective, with a dedicated day for introducing biomedical research concepts to the students. Learning resources and recent research papers related to the specific topics were identified for each elective.

Implementation of Electives

The electives module was prepared for different topics following the NMC format. The module was submitted to the Medical Education Unit for approval, and suggestions were incorporated. The list of electives was displayed for students to choose from, with a fixed number of candidates allocated for each elective based on department resources. The

physiology department accommodated 10 students during a 15-day elective posting, with 4 for exercise physiology, 3 for sleep physiology, and 3 for cardiovascular physiology, all over 20 students for physiology electives in a month. Electives were assigned on a first-come, first-served basis. On the first day of the elective posting, students received their specific elective module and were briefed on learning objectives, resources, and activities. A pre-test was conducted, covering questions related to their chosen topic and basic research. The 15-day schedule was displayed for students to be aware of the planned activities.

Measuring outcomes of Electives

The students' knowledge level was assessed through a pre-test and post-test consisting of 15 multiple-choice questions, including questions related to their chosen topic and basic biomedical research. A Likert scale-based perception survey was conducted at the end of the elective posting to gauge students' perception of the design, implementation, and effectiveness of the electives. The survey comprised 15 closed questions and one open-ended question for suggestions. Data was analyzed using IBM SPSS version 25, with paired t-tests used to assess the difference in knowledge before and after the elective postings. p value < 0.05 was considered as significant. The responses to the perception survey were presented as percentage using a diverging stacked bar chart.

RESULTS

During a one-month elective program conducted in the department of physiology, a total of 19 students successfully completed the program with a minimum attendance rate of 75%. One student who failed to meet the attendance requirement was excluded from the study. The program consisted of three different elective modules focused on exercise physiology, sleep physiology, and cardiovascular physiology.

In order to measure the gain in knowledge regarding their chosen topics and biomedical research after completing the elective postings, the participants' knowledge was evaluated through pre-test and post-test scores (Table 1 & 2).

Table 1: Comparison of pre-test and post-test scores of students

Test	N	Mean± SD	Mean difference	t	d.f	p-value
Pre-test	19	7.57 ± 1.68	3.803	6.654	18	<0.001[a]
Post-test	19	11.37± 2.087				

[a] Stastically Significant (p<0.05)

Table 2: Comparison of pre-test and post-test scores obtained by students on questions regarding basic biomedical research

Test	N	Mean± SD	Mean difference	t	d.f	p-value
Pre-test	19	3.21± 1.032	1.053	3.750	18	0.001[a]
Post-test	19	4.26± 0.806				

[a] Stastically Significant (p< 0.05)

Table 3: Students' feedback in response to open-ended question about their experience with the elective postings.

1. "It was a great experience overall. I found the elective session to be well-organized and structured."
2. "The topics covered in the electives were relevant and interesting. I learned a lot about conducting research and managing data."

3. The research article discussions and journal presentations were particularly helpful in expanding my understanding of the subject matter."

4. "I personally didn't find the need for maintaining a logbook, as it didn't contribute significantly to my learning experience."

5. "The limited time available for conducting a proper research study was a challenge."

6. "The data collection procedures were quite hectic and demanding."

7. "Some activities felt slightly repetitive, which could have been avoided for a more diverse learning experience."

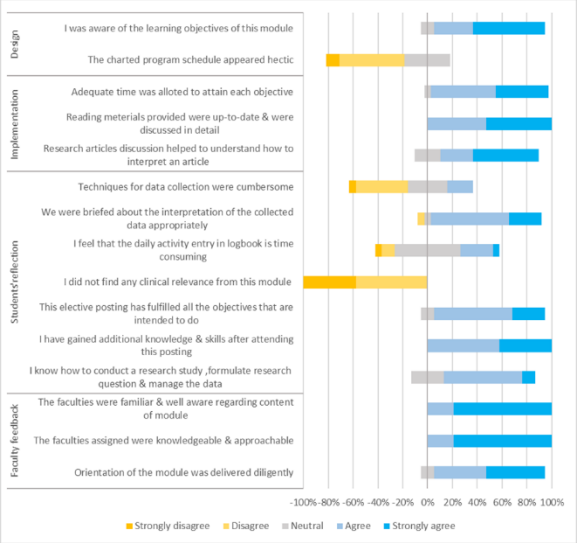

Figure 1: Diverging Stacked Bar Chart Illustrating Percentage Results from the Five-Point Likert Scale-Based Student Perception Questionnaire.

Figure.1 shows percentage results from the five-point likert scale-based student perception questionnaire. Responses to various statements were grouped under 4 main categories: Design of the module, Implementation of the module, students' reflection of electives & students' feedback of faculty.

DISCUSSION

This paper focuses on the steps involved in designing and implementing electives in physiology, considering the students' learning objectives. It also presents the perspectives of students on these electives, highlighting their experiences and insights. The effectiveness of the elective module was evaluated using a pre-test post-test design, and the assessment showed a significant improvement in students' knowledge after completing the elective postings. This finding aligns with previous studies on electives, which have demonstrated similar positive effects on students' knowledge and skills.[4,5,6] Medical students need to have knowledge and a positive attitude towards research for practicing evidence-based medicine. Research courses at the undergraduate level have been shown to enhance research knowledge and skills.[7,8,9,10] The physiology electives included a research component to familiarize students with the research process and its application to their chosen topics.

A student perception questionnaire was used to evaluate students' perception of the elective design, implementation, effectiveness, and faculty feedback. The Likert scale responses were analyzed and categorized into four main areas: elective module design, module implementation, student reflection on the electives, and faculty feedback.

Design of the Module: The design of the modules received positive feedback from the students. Approximately 76.3% of students believed that the module design effectively communicated its learning objectives, and the pace of the module was appropriate, allowing sufficient time to achieve the objectives.

Implementation of the Elective Module: A majority of students (91.2%) agreed that the elective modules were implemented proficiently. They felt they were given adequate time to accomplish the learning objectives, were provided with up-to-date learning materials, and found the research article discussions helpful in interpreting articles.

Reflection of Students about the Electives: Most students (68.4%) agreed that the research activities they engaged in as part of their elective postings, such as data collection and interpretation, were not difficult due to proper guidance.

Logbooks are a valuable tool for trainees and clinical teachers to track learning progress and ensure that training requirements are met.[11] In our study, more than half of the students (52.6%) had a neutral response regarding the time-consuming nature of maintaining a logbook of daily activities, while 31.6% agreed that it was time-consuming. A study of student perceptions of logbooks found that students find them to be time-consuming. They reported that an ideal logbook should be inexpensive, feasible & acceptable to students that allows rapid collection of valid, relevant and reliable data.[12]

All of them felt that the electives in physiology were clinically relevant & they have gained additional knowledge and skills. A recent study conducted in India reported that electives helped the students to gain a new perspective about the preclinical subjects.[13]

Majority of students (73.7%) reflected that electives made them confident enough to conduct a research study in the future. Various other studies have also reported that participation in research activities during undergraduate studies brings positive attitude among medical students towards scientific research.[14,15,16]

According to previous studies variety of challenges and obstacles have been shown to contribute to a lack of interest in research among medical students.[17,18,19]

The newly introduced mandatory elective programs in Competency-Based Medical Education curriculum that gives an opportunity to the medical students to be a part of research programs helps to remove apprehensions about research among them and increase their interest in doing research.

Student's Feedback on Faculty: Overall, the students provided positive feedback about the faculty assigned to the elective postings. Approximately 96.5% of students found the faculty to be knowledgeable, well-informed about the module and able to deliver the module orientation diligently.

The table 3 presents a compilation of the students' feedback in response to open-ended question about their experience with the elective postings. The comments received from the students varied, encompassing both positive and negative aspects of the electives. Collecting feedback from students after elective postings is vital for continuous improvement and a student-centered approach. It helps identify strengths and weaknesses of the program, leading to necessary adjustments and enhancements. Feedback also aids in the professional development of faculty members by recognizing their strengths and identifying areas for improvement.[20,21,22] It guides faculty in refining their teaching methods for future electives, promoting ongoing growth and development in instructional practices.

CONCLUSIONS

This study underscores the significance of well-designed and effectively implemented electives in physiology, which offer valuable learning experiences, expand students' knowledge, and equip them with relevant skills for their future careers.

Based on the feedback received, future improvements can be made in areas such as streamlining the logbook requirements, providing support for data collection procedures, and diversifying activities to avoid repetition. Ongoing student feedback and continuous evaluation will contribute to refining and improving future physiology elective modules.

Limitations

The current research on physiology electives is limited by the small number of students who can be accommodated. Additionally, the study did not survey faculty members involved in the program, which could have provided valuable information about their perceptions and how the electives module could be improved overall.

Large multicentric studies on a larger student population and faculty members are warranted to improve the reliability of research on physiology electives.

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