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| RESEARCH ARTICLE

Integrating Microteaching to Enhance Cardiovascular Physiology Instruction: A Review of Strategies, Outcomes, and Future Direction

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| ABSTRACT

It is essential that health professional education programs enable medical students to gain the competencies required to deliver life-saving care. Medical educators' efficacy is a major influence on the knowledge gained by students. As such, it is indispensable for medical educators to possess sufficient knowledge and skills to effectively teach extensive and complex content. Medical students often experience difficulties understanding cardiovascular physiology, which can be attributed to how the instruction is delivered. Microteaching is one of the pedagogical approaches that can be applied to enhance cardiovascular physiology instruction by improving medical faculty's knowledge, understanding, and competencies to deliver learning to their students. Microlearning strategies are peer feedback, reflection, iterative refinement, and incorporation of active learning approaches. The microlearning strategies enable medical educators to engage learners and improve their understanding of cardiovascular physiology. Applying microlearning supports in imparting medical educators with the competencies to create a dynamic learning environment that promotes an understanding of cardiovascular physiology. Microteaching is focused on developing teaching skills through expert modeling. The outcomes of microteaching are improved teaching skills, self-confidence, better lesson planning, and enhanced presentation, all of which result in creating better learners. In essence, microteaching is an effective approach to improving teaching skills among medical teachers. Accordingly, improved teaching skills can enable educators to effectively provide cardiovascular physiology. The future directions include the need to leverage technology integration and interdisciplinary partnerships. Integrating microteaching could improve medical educators' competencies to teach cardiovascular physiology instruction.

| KEYWORDS

Microteaching, cardiovascular physiology, medical education

| ARTICLE INFORMATION

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1. Introduction

Health profession educators should effectively teach extensive and complex content, assisting students in gaining adequate knowledge, which can enable them to become proficient healthcare providers (Manning et al., 2021). Physiology is recognized as a challenging course, which is indicated by prevalent drop withdrawal and failure rates (Solominski et al., 2019). Specifically, learning and understanding cardiovascular physiology are often a challenge for medical students, an issue that might in part be because of the manner the instruction is used in teaching (Borders et al., 2021; Jamieson et al., 2020). The challenge in learning the complexity of concepts such as electrophysiology, hemodynamics, and blood pressure regulation requires educators to be adequately competent for them to effectively disseminate knowledge to medical students.

The teaching methods and tools used are among the factors that can be attributed to understanding cardiovascular physiology (Halalsheh et al., 2023). Medical professionals sometimes perceive that their education does not prepare them for teaching. When teaching is conducted in a large classroom, the environment does not provide a conducive atmosphere for developing or refining skills (Ghatge et al., 2024). Consequently, the need for learning approaches to prepare medical educators is to gain

sufficient knowledge to assist learners in understanding cardiovascular physiology. The adoption of competency-based medical education has resulted in an increased focus on active learning and the development of teaching and learning skills instead of passive information acquisition (Meenal, 2024). Microteaching is consistent with competency-based medical education because the approach is an organized teaching practice that provides teachers, including medical educators, with confidence, support, and feedback.

Microteaching emerged as an approach to mitigating traditional teaching inadequacies (Ghatge et al., 2024). The instructional approach allows for engaging in dialogue and personalized attention advantages, which are often lacking in mass teaching. Microteaching is one of the strategies that can be used to improve cardiovascular psychology instruction for medical students. The use of microteaching provides an opportunity to provide specific training to teachers, such as medical faculty, to gain educational skills (Ramanathan et al., 2021). Microteaching is an educational innovation that enables teachers to exercise specific behaviors and competencies to improve training related to planning, conducting, and evaluating knowledge dissemination (Lozgka, 2024). The focus of this mini-review is to describe the integration of microteaching to promote cardiovascular physiology instruction in medical education. The specific focus is on the strategies, outcomes, and future directions.

2. Integrating Microteaching Strategies

The use of microteaching requires teaching a small group of students for a short duration by applying specific teaching skills and single concepts (Ghatge et al., 2024). Microteaching, when delivered in a congenial environment of colleagues and friends, provides teachers or professors an opportunity to receive well-intended and constructive feedback. Constructive feedback can be on engagement of the material, clarity, and effectiveness. Time management during microteaching is categorized into five to six minutes to teach, five minutes for receiving feedback, 10 minutes to re-plan, five minutes to re-teach, and five minutes for re-feedback (Ghatge et al., 2024). The phases of microteaching include knowledge gain, skill acquisition, and transfer (Bajaj et al., 2014). The iterative process promotes medical educators optimizing their teaching techniques. Knowledge gain is the preparatory stage, where a teacher is trained using lectures, illustrations, discussions, and demonstrations specific to the subject area by experts. Skill acquisition involves the teacher practicing the skills gained, which colleagues and peers evaluate. At this stage, the teacher receives well-intended feedback, which promotes modifying the pedagogical practices. The aim is to achieve better teaching and learning practices by allowing the transfer of competencies from simulated to teaching in actual settings. Educators teach a short lesson to an audience made up of four to six peers or learners for 5 to 10 minutes, who assess the process at the end of the duration. The focus is on how to teach with the sessions being organized to promote the effective implementation of visual aids such as specimens, models, projection, instructions, and audio aids (Bajaj et al., 2014). The educator re-plans the lesson, being cognizant of the feedback gained, then re-teachers the lesson. The repeated cycles assist teachers in improving their competencies.

Accordingly, the phases of microteaching can be applied in teaching to promote concept segmentation and peer teaching. Content segmentation included reducing complex cardiovascular concepts into understandable segments that can promote targeted instruction. The application of peer teaching can involve medical educators providing lessons on a specific cardiovascular topic, after which the teachers receive feedback. Similarly, microlearning can be applied by medical students, where they are requested to prepare and deliver 10 to 15-minute lessons to peers on a specific cardiovascular topic. The approach underpins active learning and enhances students' understanding of cardiovascular physiology instruction, particularly upon receiving feedback from peers and medical educators.

3. Microteaching Outcomes

Microteaching offers educators an opportunity to adopt new teaching and learning strategies while acquiring an understanding of the student's needs and expectations. Microteaching helps to assist teacher trainees in gaining competencies under controlled conditions. The competencies of microteaching are categorized into introduction skills, probing questions, explanation, stimulus vibration, blackboard writing, and achieving closure (Ghatge et al., 2024). Microteaching can help educators improve lesson planning, set induction, presentation and explanation, stimulus variation, reinforcement, questioning, and closure methods (Bajaj et al., 2014). Microteaching has been supported to train in teaching behaviors and skills in small group settings. In a microteaching session, the educator begins with a statement of concise objectives of the session, which is preceded by a presentation of the matter in an adequate sequence. Lesson planning ensures that the content is concise, appropriate, relevant, and time-bound. Set induction involves gaining the students' attention when class begins. Presentation and explanation allow teachers to have the competencies needed to explain concepts with clarity, ensuring understanding among students (Bajaj et al., 2014).

Stimulus variation in microlearning assists in avoiding boredom among learners by using gestures and changes in speech patterns (Bajaj et al., 2014). The use of reinforcement enables emphasizing challenging concepts, which allows recognizing that learners often have difficulties listening and, as such, the need to encourage their participation. Incorporating questions assists

with assessing knowledge gain and retention. The use of microlearning requires closing a teaching session by connecting the concepts learned with past knowledge and supporting applications in the future (Bajaj et al., 2014).
Microteaching supports individualized training and ensures safe and controlled teaching. The immediate feedback promotes improved and motivated learning.

Among medical college faculty, microteaching has been supported to improve teaching skills (Ramanathal et al., 2021). In addition to improving medical educators' teaching competencies, microteaching has been supported to promote self-confidence (Shilpashree, 2018). Microlearning can be used as a medical faculty development program because the techniques improve the quality of teaching, making lessons more interesting and effective (Dutt et al., 2023). The use of microteaching has been supported in setting induction during learning, promoting lesson planning, enhancing presentation, and using audio-visual aids (Deshpande and Shastri, 2020). Accordingly, internalizing microteaching skills can result making better doctors better teachers, learners, and health educators.

Consequently, if applied in cardiovascular physiology instruction, microteaching can assist educators in planning lessons and delivering teaching effectively. Microteaching should be incorporated to enable postgraduate students and novice medical students to develop teaching competencies. In essence, microteaching assists medical faculty in decreasing errors by developing proficiency in teaching. Improved teaching competencies enhance teachers' self-confidence, which can improve medical students' in-class performance (Deshpande and Shastri, 2020).

4. Microteaching Future Direction

Accordingly, applying microteaching enables teachers to gain knowledge and practice in the classroom. Additional efforts are needed to leverage the outcomes of microteaching in cardiovascular physiology instruction. The future directions include integrating advanced technologies and promoting interdisciplinary collaboration. Technology integration can support promoting the revolution of how microteaching is used in promoting cardiovascular physiology. The use of technology such as high-fidelity virtual simulations can result in replicating complex cardiovascular processes such as cardiac electrophysiology. Incorporating innovation can improve medical teachers to visualize and interact with physiological concepts in a controlled environment. The application of tools can support microteaching by helping medical educators in gaining hands-on learning experiences that complement their theoretical knowledge, promoting knowledge dissemination. Artificial intelligence can be applied to assess teaching sessions in real-time, which can provide educators with instant data-based feedback. Constructive feedback can be the clarity of explanation, student engagement, and content pacing, offering medical educators actionable insights for improving the manner they teach cardiovascular physiology. As such, in the future, leveraging artificial intelligence and high-fidelity virtual simulation can complement microteaching, making the process more scalable, adaptable, and effective.

Interprofessional collaboration is essential because cardiovascular physiology is inherently interdisciplinary, specifically in clinical and science practice. Collaboration between clinicians, educators, and researchers is important. When medical educators partner with clinicians, it ensures that the microteaching content consists of real-world scenarios. As such, when they educate medical students, the learning adequately imparts them with applicable knowledge. Collaboration with researchers can assist in ensuring that the microteaching content is up to date with the advancement in the field. As such, the knowledge that medical educators will be disseminating to students will be a representation of current practices and understanding. Peer microteaching sessions should be conducted for novice medical educators to improve their cardiovascular physiology teaching skills. Overall, interdisciplinary collaboration can ensure that medical educators receive a holistic approach to teaching where they gain an understanding of physiology and related fields such as pathology, pharmacology, and imaging. Comprehensive knowledge can better prepare educators in preparing students to think critically and apply their competencies in diverse clinical contexts. Interdisciplinary collaboration during microteaching can help in decreasing the gap between practice and theory, ensuring cardiovascular physiology is impactful and relevant.

The is a need for primary research to be conducted to assess medical educators' competencies in teaching cardiovascular physiology after microteaching. Findings from the primary research can be used in determining the causality of integrating microteaching in enhancing cardiovascular physiology instruction in medical education. The outcome measures can include medical educators' teaching skills, adaptability, and confidence. Future researchers can also conduct longitudinal studies to measure students' knowledge retention related to cardiovascular physiology instruction after being taught by educators who have experienced microteaching. Additional research can provide a comprehensive understanding of the role of microteaching in medical education, which can underpin improvement in instruction.

The use of microteaching alone cannot independently result in the full preparation of teachers because of the approach's limitations. A limitation is that time is a core constraint when implementing microteaching. Conversely, the limitations do not discredit microlearning as an innovative educational approach, which has been integrated into the practical training context.

Microteaching should be made a mainstream innovative teaching approach in health professionals' curricula. Additional investment in faculty development programs is needed to impart educators with the competencies to design and deliver effective microteaching sessions.

5. Conclusion

Microteaching can be an appropriate approach for improving cardiovascular physiology instruction by offering opportunities to try newer teaching modalities in simulated sessions instead of applying the strategies in a real class. The application of microteaching could help medical educators improve their teaching competencies, supporting their ability to deliver cardiovascular instruction. The use of microteaching in cardiovascular physiology instruction can help in planning lessons and delivering content more effectively, enabling medical students to understand complex concepts. The improved outcomes among medical educators' competencies can support their ability to improve the retention of complex concepts among students and enhance the student's ability to apply the knowledge in clinical scenarios. A need exists for medical educators to be trained in microteaching techniques and curriculum mapping to ensure that the sessions are optimally placed. The use of microteaching can enable educators to understand how to create specific learning objectives. The process of receiving feedback promotes continuous improvement among medical educators, who can subsequently apply the competencies to improve the cardiovascular physiology instruction disseminated to their students. Additional investment in faculty development can ensure educators are adequately prepared to implement microteaching strategies to improve their competencies in teaching cardiovascular physiology.

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