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Modern Techniques Of Teaching And Learning In Medical Education - A Review Study

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Abstract

Objectives: Education is a dynamic process that requires refinement periodically. Lack of innovative teaching techniques in academics makes medical curricula inadequate in making a significant stride towards the future. The objective of this review is to describe and assess alternative methods of teaching and learning which can be supplementive or alternative to traditional lectures for promoting active student participation and smooth flow of information.

Methods: A review of literature was performed with PubMed using the keywords: "learning", "modern learning techniques" AND "medical education". Databases were searched and 300 studies were identified out of which 100 were selected for further screening based on inclusion criteria and exclusion criteria. Articles were surveyed based on their relevance and significance to our study objectives with both qualitative and quantitative studies were examined.

Results: Case-based learning, evidence-based medicine, problem-based learning, simulation-based learning, e-learning, peer-assisted learning, observational learning, flipped classroom and team based learning are some of the modern learning methodologies. The various learning methods discussed attend to individual learning differences allowing students to broaden their thinking and professional knowledge by improving logical and critical thinking, clinical reasoning, and time management. Early introduction of integrative approaches develops student competency and leadership equipping students for a smooth transition into the clinical practice.

Conclusion: This study highlights the importance and challenges of modern learning systems. With technological advancement and wider implications of medical information, students require innovative skills through inter-professional learning. It is necessary to introduce and implement flexible medical curricula that accommodates distinct modern teaching to effectively balance and bridge the gap between traditional teaching methodologies and modern educational requirements.

Key words-s: Education, Medical, Teaching; Learning, Problem-Based Learning; Evidence-Based Medicine.

Introduction-

Wide spread adoption of Curriculum-Based Medical Education (CBME) would mean a paradigm shift in current approach to medical education. Components of CBME are competency, entrust able professional activity, tailored learning experiences, sequenced progression and programmatic assessment. The aim of training in the medical colleges is to produce a medical graduate who is capable of taking care of health needs of the society. Previously the teaching learning methods and assessment methods would focus on knowledge rather than on skill and attitude. The traditional curriculum is subject centered and time based. CBME is aimed at taking care of communication skills, ethics, professionalism and know-how of doctorpatient relationship. CBME promises greater accountability, responsibility, flexibility and learner-centered. [2]

Teaching is not only a transfer of information from a teacher to the student, but also a twoway process of sharing thoughts and feelings. The teacher should be aware of the recent developments in medical education. Teaching is a process which facilitates learning by encouraging students to think, feel and do. The traditional role of the teacher has been to act as a source of information and transmit this to the students. The teacher must interact with the students following suitable teaching methods to make the students well versed in the subject. Innovation in the present teaching methods is always necessary. The teacher should play a vital role for the all-round development in the subject through proper teaching methods. A teacher must be a model to the students. [4]

AIMS AND OBJECTIVE AND SIGNIFICANCE-The objective of this paper was to discuss and analyze different teaching-learning alternatives in modern medical education. There is a great need to align teaching styles of medical faculty with the changing landscape of medical education due to ever increasing emphasis on integrated, problem-based, student-directed and peer-assisted horizontal collaborative learning methods. Such changes have transformed the traditional authoritative role of teacher to more supervisory and mentoring conventions.

METHODOLOGY-A review of literature from ‘PubMed’ and goggle scholar, EMBASE was performed using the keywords: "learning" OR "modern learning techniques" and "medical education". Databases were searched and 400 studies were identified out of which 100 were selected for further screening based on inclusion criteria and exclusion criteria. Inclusion criteria was set to include studies that were peer-reviewed, published between year 2000-2020, articles reported in English, abstracts that contain at least one of the key search terms. Exclusion criteria was set as literature in non- English languages, studies published before 2000, little or no focus on educational methodologies, studies that did not include at least one of the key search terms.

RESULTS-We identified different types of modern learning techniques through our literature search. These modern techniques of teaching and learning are well validated and commonly being employed in different parts of the world to fulfil specific curricular objectives. We carefully reviewed them to analyze their perceived and proven effectiveness, and challenges in introduction and implementation. Similarly, we also provided recommendations to overcome these limitations/challenges. some of them are illustrated as follows-

1. Case based learning (CBL)
   CBL is a teaching-learning practice where clinical cases are employed to aid in traditional lectures. CBL promotes active learning, and is being used recently to compensate for the lack of motivation in didactic lectures. Students are given the opportunity to explore real cases in which patient history, signs, symptoms along with clinical and laboratory findings are provided [11]. Through teamwork and peer interaction, students assess the case while planning for investigations and appropriate management. The motto is to equip students with the necessary aptitude required for critical analysis. CBL links theory to practice promoting inquiry-based learning techniques. Students are put into groups and presented with

clinical cases to simulate real life scenarios. These groups of students then work as a team to discuss and analyze the case to uncover differential diagnoses, management strategies, and future plans.
Instructors need to undergo proper training to effectively utilize and appreciate CBL. This learning technique is more effective when conducted through small group sessions, with the involvement of engaged learners and cases closely related to clinical scenarios [12]

2. Evidence based medicine (EBM):

EBM provides students with the necessary tools to learn, comprehend, and appraise medical literature. EBM follows five steps: a) translation of undetermined information to an answerable question, b) retrieval of the best evidence available, c) critical comprehension of evidence for internal validity, d) application of results in practice, and e) performance evaluation. It advocates long-lasting learning and disciplined thinking by allowing meticulous and sensible application of current medical evidence in decisions regarding patient care [13]
EBM should be amply covered and supported by both undergraduate and postgraduate education to remove obstacles thereby preparing students with the necessary skills allowing for the effective utilization of this learning strategy. It should be introduced early in the course curriculum to develop analytical reasoning ability through the appraisal of the medical literature.

3. Problem based learning (PBL):

PBL is a modern learning system which combines complementary educational principles in the form of a clinical problem. It is particularly aimed at improving the quality of educational outcomes through collaborative, integrated, self-directed and comprehensive learning. PBL is acknowledged as a powerful strategy supporting higher-order cognitive processes among the members of the group . Knowledge application and diagnostic reasoning skills are acquired through given cases to address a variety of clinical problems[14]. Students develop better clinical reasoning skills, use time efficiently, and retain clinical knowledge. Such skills and attributes are especially important for subsequent practice as the need for continuing medical education becomes widely accepted, and necessary to cope with the explosion of medical information and technology.

4. Simulation based learning (SBL):

Simulation represents a man-made illustration of a true world to attain instructional motives through experiential learning. The main principle behind simulation learning is to utilize simulation aids to mimic real clinical scenarios. Although medical simulation is quite new, simulation has been used for a long time in other high risk professions such as aviation. Medical simulation permits the retrieval of clinical skills through intended practice rather than an apprentice-style of learning. It can assist as a substitute to real patients and clinical scenarios. Barriers that surround limited clinical settings have encouraged the use of SBL into preclinical teaching. One of the most important advantages is the absolute freedom for trainees in making and repeating mistakes without harming the patient [15] .The implementation of simulation training alongside the traditional didactic lectures, has shown to reduce errors and improve performance of medical procedures. It is therefore advisable to utilize the simulation technique in teaching complex medical procedures for better patient care outcomes. Simulation-based learning should be implemented at the very start of basic sciences allowing for more hands-on pseudo-clinical exposure.

5. E-learning-

It is advisable to validate and standardize e-learning resources to deliver unbiased, evidence-based, and accurate information on all aspects of healthcare (Pant et al., 2012). One way to ensure access to suitable online resources is to encourage sharing of the resources between the concerned stakeholders [16] . Reward or compensation can be provided to the academicians who create medical videos and online seminars. Furthermore, the best method of e-learning is to provide a self-paced and blended learning approach which can be achieved through proper collaboration and communication in between the classmates and other experts. This can be achieved through the videoconferencing or other social sites to provide the students with personalized support, target group discussion, and individualized question answer sessions [17] .

6. Peer assisted learning:

Peer-assisted learning is the development of knowledge based skill through active help and support of equals. It is a team-based, analogous, non-professional learning framework which comprises a group of motivated people helping each other in the learning process.

This learning strategy is conducted through selection of students with suitable characteristics of teaching medical concepts [18] . This allows for development of capabilities enhancing learning along with practice of medicine. It is an extensive system that promises to ensure strong affiliation amid experiential learning and a collaborative teaching environment. Assessment, feedback, observations and reflective logging, can be used to monitor both tutor and tutee progress [19] . Teachers can assist, modify or provide an alternative learning technique to address the students' academic needs only if an expected outcome is not achieved.

7. Observational learning:

Observational learning is learning through demonstration, mostly important in the medical field in due consideration of "patient safety first". Motor skill development is an essential component of medicinal expertise and therefore must be taught and practiced competently. Numerous medical procedures are termed open-skills as they necessitate physician adaptation to unpredictable and ever-changing environments (e.g. oro-tracheal intubation and surgical suture).

Observational methods are crucial to learning complex medical procedures enhancing learning and skill through observational practice. Motor skill practice becomes an important attribute to improve performance of medical procedures, and understanding the underlying mechanism for these motor actions play a crucial role in building better training systems. Strategies acquired from this technique lead to flexible capabilities and optimize motivation by enhancing information processing. It also heightens skill development through visual-spatial depiction consequently producing vivid imagery of the working memory.

Moreover, it can introduce observer-bias in which student interest can affect perception and interpretation of the demonstration. Likewise, there can be a transient change in student behavior introducing a "Hawthorne effect".

8. Flipped classroom:

Flipped classroom is the newer innovative teaching and learning strategy that incorporates blended learning techniques using online and/or offline instructional content outside the traditional classroom setting. Students are provided with the pre-recorded lectures assigned as homework for class preparation shifting from instructor-centered towards self-directed learning. They solve medical cases by engaging in small groups that will facilitate a team-based approach and promote longer retention of facts [20] .

Flipped classroom promotes self-directed learning, as students are obliged to look into alternative sources to support the given cases. Current research evidence shows that the flipped classroom approach improves student perception, learning, critical thinking skills, and motivation in comparison to traditional

lecturing methods [21]. Through incorporation of audio-visual tools, students are provided with indefinite access to instructive material thus stimulating an interactive and independent learning experience [22]. Recommendations: Successful utilization of flipped classrooms requires an active participation of both the student and teacher. Obtaining feedback by students, encouraging peer learning and promoting pre-reading can further allow smooth operations of flipped classroom.

9.Team-based learning:

Team-based learning (TBL) is one of the finest learning techniques that recently gained popularity in medical education with the basis of student- centered learning [23] . Team-based learning is defined as a learning strategy with a small group of students having the opportunity to apply educational concepts through various activities that comprises critical thinking, individual and team-based tasks, brainstorming followed by immediate feedback from the instructor. TBL has a greater advantage of increasing communication skills and team work strategies in the student groups which are essential for patient care [24] .

TBL also possesses the major advantage of having students find solutions, make decisions as a team which fosters increased motivation for learning, creates concept mapping and seeds deep learning. Instructors leading small group discussion sessions which mimics team-based learning have shown better student assessment scores compared to the standard didactic lectures [25] .

On extensive literature review, few marked multidisciplinary learning techniques are summarized in the below Table

AUTHORS	RESEARCH Tittle	PURPOSE	FINDINGS
Dash et al [1]	Preferred teaching styles of medical faculty: an international multi-center study	compared teaching styles of medical teachers from different medical schools.	This study showed that the medical teachers preferred delegator teacher style that promotes students' collaboration and peer-to-peer learning. Most teachers are conscious of their teaching styles to motivate students for scientific curiosity. These findings can help medical educators to modify their teaching styles for effective learning
Dr.V.Aruna [2]	Teaching - Learning Methods in Medical Education Merits and Demerits	The new adaptations include electronic (e-learning), on-line or web-based learning	Different TMLs have application in educating medical students. But each

		and problem-solving-based learning. The transformation is from subject-centered to centralized integrated curriculum. Skill labs and simulation techniques are new methodologies. In this are an attempt was made to discuss merits and demerits of few teaching-learning methods.	individual TLM has advantages & disadvantages as described above. Hence, hybrid techniques may be designed to teach different topics in either basic sciences or clinical skills.
D. Vasundhara Devi1, M. Kiran Deedi [4]	Teaching and learning methodology in medical education: an analysis-in gsl medical college, Rajahmundry, a. P.	To study and analyze the controversial traditional didactic teacher-centered/subject based teaching and learning approach & student-centered teaching and learning approach. And also to study and analyze the lecture teaching and learning method and problem based teaching and learning method besides large group teaching and learning method and small group teaching and learning method	Most of the students in our college are giving maximum importance to teacher centered teaching and learning approach, lecture teaching and learning method and small group teaching and learning method. The other approach and teaching learning methods which are under study except large group teaching and learning method got support up to some extent which can also be used as and when necessary. Teacher should be given suitable training in the teaching and learning skills and techniques.

Pulak Kumar Jana et al [26]	A study on the preference of teaching methods among medical undergraduate students in a tertiary care teaching hospital, India	This study aims to assess the preference of teaching methods and identify the reason for absenteeism among medical undergraduate students in a tertiary care teaching hospital.	From the study, it was highlighted that most of the medical students preferred the conventional mode of teaching like practical demonstration and with the use of blackboards. It clearly indicates that the medical student's preference is changing from passive learning to active learning.
Challa K, Sayed A, Acharya Y [5]	Modern techniques of teaching and learning in medical education: a descriptive literature review	The objective of this review is to describe and assess alternative methods of teaching and learning which can be supplementive or alternative to traditional lectures for promoting active student participation and smooth flow of information.	This study highlights the importance and challenges of modern learning systems. With technological advancement and wider implications of medical information, students require innovative skills through inter-professional learning. It is necessary to introduce and implement flexible medical curricula that accommodates distinct modern teaching to effectively balance and bridge the gap between traditional teaching methodologies and modern educational requirements.

DISCUSSION-

Students are becoming increasingly reluctant to engage in teaching and learning beyond the realm of the classroom. Modern approaches to learning are student-centered and focus the responsibility of learning on the learners . Unparallel progression in the medical systems dictates the need for an educational system that actively engages future students. Students more than just listen; they are continually engaged in the learning process through active participation . They are more effective in improving knowledge and understanding in medical education compared to didactic lectures, and shown to improve long-term retention of knowledge and self-directed learning skills .

Modern techniques of learning also provide freedom to explore knowledge and give an opportunity for reflection in a controlled environment. In simulation studies, student mistakes can be acceptable as they are not deleterious to the patient and the mistakes serve as reinforcement in avoiding future medical errors[3]

There is a greater need for curricular integration to complement basic and clinical sciences to enhance learning and promote student engagement. Early introduction and exposure of various teaching-learning strategies enhances understanding and aids in clinical practice. These learning methods attend to individual learning differences and integrate various learning strategies allowing students· [6,7]Currently, medical colleges have realized the value of early clinical exposure to support vertical integration in preclinical studies. Beyond doubt, the incorporation of modern learning methods will facilitate the acquisition of knowledge and skills. This is in contrast to the traditional medical curriculum which focuses entirely on the core medical facts rather than an overall development in research and innovation. A regular review and implementation of the modern teaching-learning technologies is needed along with timely detection of a dysfunctional curriculum. [4]

Number of studies by several research scholars have confirmed our findings in the case of problem–based teaching and learning method. Several disadvantages have been identified in problem –based teaching and learning method including the costs for starting up and maintenance, excessive demands on staff time, increased stress on both students and staff, relative in efficiency, reduced acquisition of knowledge of basic sciences, and implementation difficulties when class sizes are large or where there is a broad lack of enthusiasm for the approach. [8,9,10]

CONCLUSION-Learning is a contiguous process and it is important to recognize that students have different styles of learning. Some of these modern teaching learning methods in medical education include CBL, EBM, PBL, SBL, e-learning, PAL, observational learning, flipped classroom model and team-based learning. These student-centered alternative teaching and learning techniques broaden students' thinking through creative new approaches in constructive knowledge acquisition and strengthens the professional expertise by developing skills, competency, and leadership in the medical field. Medical education, therefore, should be flexible enough to accommodate and incorporate multidisciplinary teaching models effectively and appropriately at the right moment and context beginning from the preclinical years.

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