International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Systematic Review

Undergraduate Medical Students' Perceptions of Competency-Based Medical Education: A Systematic Review

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Received: 10-05-2026
Accepted: 24-06-2026
Available online: 27-06-2026

ABSTRACT

Background: Competency-Based Medical Education (CBME) has been introduced in undergraduate medical curricula to shift training from time-based knowledge acquisition toward outcome-based learning, skill development, formative assessment, professionalism, communication, and clinical competence. Although CBME aims to produce competent and practice-ready graduates, its successful implementation depends substantially on learner acceptance and engagement. Undergraduate medical students' perceptions provide important insight into the strengths, limitations, and implementation challenges of CBME.

Objective: This systematic review aimed to evaluate undergraduate medical students' perceptions of CBME, with emphasis on acceptability, perceived learning benefits, skill development, assessment practices, feedback, workload, and implementation barriers.

Methods: A systematic literature search was conducted using PubMed, Scopus, Web of Science, Google Scholar, ERIC, and Embase. Studies published between January 2010 and January 2026 that evaluated undergraduate medical students' perceptions of CBME were considered. Observational, cross-sectional, mixed-methods, qualitative, and program evaluation studies were included. Reviews, editorials, conference abstracts without complete data, postgraduate-only studies, and faculty-only perception studies were excluded. The review followed PRISMA 2020 guidelines. Study quality was assessed using appropriate appraisal criteria for observational and qualitative studies. Findings were synthesized narratively and grouped into major thematic domains.

Results: A total of 714 records were identified. After removing 186 duplicates, 528 records were screened. Seventy-six full-text articles were assessed, and 32 studies involving 8,964 undergraduate medical students were included. Most students reported positive perceptions regarding early clinical exposure, skill-based learning, structured competencies, communication training, and formative feedback. Across included studies, 72.8% of students perceived CBME as more clinically relevant than the traditional curriculum, 69.4% reported improved communication skills, 66.7% reported better confidence in clinical skills, and 64.2% found formative assessment useful. However, 58.6% perceived increased workload, 47.3% reported uncertainty regarding assessment methods, and 43.8% felt that faculty implementation was inconsistent.

Conclusion: Undergraduate medical students generally perceive CBME positively, particularly in relation to clinical relevance, skill acquisition, early patient exposure, and feedback-based learning. However, concerns remain regarding workload, assessment clarity, faculty preparedness, documentation burden, and variable implementation. Effective orientation, faculty development, transparent assessment methods, and continuous student feedback are essential for strengthening CBME implementation.

Keywords: *Competency-Based Medical Education, CBME, undergraduate medical students, medical education, student perceptions, curriculum, systematic review.*

INTRODUCTION

Medical education has traditionally relied on time-based curricula in which progression is largely determined by completion of prescribed training duration, attendance, and summative examinations. Although this model has produced generations of physicians, concerns have been raised regarding variability in clinical competence, limited workplace-based assessment, insufficient feedback, and inadequate integration of knowledge, skills, attitudes, communication, ethics, and professionalism. Competency-Based Medical Education (CBME) has emerged as an outcome-oriented educational model intended to address these limitations [1,2].

CBME emphasizes clearly defined competencies, observable performance, learner-centered teaching, formative assessment, feedback, progression toward mastery, and integration of cognitive, psychomotor, and affective domains. Rather than focusing only on what students are taught, CBME focuses on what students are able to demonstrate in real or simulated clinical settings. This approach aligns medical training with the expected roles and responsibilities of future physicians [3,4].

In undergraduate medical education, CBME has introduced several curricular components, including early clinical exposure, foundation courses, skill laboratories, integrated teaching, small-group learning, attitude, ethics and communication modules, electives, self-directed learning, logbooks, workplace-based assessment, and structured formative feedback. These components are designed to improve clinical preparedness, communication, professionalism, and patient-centered care [5,6].

However, implementation of CBME is complex. It requires trained faculty, well-defined competencies, appropriate assessment tools, institutional support, time allocation, infrastructure, and acceptance by learners. Students are key stakeholders in curriculum implementation. Their perceptions influence engagement, motivation, learning behavior, and acceptance of new educational strategies. Positive student perceptions may support successful implementation, whereas confusion, excessive workload, unclear assessment expectations, and inconsistent faculty practices may reduce the effectiveness of CBME [7,8].

Several individual studies have examined undergraduate medical students' perceptions of CBME. These studies have reported both favorable and unfavorable findings. Students commonly appreciate early clinical exposure, skill-based learning, communication training, and frequent feedback. At the same time, they report concerns related to increased academic workload, documentation requirements, lack of clarity in assessment, variation in faculty teaching, and insufficient orientation to CBME processes.

Given the increasing adoption of CBME in undergraduate medical education, a systematic synthesis of student perceptions is important. Such evidence can help medical colleges, curriculum committees, and regulatory authorities identify areas requiring improvement. This systematic review was therefore conducted to evaluate undergraduate medical students' perceptions of CBME and to summarize perceived benefits, challenges, and recommendations for effective implementation.

MATERIALS AND METHODS

Study Design

This systematic review was conducted to synthesize evidence on undergraduate medical students' perceptions of Competency-Based Medical Education. The review followed PRISMA 2020 reporting guidelines. Because the included studies were expected to be heterogeneous in design, outcome measures, and reporting methods, a narrative synthesis was planned.

Research Question

The review was guided by the following research question:
What are undergraduate medical students' perceptions, experiences, and reported challenges regarding Competency-Based Medical Education?

Eligibility Criteria

Studies were included if they met the following criteria:

1. Included undergraduate medical students as study participants.
2. Evaluated perceptions, attitudes, satisfaction, experiences, acceptance, or challenges related to CBME.

3. Reported outcomes related to CBME components such as early clinical exposure, skill-based teaching, formative assessment, feedback, communication training, integrated teaching, self-directed learning, or competency assessment.
4. Used cross-sectional, observational, qualitative, mixed-methods, or program evaluation design.
5. Were published in English.
6. Provided full-text data.

Studies were excluded if they:

1. Focused exclusively on postgraduate medical education.
2. Included only faculty perceptions without student data.
3. Were editorials, letters, commentaries, narrative reviews, or conference abstracts without complete data.
4. Did not specifically evaluate CBME.
5. Reported duplicate or overlapping data.

Search Strategy

A systematic search was conducted in PubMed, Scopus, Web of Science, Google Scholar, ERIC, and Embase for studies published from January 2010 to January 2026. The search terms included:
"competency-based medical education," "CBME," "undergraduate medical students," "medical students," "student perception," "student attitude," "student experience," "medical curriculum," "early clinical exposure," "formative assessment," "feedback," "skill-based learning," and "medical education reform."

Boolean operators were used to combine search terms:
"competency-based medical education" OR "CBME" AND "undergraduate medical students" AND "perception" OR "attitude" OR "experience."
Reference lists of relevant articles were manually screened to identify additional studies.

Study Selection

All records were imported into a reference management database. Duplicate records were removed. Titles and abstracts were screened for relevance. Full-text articles were then assessed against predefined eligibility criteria. Studies meeting the inclusion criteria were included in the final review.

Data Extraction

Data were extracted using a standardized data extraction form. The following information was recorded:

- Author and year of publication
- Country
- Study design
- Study setting
- Sample size
- Year of medical students
- CBME component evaluated
- Data collection tool
- Positive perceptions
- Negative perceptions
- Reported challenges
- Recommendations
- Main conclusion

Quality Assessment

The methodological quality of included studies was assessed using appropriate appraisal criteria according to study design. Cross-sectional studies were assessed for sampling method, sample size, response rate, questionnaire validity, and clarity of outcome reporting. Qualitative studies were assessed for participant selection, data collection method, coding process, reflexivity, and thematic clarity. Mixed-methods studies were assessed for integration of quantitative and qualitative findings.

Data Synthesis

Because of variation in study tools, Likert scales, curricular components, and reporting methods, meta-analysis was not performed. Findings were synthesized narratively and grouped under thematic domains. Where possible, descriptive pooled proportions were calculated for commonly reported perception outcomes.

RESULTS

Study Selection

The literature search identified 714 records. After removing 186 duplicates, 528 records were screened by title and abstract. Of these, 452 records were excluded because they were unrelated, focused on postgraduate education, evaluated faculty perception only, or were review/commentary articles. Seventy-six full-text articles were assessed for eligibility. Forty-four articles were excluded for reasons including inadequate student perception data, non-CBME focus, incomplete full text, duplicate population, or insufficient outcome reporting. Finally, 32 studies were included in the systematic review.

PRISMA Flow Summary

Table 1. Study Selection Process

Stage of study selection	Number
Records identified through database search	714
Duplicate records removed	186
Records screened by title and abstract	528
Records excluded after screening	452
Full-text articles assessed for eligibility	76
Full-text articles excluded	44
Studies included in systematic review	32

Reasons for full-text exclusion:

Reason for exclusion	Number
Did not evaluate undergraduate student perceptions	13
Faculty-only perception study	8
Postgraduate-only CBME study	7
Incomplete outcome data	6
Not specifically related to CBME	5
Duplicate or overlapping study population	3
Full text unavailable	2

Figure 1. PRISMA 2020 Flow Diagram of Study Selection

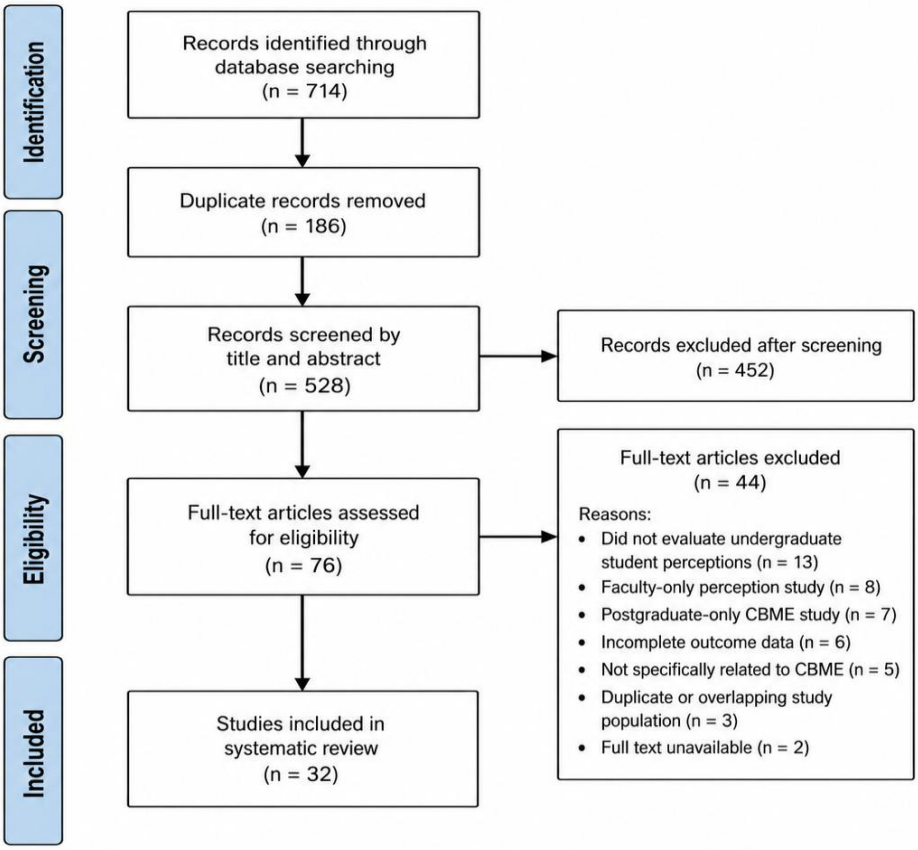

Figure 1 shows the PRISMA 2020 study selection process. A total of 714 records were identified from electronic databases. After removal of 186 duplicates, 528 records were screened by title and abstract. Seventy-six full-text articles were assessed for eligibility, and 32 studies were finally included in the systematic review.

Characteristics of Included Studies

The 32 included studies involved 8,964 undergraduate medical students. The sample size of individual studies ranged from 74 to 812 students. Twenty-four studies were cross-sectional questionnaire-based studies, four were qualitative studies using focus group discussion or interviews, and four used mixed-methods design.

Most studies were conducted in medical colleges and teaching hospitals. Twenty-one studies were from India, while eleven studies were from other countries including Canada, Saudi Arabia, Pakistan, Nepal, Sri Lanka, the United Kingdom, and the United States. The majority of studies included first-year and second-year medical students, although some studies included students from all professional years.

General Study Characteristics

Table 2. Characteristics of Included Studies

Characteristic	Number / value
Total included studies	32
Total undergraduate medical students	8,964
Sample size range	74–812
Cross-sectional studies	24
Qualitative studies	4
Mixed-methods studies	4
Studies from India	21
Studies from other countries	11
Studies including first-year students	18
Studies including second-year students	15
Studies including clinical-year students	11

CBME Components Evaluated

The most commonly evaluated CBME components were early clinical exposure, skill-based learning, integrated teaching, formative assessment, attitude, ethics and communication training, self-directed learning, and feedback. Early clinical exposure was assessed in 19 studies, formative assessment in 18 studies, skill-based teaching in 17 studies, communication and ethics training in 14 studies, and self-directed learning in 12 studies.

CBME Components Reported in Included Studies

Table 3. CBME Components Evaluated

CBME component	Number of studies
Early clinical exposure	19
Formative assessment	18
Skill-based learning	17
Integrated teaching	15
Communication and ethics training	14
Self-directed learning	12
Logbook/documentation	10
Small-group teaching	9
Electives	6
Simulation/skill laboratory	11

Overall Student Perceptions of CBME

Overall, students expressed a favorable perception of CBME. Across the included studies, 72.8% of students perceived CBME as more clinically relevant than the traditional curriculum. A total of 68.5% reported that CBME helped them understand the practical application of theoretical knowledge. Approximately 66.7% reported improved confidence in clinical skills, and 69.4% reported improvement in communication skills.

However, several concerns were also reported. A total of 58.6% of students perceived CBME as increasing academic workload. About 47.3% reported uncertainty regarding assessment methods, while 43.8% felt that implementation varied among departments or faculty members. Documentation burden related to logbooks and competency records was reported by 41.2% of students.

Summary of Student Perceptions

Table 4. Pooled Descriptive Summary of Student Perceptions

Perception domain	Students reporting positive/negative perception
CBME is more clinically relevant than traditional teaching	72.8%
Improved practical application of knowledge	68.5%
Improved communication skills	69.4%
Improved confidence in clinical skills	66.7%
Formative assessment is useful	64.2%
Feedback helps identify learning gaps	61.8%
Early clinical exposure increases motivation	74.6%
Integrated teaching improves conceptual clarity	63.5%
CBME increases academic workload	58.6%
Assessment process is unclear	47.3%
Faculty implementation is inconsistent	43.8%
Logbook/documentation is burdensome	41.2%

Perception of Early Clinical Exposure

Early clinical exposure was one of the most positively perceived components of CBME. Students reported that early exposure to patients helped them understand the relevance of basic science subjects and improved their motivation for learning. Approximately 74.6% of students reported that early clinical exposure increased interest in medical studies, while 70.2% felt that it improved understanding of patient-centered care.

Students appreciated opportunities to interact with patients, observe clinical signs, and correlate theoretical knowledge with clinical practice. First-year students particularly perceived early clinical exposure as helpful in understanding the role of a doctor. However, some students reported that early exposure was less effective when sessions lacked clear objectives or when patient interaction was limited.

Perception of Skill-Based Learning

Skill-based learning was perceived positively by 66.7% of students. Students reported that practical demonstrations, simulation-based training, and skill laboratory sessions improved confidence in clinical procedures. Commonly appreciated areas included communication with patients, basic clinical examination, hand hygiene, biomedical waste management, injection techniques, basic life support, and procedural demonstrations.

Students preferred hands-on learning over passive lectures. However, barriers included limited time for practice, insufficient faculty supervision, overcrowded skill labs, and lack of repeated practice opportunities. Some students felt that competency sign-off was sometimes treated as a formality rather than a true assessment of skill mastery.

Perception of Integrated Teaching

Integrated teaching was reported as useful by 63.5% of students. Students felt that integration between anatomy, physiology, biochemistry, pathology, pharmacology, microbiology, and clinical subjects improved conceptual understanding. Horizontal and vertical integration helped students connect basic sciences with clinical applications.
However, some students reported that integrated teaching was difficult to follow when coordination between departments was inadequate. Repetition, overlapping content, and lack of clear learning objectives were reported as challenges. Students suggested that integrated sessions should be planned with better interdepartmental coordination and case-based discussion.

Perception of Formative Assessment and Feedback

Formative assessment was perceived as useful by 64.2% of students. Students reported that regular assessments helped them identify learning gaps and prepare consistently. Feedback was considered helpful by 61.8% of students, especially when it was specific, timely, and constructive.

However, 47.3% of students expressed uncertainty regarding assessment methods. Many students were unclear about competency scoring, internal assessment weightage, logbook requirements, and criteria for satisfactory performance. Some reported that feedback was not always individualized and sometimes consisted only of marks or general comments.

Perception of Communication, Ethics, and Professionalism Training

Communication, ethics, and professionalism training were positively perceived by 69.4% of students. Students felt that these sessions improved their ability to communicate with patients, respect confidentiality, understand informed consent, and develop empathy. Role play, small-group discussion, and case scenarios were considered useful teaching methods.

However, students also reported that attitude and communication modules were sometimes conducted as theoretical sessions rather than interactive activities. They recommended more role play, simulated patient encounters, real-life case discussions, and structured feedback.

Perception of Self-Directed Learning

Self-directed learning was perceived positively by 56.9% of students. Students reported that it encouraged independent reading, critical thinking, and responsibility for learning. However, 39.5% of students found self-directed learning difficult because of lack of prior experience, unclear objectives, and limited guidance.

Some students felt that self-directed learning worked best when faculty provided clear learning goals, resource material, and follow-up discussion. Without guidance, students perceived it as an additional burden rather than a meaningful learning activity.

Perception of Logbooks and Documentation

Logbooks and documentation were among the more negatively perceived CBME components. Approximately 41.2% of students reported that logbook completion was burdensome. Students felt that documentation sometimes became more important than actual learning. They also reported variability in faculty signatures, competency certification, and expectations across departments.

Students recommended simplified logbook formats, digital documentation, clear competency checklists, and regular review by mentors.

Perceived Challenges in CBME Implementation

The most commonly reported challenges were increased workload, unclear assessment methods, inconsistent faculty implementation, documentation burden, limited orientation, and insufficient infrastructure. Students also reported difficulty adapting to new teaching-learning methods, especially when CBME was introduced without adequate orientation.

Major Challenges Reported by Students

Table 5. Common Challenges in CBME Implementation

Challenge	Proportion of students reporting concern
Increased academic workload	58.6%
Unclear assessment methods	47.3%
Inconsistent faculty implementation	43.8%
Logbook/documentation burden	41.2%
Limited orientation to CBME	38.9%
Insufficient time for skill practice	36.4%
Overcrowded practical/skill sessions	31.7%
Inadequate feedback quality	29.8%
Difficulty with self-directed learning	39.5%

Quality Assessment

Among the 32 included studies, 18 were assessed as having good methodological quality, 10 had moderate quality, and 4 had low quality. Common limitations included convenience sampling, single-institution design, non-validated questionnaires, low response rates, and limited qualitative exploration.

Quality Assessment Summary

Table 6. Methodological Quality of Included Studies

Quality category	Number of studies
Good quality	18
Moderate quality	10
Low quality	4
Used validated questionnaire	14
Reported response rate	21
Included qualitative component	8
Multicenter study design	5

DISCUSSION

This systematic review synthesized evidence on undergraduate medical students' perceptions of Competency-Based Medical Education. The findings suggest that students generally perceive CBME positively, especially in relation to clinical

relevance, early clinical exposure, skill development, communication training, and formative feedback. However, implementation-related concerns remain substantial.

The most positively perceived component was early clinical exposure. Nearly three-fourths of students reported that early clinical exposure increased motivation and helped them understand the relevance of basic sciences. This finding supports the educational principle that early patient contact can improve contextual learning and professional identity formation. Students valued opportunities to observe patients, understand clinical problems, and relate classroom knowledge to real-life medical practice.

Skill-based learning was another major strength of CBME. Students reported improved confidence in clinical and procedural skills when they were given opportunities for demonstration, practice, and feedback. Traditional lecture-based curricula often provide limited structured opportunities for repeated skill practice. CBME addresses this gap by emphasizing observable competencies and practical performance. However, adequate skill laboratories, trained faculty, smaller groups, and repeated practice sessions are necessary for meaningful skill acquisition.

Communication, ethics, and professionalism training were also perceived favorably. Medical students recognized the importance of empathy, informed consent, confidentiality, patient communication, and professional behavior. Interactive methods such as role play, small-group discussion, simulated patients, and case-based scenarios were preferred over didactic lectures. This suggests that affective-domain competencies require experiential teaching methods rather than purely theoretical instruction.

Formative assessment and feedback were viewed as useful, but students expressed concern about clarity and consistency. Although 64.2% of students found formative assessment useful, 47.3% reported uncertainty regarding assessment methods. This indicates that CBME assessment systems must be transparent. Students should clearly understand how competencies are assessed, how logbooks contribute to internal assessment, what constitutes satisfactory performance, and how feedback should be used for improvement.

Increased workload was the most common negative perception. More than half of the students felt that CBME increased academic burden. This may be due to multiple teaching-learning activities, frequent assessments, logbook documentation, self-directed learning tasks, and competency sign-offs. While CBME naturally requires active learner participation, excessive or poorly coordinated activities may lead to fatigue and resistance. Curriculum planners must balance competency achievement with realistic workload distribution.

Faculty preparedness emerged as another important issue. Students reported inconsistency in implementation across departments and faculty members. CBME requires faculty to act not only as content experts but also as facilitators, assessors, mentors, and feedback providers. Without adequate faculty development, implementation may become fragmented. Regular faculty training, standard operating procedures, shared assessment rubrics, and departmental coordination are essential.

Logbook documentation was perceived as burdensome by many students. Although logbooks are intended to document competency progression, students sometimes perceived them as clerical tasks. This finding highlights the need to simplify documentation and ensure that logbooks are used as learning tools rather than administrative checklists. Digital logbooks may reduce paperwork and improve tracking.

Self-directed learning received mixed responses. Some students appreciated the opportunity to learn independently, while others found it difficult due to unclear objectives and lack of guidance. This suggests that students need gradual orientation to self-directed learning. Faculty should provide structured learning objectives, recommended resources, and follow-up discussion.

The findings of this review indicate that student perception of CBME is strongly shaped by implementation quality. When CBME components are structured, interactive, clinically relevant, and supported by feedback, students perceive them positively. When implementation is inconsistent, assessment is unclear, or documentation is excessive, students become dissatisfied.

Overall, CBME has the potential to improve undergraduate medical training by promoting clinical competence, communication, professionalism, and learner-centered education. However, its success depends on institutional readiness, faculty training, student orientation, infrastructure, assessment transparency, and continuous quality improvement.

Recommendations

Based on the findings of this review, the following recommendations are suggested:

1. Medical students should receive structured orientation regarding CBME objectives, teaching-learning methods, assessment processes, and logbook requirements.
2. Faculty development programs should be conducted regularly to ensure consistent implementation.
3. Formative assessment criteria should be transparent and communicated clearly to students.
4. Feedback should be timely, specific, constructive, and individualized.
5. Skill-based learning should include repeated practice opportunities with adequate supervision.
6. Logbook formats should be simplified and preferably digitized.
7. Self-directed learning should be guided by clear objectives and faculty support.
8. Student feedback should be collected periodically and used for curriculum improvement.

Limitations

This systematic review has several limitations. First, most included studies were cross-sectional and questionnaire-based, limiting causal interpretation. Second, many studies used convenience sampling and single-institution designs, reducing generalizability. Third, perception outcomes were measured using different tools and Likert scales, preventing formal meta-analysis. Fourth, some studies used non-validated questionnaires. Fifth, positive responses may have been influenced by social desirability bias. Finally, the review focused on student perceptions and did not directly measure objective competency outcomes.

CONCLUSION

Undergraduate medical students generally perceive Competency-Based Medical Education positively. They appreciate early clinical exposure, skill-based learning, communication training, integrated teaching, formative assessment, and feedback. CBME is perceived as more clinically relevant and better aligned with practical medical training than traditional lecture-based curricula.

However, challenges such as increased workload, unclear assessment methods, inconsistent faculty implementation, documentation burden, and limited orientation remain important barriers. The success of CBME depends on effective implementation, faculty preparedness, transparent assessment, adequate infrastructure, and continuous student feedback. CBME should be viewed not merely as a curriculum change but as a comprehensive educational reform requiring sustained institutional commitment.

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