


Research Article

Implementing an AI-Integrated Model in the Mathematics Classroom under NEP 2020

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Abstract

NEP 2020 encourages technology-enabled skill-based student-centred learning, and constructivism-based approaches are directly aligned with these goals. Traditional mathematics education requires transformation because teaching methods often emphasise memorisation, systematic practice and examination-oriented learning, which fail to develop deep conceptual understanding or real-life problem-solving skills. The paper attempts to make student learning personalised, interactive, and data-driven by applying artificial intelligence within each level of the 5E instructional model to enhance students' conceptual understanding and problem-solving skills in order to enable students to apply mathematical knowledge in a meaningful way. The article also attempts to provide a clear structured explanation of how the 5E model (Engage-Explore-Explain-Elaborate-Evaluate) can be applied in the classroom in mathematics and artificial intelligence (AI) integrated learning. It will be helpful for a skilled teacher to prepare learning designing and classroom teaching.

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KEYWORDS: Mathematics Education. AI in Teaching and Learning, 5E Instructional Model, Constructivist Pedagogy, Classroom Practice.

INTRODUCTION

Today, mathematics education needs to transformation because traditional teaching methods emphasize memorization, procedural drills and examination focused learning i.e. increasing test scores, which fail to develop deep conceptual understanding or real-life problem-solving skills. The rapid development of artificial intelligence and 21st century technologies, data literacy, logical reasoning, computational thinking requires a more dynamic, student centered, skill-based approach. In the current context, the transformation of mathematics education is essential to enhance creativity, critical thinking, collaboration, and digital readiness, so as to ensure that students can apply meaningful mathematical knowledge in everyday life and in their future careers.

Technology plays a vital role in innovation and development in the field of education, such as its contributions to various fields, reshaping traditional practices and enhancing skills relevant and demands to the 21st century. Like other aspects, technology has brought significant changes, advancements, and transformations to the field of education (Yanar & Ergene, 2025). In recent scenario, artificial intelligence is one of the technological innovations that is making significant progress in the field of education (De Angelis et al., 2023).

In this context, mathematics education is facing a crucial turning point, where artificial intelligence-powered tools and platforms are not only playing a supportive role in teaching but are also raising fundamental questions about the nature of traditional mathematics teaching and learning, gradually moving away from rote memorization of formulas and problem-solving skills according to patterns to more dynamic, flexible, personalized and interactive models (Nguyen & Pham, 2025). Artificial intelligence in mathematics education can revolutionise how students interact with complex concepts and learn. Using AI, teachers can provide personalised learning experiences tailored to teach students' needs and abilities. AI can also analyse student performance data to identify areas of weakness and provide additional support and resources to help students understand mathematical concepts (Opesemowo & Adewkyi, 2024).

Role of NEP 2020

NEP 2020 emphasises experimental, inquiry-based, skill-based learning, interactive pedagogy, digital literacy, computational thinking, and the use of AI. The basic principles of NEP 2020 are centred around "identifying the qualities of each student and nurturing them". NEP 2020 guides students for holistic development in nature. NEP 2020 also provides flexibility; the policy enables students to choose programs or interests (Sawshilya, 2025).

NEP 2020 encourages the use of AI-based adaptive learning platforms that can personalise mathematics learning. These adaptive platforms would be ones that can assess student progress and identify areas of difficulty and provide on-demand resources to address area of weakness. For example, if a student is struggling with algebra, the AI system could offer additional

practices problems or video tutorials tailored to their level of understanding.

To enhance the skills of teachers, necessary equipment and training based on artificial intelligence and advanced technology will be provided so that they have the opportunity to effectively integrate AI into their teaching practice.

The teaching method must be made completely student centered, inquiry based, discussion based, discovery based, flexible, and enjoyable (NEP 2020). It is recognition that mathematics and mathematical thinking will be crucial for Indian's near future and for the leadership role of Indians in numerous upcoming fields and professions involving topics such as artificial intelligence, machine learning, and data science (Barik, 2023). Thus, increased emphasis will be placed on mathematics and computational thinking throughout the school year, starting from the primary level, throughout various innovative approaches, including the regular use of puzzles and games that aim to make mathematical thinking more enjoyable and engaging, as recommended by clause 4.25 of the National Education Policy 2020.

Mathematics is a part of the core curriculum primary to class X and is compulsory, so it is clear that studying a subject like mathematics will play an important role in the overall school education of children and young adults (Barik, 2023). Now, teaching and learning mathematics and developing critical thinking and analytical mind in a student requires special teaching strategies, which is different from the traditional method of giving one-way lectures, which will not be limited to giving and solving a few specific problems on the blackboard at the same time.

5E Instruction Model

Instead of passively receiving information like the traditional teacher-centred teaching methods of the past, today's student-centered inquiry-based learning directly engages students in the learning process and keeps them active, providing learning benefits (Kunnath & Botes, 2025). Inquiry based learning model includes various activities such as questioning, making predictions, analysing information, critical thinking, and communication (Berie *et al*, 2022). When teachers teach mathematics by discussing how the topics they teach can be applied in real life used in future lives, students become interested in the subject and are encouraged to explore and create their own knowledge about it. The main goal of IBL is to increase deeper understanding of the subject by encouraging students to ask questions, explore topics, and create their own knowledge inquiry (Kunnath & Botes, 2025).

ENGAGE: The first phase of the 5E model involves students engaging with the topic by asking them to mentally focus on an event, object, problem, situation, or phenomenon. The activities in the engagement phase are designed to help students make connections between past learning and new learning experiences, express prior knowledge, and organize their thinking toward the questions and learning outcomes required for the learning sequence. In the Initial stage of the 5E model,

the participation stage, the teacher's role is to present a situation accurately, identify the instructional task for the topic, and set the rules and procedures for the activity. The teacher structures are well-expressed, which can become resource for the upcoming lesson.

Students' Behavior

Show curiosity and interest in the problem presented or the scenario displayed on the chart or projector screen.

Be mentally prepared and motivated to learn with enthusiasm.

Recall previous knowledge and try to connect previous knowledge to new topic.

Let learners ask simple question such as, "Why is this happening?" or "Is this always true?"

Teacher's Strategies

Ask a riddle, give examples from real-life situations, use stories, or demonstrations.

Ask simple analytical questions of a diagnostic nature to probe students' existing ideas.

Avoid making straightforward statements of definitions or formulas at this stage.

Instead of providing mathematical solutions, stimulate students' thinking.

EXPLORE: Once students have participated in an activity, they need time to properly explore their ideas. Exploration activities are designed so that all students have common, concrete experiences that can later be used when formally presenting and discussing scientific and technical concepts and explanations. Students are given time to investigate object, event, or situations. As a result of their mental and physical involvement in this activity, students raise questions about the topic, observe examples, identify and test variables, if any, and establish cause and effect relationship. The teacher's role in the exploration phase is to facilitate learning. They imitate the activity and provide students with as much time and opportunity as possible to explore objects, materials, and situations. The teacher provides training and guidance as students make observations or record and analyze data and begin to construct models or initial explanations.

Students' Behavior:

Students will work in groups or individually to investigate the problem.

Student will try different strategies, make predictions, and test them.

They will use materials such as graph paper, rulers, algebra tiles, GeoGebra.

They will make mistakes, discuss, and collaborate with peers.

Teacher's Strategies:

Provides students with hands-on learning activities. Provide support rather than lectures about math content; observe with hands-on activities rather than giving direct answers and provide support as needed.

Ask open-ended questions such: "What do you notice?", "Did you find any other way?"

Ensure that all types of students participate in mathematical exploration.

EXPLAIN: This phase consists of two parts. First, the teacher asks students to share their initial ideas and explanations derived from their experiences. Secondly, teachers provide resources and information to support students in their learning and introduce the uses of scientific or advanced technological and artificial intelligence. Students use these resources, ideas and information from artificial intelligence tools applications, as well as ideas from other students, to develop their own interpretations or revise their ideas based on evidence-based results or models.

Students' Behavior:

Show other students' models, explanations, answers, solutions from artificial intelligence tools, or possible solutions.

Share the results, patterns, and observations with the rest of the class.

Listens critically and impartially to the explanations given by other students and asks questions.

Explain using evidence and results from various investigations.

After discussion, start using correct mathematical language.

Find explanations if you are confused about why you are confused.

Teacher's Strategies:

At this level, the teacher will help students to make the concept concrete based on their exploration. The teacher will introduce concepts such as definitions, theorems, formulas, and standard methods.

The student's ideas are clarified using board work, examples, diagrams, or digital tools as well as artificial intelligence tools.

The teacher will ask probing questions to measure the level of understanding of the students.

Ask students for clarification of reasoning and ideas.

Give students time to compare and contrast their ideas with others and to revise ideas if desired, so that students are encouraged to explain ideas in their own words.

ELABORATE:

Once students have created an explanation of an event in their own words or developed a solution to a problem, it is important to engage them in further experiences. Artificial Intelligence - enabled tools can be used to generate ideas that can apply, extended, or clarify the concept, process, or skill they are learning. Some students may still have misconceptions, or they may only be mastering a concept through exploratory experience. Extensive activities should provide students with time to apply their understanding of concepts and skills. Using artificial intelligence tools can provide opportunities to test their concepts in a short period of time. They can apply their understanding to similar events or problems.

Students' Behavior:

Apply learned concepts to new, more complex, or real-life situations.

Demonstrate problem solving and higher-level thinking.

Draws reasonable conclusions from evidence.

Attempts to solve a variety of problems using artificial intelligence tools.

Make deeper connections to previous or related topics.

Critique models, explanations, and arguments developed by others using evidence and logic.

Relate new concepts to earlier experiences.

Communicate understanding to others.

Work independently with confidence.

Teacher's Strategies:

Provides advanced tasks, numerical problems or interdisciplinary questions.

Encourage reasoning, justification and multiple solution methods. Even help find multiple solution methods with the help of artificial tools.

Bing in technology: Use Geogebra, Graphing calculator, Desmos dynamic geometry software, Artificial intelligence simulations.

The teacher will encourage students to apply concepts and skills to new situations.

Use artificial intelligence-driven tools as needed to provide additional evidence, explanation or reasoning.

Provide opportunities to generalize and extend the idea.

Reinforce the use of previously introduced scientific terms and descriptions.

Ask students that help students draw reasonable conclusions from evidence and information.

EVALUATE

It is important to get feedback on the quality of students' explanations. Informally, this can happen throughout teaching and learning. Formally, the teacher will also conduct summarization and evaluation at the end of the learning session. This stage encourages learners to examine how well they understand the topic. Artificial Intelligence can be applied to the assessment if necessary, and students will be given the opportunity to assess each student's progress towards achieving learning goals and outcomes.

Students' Behavior

Students will demonstrate their understanding of concepts through written work, presentation, quizzes, and projects.

Give feedback to other peers. Evaluate the progress by comparing current learning understanding with previously acquired knowledge.

Have students reflect on the content they have learned: "Where did I go wrong?"

Students work will be assessed according to a scoring guideline or against established standard.

They will self-assess their strategies and reasoning, use artificial intelligence tools for evaluation if necessary, and be evaluate by peers.

Teacher's Strategies:

The teacher uses open-ended questions to promote thinking, such as, "What are your thoughts?" What evidence do you have? How would you answer the question?

The teacher will observe and record notes as students demonstrate personal understanding of the effectiveness of learned concepts and skills.

Use different types of formative assessment to gather evidence regarding students' level of understanding, such as: class discussion, worksheets, practical tasks, Rubrics, Exit tickets.

Provide feedback on students' formative assessments, highlighting strengths and areas for improvement. Teachers will integrate student assessment results into decision about future new teaching.

5E Instructional Phase

Table-1 describes the goals of each stage of the 5E instructional approach, describes the role of the teacher at each stage, provides information on the use of some AI tools that teachers can easily use, and provides examples of what types of activities students should carry out at each stage, forming a Learning Design.

Subject: Mathematics

Class: X

Topic: Surface Area and Volume of a Cylinder

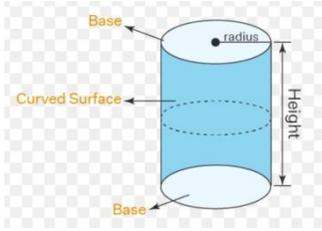
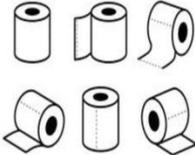
Learning Objectives

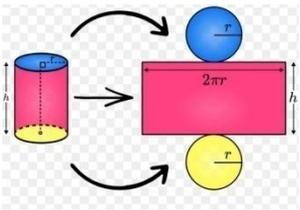
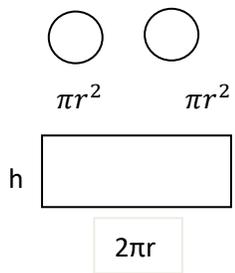
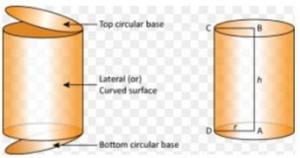
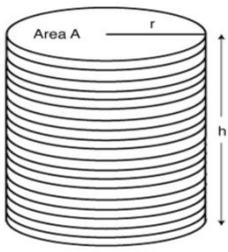
Students will be able to-

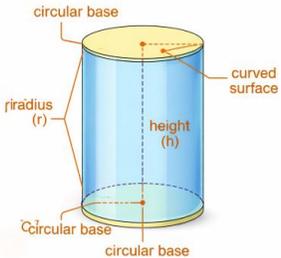
- Identify and state the parts of a cylinder using AI visualization.
- Recall and state the formulas for Curver Surface Area (CSA), Total Surface Area (TSA) and Volume.
- Understand and explain the formulas.
- Solve problems by applying the formulas to real-life situations.
- Apply the formula to real life problems using AI feedback.

With personal AI assistance, they will be able to solve problems at their own pace, and AI can be used to check for error in problem solving.

5E Instructional Model: Aims, Teacher’s Strategies, Students’ Behavior and Activity Examples

Phase	Aims	Teacher’s Strategies	Students’ Behavior	Activity Examples
<p>Engagement (At this phase, the teacher motivates the students by showing real-life objects and pictures related to cylindrical shapes, and ask stimulating questions to pique their curiosity and connect with their prior knowledge.)</p>	<p>To create interest among students, To capture students’ attention To arouse curiosity To activate prior knowledge.</p>	<p>Real-life connection: Ask: How much material was used to make this water bottle? Challenge: Can you wrap a gift in the shape of a cylinder without wasting paper? How much water can this water bottle hold? <i>The smart board displays a 3D AI-generated rotating cylinder.</i> <i>A model simulation of filling a cylinder with water is being shown.</i></p>	<p>Observe and show curiosity. Recall prior knowledge of circles and rectangles. Students will try to wrap the water bottle with paper.</p>	<p>Activity: Show a real-life cylinder, e.g. a soda can, a cylindrical water bottle, drum, tank.</p>   <p>This is illustrate with a short video animation showing everyday examples, such as wrapping a package with cylindrical gift paper and attempting to pour one liter of water into a cylindrical bottle.</p>
<p>Explore (At this phase, students actively investigate cylindrical objects through activities such as observation, measurement, rolling experiments, drawing, and model making, so that they can develop their own understanding of the concept.)</p>	<p>To connect prior knowledge with the current topic/subject in a practical way. To investigate cylinder dimensions through hands-on activities. To discover new knowledge without direct instruction.</p>	<p>Ask: What is the measurement of the cylinder’s radius, height, and circumference? Challenge: If we cut open a soda can, what kind of shape will we get? <i>Provides access to AI simulation tools.</i> <i>Encourage students to change the values of the radius and height.</i></p>	<p>Students can attempt to measure the radius, height, and circumference of the cylinder themselves. Students can try to pour water into a real cylindrical container and estimate its volume. <i>Experiment with the virtual cylinder.</i> <i>Observe how the lateral surface area, total surface area and volume changes.</i> <i>Discuss your observation in groups.</i></p>	<p>Activity: Measuring and constructing cylinders. Provide the students with paper, tape, and a ruler to create a cylinder by rolling up a rectangle.</p> 

<p>Explanation (In this stage, the teacher facilitates discussion based on the students' observation and presents the correct terminology, definitions, diagrams, and formulas related to cylinders, thereby ensuring conceptual clarity)</p>	<p>To connect the students' discoveries with mathematical formulas. To clarify misconceptions among students.</p>	<p>Derivation of formulas: When the cylinder is unfolded, you get two circles + one rectangles. The lateral surface area (curve surface area) of a cylinder with one open end: one circle +one rectangle. The lateral surface area (curved surface area) of a cylinder with two open ends: one rectangle only.</p> <p>Derivation of formula: Volume of Cylinder: The circular disks of radius (r) each of unit height are stacked one above the other.</p> <p><i>Instruct the students to express their observations. The formulas are presented below:</i> Lateral surface area=$2\pi rh$ Total surface area=$2\pi r(h + r)$ Volume=πr^2h The misconception identified by AI has been corrected.</p>	<p><i>Explain the concept using mathematical terminology. Ask questions to clarify any doubts.</i></p> <p>Students should calculate the volume of their own cylinder model or water bottle by substituting the values for the radius and height they have obtained.</p>	<p>Activity: Derive the formula: The formula for calculating the total surface area of a cylinder with radius 'r' and height 'h' is:</p>   <p>Area of two Circles: $2\pi r^2$ sq. unit Area of rectangle: $2\pi r \times h$ sq. unit Total surface area: $2\pi r^2 + 2\pi rh$ sq. unit $=2\pi r(r+h)$ sq. unit</p>  <p>The lateral surface area of a cylinder with one open end: $\pi r^2 + 2\pi rh$ sq. unit The lateral surface area of a cylinder with both ends open: $2\pi rh$ sq. unit</p>  <p>Circular disks of radius (r) stacked one above the other</p> <p>The disks, each of unit height, are stacked one after another. If there are h number of disks, then the Volume: $V = \pi r^2h$ cubic unit.</p>
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<p>Elaboration (At this stage, students apply the concepts of cylinders to real-life situations through measuring objects, creating problems, comparing them with other solid shapes, and engaging in hand on activities, which strengthens their conceptual understanding)</p>	<p>To apply the concepts to real world and interdisciplinary contexts.</p>	<p>Example 1: A cylindrical water tank has radius of 3 meters and a height of 12 meters. How much water can it hold? Example 2: A company wants to design a cylindrical container to pack a dry food product. The container has: Radius= 6 cm Height = 15 cm The container is closed from both ends. Students are asked to calculate: How much material is required to manufacture one container?</p>	<p>Solve real life problems. Apply formulas independently.</p>	<p>Example 1: Given data Radius of the tank =3 m Height of the tank= 12 m Student activity 1. Students recall the formula: Volume of a Cylinder= $\pi r^2 h$ 2. Students substitute the given values: $V = \pi \times 3^2 \times 12$ 3. Using $\pi = \frac{22}{7}$ $V = 108 \times \frac{22}{7} = 339.43 \text{ m}^3$ Example 2: Given Radius = 6 cm Height =15 cm Student Activity: Step 1: Identify the required Surface Area Since the container is closed, material needed= Total Surface Area (TSA)=$2\pi r(h+r)$ Step 2: Substitute the Values TSA= $2 \times \frac{22}{7} \times 6 \times (15 + 6)$ $= 12 \times \frac{22}{7} \times 21$ $= 36 \times 22$ $= 792 \text{ cm}^2$ Material required to make one cylindrical container = 792 cm^2</p>
<p>Evaluation (At this stage the teacher assesses students' understanding through worksheets, oral questions, real-life identification tasks, and problem-solving activities related to cylinders.)</p>	<p>To think about new learning. To assess students' understanding of the subject matter and their progress. To identify areas of concern and providing remedial measure. To focus is on higher order thinking.</p>	<p>Identify which are cylinders? Justify why? Which surface rolls? Which does not? Find the Curved surface area of cylinder with radius 6 cm and height 10 cm. Find the volume of water bottle with radius 3.5 cm and height 28 cm. Write one real life example of a cylinder. Write one formula related to cylinder.</p>	<p>Students identify two circular bases, curved surface, and equal radius from the pictures. Students solve individually or in pairs. A student explains the volume or surface area of a cylinder to their partner. A Partner asks a question.</p>	<p>Show the students pictures like these.</p>  <p>Provide a diagram of cylinder:</p> 

DISCUSSION

This research paper presents the concept of integrating artificial intelligence within the 5E instructional model as a classroom-based pedagogical framework for mathematics teaching and learning, in alignment with the vision of NEP 2020. The discussion highlighted how the AI-integrated 5E model addresses long standing challenges in mathematics education, particularly issues such as rote learning, procedural instruction, and exam centric practices, thereby encouraging conceptual understanding, inquiry, and real-world application. The 5E instructional model is constructivist, focusing on aspects such as engagement, exploration, explanation, elaboration, and evaluation. When supported by artificial intelligence tools, it is expected that each stage of the model will become even more responsive to the individual needs of the learners.

In the initial stages of teaching and learning, during the phases of engagement and exploration, AI –based visualizations and simulations help students grasp abstract mathematical concepts—such as the surface area and volume of a cylinder—in a concrete and meaningful way. These dynamic representations allow students to manipulate variables, observe patterns, and make conceptual understanding, which often remains weak in traditional lecture-based instruction.

At the explanation stage, AI tools help students articulate their reasoning, test hypotheses, and correct misconceptions through immediate feedback. This shifts the focus of mathematics education from simply getting the right answer to understanding the underlying principles. The use of AI also enables teachers to identify common errors and learning gaps, allowing for timely educational interventions. These data driven insights align with the National Education Policy 2020's emphasis on formative assessment and personalized learning.

At the elaborate phase particularly benefits from AI integration, as students are encouraged to apply mathematical concepts to complex, unfamiliar, and real-life environments. AI-enabled problem-making, simulations, and adaptive tasks enhance higher-level thinking, reasoning, and problem-solving skills. This aligns with NEP2020's focus on skills-based learning, computational thinking, and knowledge application and beyond the classroom.

At the assessment stage, AI supports continuous and diverse assessment practices; including self-assessment, peer-assessment, and adaptive testing. Rather than relying solely on holistic testing, AI-assisted assessment facilitates reflective learning by enabling students to analyze their own errors and learning strategies. This approach encourages increased cognitive awareness and accountability, which are essential components of meaningful mathematics learning.

From the teacher's perspective, the AI-integrated 5E model redefines the instructional role from that of a knowledge transmitter to a facilitator of the learning experience. Teachers use AI tools to guide inquiry, assist in discovery, and scaffold understanding while learning to manage classroom diversity and the pace of learning. The structured learning design presented in this paper demonstrates that technology integration does not need to be complex or disruptive; rather, it can be

systematically embedded within familiar educational frameworks, such as the 5E model.

Overall, the discussion suggests that the integration of artificial intelligence with the 5E instructional model provides a practical, scalable, and pedagogically sound approach to transforming mathematics classrooms in the line with NEP2020. By combining constructivist teaching with intelligent technological support, this framework holds significant potential for conceptual understanding, student engagement, and real-world problem solving in mathematics education.

Implications for mathematics teachers:

The AI integrated 5E instructional model encourages mathematics teachers to move beyond lecture-based teaching to inquiry driven, student centered learning. Teachers need to design structured activities that encourage participation, exploration, conceptual clarity, application, and reflective assessment, while simultaneously using artificial intelligence as an instructional support tool. Developing technological pedagogical skills is essential to effectively integrate adaptive learning platforms, visualization tools, and AI assisted assessment. These tools can facilitate differentiated instruction, provide immediate feedback, and help identify misconceptions in diverse classrooms. Teachers must ensure ethical and responsible use of AI to maintain academic integrity. Continuous professional development and alignment with the competency-based vision of NEP 2020 are critical to successful classroom implementation.

Implications for Teacher Education and Policy (NEP 2020)

The proposed AI integrated 5E instructional framework has significant implications for teacher education and education policy emphasizes experiential learning, digital literacy, computational thinking, and competency-based learning, which necessitates reforms in teacher preparation programs (Barik, 2023; Sawshilya, 2025). Pre-service and in service teacher education should include structured training in AI-supported pedagogy, adaptive assessment systems, and formative instructional design models. Recent studies indicate that the effective integration of AI in mathematics education largely depends on the pedagogical preparation and technological skills of teachers (Yanar & Ergene, 2025; Nguyen & Pham, 2025). Therefore B.Ed. and M.Ed. curriculum should include modules on AI integration in subject specific pedagogy. Additionally, policy initiatives need to ensure equitable access to digital infrastructure, professional development opportunities, and technological resources to implement the transformative vision of NEP 2020 in mathematics classrooms.

Limitations of the study:

This study focuses on the conceptual integration of artificial intelligence into the theoretical and designed-based 5E instructional model. It does not include empirical data or classroom-based experimental validation. Therefore, the actual impact of the proposed framework on students' conceptual understanding and problem-solving skills remains to be tested. Implementation may also be affected by teacher preparation,

digital skills, and availability of technological infrastructure. Difference in school contexts and access to Ai tools may limit generalizability. Further empirical research is needed to assess the effectiveness and scalability of the proposed model in different educational settings.

Scope of Future research:

- Conduct empirical validation of the proposed AI integrated 5E instructional framework through experimental or quasi-experimental studies in mathematics classrooms.
- Studies examined the differences between traditional instruction and AI-assisted constructivist approaches to determine their impact on conceptual understanding and problem-solving performance (Nguyen & Pham, 2025; Opesemowo & Adewkyi, 2024).
- Conduct longitudinal research to examine the long term impact of sustained AI integration on retention, critical thinking, and conceptual skills, consistent with the objects (Barik, 2023).
- Investigate teacher preparation and professional development models required for effective AI integration in mathematics education (Yanar & Ergene, 2025).
- Explore policy, infrastructure, and equity considerations that influence AI implementation in diverse schools contexts.
- Extended the framework to other mathematical fields to increases broader applicability and policy relevance.

CONCLUSION

The current study process an AI- integrated 5E instructional framework as a pedagogically grounded approach to strengthening mathematics teaching learning, in line with the vision of NEP 2020 (Barik, 2023; Sawshilya, 2025). By combining the constructivist principles embodied in the 5E model with artificial intelligence-supported tools, the framework promotes inquiry-based learning, conceptual understanding, and skill-based mathematical practice. Supporting recent findings on the integration of AI in mathematics classrooms (Nguyen & Pham, 2025; Opesemowo & Adewkyi, 2024), the structured integration of AI into this stage of Engage-Explore-Explain-Elaborate-Evaluate can enhance personalization, formative assessment, and differentiated instruction. The illustrated classroom design on the topic of cylinders demonstrates the practical applicability of the framework at the secondary level. With appropriate teacher preparation and institutional support (Yanar & Ergene, 2025), AI-integrated teaching has the potential to enhance critical thinking, problem-solving abilities, and digital skills in the mathematics classroom.

REFERENCE

1. Barik R. Mathematics education and its significance under the National Education Policy 2020. *J Educ Policy Pract.* 2023;8(2):45-58.
2. De Angelis L, Baglivo F, Arzilli G, Privitera GP, Ferragina P, Tozzi AE, et al. ChatGPT and the rise of large language

models: the new AI-driven infodemic threat in public health. *Front Public Health.* 2023;11:1166120.

3. Nguyen DT, Pham QV. The evolving landscape of AI integration in mathematics education: a systematic review of trends (2015–2025). *Eurasia J Math Sci Technol Educ.* 2025;21(10):em2714.
4. Opesemowo OAG, Adewkyi HO. A systematic review of artificial intelligence in mathematics education: the emergence of 4IR. *Eurasia J Math Sci Technol Educ.* 2024;20(7):em2478.
5. Sawshilya A. Integrating AI into Indian teaching under National Education Policy 2020: teachers' perspective on holistic development, equity, inclusivity in pursuit of SDGs. *Int J Environ Sci.* 2025;11(8):1844-1855.
6. Yanar AN, Ergene O. Integrating artificial intelligence in education: how pre-service mathematics teachers use ChatGPT for 5E lesson plan design. *J Pedagog Res.* 2025;9(2):158-176.

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