

# PATTERN RECOGNITION AS A LEARNING STRATEGY IN THE STUDY OF ENGINEERING DYNAMICS

PRESENTED BY

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# INTRODUCTION

- **Background:** The challenge of students passing dynamics without understanding fundamental concepts.
- **Study Focus:** Pattern recognition as a learning strategy.
- **Objectives:** Investigate PR, its characteristics, and implications for engineering education.

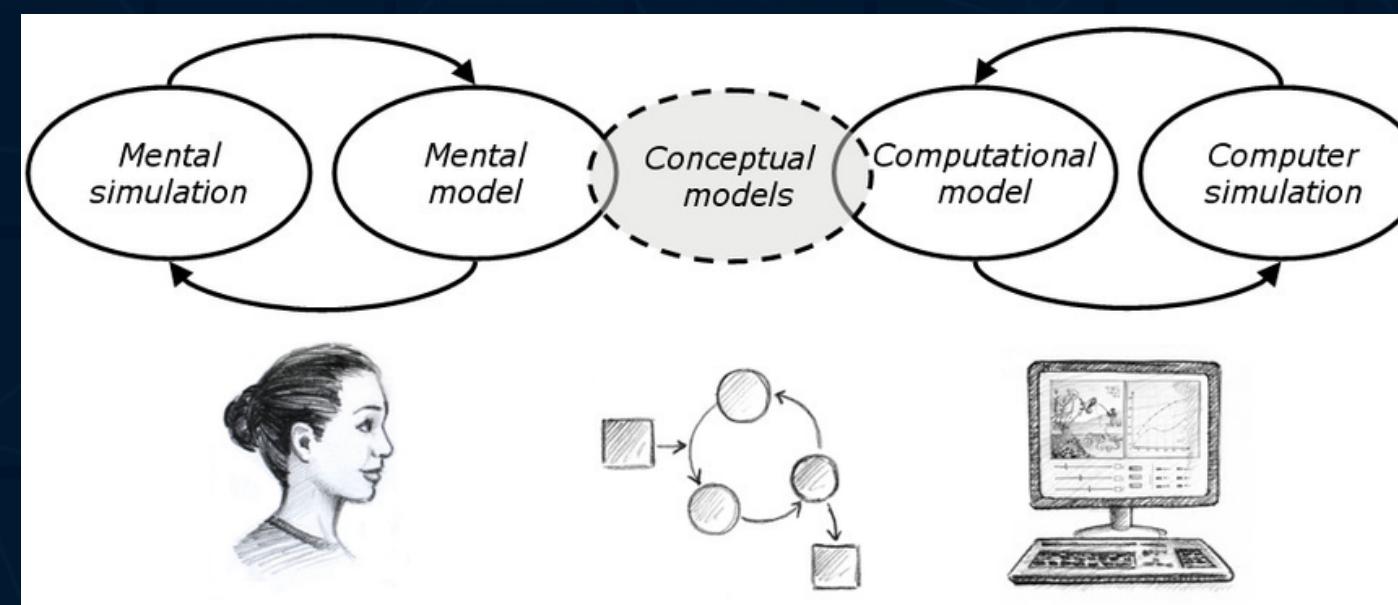
# PATTERN RECOGNITION IN TWO CONTEXTS

01

**Contrast with Conceptual Understanding:** Mental simulation vs. computer science/cognitive psychology.

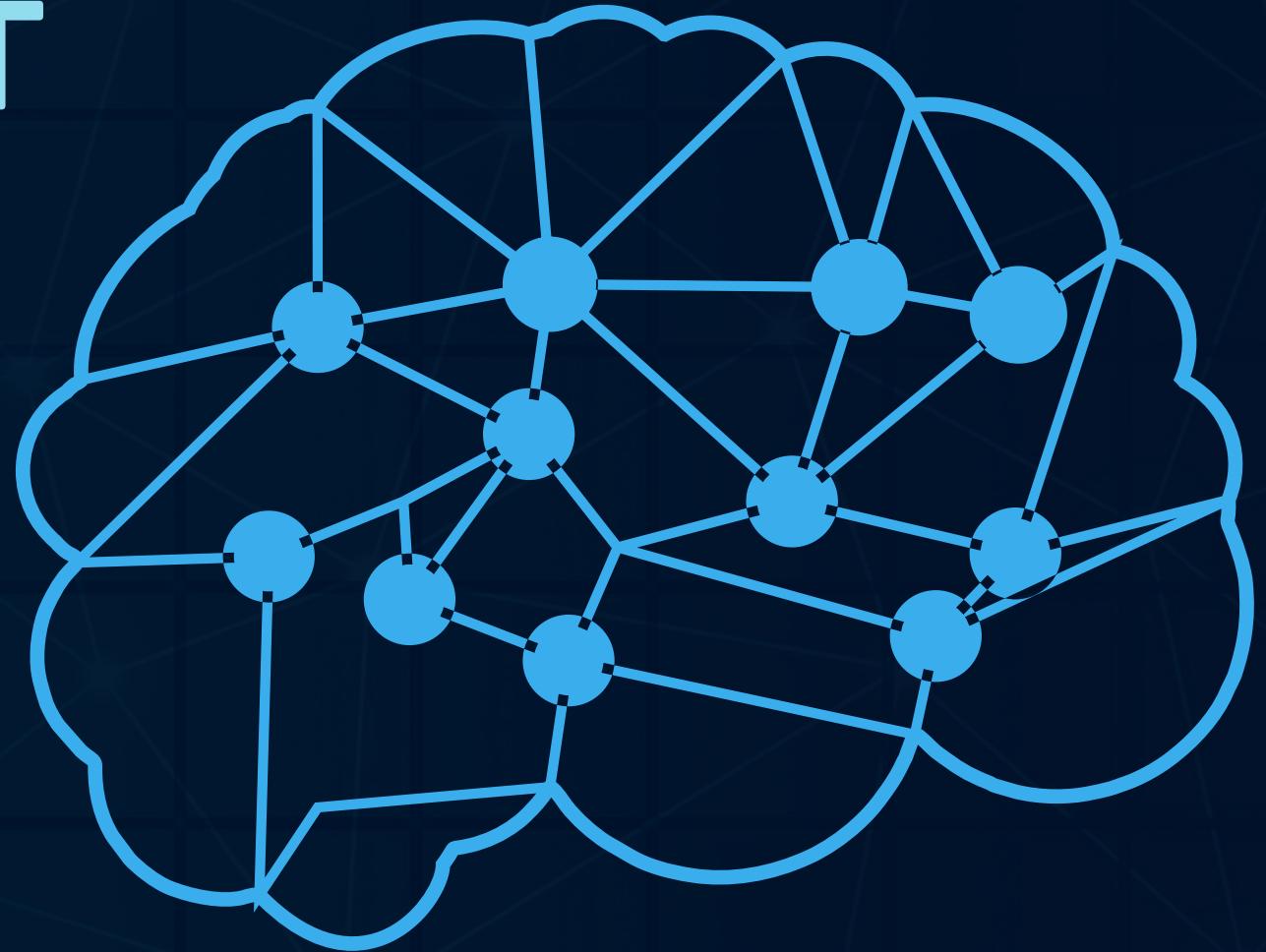
02

**Characterization:** Use of sample cases, learning through practice, emphasis on correct patterns.



# SURVEY INSTRUMENT

- **Purpose:** Identify evidence of pattern recognition as a learning strategy.
- **Cronbach's Alpha:** Reliability of the survey instrument (0.649).
- **Key Findings:** PR learners emphasize practice and memorization over concepts.



# CHALLENGES IN TEACHING DYNAMICS



## Common Misconceptions:

Students rely on surface features and everyday experiences.



## Pedagogical Approaches:

Experimentation, visualization, and social aspects.

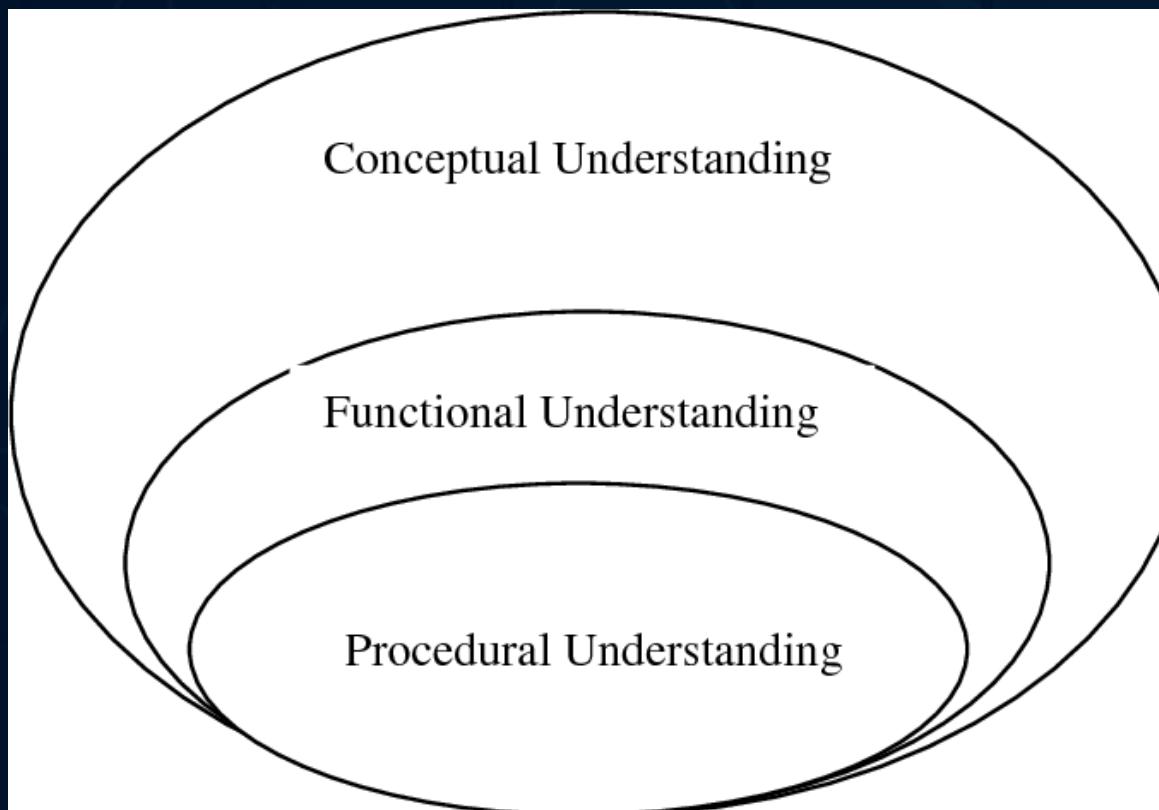


## Persistence of Misconceptions:

Students struggle with conceptual questions.



# Conceptual Understanding in Engineering



- Emphasize the importance of conceptual understanding in engineering, especially in terms of analyzing basic quantities and their relationships.
- Describe the concept of representational fluency and its positive association with students' conceptual understanding.
- Introduce the idea of mental simulation as a cognitive skill to apply scientific concepts in engineering contexts.

## PROPERTIES

- Independence of contexts, learning through statistics, result-oriented assessment.

## COGNITIVE ADVANTAGES

- Infer correct patterns based on experience.

Computer  
vs  
Learners in PR

## QUALITY ASSESSMENT

Accuracy and computational efficiency.

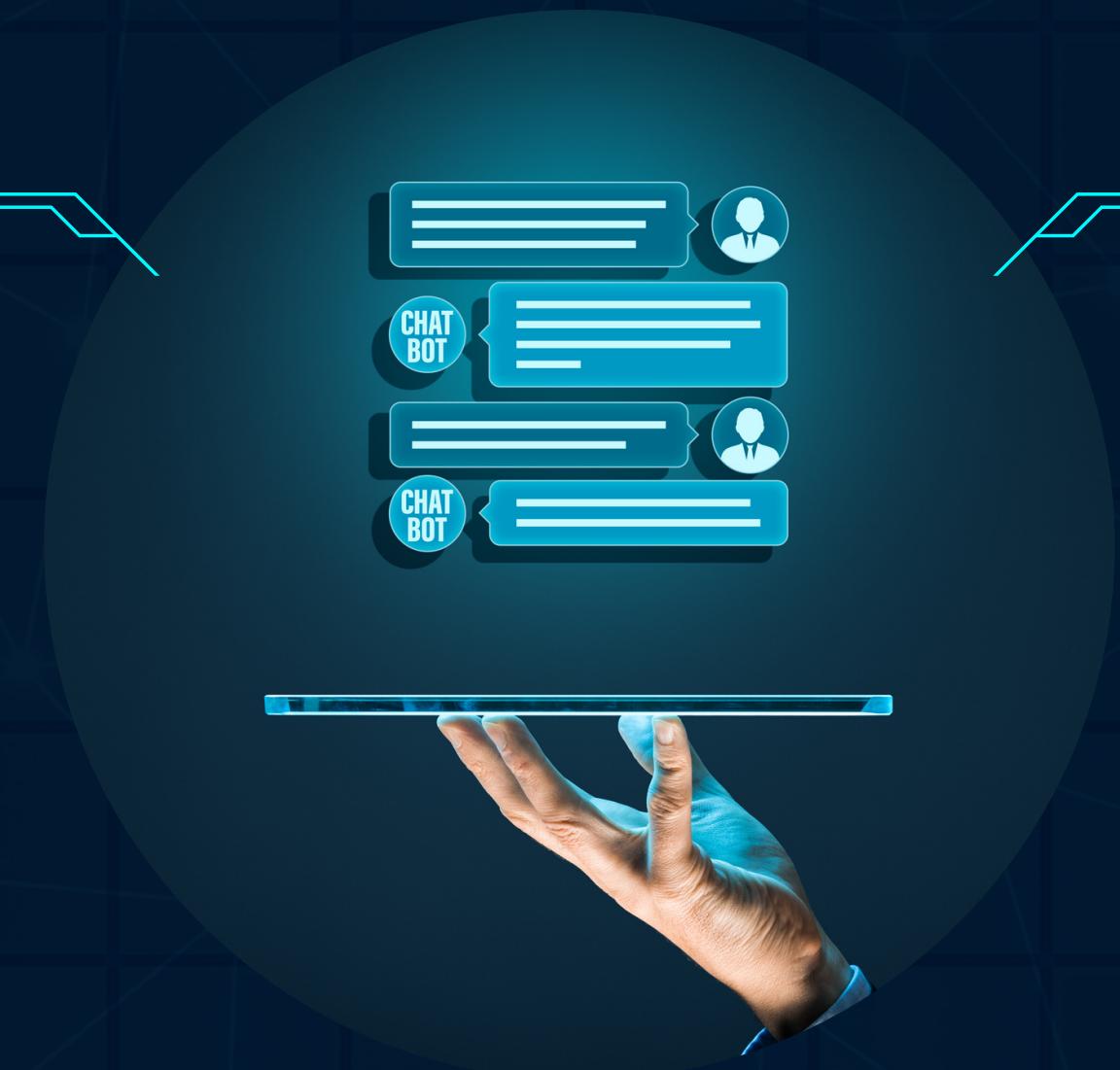
# HUMAN-BASED PATTERN RECOGNITION

## MECHANISMS

- Template matching and feature detection.

## CATEGORIZATION

- Cognitive economy and perceived world structure.



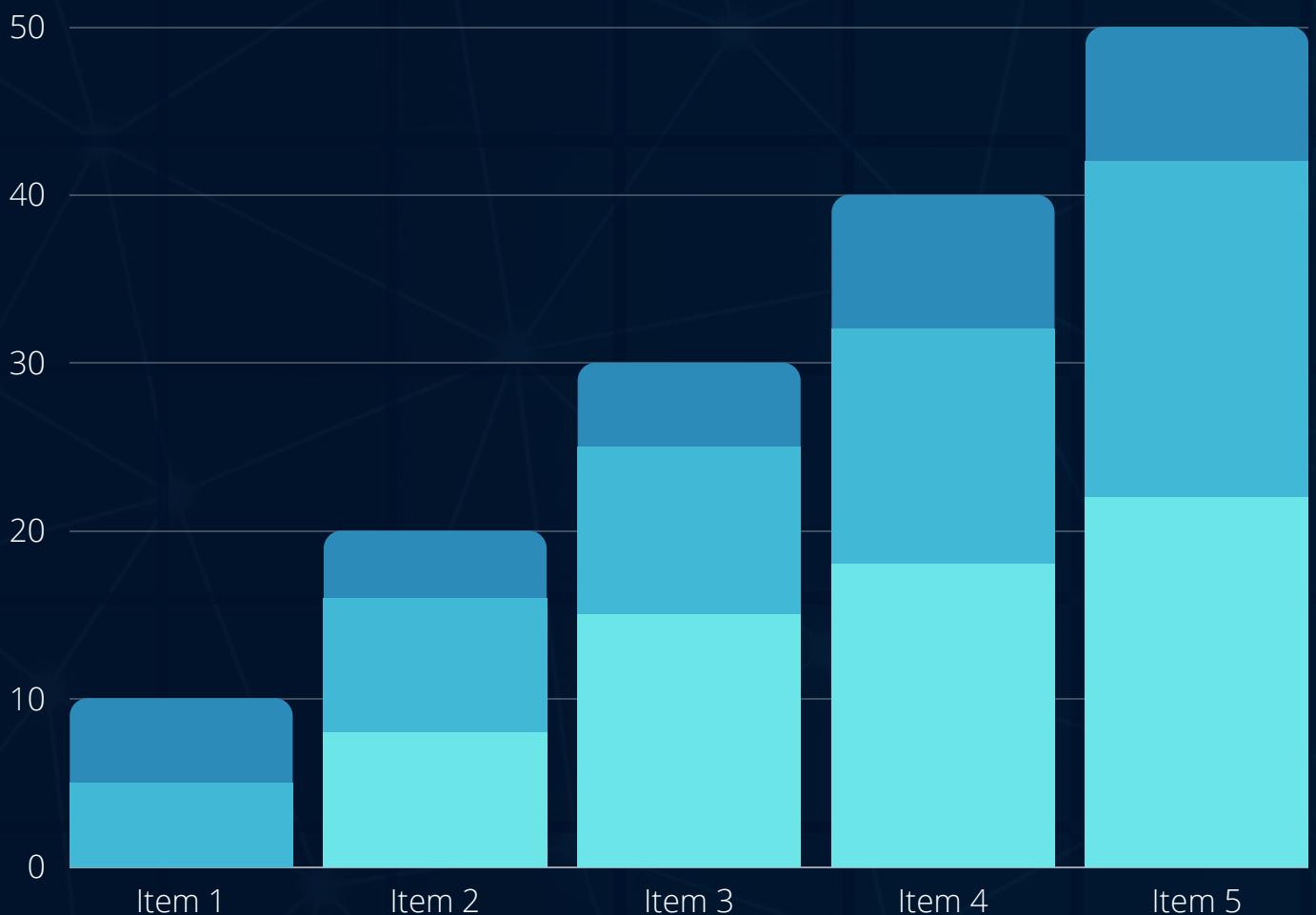


# PR as a Learning Strategy

- Explore the characteristics of pattern recognition as a learning strategy in student dynamics learning.
- Detail the three identified characteristics: the use of sample cases (work examples and homework problems), learning through practice, and the integration of conceptual understanding.
- Highlight differences between how computers and humans approach pattern recognition due to their cognitive properties.

# QUANTITATIVE DATA ON PR

## REVENUE



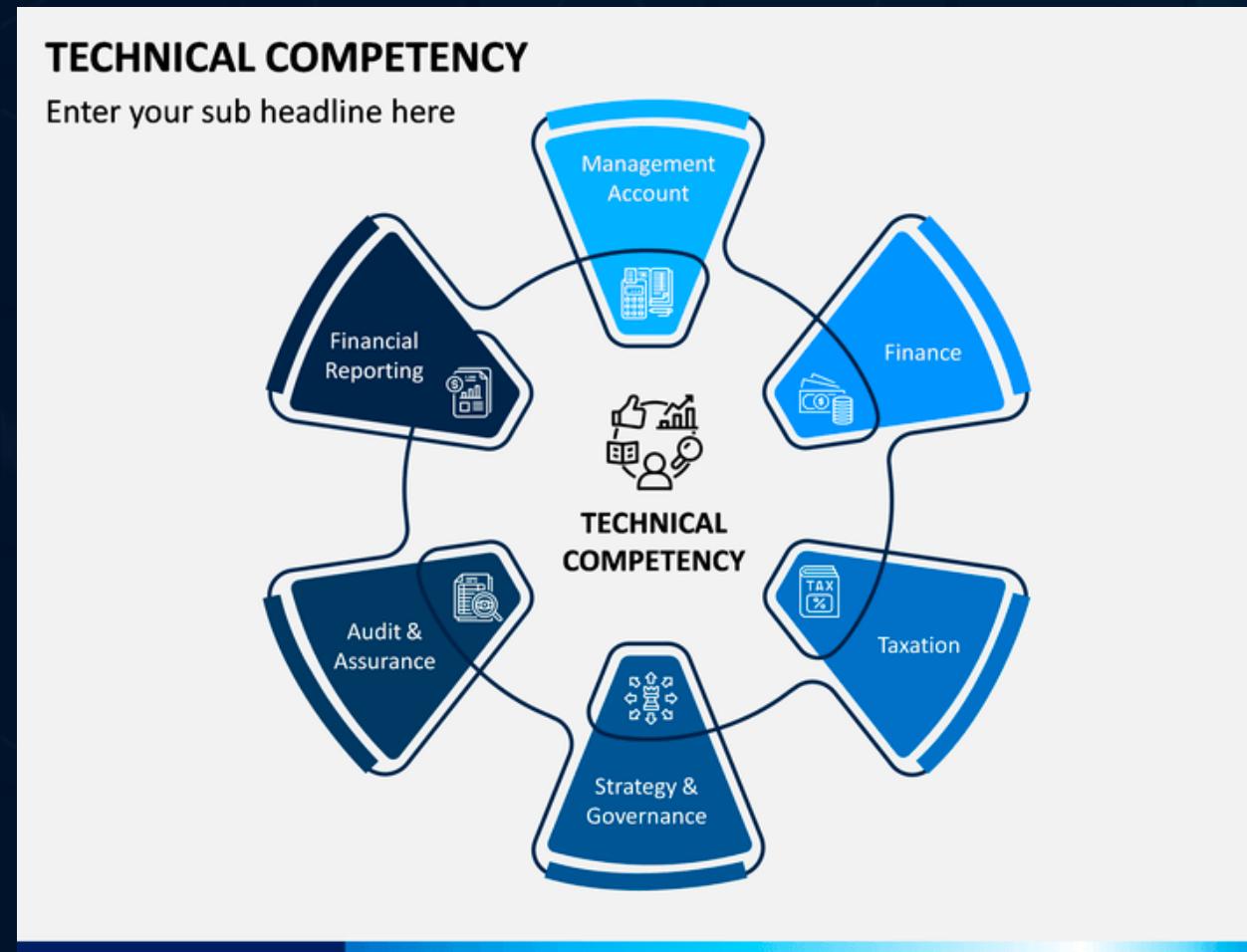
## SURVEY STUDY

- PR strategies in studying particle dynamics.

## RESULTS

- General understanding of PR strategies and implications for engineering education.

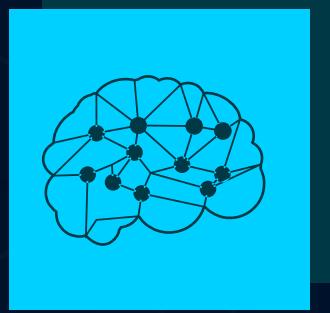
# PR and Technical Competency



- Present the focus of the study on the relationship between problem-solving tendency (PR) and students' technical competency in dynamics.
- Explain how participants were asked to solve technical questions and how the PR score was calculated based on the number of PR items chosen by each participant.
- Mention the study's findings, particularly that participants with high PR scores demonstrated a higher tendency for pattern recognition in learning.

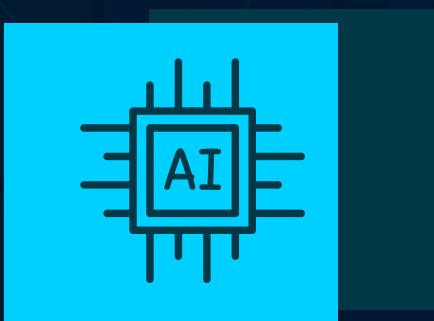


# LEARNING PERSPECTIVES



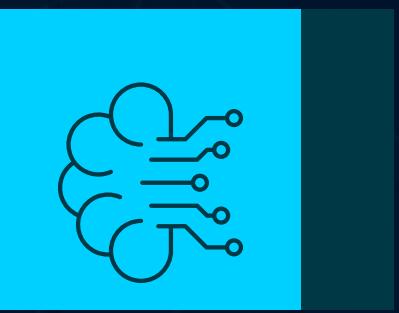
## LEARNING RESOURCES

- Textbooks and homework problems.



## ENGINEERING PRACTICE

Dynamics' importance.



## HANDS-ON PROJECTS

- Preference based on PR levels.



# ASSESSMENT PERSPECTIVES



## DIFFICULTY

Participants' views on challenging concepts.

## FAIRNESS

Opinions on different types of exam questions.

# CONCLUSION

- **Learning Strategy:** PR as a bridge between rote memorization and conceptual understanding.
- **Key Findings:** PR learners may disengage from mental simulation.
- **Future Research:** Further investigation into the role of PR in dynamics education.

# THANKS!

Do you have questions?

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