Report

Title: Investigating Pattern Recognition as a Learning Strategy in Engineering Dynamics

Paper link -
https://www.researchgate.net/publication/374292216_Pattern_recognition_as_a_learning_strategy_in_the_study_of_engineering_dynamics

Introduction: This report presents the findings and analysis of a study that aimed to investigate the use of pattern recognition (PR) as a learning strategy in the context of engineering dynamics. The study examined the PR scores of participants, their academic performance, and their learning perspectives. The report discusses the methods used, the results obtained, and the implications of the study.

Methodology: The study evaluated the PR scores of participants for questions 6–10 to assess the internal consistency of the PR score. The PR score was considered acceptable for further analysis. An overall PR score was calculated for each participant based on their scores for questions 6–8. Participants were then divided into three bins based on their summed scores.

- High PR: 2 ≤ summed PR score ≤ 3 (10 participants)
- Medium PR: 1 ≤ summed PR score < 2 (16 participants)
- Low PR: 0 ≤ summed PR score < 1 (13 participants)

The study also analyzed technical competency based on questions 1–5, which were considered technical questions. A grader marked these questions, and the quality of solutions was classified into three levels.

Findings:

Analysis of Technical Competency:

- Questions 1 and 2 were calculation questions, and the tendency of PR was not correlated with solution quality. About 30.0% to 38.5% of participants of both high and low PR levels provided good quality solutions.
- Notably, participants with a high PR level tended to yield weak-quality solutions in these questions.
- Questions 3–5 were conceptual questions, and the results did not support the notion that high PR levels were related to weaker solutions.
- In question 4, participants with low PR levels tended to perform better, while in question 5, high PR participants tended to do better.

Analysis of Learning Perspectives:

- Participants with high PR levels tended not to use textbooks as a helpful resource for learning dynamics.
- Homework problems were popular among participants of all PR levels, but participants with low PR levels considered textbooks and equations as additional helpful resources.
- Most participants (76.9%) indicated that dynamics was important for engineering practice, with no significant differences between PR levels.
- Participants with high PR levels did not show a preference for hands-on projects, while those with low PR levels found them helpful.
- Question 14 showed that the "connection of particle motions and equations" was considered the most difficult by participants of all PR levels.

Discussion and Limitations:

- The study suggests that high-PR learners may not see the advantage of pursuing conceptual understanding due to their success in traditional examinations.
- The study had limitations, including a relatively small sample size and the potential deterrent effect of technical questions.
- The study recognized that PR should not be an exclusive phenomenon, and learners may engage in both PR and conceptual understanding interchangeably.

Conclusion: This study identifies pattern recognition (PR) as a learning strategy between rote memorization and conceptual understanding in the context of engineering dynamics. High-PR learners may not have a strong incentive to pursue conceptual understanding if traditional examination questions do not effectively distinguish their performance. The study emphasizes the role of the education environment in encouraging pattern-recognition learning and highlights the potential disengagement of mental simulation in PR learners.