

AI-mediated learning: ChatGPT explanation quality as a predictor of students' confidence in physics learning

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INTRODUCTION & AIM

Physics is often perceived as one of the most difficult school subjects because students must understand abstract concepts and apply them to real situations [1]. As a result, many students experience low confidence when learning physics, especially when solving problems, explaining concepts, or preparing for exams.

Artificial Intelligence (AI) tools such as ChatGPT are increasingly used as learning assistants because they can provide instant, interactive, and personalized explanations [2,3]. In physics learning, ChatGPT may help students overcome conceptual difficulties and strengthen their confidence. However, little empirical evidence explains which dimensions of ChatGPT explanation quality actually contribute to students' confidence in learning physics [4].

Most previous studies focused on general perceptions of AI in education, while specific dimensions of explanation quality that influence confidence remain underexplored.

Aim

This study investigates how different dimensions of ChatGPT explanation quality predict students' confidence in learning physics among Indonesian high school students.

Research Questions

- How do students perceive ChatGPT explanations?
- How do perceptions differ by gender?
- Which dimensions of explanation quality best predict confidence?

METHOD

Participants

- 167 Indonesian high school students
- Age: 15-18 years
- Male: 70 (41.9%)
- Female: 97 (58.1%)

Design

Quantitative survey using online questionnaire.

Analysis

- Descriptive statistics
- Multiple linear regression

Variables

Explanation Quality (EQ)

- EQ1: Easier to understand than textbooks
- EQ2: Helps understand basic principles
- EQ3: Accurate real-life applications
- EQ4: Simplifies difficult concepts

Confidence in Learning Physics (CLP)

- CLP1: Confidence understanding concepts
- CLP2: Confidence explaining concepts to others
- CLP3: Confidence facing physics exams

RESULTS & DISCUSSION

Students' Perceptions of ChatGPT Explanation Quality

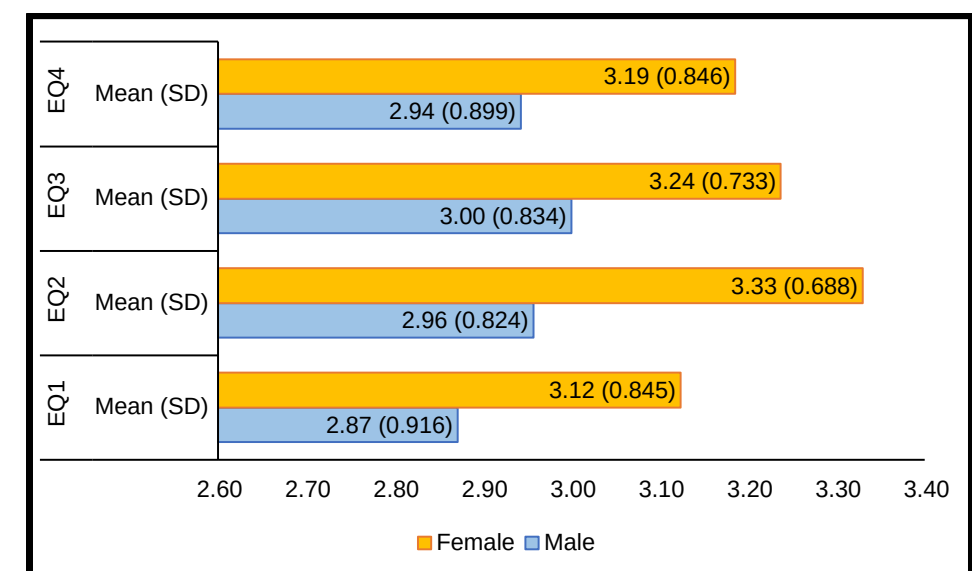


Figure 1. Student perceptions of ChatGPT explanation quality by gender. Female students rated ChatGPT explanations more positively than male students across all dimensions, particularly in ease of understanding, conceptual understanding, and real-life application.

Confidence in Learning Physics

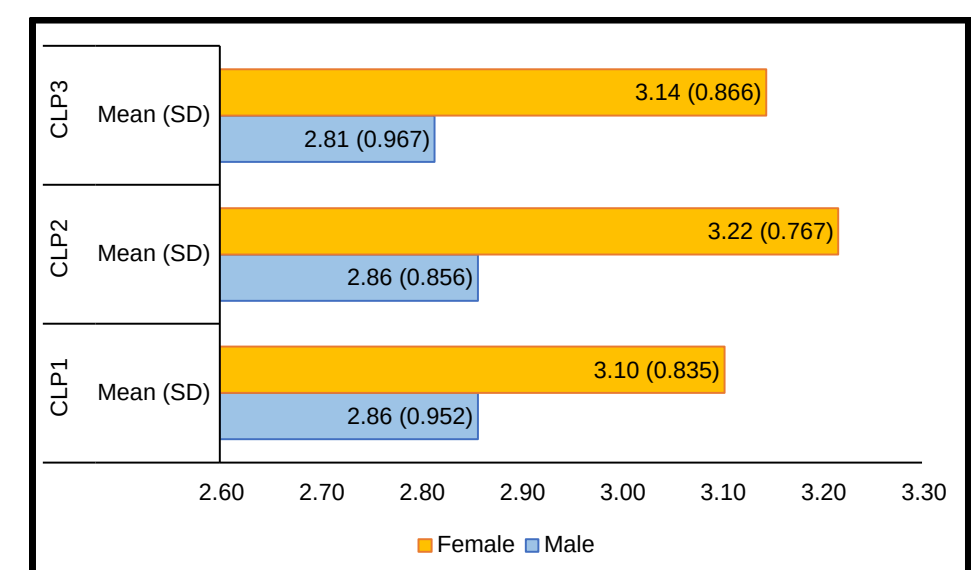


Figure 2. Students' perceptions of ChatGPT on confidence in learning physics based on gender.

Female students also reported higher confidence after using ChatGPT in understanding concepts, explaining physics to others, and facing exams.

Strongest Predictors of Confidence

Regression analysis showed that:

- EQ2 (understanding basic principles) strongly predicted confidence in explaining concepts ($\beta = 0.432$)
- EQ3 (accurate applications) strongly predicted exam confidence ($\beta = 0.460$)
- Simplification (EQ4) showed weaker effects

These findings indicate that confidence is driven more by understanding and application than by simplification.

CONCLUSION

Students generally reported positive perceptions of ChatGPT explanations, which were associated with their confidence in learning physics. Explanations that support understanding of basic principles and real-life applications were the strongest predictors of confidence. In addition, female students reported more positive perceptions than male students.

Key Message: Students gain confidence not from simplification alone, but from meaningful understanding.

REFERENCES

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