



Scaffolded Independent Practice in Physics: An Action Research Study

Shafiq R
Sarawak Matriculation College

Research Problem



- Failure of traditional, lecture-based physics instruction to foster deep conceptual understanding of Newtonian mechanics
- Students consistently demonstrated an inability to meaningfully engage with homework.

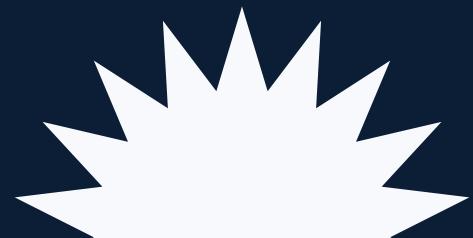


Objectives



ACTION OBJECTIVES

To improve the conceptual understanding of Newtonian mechanics among struggling matriculation physics students by implementing and refining Scaffolded Independent Practice (SIP) worksheets in my classroom.



RESEARCH OBJECTIVES

QUANTITATIVE:

- To evaluate the impact of the refined SIP on the conceptual understanding of a cohort of students with significant conceptual difficulties, as measured by the HFCI.

QUALITATIVE:

- To identify the mechanisms (e.g., cognitive load, metacognition, problem-solving confidence) through which the scaffolds facilitate learning, using qualitative data from student interviews.

Methodology Overview

Action Research Design with Two Cycles



Study Instruments and Procedures

- Half-Length Force Concept Inventory
- Semi-structured interviews
- Cycle 1: Identify misconceptions
- Cycle 2: Refine and re-implement
- Action Research Cycle phases

Development of the Scaffolded Independent Practice (SIP) Worksheets

Development of Scaffolded Learning Framework

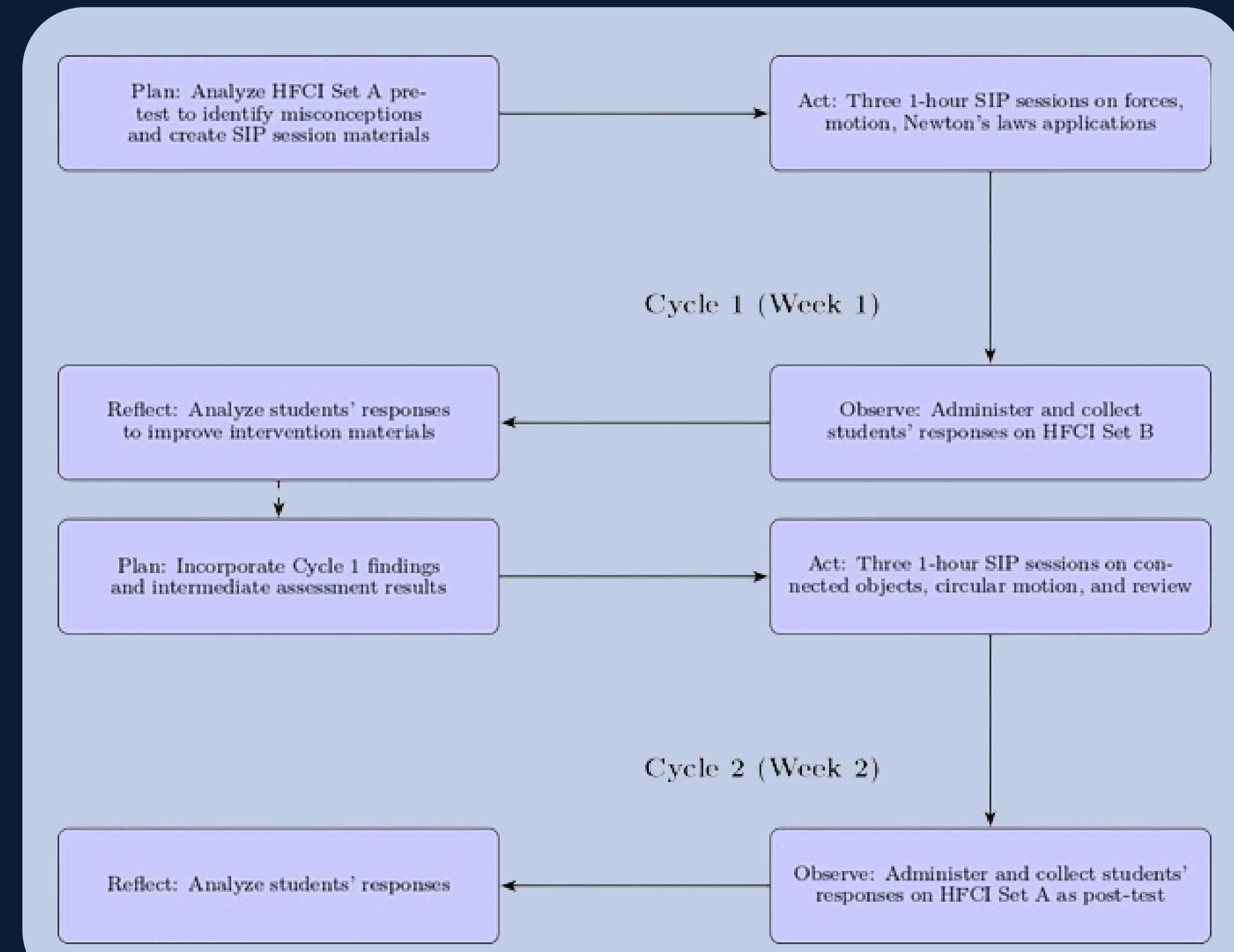


Methodology Overview

Action Research Design with Two Cycles

Research Design Overview

- Action research approach
- Two iterative cycles
- 12 matriculation students
- Qualitative and quantitative methods
- Pre, post, and intermediate testing



80.36% Post-Test Score

Significant improvement in understanding

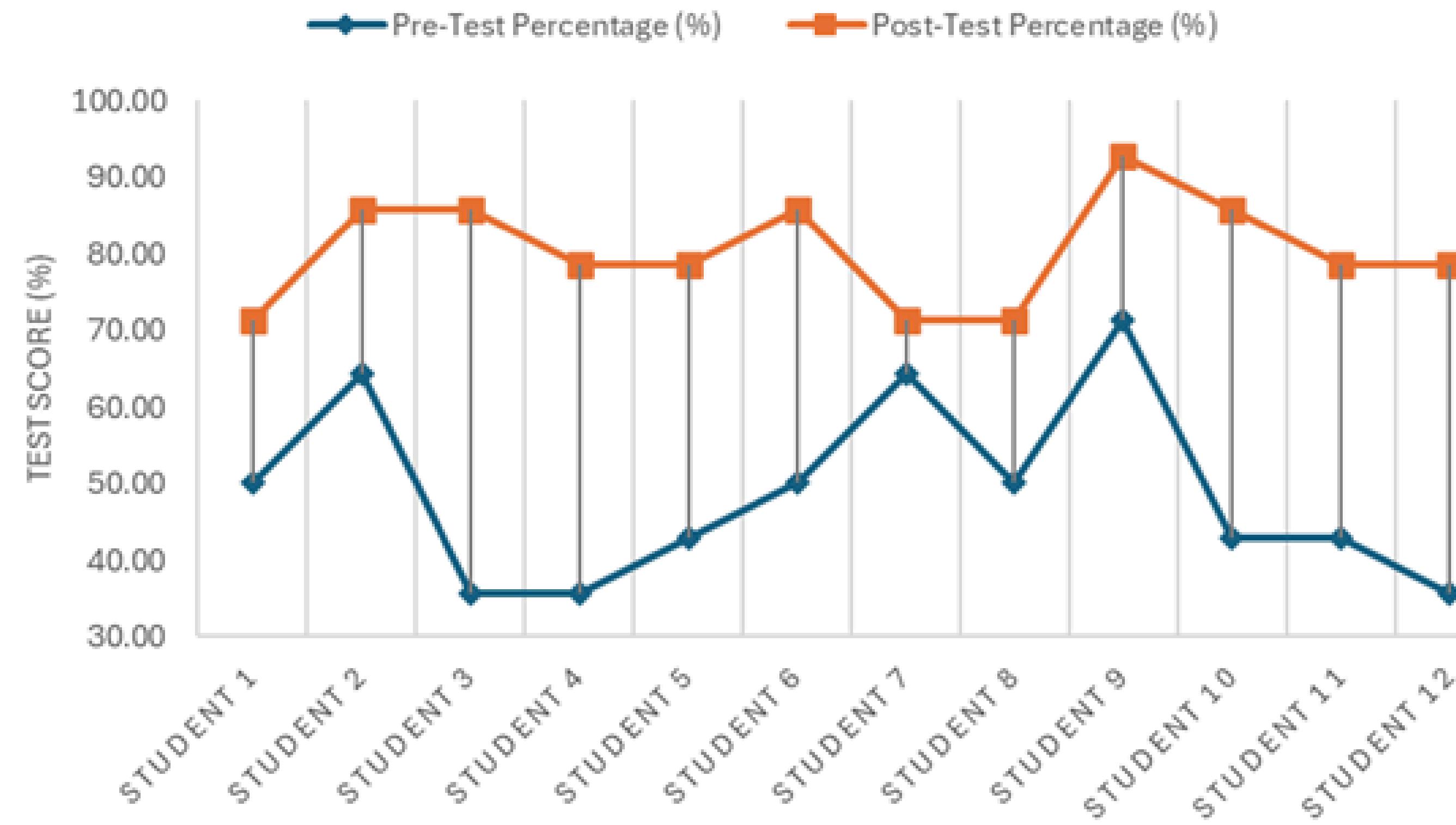
$$\langle g \rangle = 0.62$$

High conceptual gain achieved

$$\text{Cohen's } d = 2.80$$

Large effect size observed

STUDENTS' PRE AND POST SCORES (%)

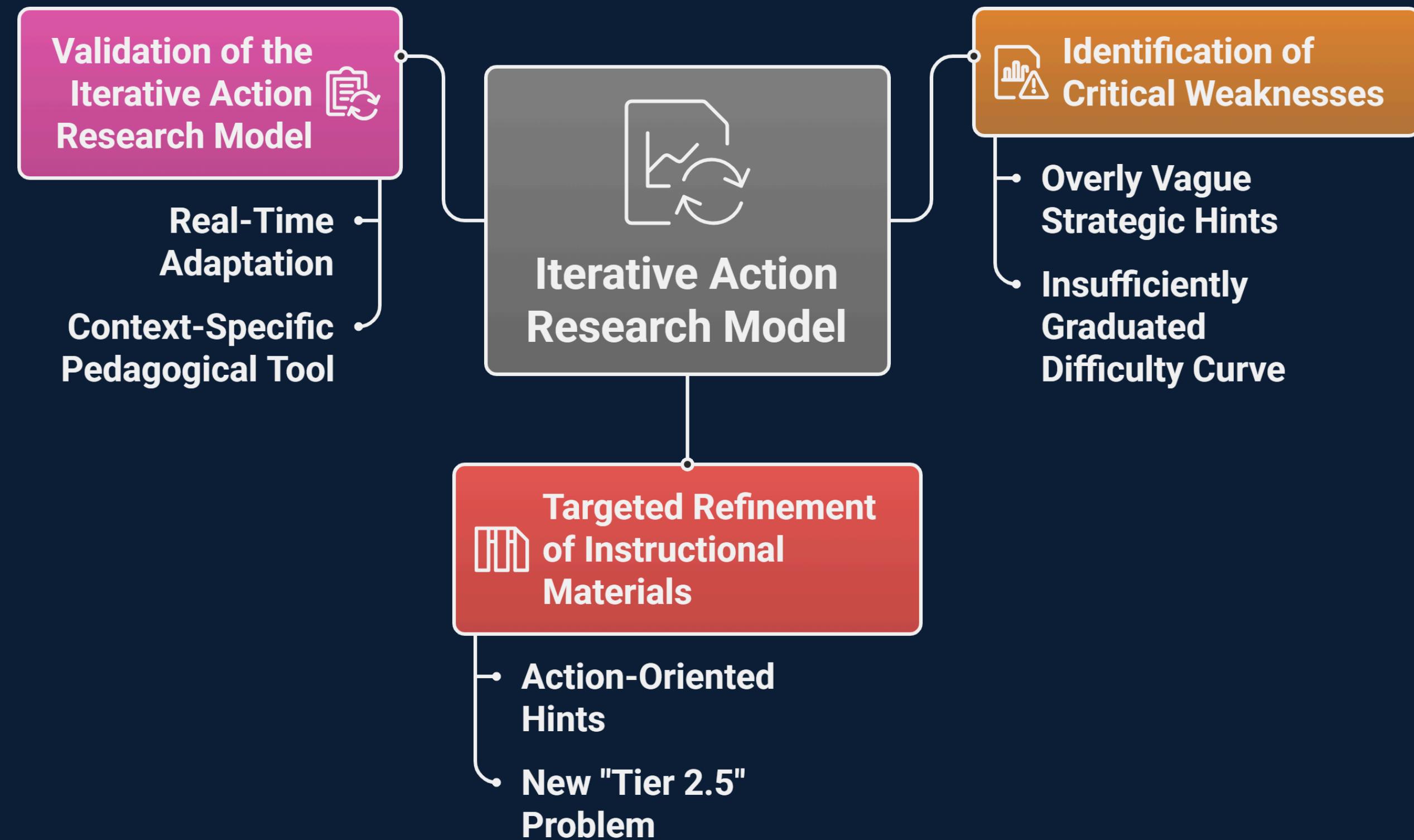


Qualitative Findings: Student Insights



Reflections

Integrating Research Findings into Practice



Conclusions

Integrating Research Findings into Practice



How effective was the intervention?

It was highly effective, producing significant gains in conceptual understanding.

What drove the success?

Specific cognitive and metacognitive mechanisms, such as reduced cognitive load and enhanced problem-solving confidence.

How important was the research design?

The iterative, reflective action research design was essential for responsive refinement and effective pedagogy.



Contact Me

I welcome your
questions and
feedback!

EMAIL

bm-3542@moe-dl.edu.my

PHONE

0105520080