



Mr. Emmanuel Jnr Asa

LECTURER, DEPARTMENT OF EDUCATION
MATHEMATICS & SCIENCES
DIVINE WORD UNIVERSITY (DWU)
ST. BENEDICT'S CAMPUS, WEWAK
EAST SEPIK PROVINCE, PAPUA NEW GUINEA



easajunior25@gmail.com
easa@dwu.ac.pg



+675 70321635



+675 70321635



Wewak, Papua New Guinea

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Dedication To:

1. Mr. Marcus Asa,
2. Cecelia Asa and their Late Grand son
3. Emmanuel Jnr (II)

EVALUATING FACTORS AFFECTING THE EFFECTIVENESS OF PHYSICS TEACHING AND LEARNING IN SENIOR SECONDARY SCHOOLS: EVIDENCE FROM PAPUA NEW GUINEA WITHIN A GLOBAL STEM EDUCATION CONTEXT

1 INTRODUCTION & AIM

INTRODUCTION

Despite the central role of Physics in developing scientific literacy and innovation, students in many developing contexts, including Papua New Guinea (PNG), continue to underperform due to interconnected systemic and classroom-level challenges.

AIM



To evaluate the factors affecting the effectiveness of Physics teaching and learning among Grade 11 and 12 students in Papua New Guinea, and propose context-responsive strategies to improve STEM education within a global education context.

OBJECTIVES

- ✓ To identify key factors influencing the effectiveness of Physics teaching and learning.
- ✓ To examine the extend of these factors across six secondary schools in three provinces of PNG.
- ✓ To explore teachers' and students' perceptions and experiences.
- ✓ To propose context-responsive strategies to enhance Physics education and support STEM outcomes.

2 METHOD



Research Design

Mixed-methods approach (convergent parallel design) combining quantitative and qualitative data



Participants

6 Physics teachers and 60 Grade 11 & 12 students from 6 secondary schools in 3 provinces: Madang, East Sepik and West Sepik.



Data Collection

Questionnaires, semi-structured in interviews and classroom observations.

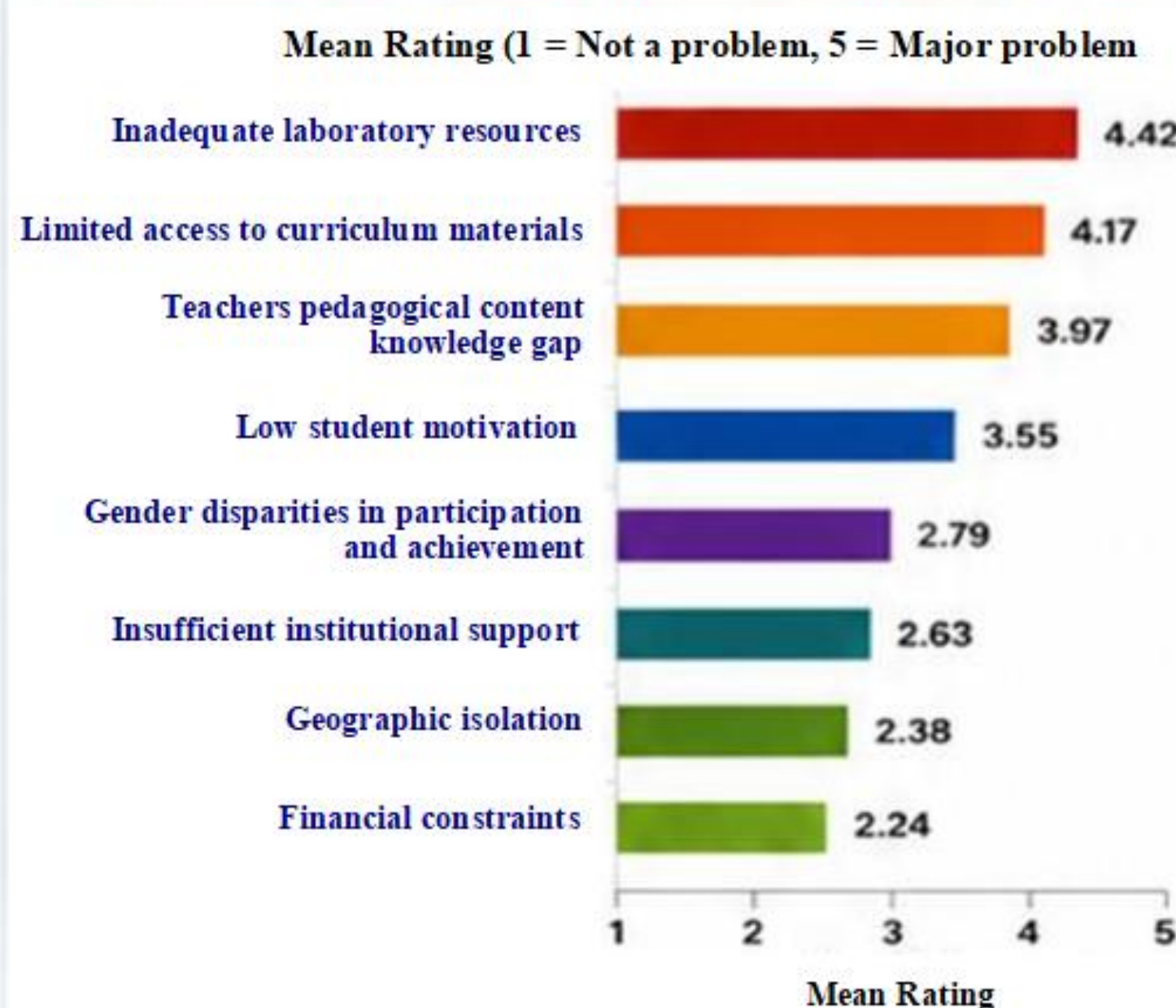


Data Analysis

Descriptive statistics (frequencies, percentages, means) and thematic analysis for qualitative data.

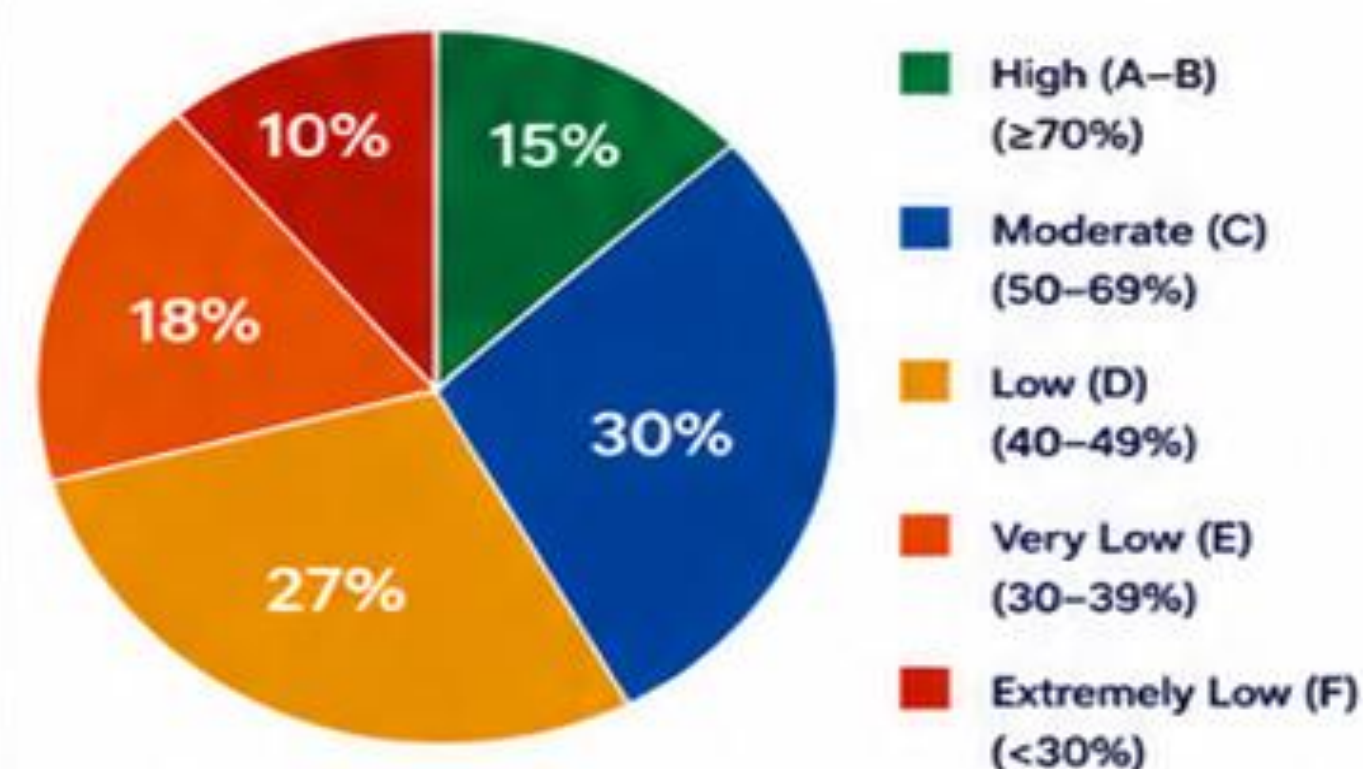
3 RESULTS & DISCUSSION

3.1 Key Factors Affecting the Effectiveness of Physics Teaching and Learning (Student Responses, n = 60)

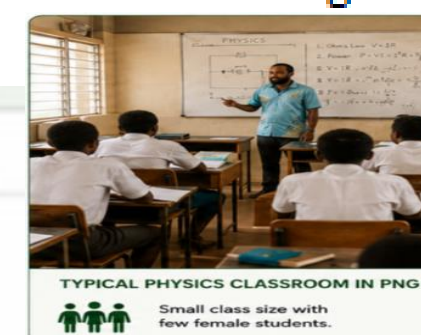


3.2 Academic Performance

Distribution of Students by Achievement Level (n = 60)



Most students (55%) achieved low or very low levels, highlighting the urgent need for targeted interventions.



3.3 Laboratory Resource Availability (Teacher Responses, n = 6)

Adequate Lab Space	Basic Equipment Available	Functional Equipment	Consumables Available	Safety Equipment	ICT for Physics Instruction
17% (1/6)	33% (2/6)	17% (1/6)	17% (1/6)	33% (2/6)	17% (1/6)

3.4 Gender Participation and Achievement (Students, n = 60)

Indicator	Male (n = 33)	Female (n = 27)	Observation
Enrollment in Physics	22 (66.7%)	11 (33.3%)	Lower female participation
Mean Achievement Score (%)	61.2	48.3	Gender gap in achievement
High Achievement (A-B)	10 (30.3%)	2 (7.4%)	Fewer females in top band

3.5 Themes from Interviews and Observations

- Teachers emphasized limited professional development opportunities and large class sizes
- Students reported difficulty understanding abstract concepts due to lack of practical and learning resources
- Geographic isolation and transport challenges limit access to workshops, resources and support
- Strong desire for improved labs, relevant teaching strategies and greater encouragement for girls in Physics

4 CONCLUSION



This study reveals that the effectiveness of Physics teaching and learning in PNG is constrained by limited resources, pedagogical gaps, low motivation, and gender disparities-challenges also evident in many developing contexts globally.

Addressing these interconnected factors through targeted, context responsive interventions is critical to improving Physics outcomes and strengthening STEM education.

Investing in teachers, resources and equity will better prepare students for participation in the global, technology-driven knowledge economy.

5 FUTURE WORK



1. Expand the study to include more provinces and a larger sample size
2. Conduct longitudinal studies to access the impact of interventions over time.
3. Develop and evaluate contextually relevant Teaching resources and practical kits.
4. Investigate the role of technology and digital resources in enhancing learning
5. Implement targeted interventions to promote gender equity in Physics

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