Improving Physics Lab Data Analysis with Spreadsheet Integration

# Researcher Information

Name: Shafiq Rasulan

Institution: Sarawak Matriculation College

Email: bm-3542@moe-dl.edu.my

# Abstract

This study aims to evaluate the effectiveness of using Microsoft Excel in improving students' skills in analyzing experimental data in physics laboratories. An action research approach was adopted, involving Semester 2 pre-university students. The Concise Data Processing Assessment (CDPA) was used as a pre- and post-test instrument to measure learning gains. Findings showed a significant improvement in students’ understanding and efficiency in data processing, particularly in graph clarity, accuracy of interpolation, and awareness of data uncertainty. The results suggest that spreadsheet integration is a highly effective teaching practice that should be expanded in physics laboratory instruction.

# 1.0 Introduction

In physics laboratories, the ability to process and interpret data is a critical component of scientific understanding. However, students often face challenges in effectively representing data and grasping concepts such as uncertainty and relationships between variables. Microsoft Excel, as a digital tool, has great potential to enhance learning by allowing students to create graphs, identify trends, and analyze data visually and efficiently.

# 2.0 Reflection on Past Teaching and Learning Practices

Previous teaching practices relied heavily on manual methods such as plotting graphs on graph paper and performing calculations using scientific calculators. Students showed low engagement during data analysis activities and frequently made basic errors in plotting graphs, setting scales, and interpreting linear relationships. Reflecting on these weaknesses highlighted the need to introduce interactive digital tools such as Microsoft Excel to support more effective data analysis.

# 3.0 Focus of Study / Area of Concern

The main focus of this study is to improve students’ efficiency in analyzing laboratory data through the use of spreadsheet software. The key issue of concern is students’ inability to produce accurate graphs and interpret data correctly, which negatively affects their performance in laboratory assessments and understanding of physics concepts.

# 4.0 Research Objectives

1. To determine the effectiveness of Microsoft Excel in improving students’ data analysis skills.  
2. To assess the gain in CDPA scores before and after Excel-based instruction.  
3. To explore students’ perceptions of using Excel in physics lab sessions.

# 5.0 Target Group

This study involved 25 Semester 2 students from the Pure Science Program at [State] Matriculation College. The participants were selected based on their involvement in lab sessions on “Simple Harmonic Motion” and “Vertical Motion.”

# 6.0 Implementation of Action / Study

Step 1: Students completed the pre-test (CDPA).  
Step 2: Training sessions were conducted on using Microsoft Excel (graphing, trendlines, uncertainties, etc.).  
Step 3: Students carried out physics experiments using Excel-based worksheets.  
Step 4: Students completed the post-test (CDPA).  
Step 5: Data was analyzed using descriptive and inferential statistics.

# 7.0 Observations and Research Findings

Quantitative Findings: The average CDPA score increased from 42% (pre-test) to 73% (post-test).  
Areas of Improvement:  
- More accurate and neat graph plotting  
- Use of trendlines and R² values  
- Better understanding of uncertainty in measurements  
Teacher’s Observation: Students were more confident and actively engaged during data analysis discussions.

# 8.0 Reflection and Conclusion

The integration of Microsoft Excel in physics lab instruction significantly improved students’ understanding of data processing. In addition, 21st-century skills such as digital literacy and critical thinking were effectively fostered. Teachers also found the approach more structured and time-efficient during lab instruction. This study supports the broader use of digital tools in laboratory settings to develop scientifically literate students.

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# References

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# Appendices

Appendix A: Sample CDPA Items

Appendix B: Pre-test and Post-test Scores

Appendix C: Excel-based Lab Worksheets

Appendix D: Students’ Reflection Responses