Second Data
Vol.1 (1), pp. 10-15, 2024
Doi: 10.58197/prbl/WGSU1427

Parabolum Publishing

Available online at http://www.parabolumpublishing.org/

Type of article: Data Article

Dataset on the Availability of Physics Resources and Usage of Virtual Labs in Rwandan Secondary Schools

Joseph Nzabahimana[1]*, Kizito Ndihokubwayo[2] & Leon R. Mugabo[1]

[1]University of Rwanda College of Education (URCE), PO BOX 55 Rwamagana, Rwanda
[2]Parabolum Research & Development Consulting Limited, Kigali, Rwanda

Abstract

This dataset captures the availability of physics resources, such as laboratories, textbooks, and Virtual Labs (VLs), as well as the self-reported challenges faced by physics teachers in secondary schools in Rwanda. The data were collected in 2021 from a range of teachers across various schools. This dataset can be used to assess gaps in physics education resources and identify areas where further training or equipment is required to enhance the teaching and learning of physics in Rwandan secondary schools.

Keywords: Physics Education, Virtual Labs, Science Resources, Secondary School Data, Rwanda, Physics Textbooks, Teacher Training

Article information

Received: 06/10/2024;
Reviewed: 29/10/2024;
Revised: 31/10/2024;
Accepted: 05/11/2024

*** Corresponding author:** Joseph Nzabahimana: jeef.nzaba@gmail.com

How to cite this article: Nzabahimana, J., Ndihokubwayo, K., Mugabo, R. L. (2024) ' Dataset on the Availability of Physics Resources and Usage of Virtual Labs in Rwandan Secondary Schools', *Second Data*, 1(1), 10-15. Available at: http://doi.org/10.58197/prbl/WGSU1427

Introduction

Teaching physics in secondary schools relies heavily on practical resources like laboratories, textbooks, and technological tools. In Rwanda, the availability of these resources varies, leading to different teaching outcomes (Nzabahimana et al., 2024). This dataset aims to assess the current status of these resources and identify challenges that physics teachers face, particularly in using technology such as Virtual Labs (VLs). By providing a comprehensive look at the availability of teaching aids and teachers' experiences, this dataset can serve as a foundation for improving physics education in Rwanda.

This dataset provides valuable insights into the state of physics education resources in Rwanda. By analyzing this data, policymakers and educational institutions can better understand where to allocate resources and how to support teachers (Ndayambaje et al., 2024) in delivering quality physics

education. The dataset is freely available for use and further research into improving STEM education in Rwanda.

Methodology

The dataset was collected via a structured survey administered to secondary school physics teachers in Rwanda. The data were collected using a convenience sampling technique (Orodho et al., 2016), and the survey was distributed to physics teachers online in various provinces of Rwanda. The dataset was collected through an online survey conducted from 2021/06/30 12:56:44 PM GMT+2 to 2021/08/15 11:26:55 AM GMT+2, and 107 responses were gathered. Data collection tools included both multiple-choice questions and open-ended prompts to capture detailed insights from the participants.

The survey included both closed-ended and open-ended questions designed to capture the following key areas:

Demographics: Gender, Qualification, Teaching Experience, Location, and School Type

Availability of Physics Resources: Whether the school has a physics laboratory, library with physics textbooks, access to the internet, and computer labs.

Usage of Virtual Labs (VLs): Teachers' familiarity and comfort with using VLs for teaching.

Challenges and Suggestions: Teachers' responses regarding difficulties in conducting physics experiments and suggestions for improvement.

A total of 107 teachers responded to the survey, providing insights into the availability of resources and their perceptions of teaching physics.

Data description

The dataset is available in a structured format, with each row representing the response of a single teacher. The following information is captured:

Teacher ID: Unique identifier for each respondent.

Gender: Male or Female.

Qualification: Level of education (e.g., Diploma, Bachelor's degree).

Teaching experience: Number of years of teaching experience.

School type: 9YBE or 12YBE (Rwandan school categories).

Location: Whether the school is in an urban or rural area.

Province: The province where the school is located.

Additionally, teachers provided responses to statements about the availability of physics laboratories, access to the internet and computers, and the usage of Virtual Labs (VLs). These responses were rated on a Likert scale from "Strongly Agree" to "Strongly Disagree."

Data demography

The dataset comprises responses from 107 secondary school teachers in Rwanda, detailing various demographic and professional characteristics that provide context for their teaching experiences and needs. Most respondents are male (77), with 30 female teachers highlighting a gender disparity in secondary school physics education. In terms of qualifications, 39 teachers hold a Diploma (A1), while 68 possess a Bachelor's degree (A0), indicating that most have at least an undergraduate qualification. Regarding their field of study, 74 teachers specialize in Physics with Education, 11 in Mathematics and

Physics with Education, and the remaining 22 are in related fields, such as Pure or Applied Physics, with or without a postgraduate certificate in education. The dataset also reveals a balanced range of teaching experience: 30 teachers have less than 5 years of experience, 47 have between 5 and 10 years, and 30 have over 10 years of teaching experience.

The teachers work across different school types, with 31 affiliated with the 9-Year Basic Education (9YBE) system, 43 with the 12-Year Basic Education (12YBE) system, 16 in Boarding schools, and 17 in Boarding and Schools of Excellence. Additionally, 85 teachers are engaged at the Ordinary level, while 22 are involved at the Advanced level. Geographically, 48 teachers are based in urban areas, while 59 work in rural locations. The distribution across provinces includes ten teachers from the Eastern Province, 33 from the Western Province, 16 from the Northern Province, 32 from the Southern Province, and 16 from Kigali City. This demographic diversity underscores the range of experiences and contexts in which secondary school physics education is provided across Rwanda, making the dataset valuable for understanding the varying challenges and resource needs among teachers in different regions and school settings.

Ethics Statement

Participation in the survey was voluntary, and respondents were informed about the nature and purpose of the research. The dataset was collected anonymously to protect participants' identities.

Availability of Data

The dataset is available for public use and can be accessed from the figshare repository at 10.6084/m9.figshare.27325650.

References

Ndayambaje, I., Nduwingoma, M., Yanzigiye, B., Habimana, O., & Ndihokubwayo, K. (2024). Dataset on University Lecturers' Competence and Experiences with Online Learning Platforms in Rwanda. *Second Data*, *1*(1), 6–9. https://doi.org/10.58197/prbl/XDXV8934

Nzabahimana, J., Ndihokubwayo, K., & Mugabo, L. R. (2024). Teachers' Experiences with the Use of Virtual Laboratories in the Teaching of Physics in Rwandan Secondary Schools: A Survey Design. *African Journal of Research in Mathematics, Science and Technology Education*, *0*(0), 1–14. https://doi.org/10.1080/18117295.2024.2361546

Orodho, A., Nzabarirwa, W., Odundo, P., Waweru, P. N., & Ndayambaje, I. (2016). *Quantitative and Qualitative Research Methods. A Step by Step Guide to Scholarly Excellence*. Kanezja Publishers & Entreprises.

Appendix: Research questionnaire

Section 1 – Identification

Name of teacher (Optional): ……...

Gender: Male ☐ Female ☐

Qualification: Bachelor (A0) ☐ Diploma (Or A1) ☐ A2 ☐ Other (Please, specify):

Field of study: Physics with Education ☐ Pure Physics ☐ Other (Please, specify):

Teaching experience: < 5 years ☐ 5 – 10 years ☐ > 10 years ☐
Name of the school where you teach: ……
Status of your school: 9YBE ☐ 12YBE ☐ Boarding school ☐ Boarding and school of excellence ☐
Level you are teaching: Ordinary level ☐ Advanced level ☐
Location of your school: Urban ☐ Rural ☐
District:
Province:

Section 2 – Teaching/learning resources at your school

1. Does your school have a physics laboratory?

Yes ◯ No ◯

2. Does your school have a library with high-quality physics textbook?

Yes ◯ Maybe ◯ No ◯

3. In the table below, please read each statement very carefully. Decide whether you "*Strongly Agree*", "*Agree*", "*Disagree*" or "*Strongly Disagree*" with the statement. If you neither agree nor disagree, mark the "*Neutral*" column.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	My school has a well-equipped physics laboratory.					
2	My school has science (physics) kits.					
3	My school has improvised locally made materials.					
4	My school has computer lab.					
5	My school has internet connectivity.					
6	I have access to (can use) the school internet in my classroom.					
7	Learners in my school use computer lab.					
8	I have my personal computer.					
9	I use my personal computer for teaching activities.					
10	My school has projectors to use while teaching.					
11	My school has access to electricity.					

Section 3 – Teaching strategies (ways to perform physics labs & use of VLs) and skills in ICT

1. To what extent do you agree or disagree with the following statements? Please, rate your level of agreement from "strongly agree" to "strongly disagree."

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	I have a laboratory manual with detailed instructions about how to perform physics experiments.					
2	My teaching timetable clearly shows the time for physics laboratory-based activities.					
3	I rarely perform physics lab experiments due to many students in my classroom.					
4	I rarely perform physics lab experiments due to the lack of laboratory materials at my school.					
5	My timetable is overloaded, and I do not get enough time to perform physics lab activities.					
6	I have improved skills in using information technologies (IT) in the teaching of physics.					
7	I am aware of the importance of ICT integration in the teaching and learning of science, especially Physics.					
8	I use IT in the teaching of physics.					
9	I have learned how to use available online teaching resources (e.g., videos, simulations, etc.) in my lessons.					
10	I know what Open Education Resources (OERs) are.					
11	I have never heard of OERs.					
12	I know what Virtual Laboratories (VLs) are.					
13	I have never heard of VLs.					
14	I am aware of the importance of VLs in the teaching and learning of Physics.					
15	I am familiar with VLs in teaching Physics.					
16	I regularly use VLs in the teaching of Physics.					
17	I find VLs easy to use.					
18	I am confident about how to select and use VLs and related learning tasks for classroom activities.					

19	I am regularly provided with in-service trainings on how to conduct laboratory activities.					
20	I am encouraged to use ICT in the teaching of physics.					

2. How often do you use the following when teaching physics? For each activity, select the appropriate column: "*Always*"; "*Often*"; "*Sometimes*"; "*Rarely*" or "*Never*".

		Always	Often	Sometimes	Rarely	Never
1	Computer simulations to illustrate some physics concepts.					
2	Animations to illustrate some physics concepts.					
3	Videos to illustrate some physics concepts.					
4	Pictures and diagrams (charts) to illustrate some physics concepts.					
5	Improvised locally made materials.					
6	Physics textbooks.					

Section 4 – Challenges

1. What are difficulties, if any, do you face while conducting physics lab experiments in general?
   ……
   ……
2. What are challenges, if any, do you have to effectively use VLs in teaching physics?

……
……

3. What do you suggest that can be done to effectively use VLs in the teaching of physics?

……
……

THE END – THANKS FOR YOUR TIME AND CONSIDERATION!