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Original Article

Project Based Learning and Learner's Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality

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The study focused on examining the relationship between project-based learning and academic achievement in physics among ordinary level students in government aided secondary schools in Ibanda Municipality. A cross-sectional design was employed using both quantitative approaches. Simple random sampling technique was applied to select the 412 respondents as response rate. Data collection was collected using questionnaire survey. Data was analysed with Pearson correlation coefficient and multi-linear regression analysis. The study concluded that there is a positive significant weak relationship between Project Based Learning and Academic learners' achievement. The study recommends that Project Based Learning should highly be emphasized in the new current curriculum so that learners can perform very well especially in science subjects such as physics as well. The study also recommends that enough resources in form of scholastic materials should be provided so as to promote project-based learning and learner's academic achievement in physics at Ordinary level in government aided secondary schools especially in Ibanda Municipality.

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INTRODUCTION

In the project-based learning approach, students build up and direct their own learning, develop their creativity, prefer to solve problems they face in cooperation and life is brought to the classroom. In brief, the project-based learning is an approach based on students' working alone or in small groups with the aim of producing concrete products (Gültekin, 2020). At the base of the project The study concluded that there is progress assessment scores determines physics academic achievement; end of term scores manifests physics performance in schools; grades at UCE is an indicator of physics academic achievement and collaboration between teachers and students can improve their performance in physics. However, it was established that respondents disagreed that project teaching practices improves physics performance and hands on learning can influence physics good grades among students in schools. Thus, project based practices should play an important role in relation to product attainment.

The study concluded that there is a positive significant weak relationship between project-based learning and academic learners' achievement. The study also concluded that there is statistical unit increase in Project Based Learning will lead to 22.6% increases in academic achievement.

is students' finding solutions to problems they face in any way and order in the direction of their own. Moreover, this approach supports students in acquiring manual skills and learning more by performing original activities (Chen, 2021). Due to these characteristics, the thought of use of project-based learning environments providing many advantages for students is gradually becoming widespread especially in lessons where daily life is related more such as science and technology (Ayvaci & Coruhlu, 2020).

Studies made in recent years have shown that students face difficulties comprehending some concepts in physics (Beichner, 2020). In Africa, academic achievement in physics in secondary schools across the continent dates back to the colonialism era of the 1900s, when science

teaching was of a theoretical rather than a practical nature, and physics as a subject, alongside other science subjects, were designed mainly as an introduction to scientific studies at advanced levels (Manià et al., 2018). This explains in part why African countries fell behind in the general field of science and technology, and its backwardness in this respect is one of the basic factors that accounts for its continuing state of under-development (Depaepe, 2017). In Senegal for example, initial technological instruction and manual work became basic subjects in the curriculum for the whole of the lower secondary course (Artigue & Smith, 2019).

In Uganda, academic achievement in physics in secondary schools has been an issue for many years (Ssekamwa, 2000). The Government of Uganda has recognized illiteracy and ignorance as the main problems to tackle through education (Jepkoech, 2012). The enrolment of Ugandans in secondary schools was low and on that small numbers very few students chose to offer science subjects especially physics up to higher levels. Most of the students who offered sciences went to technical institutes and other tertiary institutes that were around by that time. The performance of science subjects has been poor ever since that time, however, there is a slight considerable improvement in performance and enrolment in the past 10 years (Sekiwu et al., 2022).

Problem Statement

The government of Uganda has worked hard to build new and renovate existing science laboratories, supply physics textbooks, science kits, and resource materials, as well as in-service training for science teachers through SESEMAT, all in an effort to improve academic achievement in physics (Ministry of Education and Sports report, 2021). The Ibanda municipality's government-aided secondary schools continue to have low academic achievement in physics despite these efforts. According to the UCE scores for the 2018–2022 school year, physics was poorly performed, with the majority of students having failure grades (Ibanda Municipal Education Department report, 2022). Worth

noting is that performance in Physics has improved, although the overall pass levels are still low. “In the years 2022, Over 40% of the candidates have totally failed the subject”, Dan Odongo, the Executive Secretary of UNEB said. Previous research has linked project-based learning to academic success in physics (Bilgin & Karakuyu, 2015). The fact that these studies weren't carried out in Ibanda Municipality and specifically among secondary schools in Ibanda Municipality, as they were in other nations like England, Turkey, Nigeria, Mbale district, and Yumbe district, leaves a knowledge gap. Therefore, the purpose of this study is to investigate the association between PBL and academic achievement in physics at ordinary level government-aided secondary schools in Ibanda Municipality.

Objective of the Study

To determine the relationship between project-based learning and academic achievement in physics at Ordinary level in government aided schools in Ibanda Municipality.

Hypotheses of the Study

H₀: Project Based Learning has not affected Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality.

METHODOLOGY

Research Design

The study adopted descriptive research design is a type of research design which aims at systematically obtaining the information to describe a situation, or population. More specifically, it does not answer a question of why but rather helps answer what, when, where, and how questions regarding the research problem (Shrutika Sirisilla, 2023). Descriptive research design was used because it's cheap and enables the description of the relationship between the study variables that is Project Based Learning and academic Achievement in physics at Ordinary Level in Government Aided secondary Schools in Ibanda Municipality,

Sample Size and Selection

The study targeted students and a sample population of 467 was selected from a study population of 578 participants with the response rate of 412. The sample population was determined using the tabulation method in which the sample size versus total population (Krejcie & Morgan, 1970).

Sampling Procedures/Techniques

Systematic sampling is a sampling technique where a list of elements in the population is randomly arranged either in alphabetical order or numerical order digits (Ken Black, 2004). It was used to select students in single sex schools that is; Ibanda ss and Kibubura girls' ss. It uses fixed, periodic intervals to create a sampling group that generates data for researchers to evaluate without bias. Stratified sampling is applied when a researcher wishes to ensure that particular categories in the population are represented in the sample in the same proportion as in the population. Such sub-groups may about age, gender, class levels and religion. If well applied, stratified sampling it is efficient in a sense that it provides more information with regard to given sample size. This design was used to reach students in mixed schools because of their nature of different sexes. This technique was used to sample students in mixed schools to cater for gender inclusiveness. After arranging learners in small groups called strata, systematic sampling was used.

Data Collection Tools

Onen and Oso (2008) asserts that questionnaires are items or tools used to collect information over a short period. A self-administered questionnaire is a tool that is designed explicitly to be completed by a participant without an interviewer's assistance (or bias). Self-administered questionnaires are widely used for collecting quantitative research data. A questionnaire was subjected to teachers since they know how to read and write. A considerable advantage of the self-administered survey was the potential anonymity of the participant, which can lead to more truthful or valid responses. Also, the questionnaire can be

filled out at the convenience of the participant. The questionnaire was comprised of two sections. Section A is bio demographic data about gender of the respondent and section B is a Likert scale ranging from strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1).

Data Management

Quantitatively, the information was modified to remove errors after being collected for quality control. To eliminate errors and increase information dependability, data was sorted and coded in accordance with the research objectives before being entered primarily for analysis into the Statistical Package for Social Scientists (SPSS) version 20 software. For simple analysis and interpretation of the findings, the quantifiable data was assembled, sorted, edited, categorized, coded into a coding sheet and analysed using SPSS version 20. Multivariate analysis methods were used to analyse the quantitative data. In multivariate analysis, numerous variables (more than two) are analysed to find any potential relationships between them. By examining every potential independent variable and how it relates to other independent variables, multivariate analysis provides a more thorough interpretation of the data. The multivariate analysis methods were used include, dependence techniques, which look at cause-and-effect relationships between variables, and interdependence techniques, which explore the structure of a dataset.

RESEARCH FINDINGS

This chapter presents the analysis and interpretations of the study findings arising from the data collected from the respondents using questionnaires. The section presents the analysis of the study findings in relation to specific objectives.

Indicators of Project-Based Learning and Academic Achievement in Physics

The results in *Table 1* show that 65 (15.8%) strongly disagreed, 71 (17.2%) disagreed, 13 (3.2%) were undecided, 121 (29.4%) agreed and 142 (34.4%) strongly agreed that students are grouped and given supervisors for project learning

with the mean of 3.42. It was also established that 58 (14.1%) strongly disagreed, 67 (16.3%) disagreed, 21 (5.1%) were neutral, 129 (31.3%) agreed and 137 (33.2%) strongly agreed that class timetable has a provision for project work with the mean of 4.22.

The results in *Table 1* show that 148 (35.9%) strongly disagreed, 133 (32.3%) disagreed, 28 (6.8%) were neutral, 56 (13.6%) agreed and 47 (11.4%) strongly agreed that student identify the critical project problem. The mean of 1.84 implies that the majority of the respondents disagreed with the statement. It was noted that 48 (11.7%) strongly disagreed, 33 (8%) disagreed, 18 (4.4%) were neutral, 155 (37.6%) agreed and 160 (38.8%) strongly agreed that students conduct research and hands on during the assessments. The mean of 4.62 implies that the majority of the respondents agreed with the statement.

It was noted that 48 (11.7%) strongly disagreed, 33 (8%) disagreed, 18 (4.4%) were neutral, 155 (37.6%) agreed and 160 (38.8%) strongly agreed that students conduct research and hands on during the assessments. The mean of 4.62 implies that the majority of the respondents agreed with the statement. The results in *Table 1* shows that 165 (40%) strongly disagreed, 144 (34.9%) disagreed, 11 (2.7%) were neutral, 53 (12.9%) agreed and 39 (9.5%) strongly agreed that students present results from projects. The mean of 1.91 shows that the majority of the respondents disagreed with the statement.

The results in *Table 2* shows that 72 (17.5%) strongly disagreed, 69 (16.7%) disagreed, 16 (3.9%) were neutral, 117 (28.4%) agreed and 138 (33.5%) strongly agreed that Progress assessment scores determine physics academic achievement. The mean of 4.21 shows that the majority of respondents agreed with the findings. It was found out that 78 (18.9%) strongly disagreed, 65 (15.8%) disagreed, 12 (2.9%) were neutral, 124 (30.1%) agreed and 133 (32.3%) strongly agreed that the end of term scores manifests physics performance in schools. The mean of 3.12 shows that the majority of respondents agreed with the findings.

Table 1: Indicators of project-based learning in physics

Statement	SD	D	NS	A	SA	M
Students are grouped and given supervisors for project learning	65 (15.8%)	71 (17.2%)	13 (3.2%)	121 (29.4%)	142 (34.4%)	3.42
Class timetable has a provision for project work	58 (14.1%)	67 (16.3%)	21 (5.1%)	129 (31.3%)	137 (33.2%)	4.22
Students identify the critical project problem	148 (35.9%)	133 (32.3%)	28 (6.8%)	56 (13.6%)	47 (11.4%)	1.84
Students conduct research and hands on during the assessments	48 (11.7%)	33 (8%)	18 (4.4%)	155 (37.6%)	160 (38.8%)	4.62
Students present results from projects	165 (40%)	144 (34.9%)	11 (2.7%)	53 (12.9%)	39 (9.5%)	1.91

Source: Primary data (2024)

Table 2: Indicators of Academic achievement in physics at ordinary level in government aided secondary schools in Ibanda municipality

Variables	SD	D	NS	A	SA	M
Progress assessment scores determine physics academic achievement	72	69	16	117	138	4.21
End of term scores manifests physics performance in schools	78	65	12	124	133	3.12

Source: Primary data (2024)

To obtain the relationship between Project Based Learning and Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality, a correlation analysis was conducted using Pearson’s correlation coefficient and significance at the 95% confidence limits (two tailed level) and the findings are obtainable in *Table 3*.

Table 3: Pearson correlation coefficient between project-based learning and learners’ achievement in physics.

		Project based Learning	Academic learners achievement
Project based Learning	Pearson Correlation	1	.302*
	Sig. (2-tailed)		.002
	N	412	412
Academic learners achievement	Pearson Correlation	.302*	1
	Sig. (2-tailed)	.002	
	N	412	412

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data (2023)

Table 3 shows that there is a positive significant weak relationship between Project based Learning and Academic learners achievement ($r=0.302$, $p=0.000$, $N=412$). The relationship is statistically significant at 95% confidence level (2-tailed) since p -value $0.002 < 0.05$. This implies that Project based Learning leads to improvement in learner’s Academic Achievement in physics at Ordinary level in government aided secondary schools in Ibanda Municipality. The results are in agreement with Jerrim et al. (2019) who investigated the connection between inquiry-based instruction and academic attainment and

found scant evidence that the frequency of inquiry-based instruction is positively associated with adolescents’ performance on science exams using nationally representative, linked survey, and administrative data. Their findings hold up when different examinations and measures of achievement are used, different levels of discipline are used in different classrooms, and different gender and prior achievement subgroups are taken into account.

Test of Hypothesis

The hypothesis (H1) of this study was *Project Based Learning has not affected Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality*. In testing this hypothesis, simple

linear regression was used because the relationship between the variables is linear, and the independent variable can be used to predict the value of dependent variable. However, before testing the hypothesis, a regression model summary was first presented in *Table 4* below.

Table 4: Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of estimate
1	.742 ^a	.608	.521	4.8134

a. Predictors (constant), Project Based Learning

b. Dependent variable, Academic Achievement

From the above *Table 4*, the adjusted R value is high at 0.521 which shows the contribution of Project Based Learning on Academic Achievement. Therefore, any deviation in academic Achievement is as a result of 52.1% contribution in Project Based Learning thus a

goodness of fit is achieved. The findings are also in line with Santyasa et al. (2020) who found out that students that learned using the PBL paradigm excelled in their academics. For both learning models, there was significant interaction in low procrastination.

Table 5: ANOVA

Model	Sum of Squares	Df	Mean of Squares	F	Sig.
Regression	92.623	1	88.761	132.266	.000 ^a
Residual	71.313	411	.264		
Total	163.956	412			

a. Predictors (constant), Project Based Learning

b. Dependent variable, Academic Achievement

Table 5 above indicates ANOVA and tests the acceptability of the model from a statistical perspective. The level of significance of the P-value statistic is 0.000, which is lesser than 0.05. Therefore, it can be noted that Project Based Learning have a positive and high statistically significant contribution on Academic Achievement in physics at Ordinary level in government aided secondary schools in Ibanda Municipality. The findings are also in agreement with Abdullatif (2020) and found it to significantly influence student engagement through collaborative learning, critical thinking, disciplinary subject learning, and authentic

learning. The findings demonstrate that through facilitating knowledge and information sharing and discussion, the PBL technique enhances the independence of students and enables research and critical thinking. Therefore, the PBL approach is strongly advised for use in the classroom and outside classroom by students and should be promoted in secondary schools.

Coefficients

The *Table 6* below summaries the coefficients on the effect of Project Based Learning on academic achievement. and tests the first hypothesis.

Table 6: Coefficients

Model	Un standardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
1 (constant)	4.679	.613		13.629	.001
Project Based Learning	.364	.254	.226	4.642	.125

a. Dependent variable: Academic Achievement.

The results in *Table 6* shows that $\beta = .0.226$ implying that a unit increase in Project Based Learning will lead to 22.6% increases in academic achievement. This is statistically insignificant at 95% confidence levels since $p=0.125>0.05$. This implies that Project Based Learning contributes low to academic achievement in physics at Ordinary level in government aided secondary schools in Ibanda Municipality. Therefore, the null hypothesis (H_0); Project Based Learning don't significantly affect Academic Achievement is hereby accepted. The findings are in line with Michael (2022) who performed research to look at how management methods impacted academic achievement in public secondary schools and showed that planning was a crucial managerial requirement for enhancing academic performance. To improve academic performance in public secondary schools, the study suggests increasing stakeholder involvement, resources, and financial assistance.

CONCLUSION

The study concluded that there are progress assessment scores determines physics academic achievement; end of term scores manifests physics performance in schools; grades at UCE is an indicator of physics academic achievement and collaboration between teachers and students can improve their performance in physics. However, it was established that respondents disagreed that project teaching practices improves physics performance and hands on learning can influence physics good grades among students in schools. Thus, project based practices should play an important role in relation to product attainment.

The study concluded there is a positive significant weak relationship between Projects based Learning and Academic learners' achievement. The study also concluded that there is statistical unit increase in Project Based Learning will lead to 22.6% increases in academic achievement.

Recommendations

The study recommends that PBL should highly be emphasized in the new current curriculum so that learners can perform very well especially in science subjects that's chemistry, biology and

physics as well. The study also recommends that enough resources in form of scholastic materials should be provided so as to promote project-based learning and learner's academic achievement in physics at Ordinary level in government aided secondary schools especially in Ibanda Municipality.

REFERENCES

- Artigue, H., & Smith, G. (2019). The principal problem with principal components regression. *Cogent Mathematics & Statistics*, 6(1), 1622190.
- Ayvacı, H.Ş., & Çoruhlu, T.Ş. (2020). Fen ve teknoloji dersi proje tabanlı öğretim uygulamasında ilköğretim öğrencilerinin karşılaştıkları güçlükler. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi* 1, 43-59.
- Beichner, R. J. (2020). Students' understanding of direct current resistive electrical circuits. *American Journal of Physics*, 72, 98-115
- Bilgin, I., Karakuyu, Y., (2015). The effects of project-based learning on undergraduate students' achievement and self-efficacy beliefs towards science teaching. *Eurasia Journal of Mathematics Science and Technology Education*, 11(3).
- Chen, L. (2021). "Cooperative Project-Based Learning and Students' Learning Styles on Web Page Development." *J. Educational Technology Systems*, 32(4), 363-375.
- Depaepe, M., (2017). Colonial education in the Congo-a question of "uncritical" pedagogy until the bitter end? *Encounters in Theory and History of Education*, 18, 2-26.
- Gültekin, M. (2020). Project Tabanlı Öğrenmenin Beşinci Sınıf Fen Bilgisi Dersinde Öğrenme Ürünlerine Etkisi. *Elementary Education Online*, 6(1), 93-112
- Jepkoech, S. (2012). A survey of factors that influence the performance of students in Economics in UCE: A Case of selected schools in Rift Valley province of Uganda. .

Makerere University. Unpublished M. Phil. Thesis.

Jerrim, J., & Moss, G. (2019). The link between fiction and teenagers' reading skills: International evidence from the OECD PISA study. *British Educational Research Journal*, 45(1), 181-200.

Ken Black (2004). *Business Statistics for Contemporary Decision Making* (4th Edition Wiley Student Edition for India.). Wiley-India.

Krejcie, R.V., & Morgan, D.W., (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*

Manià, K., Mabin, L. K., & Liebenberg, J. (2018). 'To go boldly': teaching science fiction to first-year engineering students in a South African context. *Cambridge Journal of Education*, 48(3), 389-410.

Michael, G. K. (2022). Management practices and academic performance of government-aided secondary schools in Uganda. *Journal of Physical Education and Sport Management*, 13(1), 31-38.

Oso, W. K., & Onen, D. (2008). *A General Guide to Writing Research Proposals and Report*. Makerere University.

Sekiwu D., Akena F., Rugambwa N. O. (2022). *Ranking and assessment of scientists in academic subjects and branches and in 19,500 universities*. 31 university Version 2: April 2022 Version 3: August 2022. AD Scientific Index, Kampala Uganda.

Shrutika Sirisilla (2023). <https://www.enago.com/academy/descriptive-research-design/Small-Sample-Techniques> (1960). *The NEA Research Bulletin*, Vol. 38.

Ssekamwa, J. C., (2000). *History and Development of Education in Uganda*. Kampala: Fountain publishers.