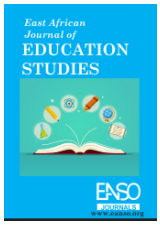
Article DOI : https://doi.org/10.37284/eajes.6.1.1150



East African Journal of Education Studies
eajes.eanso.org
Volume 6, Issue 1, 2023
Print ISSN: 2707-3939 | Online ISSN: 2707-3947
Title DOI: https://doi.org/10.37284/2707-3947

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda

Wafula Alfred[1*], *Dr. George Oriangi, PhD*[1], *Dr. Stephene Odama, PhD*[1] *& Daniel Ochieng Ologe*[2]

[1] Gulu University P. O. Box 166. Gulu, Uganda.
[2] Makerere University P. O. Box 7062, Kampala, Uganda.
[*] Author for Correspondence Email: alfredwafula2020@gmail.com

Article DOI: https://doi.org/10.37284/eajes.6.1.1150

Date Published: *28 March 2023*

Keywords:
Academic Performance, Science-Based Subjects, Primary Schools.

ABSTRACT

Poor academic performance in science subjects continues to be a major setback in schools of developing countries, despite several interventions to curb the vice. This study investigated the trend in academic performance in mathematics and integrated science in Kigumba town council in Kiryandongo district in Uganda. It used a retrospective cohort analysis design of 8 government-aided and privately funded primary schools while employing documentary analysis to obtain primary leaving examinations (PLE) results. PLE data obtained using documentary analysis was subjected to trend analysis to determine trends in pupils' performance in the last decade. The findings indicate that performance in mathematics and integrated science in private schools was better than that in government schools over the last decade. In conclusion, teachers in Ugandan government primary schools need to be more committed to teaching mathematics and integrated science so as to improve the academic performance of pupils. In turn, the government and other stakeholders need to provide the necessary prerequisites to enable the teachers to do their work effectively.

APA CITATION

Alfred, W., Oriangi, G., Odama, S. & Ologe, D. O. (2023). Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda *East African Journal of Education Studies*, *6*(1), 311-319. https://doi.org/10.37284/eajes.6.1.1150.

CHICAGO CITATION

Alfred, Wafula, George Oriangi, Stephene Odama and Daniel Ochieng Ologe. 2023. "Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda". *East African Journal of Education Studies* 6 (1), 311-319. https://doi.org/10.37284/eajes.6.1.1150

HARVARD CITATION

Alfred, W., Oriangi, G., Odama, S. & Ologe, D. O. (2023) "Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda", *East African Journal of Education Studies*, 6(1), pp. 311-319. doi: 10.37284/eajes.6.1.1150.

IEEE CITATION

W., Alfred, G., Oriangi, S., Odama & D. O., Ologe, "Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda", EAJES, vol. 6, no. 1, pp. 311-319, Mar. 2023.

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

MLA CITATION

Alfred, Wafula, George Oriangi, Stephene Odama & Daniel Ochieng Ologe. "Modelling Academic Performance in Science-Based Subjects in Primary Schools in Uganda". *East African Journal of Education Studies*, Vol. 6, no. 1, Mar. 2023, pp. 311-319, doi: 10.37284/eajes.6.1.1150

INTRODUCTION

The performance in science-based subjects in developing countries has continued to show a persistent decline in the last two decades (Adeyemi, 2011; Thompson & Thompson, 2018; Oginni & Oginni, 2019). This has been attributed, among others, to high enrolment rates, high pupil-teacher ratio, poor infrastructural development, poor teacher motivation, weak and inconsistent community engagement and poor supervision mechanisms (Ayodele, 1988; Kayabwe et al., 2014; Thompson & Thompson, 2018; Avvaru et al., 2023). Pryor et al. (2012) attribute the decline in academic performance in schools to old-fashioned curricula and ineffective pedagogy that limits students to memorising facts and reciting them back to the teacher. Yet performance in science based-subjects in primary school is used as a yardstick for measuring a child's level of academic development which in turn affects their progression from the primary to secondary level of their studies (Oginni & Oginni, 2019; Sümen, 2020). Moreover, science-based subjects are highly treasured due to their contribution to economic development. Adikwu (2012) in his report notes that any nation that wants to grow economically must have a strong commitment towards performance in science based-subjects because they play a significant role in economic, technological, political, and environmental development. That is why Uganda has made these subjects compulsory in both primary and secondary schools.

Conversely, the performance trend in science-based subjects in the developed world has been on the rise (Mullis & Martin, 2017; Kirabo et al., 2023). The Programme for International Student Assessment (PISA), which measures performance every three years in both developed and developing countries reported that between 2009 and 2015, the average scores among pupils in the United States of America improved (Thompson & Thompson, 2018). In another international comparative test in mathematics and science at the 4th and 8th-grade school level, Trends in International Mathematics and Science Study (TIMSS) similarly reported that in 2019 the United States of America (USA) had higher average scores compared to other participating countries. This indicates that the USA is performing well compared to many other countries. However, TIMSS only focuses on countries that participate in the STEM (Science, Technology, Engineering and Mathematics) examinations (Sümen, 2020) which exclude East African countries.

The Uganda National Examinations Board (UNEB), in turn, reported that the performance trend in mathematics and integrated science at the primary and secondary level of education is showing a persistent decline at the distinction level with 6% and 4.9% having got distinctions in the year 2019 down from 6.2% and 13.5% in the year 2018. The high failure rates in the primary level of education translate to a low number of students majoring in science-based subjects at secondary, tertiary and university levels of education. The then Executive Secretary of UNEB lamented that only 20% of the total candidates who sat advanced level examinations in 2014 offered Mathematics, 14.4% offered Physics, and 11.5% offered Biology, of which the majority did not get the principal pass required for progression to specialised studies in universities and other tertiary institutions of learning. While releasing the 2015 results in 2016, the former Minister of Education in Uganda also lamented the persistent high failure rates in science-based subjects. The above patterns call for investigations on location-specific trends in performance that can clearly reveal the state of the problem of poor academic performance in science-

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

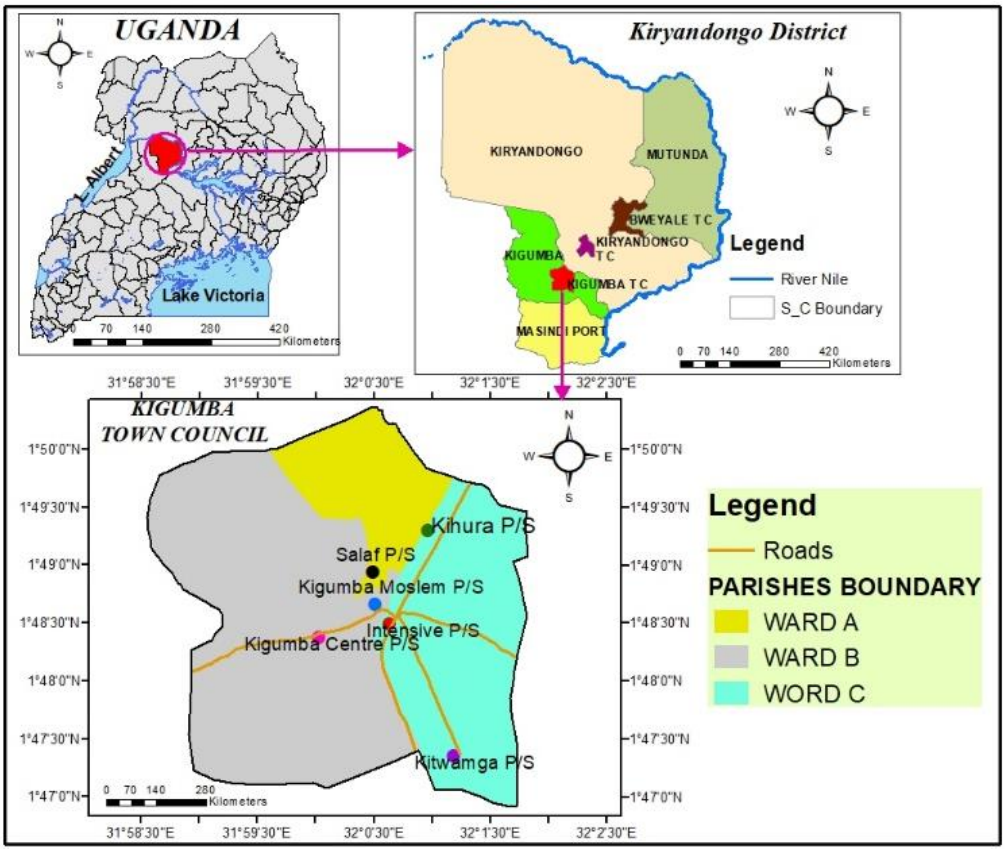
based subjects in Uganda's primary schools. Therefore, this study investigated the trend in academic performance in mathematics and integrated science in Kigumba town council in Kiryandongo district in Uganda.

MATERIALS AND METHODS

Description of Study Area

This study was conducted in government and privately funded primary schools in Kigumba Town Council, Kiryandongo district in Western Uganda (*Figure 1*). Kigumba Town Council was selected based on the perceived poor performance of its primary schools.

Figure 1: Location of Kigumba Town Council and the schools that were studied in Mid-Western Uganda



Source: (Self-generated geographical information science map, based on UBOS shape files, 2020)**.**

Study Design, Sample Size and Sampling Procedure

A retrospective cohort study design was used to collect data on PLE results for the period 2010 to 2019 from both government and privately sponsored primary schools in Kigumba town Council in Kiryandongo district. A sample of 8 primary schools, 4 government-aided and 4 privately funded primary schools were selected. The study population were the primary seven leavers of PLE results. All the PLE results from the eight schools for the period 2010-2019 were obtained following Isreal's (1992) sample size procedure. The choice of the schools was based on the existence of primary seven (7) classes for over ten (10) years and the perceived poor academic performance in these schools, particularly the government-aided primary schools.

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

Data Collection

The study used documentary analysis to examine schools' PLE results in mathematics and integrated science for the period ranging from 2010-2019. Documentary analysis was employed based on the fact that it allows an explanation of past trends, it is relatively low-cost and there is non-interference in data collection (Ahmed, 2010). The researchers approached the head teachers in their respective offices in the primary schools to collect these data.

Data Analysis

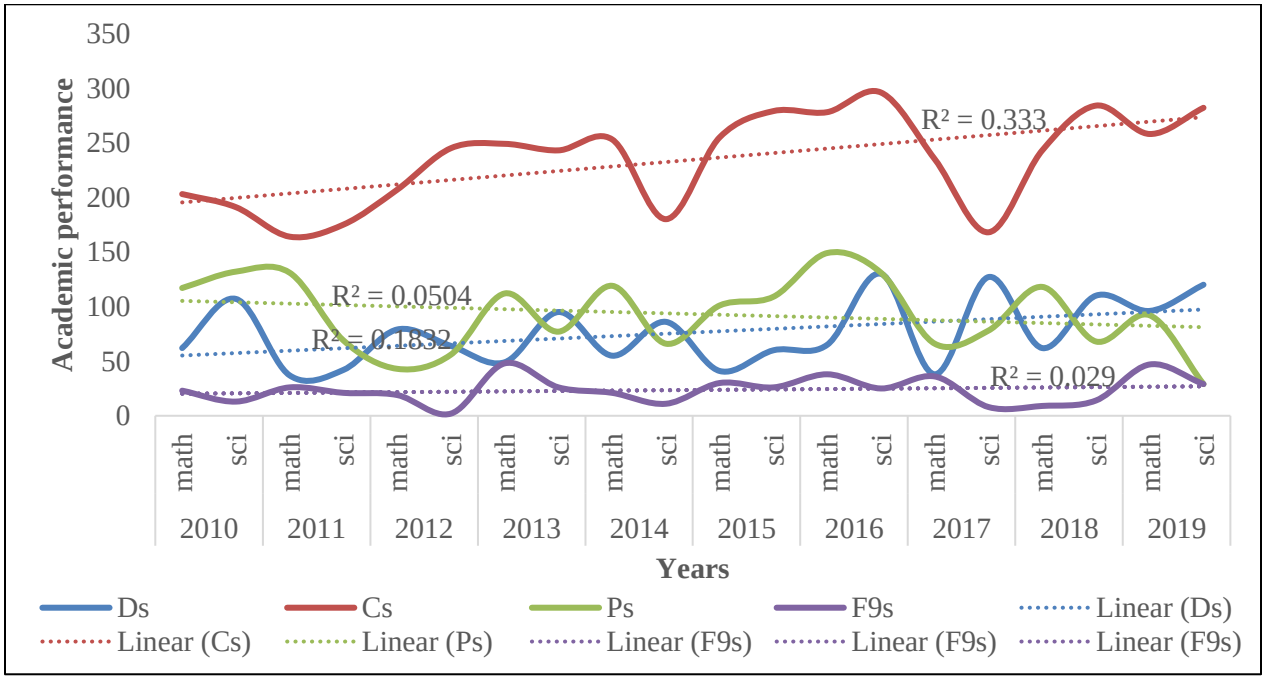
To analyse PLE data obtained from the eight schools, trend analysis was used to determine the trend of academic performance in mathematics and integrated science in the last 10 years (2010-2019). This helped to deduce whether academic performance over the last 10 years in these schools has been improving or declining in the different grades in mathematics and integrated science.

RESULTS

Overall Trend of Academic Performance in Government-Aided and Privately Sponsored Primary Schools

Findings on linear trends of pupil's overall performance in mathematics and integrated science in government and private primary schools in Kigumba town council, mid-western Uganda between the period 2010-2019 (*Figure 2*) revealed that performance at distinction (Ds) level was increasing at $R^2 = 0.183$. However, the increase was not strong. Pupils' performance at credits level (Cs) was also increasing, but the increase was also weak, indicated by $R^2 = 0.333$. At the pass level (Ps), pupils' performance was decreasing, indicated by $R^2 = 0.050$ and at the fail level (F9s), pupils' performance was slightly increasing, indicated by $R^2=0.029$. Therefore, pupils' academic performance at distinction, credit and fail levels was increasing while at pass level, performance was decreasing.

Figure 2: Trend of pupil academic performance in mathematics and integrated science in both government and private primary schools in Kigumba town council, mid-western Uganda between the period 2010-2019

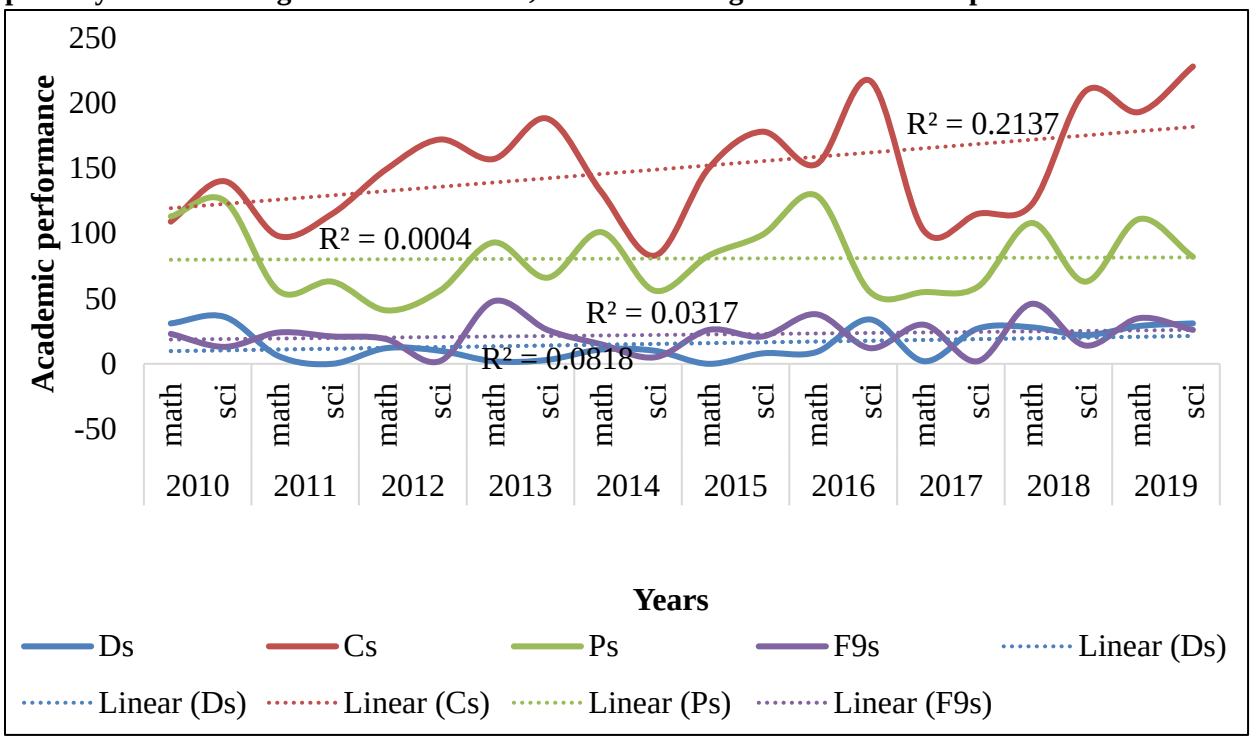


Article DOI : https://doi.org/10.37284/eajes.6.1.1150

Overall Trend of Academic Performance in Government-Aided Primary Schools

Findings on linear trends of pupils' performance in mathematics and integrated science in government primary schools in Kigumba town council, mid-western Uganda between the period 2010-2019 (*Figure 3*) revealed that performance did not change at distinction, pass and fail levels indicated by $R^2 = 0.082$, $R^2 = 0.000$ and $R^2 = 0.032$ respectively while at credit levels, performance increased indicated by $R^2 = 0.214$. However, this was a weak increase.

Figure 3: Trend of pupil academic performance in mathematics and integrated science in government primary schools in Kigumba town council, mid-western Uganda between the period 2010-2019.

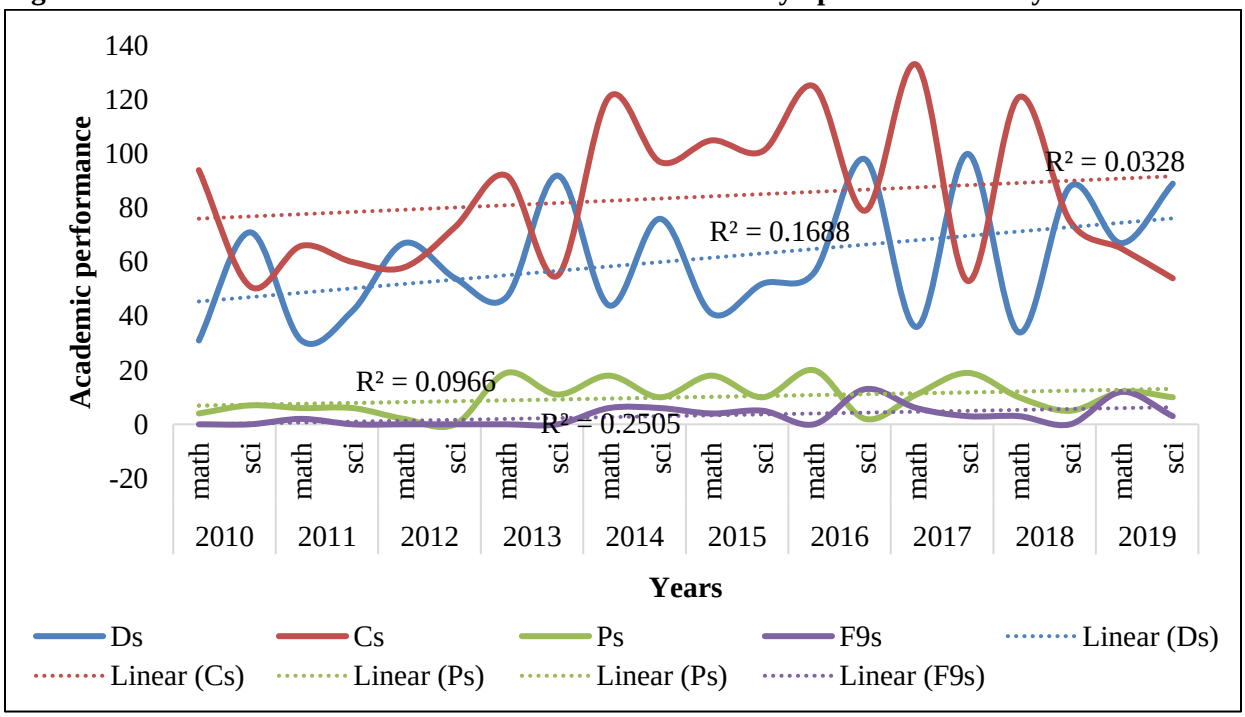


Overall Trend of Academic Performance in Privately Sponsored Primary Schools

Findings on linear trends of pupils' performance in mathematics and integrated science in privately sponsored primary schools in Kigumba town council, mid-western Uganda between the period 2010-2019 (*Figure 4*) revealed that performance at distinction and credit level was increasing, but the increase was weak indicated by $R^2 = 0.169$ and $R^2 = 0.033$ respectively while at pass and fail levels, there was no change indicated by $R^2 = 0.097$ and $R^2 = 0.251$ respectively.

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

Figure 4: Overall Trend of Academic Performance in Privately Sponsored Primary Schools



DISCUSSION OF STUDY FINDINGS

Overall Trend of Academic Performance in Government-Aided and Privately Sponsored Primary Schools

Pupils' overall academic performance in mathematics and integrated science in government-aided and privately sponsored primary schools in Kigumba town council in mid-western Uganda in the period 2010-2019 was improving at distinction and credit levels. However, the increase was not strong. At the pass level, pupils' academic performance was decreasing. The increasing academic performance at distinction and credit levels is likely to be a result of teachers' commitment in terms of lesson preparation, good time management, parental support for their children, intensive supervision by head teachers and other stakeholders, improved facilities, and adequate learning aids. However, this study's findings that academic performance was improving at distinction and credit levels disagree with a report by Oginni and Oginni (2019) who reported that the trends in academic performance in science-based subjects in the developing world have generally been on the decrease.

Overall Trend of Academic Performance in Government-aided Primary Schools

Pupils' academic performance in mathematics and integrated science in government primary schools in Kigumba town council in mid-western Uganda between the period 2010-2019 did not change at distinction, pass and fail levels while at credit level, academic performance increased, but the increase was not strong. The stagnation in academic performance at distinction and pass levels could be because of challenges associated with Universal Primary Education, such as high enrolment rate, high teacher-pupil ratio, inadequate learning materials, poor working conditions of the teachers, inadequate continuous assessment, teacher laxity due to minimal supervision and minimal teacher motivation (Wamala, 2013). This study's findings of neither an increase nor decrease in academic performance at distinction and pass levels by pupils disagree with UNEB (2019) report, which indicated that the trend in academic performance in

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

mathematics and integrated science in primary and secondary schools in the last decade has consistently declined particularly at distinction level.

At the credit level, academic performance increased slightly probably due to the improved learning environment, the recent government commitment to recruit more qualified teachers, improved inspection by district inspectors and head teachers, government emphasis on science-based subjects and the increased supply of textbooks (Altinyelken, 2010). This disagrees with the findings by Mullis and Martin (2017) who reported that the trends in academic performance in science-based subjects in the developing world have generally been on the decrease.

Overall Trend of Academic Performance in Privately Funded Primary Schools

Pupils' academic performance in mathematics and integrated science in privately funded primary schools in Kigumba town council in mid-western Uganda between the period 2010-2019 increased at distinction and credit levels. However, the increase in academic performance was not strong. And at pass and fail levels, there was no change. The improvement in academic performance at distinction and credit levels could be because of teachers' commitment to work, setting of pupil's academic improvement targets to be met by teachers and learners, tight supervision by head teachers and other stakeholders, maintaining small classroom sizes and improved teaching-learning environment by private schools in Kigumba town council (Zuze & Leibbrandt, 2011). This finding disagrees with reports given by Thompson and Thompson (2018) and Oginni and Oginni (2019), who showed that the trend of learners' academic performance has been on the decrease in science-based subjects in most of the developing countries of the world.

Conversely, at pass and fail level, the constant number of students scoring this grade in private primary schools could be because of the greater numbers of pupils that these schools attract which include children of below average intelligence quotient, and such students may not be able to perform so well even when exposed to better conditions. This finding agrees with the UNEB report of 2019 which indicated an increase in failure rates in mathematics and integrated science subjects at PLE.

Comparing Pupils' Academic Performance in Government-aided Schools and Privately Sponsored Schools

Generally, academic performance in mathematics and integrated science in government primary schools in Kigumba town council in the period 2010-2019 did not improve except at the credit level, while in privately sponsored primary schools, academic performance improved at distinction and credit levels. The stagnation in academic performance at distinction and pass levels in government schools could be due to Universal Primary Education related issues like high pupil-teacher ratio, absenteeism of teachers and learners, too much workload on the teachers (Nuwaha et al., 2021; Warsame, 2023), congestion in classrooms and inadequate facilities (Yonas et al., 2023), low level of parental involvement in the education affairs of their children, negligence by the supervisory bodies, general lack of teaching-learning materials among others while in privately sponsored primary schools academic performance improvement at distinction and credit level could be due to tight competition from other privately aided primary schools, highly motivated staff (Sakwa et al., 2023), need to attract more learners in order to get more fees collections, availability of the necessary teaching-learning materials and commitment by the teachers (Wamala, 2013; Zuze & Leibbrandt, 2011). This finding agrees with Shabbir et al. (2014) who reported that pupils in private schools perform better academically than those in public schools.

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

CONCLUSION AND RECOMMENDATIONS

There is a need for primary school teachers in government schools to be more committed to the teaching of mathematics and integrated science so as to improve the academic performance of pupils in UPE because over the last decade, academic performance in mathematics and integrated science did not change at distinction and pass levels. By the same token, the government needs to provide teachers with a good teaching-learning environment, improve the remuneration of teachers inform of increased salaries, and other benefits so that teachers can concentrate on their jobs instead of trying to do other things that may help subsidise their salaries. Finally, this study investigated the trend in academic performance in mathematics and integrated science in Kigumba town council in Kiryandongo district in Uganda. However, more similar studies need to be undertaken in rural areas and in other developing countries to ascertain what the situation really is given the fact that even in urban schools, performance is still wanting.

REFERENCES

Adeyemi, T. O. (2011). A comparative study of students' academic performance in public examinations in secondary schools in Ondo and Ekiti States, Nigeria. *Current Research Journal of Economic Theory*, *3*(2), 36-42.

Ahmed, J. U. (2010). Documentary research method: New dimensions. *Indus Journal of Management & Social Sciences*, *4*(1), 1-14.

Altinyelken, H. K. (2010). Curriculum change in Uganda: Teacher perspectives on the new thematic curriculum. *International journal of educational development*, *30*(2), 151-161. doi:10.1016/j.ijedudev.2009.03.004

Ayodele, S. O. (1988). A study of the Relative Effects of the Problems of Class Sizes and Location of Schools on Performance of Pupils. *Nigerian Journal of Curriculum Studies*, *6*(2), 1-11.

Avvaru, R., Prusty, R., & Narayana, R. D. (2023). Teachers' Concerns about Teaching-Learning Process. *East African Journal of Education Studies*, *6*(1), 56-64. DOI: https://doi.org/10.37284/eajes.6.1.1061

Thompson, D. L., & Thompson, S. (2018). Educational Equity and Quality in K-12 Schools: Meeting the Needs of All Students. *Journal for the Advancement of Educational Research International*, *12*(1), 34-46.

Israel, G. D. (1992). *Determining Sample Size.* Cooperative Extension Service, Institute of food and Agriculture Sciences. EDIS. University of Florida.

Kayabwe, S., Nabacwa, R., Eilor, J., & Mugeni, R. W. (2014). The use and usefulness of school Grants: Lessons from Uganda. *IIEP Country Notes. Paris, France: International Institute for Educational Planning*.

Kirabo, P., Sudi, B., & Jean, T. (2023). Quality of Headteachers' Supervision Practices and Teachers' Performance in Primary Schools in Bugamba Sub-County, Rwampara District. *East African Journal of Education Studies*, *6*(1), 103-110. DOI: https://doi.org/10.37284/eajes.6.1.1074.

Nuwaha, W., Atukunda, G., & Kyayemagye, F. (2021). The Relationship between Workload and Teachers Effectiveness in Secondary Schools: A Case of Uganda. New Trends of Global Influences in Africa, 303. *East African Journal of Education Studies,* 6 (1) (2023): DOI: https://doi.org/10.37284/eajes.6.1.1035.

Oginni, O. I & Oginni, T A. (2019). Longitudinal studies of vertical and horizontal organisation on mathematical contents and students'

Article DOI : https://doi.org/10.37284/eajes.6.1.1150

performance in secondary schools. EKSU Journal of Education, 9(2), 2019.

Sümen, Ö. Ö. (2020). Examination of the Relationships between Gender, Mathematics Achievement and STEM Activity Preparation Skills of Prospective Teachers with a Structural Equation Model. *African Educational Research Journal*, *8*(4), 784-790. DOI: 10.30918/AERJ.84.20.164, ISSN: 2354-2160

Pryor, J., Akyeampong, K., Westbrook, J., & Lussier, K. (2012). Rethinking teacher preparation and professional development in Africa: An analysis of the curriculum of teacher education in the teaching of early reading and mathematics. *Curriculum Journal*, *23*(4), 409-502.https://doi.org/10.1080/09585176.2012.747725.

Sakwa, S. E., Mugwe, M. C., & Macharia, S. (2023). Principal's Teacher Reward Strategies on Teacher Performance in Public Secondary Schools in Mumias East Sub-County, Kenya. *East African Journal of Education Studies*, *6*(1), 38-55. DOI: https://doi.org/10.37284/eajes.6.1.1050.

Shabbir, M., Wei, S., Fu, Y. G., Chong, R., Marwat, M. A., Nabi, G., & Ahmed, B. (2014). A comparative study of public versus private primary schools, an evidence from Azad Kashmir (Pakistan Administrative Kashmir). *Journal of Education and Practice*, *5*(9), 154-168.

Mullis, I. V., & Martin, M. O. (2017). *TIMSS 2019 Assessment Frameworks*. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.

UNEB (2019); PLE Results Report

Wamala, R., & Seruwagi, G. (2013). Teacher competence and the academic achievement of sixth grade students in Uganda. *Journal of International Education Research (JIER)*, *9*(1), 83-90.

Warsame, A. M. (2023). Analysis of Grade Eight Examination Subjects in the Banadir Region of Somalia. *East African Journal of Education Studies*, *6*(1), 11-21. DOI: https://doi.org/10.37284/eajes.6.1.1046

Yonas, V., Rupia, C., & Onyango, D. (2023). Classroom Management Challenges Facing Teachers in Enhancing Students' Academic Achievement in Public Secondary Schools in Tarime District. *East African Journal of Education Studies*, *6*(1), 22-37. DOI: https://doi.org/10.37284/eajes.6.1.1048

Zuze, T. L., & Leibbrandt, M. (2011). Free education and social inequality in Ugandan primary schools: A step backward or a step in the right direction? *International Journal of Educational Development*, *31*(2), 169-178. https://doi.org/10.1016/j.ijedudev.2010.06.013

