Revitalizing Public Education in Nigeria: The Case for School Connect

1. Executive Summary

This report analyzes WASSCE and NECO [1] performance across various states in Nigeria between 2019 and 2021. A School Connect pilot program conducted in Osun state demonstrated significant improvement in student outcomes. Based on these findings, we recommend strategic actions to be taken by states with declining scores and propose ways for the private sector and donors to support the expansion of these initiatives to enhance educational outcomes nationwide.

2. Highlights

1. **Addressing Teacher Shortages**: The School Connect program effectively combats teacher shortages in public schools by utilizing trained university scholars.
2. **Positive Student Feedback:** Public school students reported high satisfaction and gave positive feedback on the School Connect program compared to traditional learning methods.
3. **Improved Student Performance:** Student performance in the WASSCE improved significantly in 2022 with the implementation of School Connect compared to previous years.
4. **Funding Disparities:** There is a significant gap in government spending on education compared to private schools and educational boards in Regina, Saskatchewan, Canada.
5. **Potential for Impact**: Funding from the private sector and multinational donors for initiatives like School Connect can help bridge the funding gap for public school boards in Nigeria, leading to substantial improvements in student outcomes, as demonstrated by the pilot program

3. Introduction

Over the past 20 years, the declining standards in Nigeria's public primary and secondary schools have eroded trust, prompting a significant number of parents to turn to relatively expensive private schools for their children's education. Consequently, only private schools can now attract and retain highly qualified and skilled teachers, leaving public schools and their students at a disadvantage. Public school students often lack up-to-date learning materials and qualified teachers, particularly in Science, Technology, Engineering, and Mathematics (STEM) subjects and English. This disparity hinders their ability to compete with private school students for university placements and future employment opportunities. As a result, the country is deprived of valuable human capital, making it difficult to compete on a global scale.

The School Connect program aims to bridge the gaps in teacher availability, technology, and teaching methods that challenge the public school system in Nigeria. The pilot project at The School of Science in Ife, Osun State, Nigeria, had a primary objective of demonstrating how remote tutoring, utilizing university scholars, can complement government efforts. In collaboration with the private sector, this initiative addresses teacher shortages, enhances teaching methods, and improves technology literacy in public schools.

This paper presents the experience, results, and main conclusions of the School Connect pilot project conducted in 2022. Notably, the interactive teaching methods, including engaging learning activities, games, and real-life case studies, were highlighted by students as the most effective components in helping them achieve their learning outcomes. The pilot project demonstrated that these innovative approaches could be successfully applied to other public schools in Nigeria facing similar challenges. Furthermore, the project has the potential to attract support from the private sector and multinational donors, enhancing the government's efforts to improve educational outcomes in public schools. There is a significant disparity between the funding allocated by the Osun State government for secondary schools in 2022 and the average expenditure of private schools in Osun State, top-tier schools in Nigeria, and Regina public schools in Canada. Initial results indicate that student engagement, satisfaction, and academic achievements improved compared to previous years, underscoring the program's effectiveness.

4. Comparative Analysis of WASSCE Scores: Public vs. Private Schools

Our analysis covers WASSCE performance data from 2019 to 2021, providing a comprehensive view of the trends and variations in the percentage of students with 5 credits including Math and English between public and private schools. Below is a summary of the key statistics:

4.1 Summary Statistics by Year (Public vs Private Schools)

Year	Mean	Median	Standard Deviation	Range	IQR	Total Students	Type
2019	52	52.7	18.4	76.9	20.8	838,486	Public
2019	72	74.4	11.7	54.9	15.2	721,494	Private
2020	62	64.5	21	85.1	26.9	830,756	Public
2020	70	72.6	15.7	62	17.5	707,350	Private
2021	74	77.2	17.9	84.7	18.3	879,431	Public
2021	70	72.6	15.7	61.1	11.7	710,426	Private

Table 1: Comparative Analysis of WASSCE between Public and Private Schools (2019-2021)

Key Findings

1. **Performance Trends:**
    - 2019: Private schools had a significantly higher mean of percentage of students with 5 credits including math and English (72.1) compared to public schools (51.7). The median performance was also higher for private schools (74.4 vs. 52.7).
    - 2020: Public schools showed improvement with a mean score of 62.1, yet private schools maintained a higher mean score of 70.1.
    - 2021: Public schools continued to improve, reaching a mean score of 74.1, surpassing the private school mean score of 70.2.
2. **Variability and Range:**
    - Public schools consistently exhibited higher variability in performance (standard deviations: 18.4, 21, and 17.9) compared to private schools (standard deviations: 11.7, 15.7, and 15.7).
    - The range for public schools was significantly broader in all years, indicating a wider disparity in performance among students.
3. **Interquartile Range (IQR):**

- Public schools had a larger IQR in 2019 and 2020, suggesting more variability in the middle 50% of performance of states with at least 5 credits in WASSCE including Math and English. However, the IQR decreased in 2021, indicating more consistent performance among the majority of student

4.2. Visualizations

Line Plots

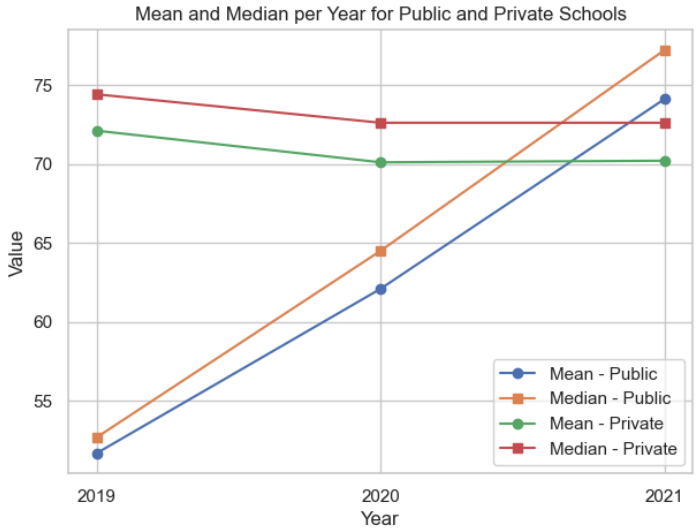

Figure1: Comparative Analysis of mean and median of WASSCE performance between Public and Private Schools (2019-2021)

In 2019, private schools had a significantly higher mean percentage of students with 5 credits, including Math and English, at 72.1% compared to 51.7% in public schools. The median scores were also higher for private schools (74.4% vs. 52.7%). Public schools showed continuous improvement over the three years.

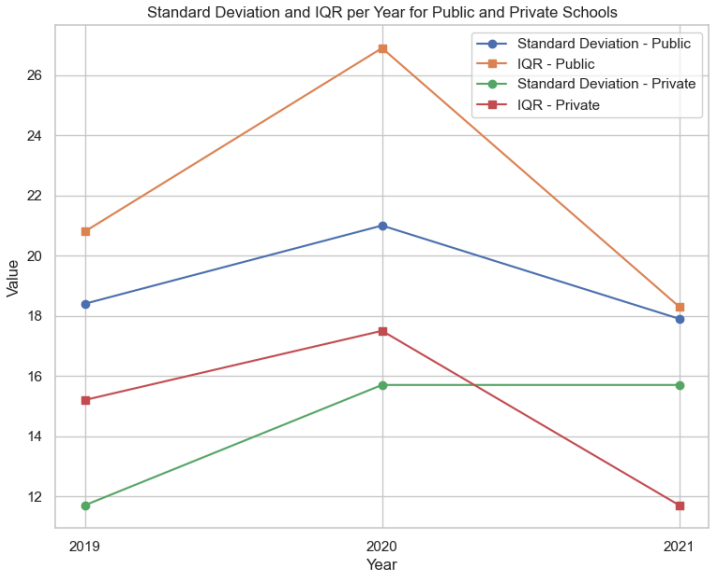

Figure 2: Comparative Analysis of standard deviation and IQR of WASSCE performance between Public and Private Schools (2019-2021)

Public schools consistently exhibited higher variability in performance over the period, with standard deviations of 18.4, 21, and 17.9, compared to private schools, which had standard deviations of 11.7, 15.7, and 15.7.

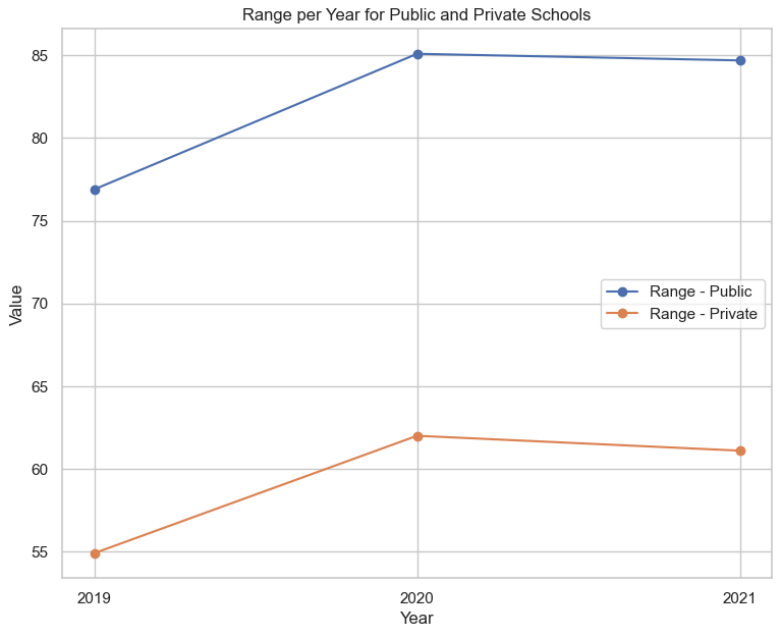

Figure3: Comparative Analysis of Range of WASSCE performance between Public and Private Schools (2019-2021)

The range of scores for public schools was significantly broader in all years, indicating a wider disparity in performance among public school students. In 2021, the range was 84.7 points. Enugu State had the highest percentage, with 93.9% of public school students achieving 5 credits including Math and English. Conversely, Zamfara had the lowest performance at 9.2%, followed by Osun at 32.6%.

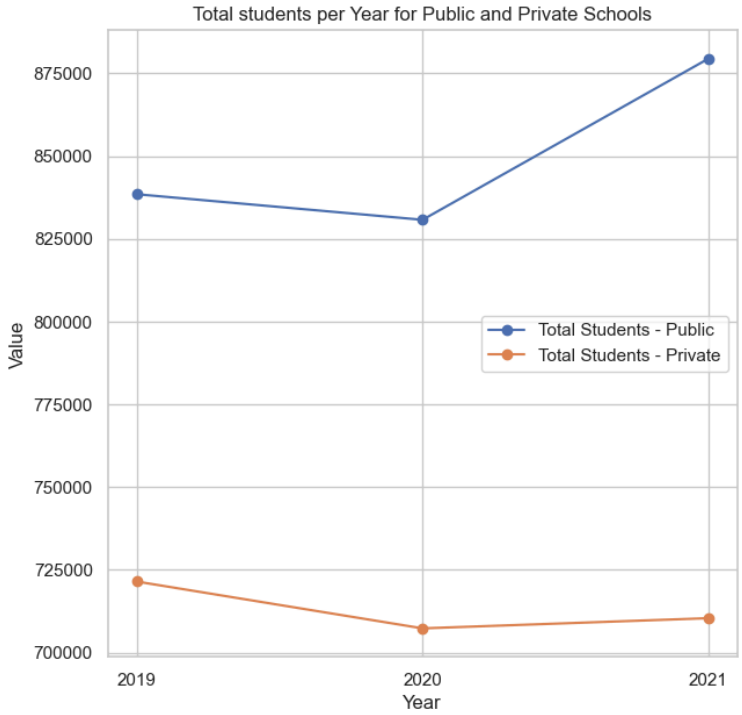

Figure 4: Comparative Analysis of total number of students that sat for WASSCE between Public and Private Schools (2019-2021)

This figure shows that the number of students sitting for WASSCE in public schools increased over the period, rising by 4.9% from 838,486 in 2019 to 879,431 in 2021.

Box Plots

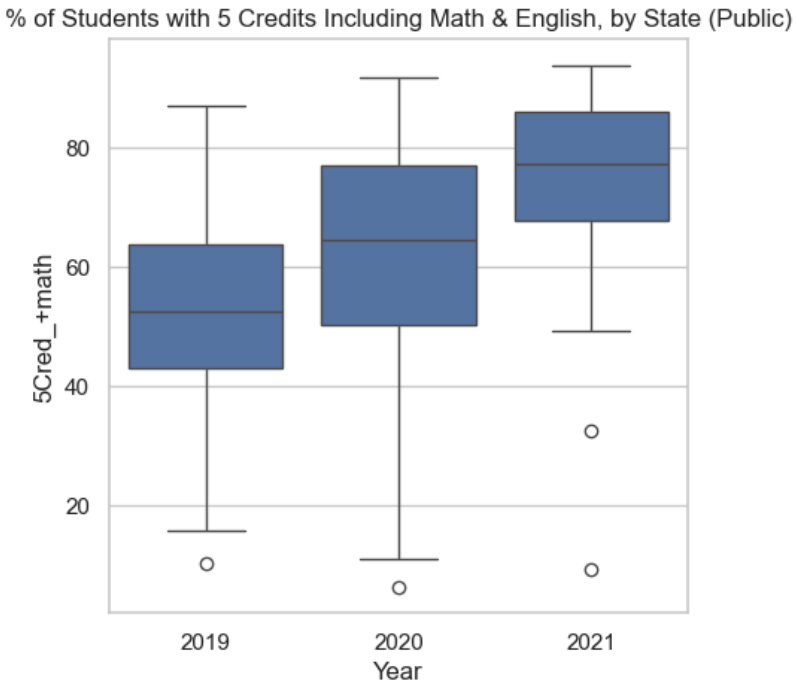

Figure 5: Box Plot Analysis for all students Public Schools (2019-2021)

For public schools, some outliers were observed at the bottom of the box plot i.e. those states with a huge gap between Q1 value and minimum % of students with 5 credits from 2019 to 2021 in the states. These states need special attention, they are 2019: Jigawa (10.3%), 2020: Osun(6.3%), 2021: Zamfara (9.2%)

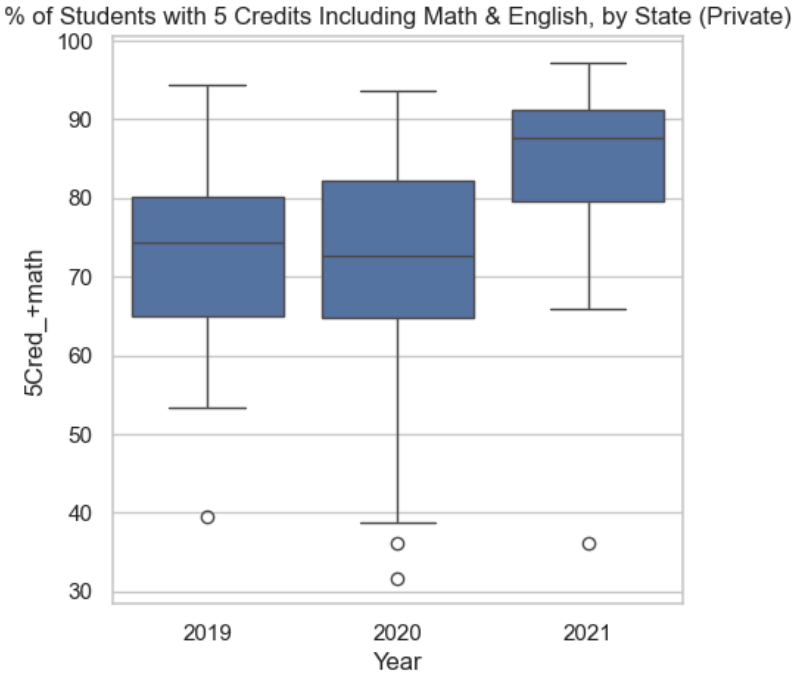

Figure 6: Box Plot Analysis for all students Private Schools (2019-2021)

For private schools, some outliers were observed at the bottom of the box plot i.e. those states with a huge gap between Q1 value and minimum % of students with 5 credits from 2019 to 2021 in the states. These states need special attention, they are 2019: Yobe (39.4%), 2020: Osun (31.7%) and Bayelsa (36.2%), 2021: Zamfara (36.1%)

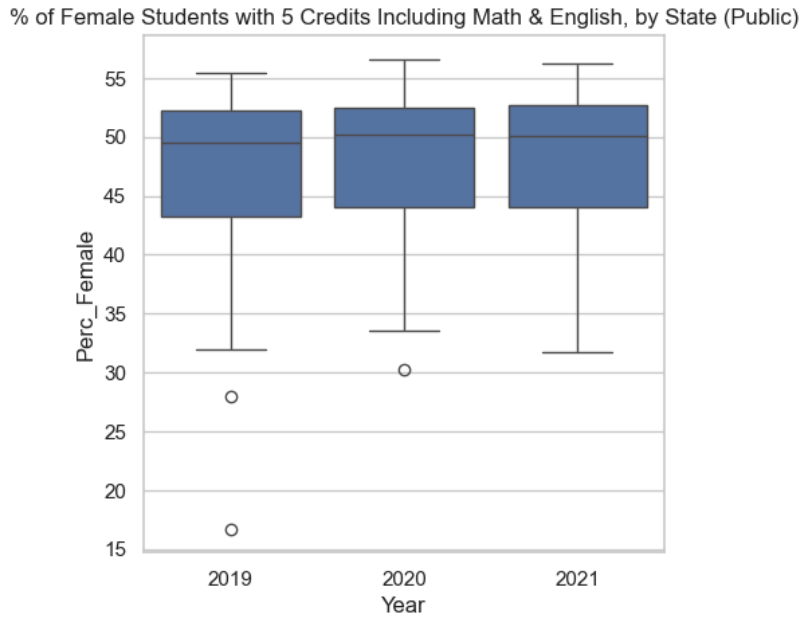

Figure 7: Box Plot Analysis for all female students Public Schools (2019-2021)

The mean performance of female students across states remained similar over the three years, with some outlier states showing significantly lower performance in 2019 and 2020. Specifically, the outliers are Yobe (16.7%) and Jigawa (28%) in 2019, and Yobe (30.3%) in 2020. These states, located in the Northern part of Nigeria, require special intervention to address and improve female student performance.

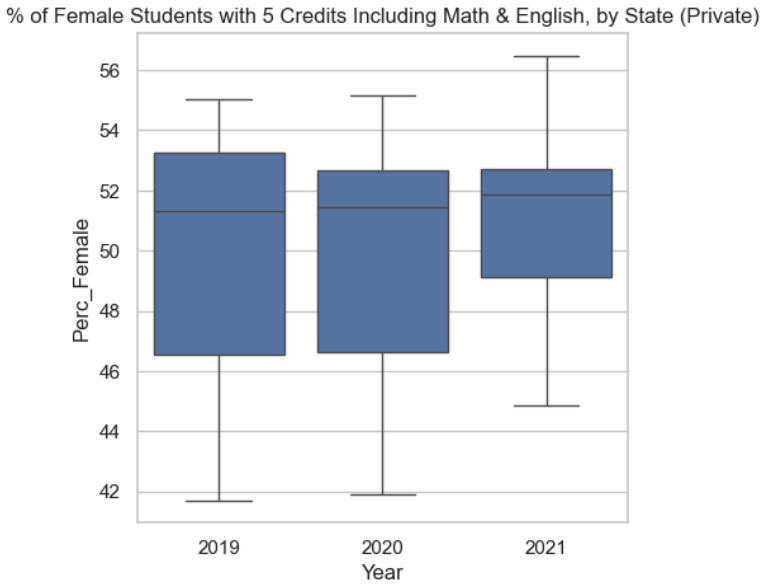

Figure 8: Box Plot Analysis for all female students Private Schools (2019-2021)

There is significant variability in the performance of female students across states in private schools. However, this variability was notably reduced in 2021, accompanied by a slight improvement in the mean performance of female students across the states. Further investigation is needed to understand the factors contributing to this variability and to continue enhancing performance.

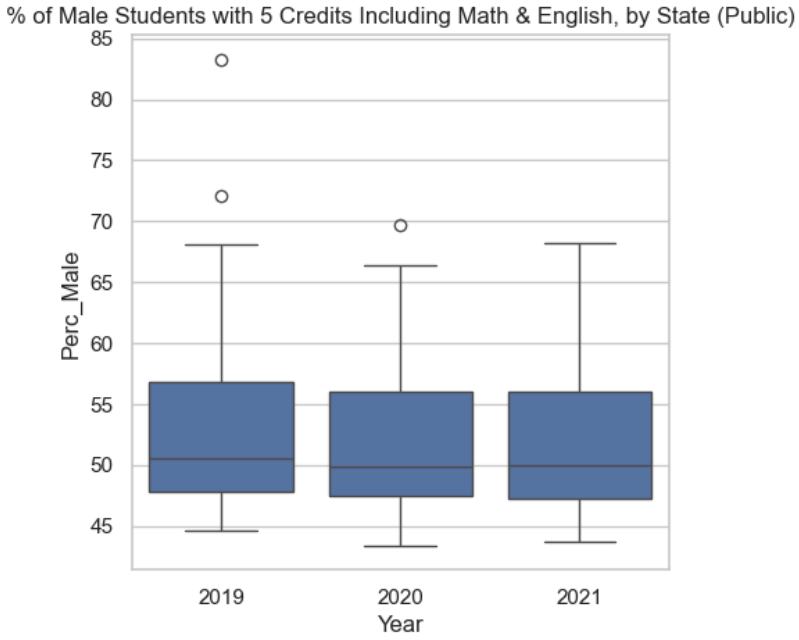

Figure 9: Box Plot Analysis for all male students Public Schools (2019-2021)

The mean performance of male students across states remained consistent over the three years, with some outlier states showing significantly higher performance in 2019 and 2020. Specifically, the outliers are Yobe (83.3%) and Jigawa (72%) in 2019, and Yobe (69.7%) in 2020. These states, located in the Northern part of Nigeria, also recorded the lowest performance for female students during the same period. This highlights a pressing need to address and reduce the performance gap between male and female students in these states.

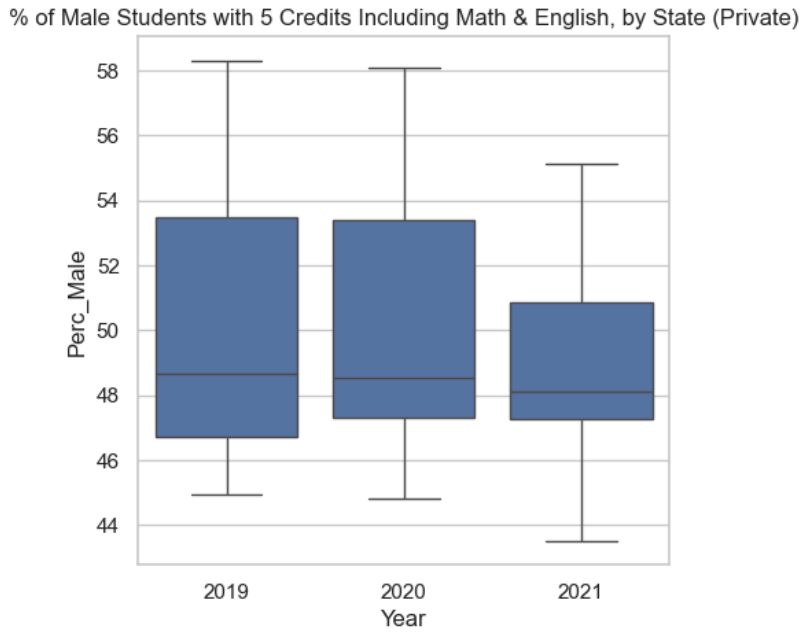

Figure 10: Box Plot Analysis for all male students Private Schools (2019-2021)

There is significant variability in male students' performance across states in private schools. However, this variability was notably reduced in 2021, accompanied by a slight improvement in the mean performance of male students across the states. Further investigation is needed to understand the factors contributing to this variability and to continue enhancing performance.

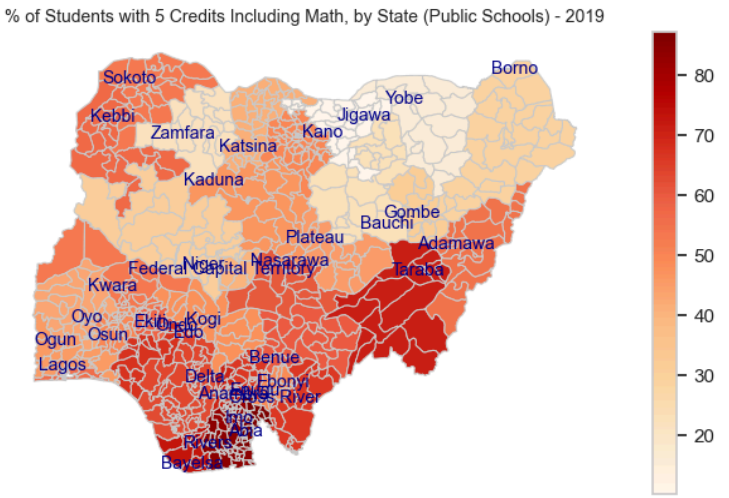

Figure 11: Heat Map by states for Public Schools (2019)

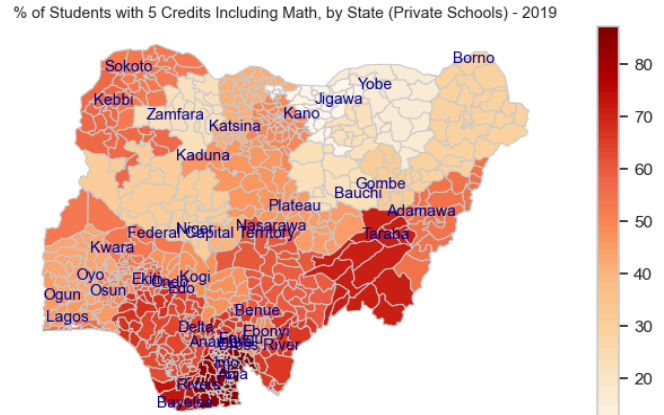

Figure 12: Heat Map by states for Private Schools (2019)

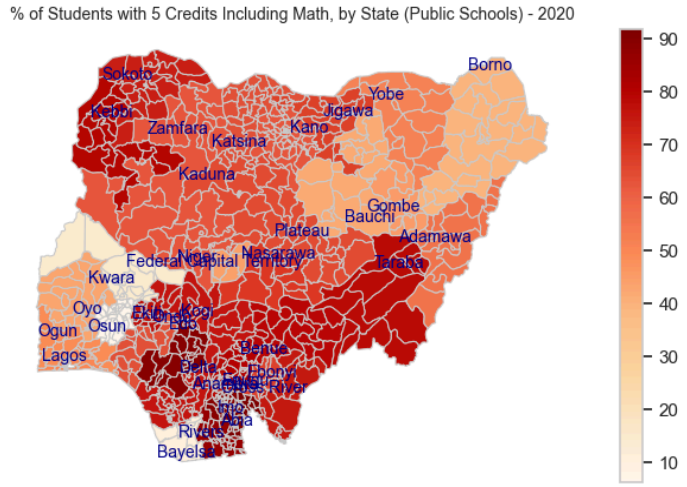

Figure 13: Heat Map by states for Public Schools (2020)

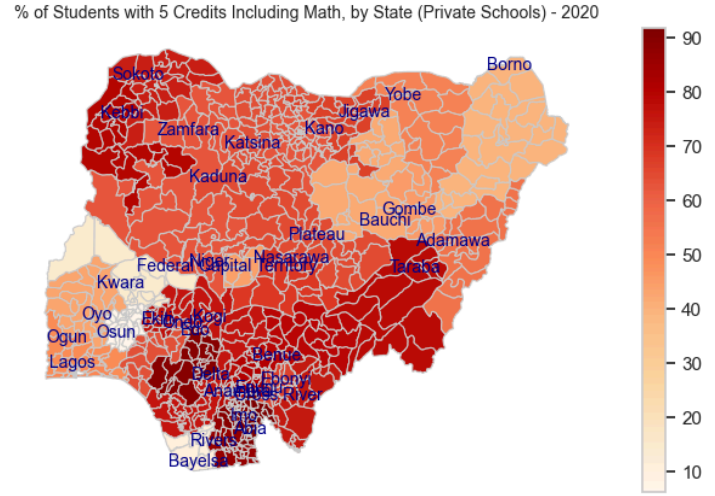

Figure 14: Heat Map by states for Private Schools (2020)

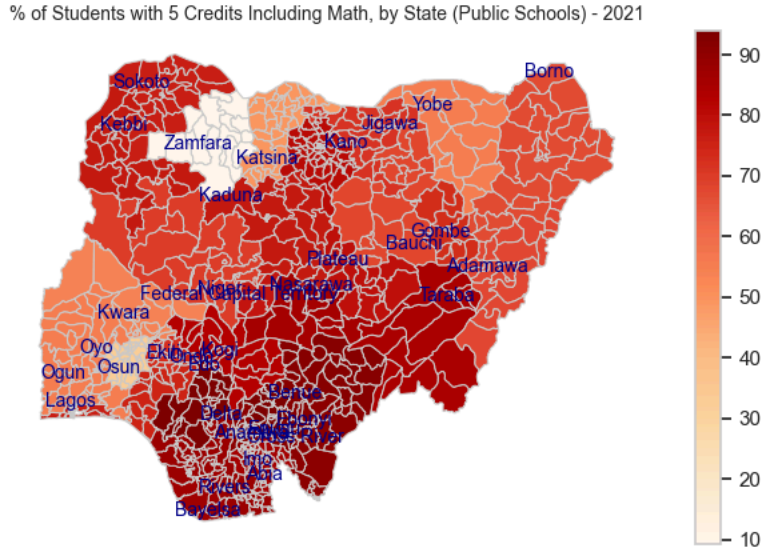

Figure 15: Heat Map by states for Public Schools (2021)

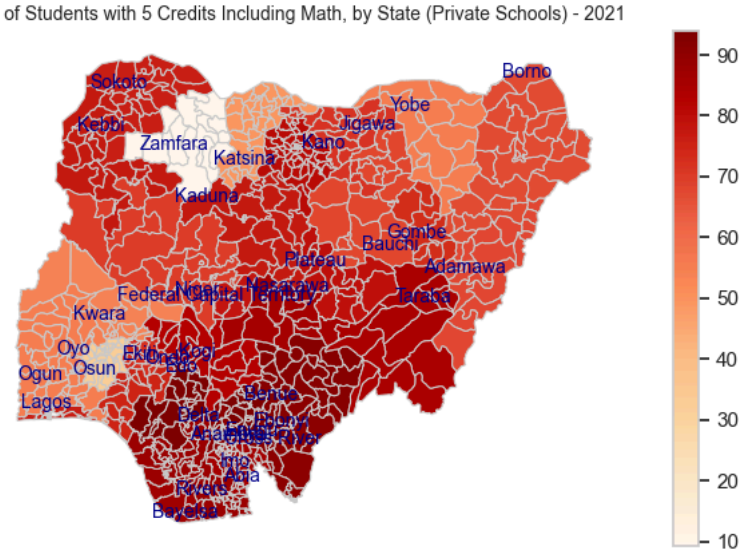

Figure 16: Heat Map by states for Private Schools (2021)

The heat maps illustrate the improvement in student performance between 2019 and 2021. In these maps, darker colors represent higher-performing states, while lighter colors indicate lower-performing states. This visual representation clearly shows the geographical variation in performance, highlighting areas of significant progress.

5. Methodology and School Connect Pilot Program Results

Pilot Program in Osun State

Objective: To improve WAEC and NECO performance in Math and Physics through targeted interventions.

Interventions:

1. **Tutor Training:**
    - **Selection:** Identified highly passionate and high-performing university scholars [4] and top tutors from private schools.
    - **Training**: Conducted a three-week intensive training program focused on enhancing instructional skills and online tutoring techniques. This training aimed to improve the quality of teaching in the public school system by integrating skilled tutors into the classroom.
2. **Partnerships:**
    - **University Collaboration**: Partnered with the Faculty of Technology at the University of Ibadan [4] to select high-performing and motivated students who were already engaged in peer teaching or private tutoring.
    - **Industry Support**: Collaborated with Brighthat to provide technical and operational support for the program.
3. **Technology Integration:**
    - **Cloud-Based LMS**: Developed and implemented a customized cloud-based Learning Management System (LMS) to facilitate remote tutoring sessions. This platform allowed for seamless delivery of lessons by remote tutors in coordination with trained public school teachers.
    - **Classroom Setup**: Designed and implemented a cost-effective classroom setup using readily available market equipment and public internet services from local mobile operators. Remote technical support was provided by the Brighthat team,

with all equipment and operational costs covered by Brighthat at no expense to the pilot school.

4. **Student Support Services:**
    - **Collaborative Teaching**: Trained public school tutors to work alongside remote tutors, ensuring that classroom setups met design standards and maintained discipline. This included marking online attendance and ensuring students' presence in online classes.
5. **Curriculum Enhancements:**
    - **WASSCE Preparation**: Introduced specific preparatory materials and practice tests for the West African Senior School Certificate Examination (WASSCE). These materials were developed in collaboration with top tutors who specialize in WASSCE curriculum design and assessment.

6. Results

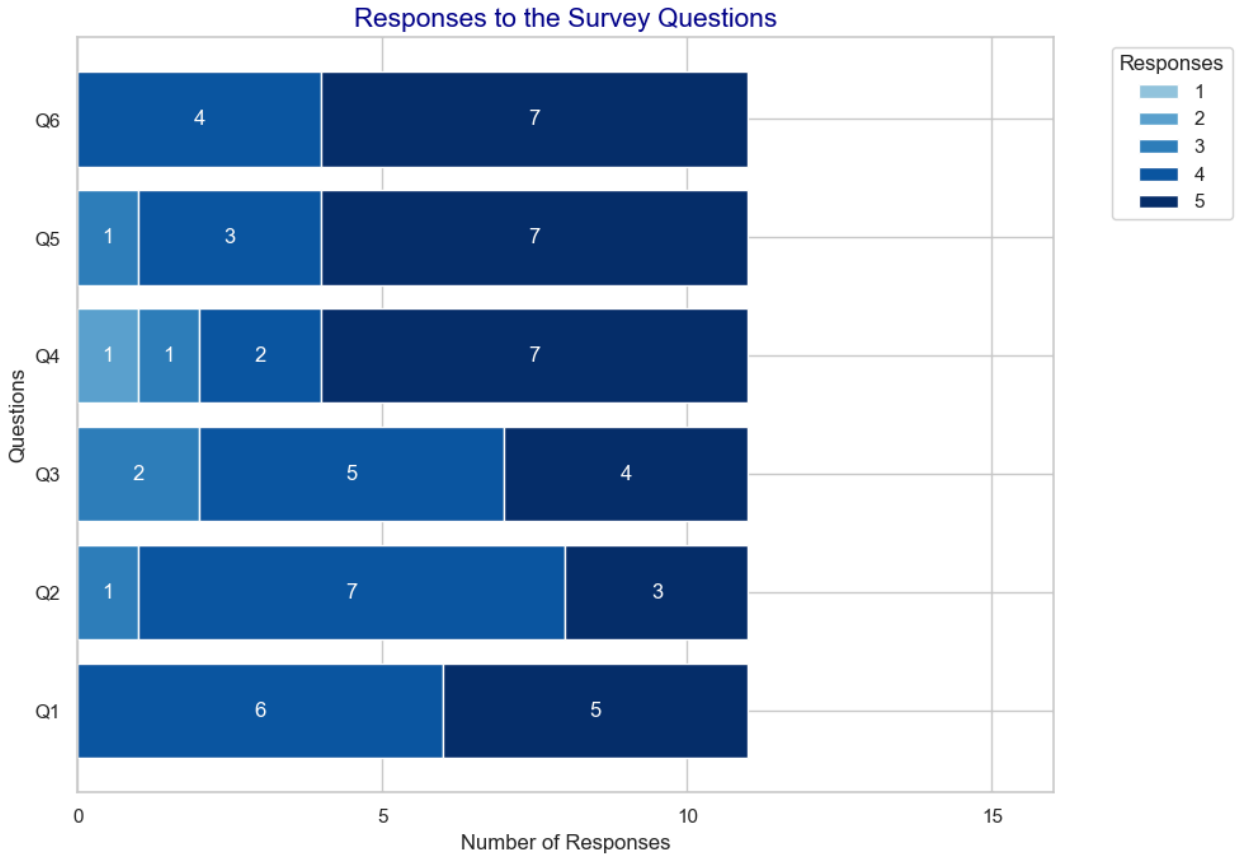

Figure 16: Summary of student feedback based on a survey conducted after the program

Figure 16 provides an overview of the general evaluation of the School Connect Project. Out of the 40 students who participated in the program, 11 were asked to respond to 6 questions. The results show that for all 6 questions, which used a Likert scale ranging from 1 (total disagreement) to 5 (total agreement), more than 75% of the responses were positive.

One question, "How would you rate the tutors that taught you in the program?" (Q4), received slightly lower ratings from 2 students. Specifically, one student rated the tutors a 2, and another rated them a 3. However, the majority of students (9 out of 11) rated the tutors either 4 or 5. This overall positive feedback correlates with the improved student performance observed in the 2022 WASSCE.

The other five questions assessed different aspects of the program:

- Q1: "How easy was it for you to understand the content taught in the program?"
- Q2: "Were the program materials and lesson contents relevant to your academic needs?"
- Q3: "How satisfied were you with the program's contents?"
- Q5: "How likely are you to recommend the program to a friend or colleague?"
- Q6: "How would you rate the School Connect program overall?"

The overwhelmingly positive responses indicate that the program was well-received and met the students' academic needs effectively.

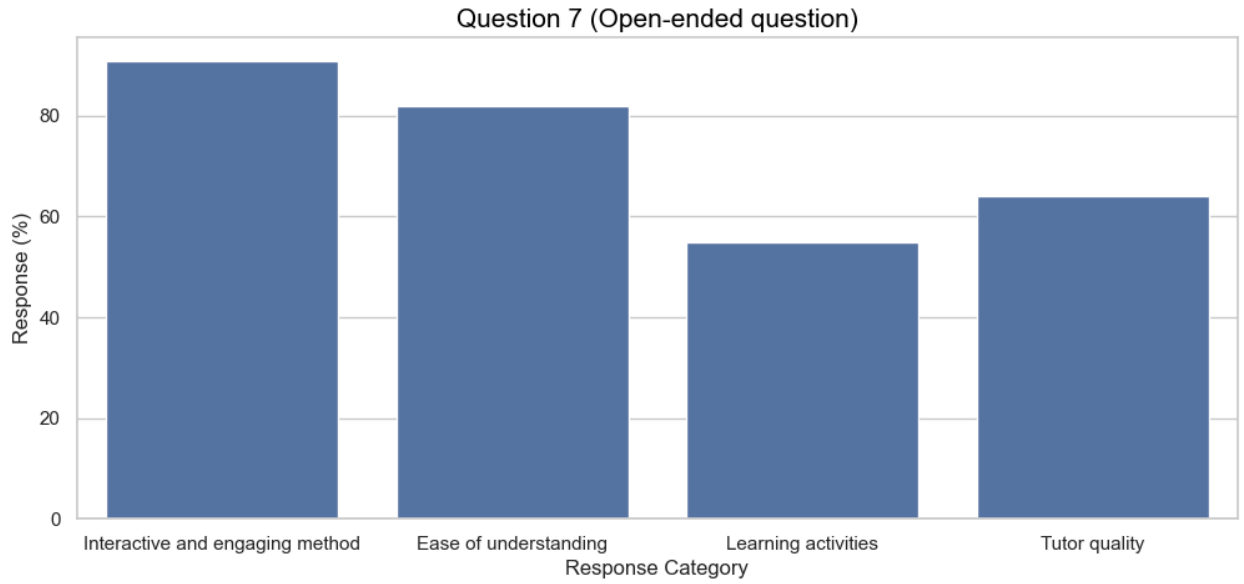

Figure 17: Summary based on an open-ended question in the post-program survey

To analyze the responses to the open-ended question Q7, "What part of the program helped you most in reaching your goals?", we employed a coding technique to categorize the feedback. This approach allowed us to identify the most frequently mentioned aspects of the program that students found beneficial. The results of this analysis are depicted in Figure 17 above.

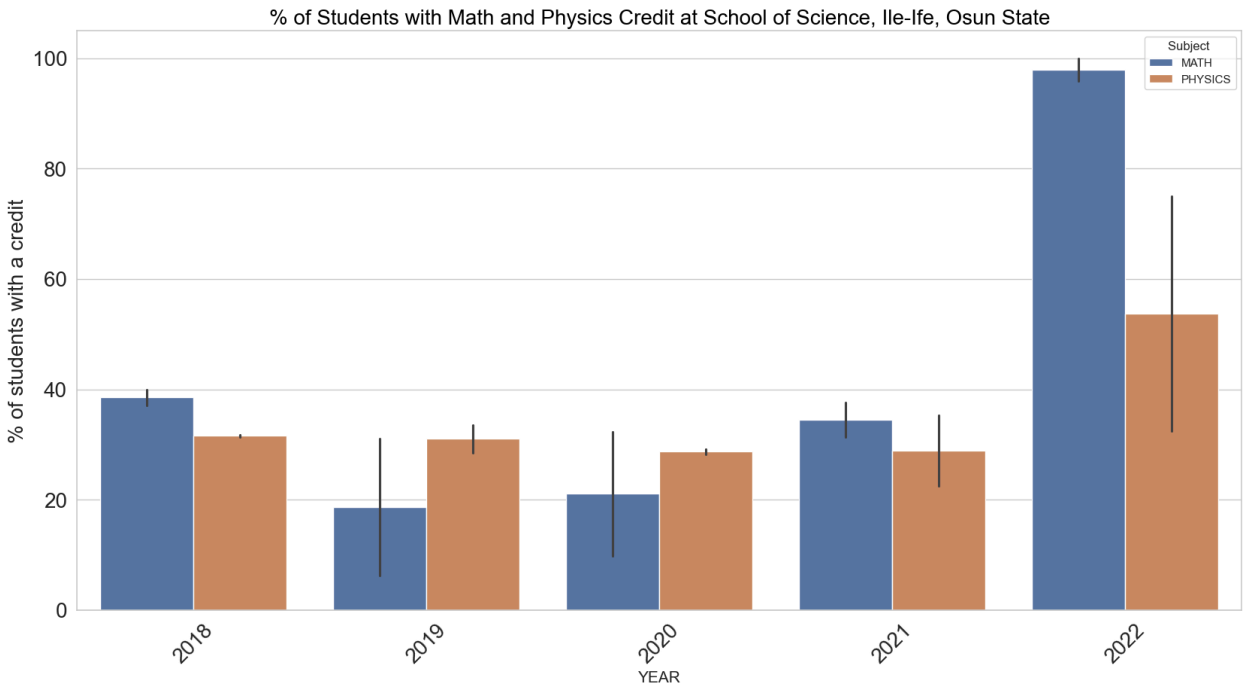

Figure 18: Comparative Analysis of WASSCE performance at the pilot school (2018-2022)

A significant improvement in student performance in math and physics was observed in 2022, coinciding with the implementation of the program. Notably, over 90% of the students achieved at least a credit in math. Although there was also an improvement in physics, the performance was not as pronounced as in math. This disparity can be attributed to the greater number of math classes conducted during the program (25 of 25) compared to physics classes (15 of 24).

Unit Economics

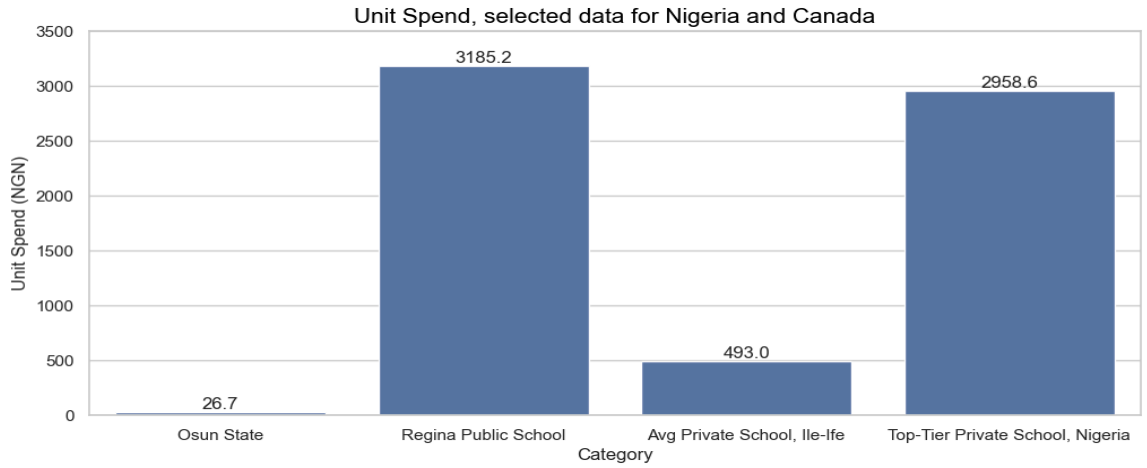

Figure 19: Comparative Analysis of Funding in Public Schools (Nigeria: Public and Private Schools vs. Regina Public Schools, Canada)

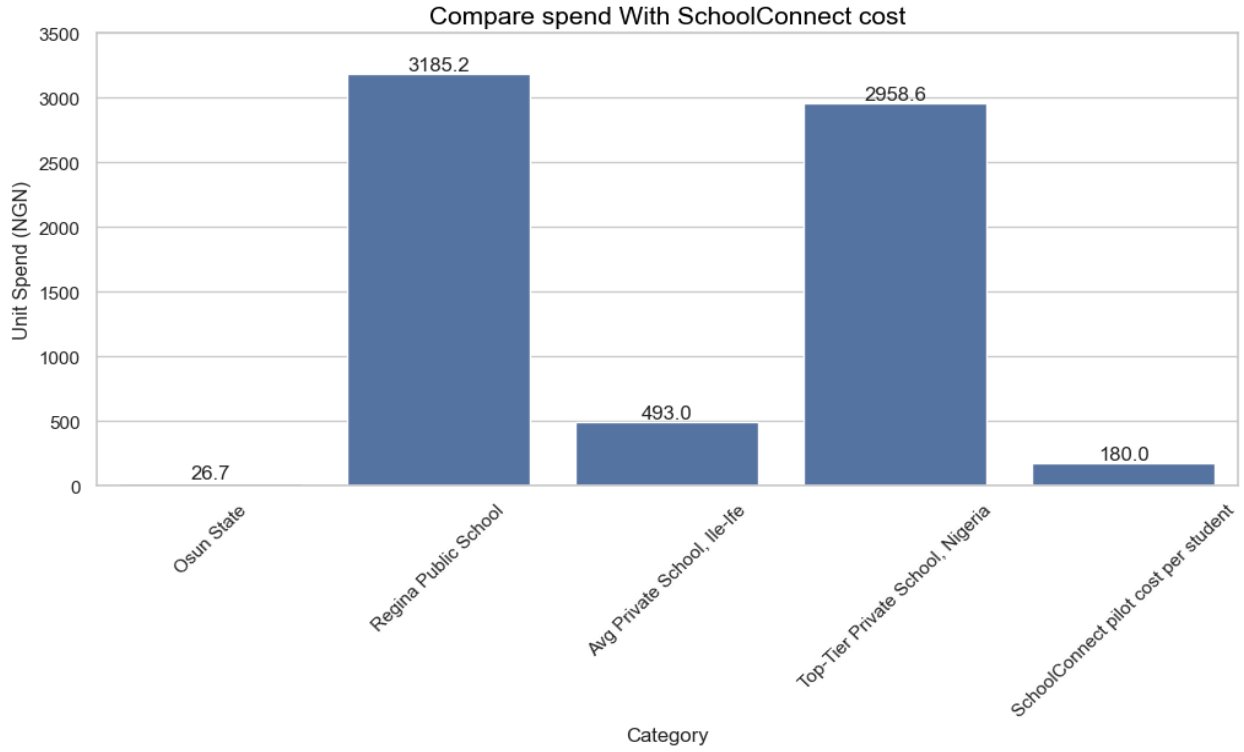

Figure 20: Comparative Analysis of Funding in Public Schools (Nigeria: Public and Private Schools vs. Regina Public Schools, Canada vs School Connect pilot program)

Figures 19 and 20 highlight a significant funding gap between secondary education funded by the Osun State School Board [3] and the average private schools in Osun State, which charge approximately NGN 500,000 [5] in tuition per year. This disparity is even more pronounced when compared to top-tier private schools and expenditure by Regina Public School Board [2] in Canada. The pilot program demonstrated that even a modest increase in funding for initiatives like School Connect can lead to significant improvements in student outcomes in Osun State and across Nigeria. The Tables 2 and 3 below presents the data sets used in computing unit economics.

Year	Organization	Budget (NGN)	School Category	Number of students	School days/yr	Instructions hours/day	Type	Country
2022	Osun State Educational Districts	3,684,525,950	Secondary Schools	64,501	199	6	Public	Nigeria
2021/2022	Regina School Division	783,600,000,000	Primary - High Schools	25,274	169	6	Public	Canada

Table 2: Unit Economics data sets 1 (ROE: 1 CAD = NGN 400)

Year	Avg Tuition Fee/yr (NGN)	Location	Category
2022	500,000	Ile-Ife	Average private school
2022	2,500,000	Nigeria	Top-tier private school

Table 3: Unit Economics data sets 2

Overall, the pilot program in Osun State demonstrated significant improvements in student performance in Math and Physics for WAEC and NECO examinations. The integration of trained remote tutors, supported by robust technology and enhanced curriculum materials, contributed to these positive outcomes.

7. Recommendations for Scaling

1. Expand Tutor Training Programs: Increase the scale of the tutor training programs to include more university scholars and private tutors across Nigeria.
2. Strengthen Partnerships: Continue and expand partnerships with universities and technology providers to ensure a steady supply of qualified tutors and technological support.
3. Enhance Technology Infrastructure: Invest in scalable, cost-effective classroom setups and ensure reliable internet connectivity in public schools.
4. Increase Student Support Services: Provide ongoing training for public school teachers to collaborate effectively with remote tutors and maintain high standards of classroom management and student engagement.
5. Monitoring and Evaluation: Support robust monitoring and evaluation frameworks to track progress and ensure accountability.
6. Distribute Curriculum Materials: Ensure all public schools have access to high-quality preparatory materials and practice tests for WASSCE and other standardized exams.
7. Funding:
    a) **Public-Private Partnerships (PPPs)**
    - Strategy: Establish partnerships between the government, private sector, and non-governmental organizations to pool resources and expertise. Encourage private companies to invest in education through corporate social responsibility (CSR) initiatives, with a focus on funding educational programs like School Connect.
    - Rationale: Leveraging the financial strength and innovative capabilities of the private sector can bridge the funding gap and provide additional resources for scaling the program. Successful PPPs can enhance the quality of education by integrating advanced technology and best practices from private institutions.
    - Implementation: Develop a framework for PPPs that outlines the roles and responsibilities of each partner, and create incentives for private sector participation, such as tax breaks or public recognition for contributing to education.

b) Government Funding and Policy Reform

- Strategy: Advocate for increased government funding for secondary education, specifically targeting programs that have demonstrated success, such as School Connect. Propose policy reforms to allocate a higher percentage of the state budget to education, ensuring sustained and adequate funding.
- Rationale: Government commitment to increasing education funding is essential for long-term sustainability and scalability of successful programs. Enhanced funding can support the expansion of the School Connect initiative to more schools, improving educational outcomes on a broader scale.
- Implementation: Engage with policymakers to highlight the positive impact of the pilot program and present data-driven evidence of its success. Lobby for policy changes that prioritize education funding and establish dedicated funds for innovative educational projects.

By adopting these recommendations, we can build on the success of the Osun State pilot program and improve educational outcomes across Nigeria.

8. Conclusion

The findings from the pilot program highlight the potential for significant improvements in WASSCE performance through targeted interventions. By scaling these efforts and leveraging support from the private sector and donors, we can enhance educational outcomes across Nigeria, ensuring that students are better prepared for their academic futures.

9. Credit author statement

Adewale Adeyemo and Mobolaji Moyosore: Conceptualization, Methodology, Investigation, Project Administration, Conceptualization - Review, **Adewale Adeyemo**: Writing - Original Draft, Visualizations, Writing - Investigation, Review & Editing, Writing - Statistics, Formal Analysis, Review & Editing, Software, Validation, Data Collection and Data Curation, Supervision

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