International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 06 June 2026
DOI: 10.47191/ijcsrr/V9-i6-59, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Integrating Technology into The Grade Ten Mathematics Curriculum at New Amsterdam Secondary School: Enhancing Instruction and Student Outcomes

Jason Phillips[1*], Shawn Jagnandan[2], Antalov Jagnandan[3], Bibi Sherriza Ali[4]
[1]Department of Computer Science, Berbice Campus, University of Guyana, Guyana
[2,3]Department of Mathematics, Physics & Statistics, Turkeyen Campus, University of Guyana, Guyana
[4]Department of Mathematics, Physics & Statistics, Berbice Campus, University of Guyana, Guyana

ABSTRACT: Mathematics remains one of the essential subjects for the foundation of problem-solving, logical and analytical skill in the twenty-first century. There are, however, difficulties in mathematics achievement that are still evident in Guyana, and throughout the Caribbean. The study was carried out in the context of integrating technology in the Grade Ten Mathematics curriculum at New Amsterdam Secondary School, to determine if a technology-based teaching method would be effective for students in the school to achieve higher academic performance than the traditional method. The study had a quasi-experimental research design with a non-equivalent control group. There were three Grade Ten classes: two experimental and one control. Students took pre-tests and post-tests and the intervention was used in twelve lessons of the topic: mensuration. The technology-enhanced lessons for the experimental groups used multimedia presentations, videos, simulations, games and interactive activities, whereas the control group was taught the same using traditional methods.

Results showed significant gains in mathematics achievement for students in the technological approach. The mean gain score of the experimental group (Group I) was 11.286 (SD = 3.041) whereas that of the experimental group (Group II) was 10.231 (SD = 4.072) and the control group was 4.452 (SD = 2.803). The independent samples t-test gave a p value that was much lower than 0.05, which is the level of significance, and this meant that there was a significant difference between the technological method of instruction and the traditional method of instruction. The results of the study indicate that technology enhanced instruction has a positive impact on students' academic achievement and comprehension in mathematics. The study recommends that technology can enhance mathematics education in secondary schools in Guyana and may be used to help remediate some of the issues that have long plagued mathematics education in Guyana and the wider Caribbean.

KEYWORDS: technology approach, traditional approach, technology, mathematics, student achievement.

INTRODUCTION

In this digital age, the development of problem-solving skills, logical thinking, critical thinking and decision-making skills in mathematics education is a key factor in preparing students for the twenty-first century. Globally, mathematics is seen as a core subject that underpins the progress of science, technology, engineering and innovation [1]. While it is vital, many countries still have problems in education linked with low achievement of students and falling interest in employment in math related fields. Numerous concerns have been raised about students' mathematics competencies in developed and developing countries in international assessments, including the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) [1] [2]. In response to this, educational systems around the world have been examining new ways to teach and implement new technologies into the classroom to enhance student learning and engagement [3].

In the Caribbean, mathematics performance remains a significant educational issue. The Caribbean Secondary Education Certificate (CSEC) Mathematics pass rate in the Caribbean is very variable, often ranging between 35% and 48%. The percentage of the region's latest exams (2025) was 38.5% [4].

It has long been noted that there have been disruptions in the foundations of learning that have had a significant impact on performance. A year-by-year breakdown of the regional average and Guyana national statistics for the CSEC Mathematics is given below:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 06 June 2026
DOI: 10.47191/ijcsrr/V9-i6-59, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Table 1 – A comparison of the Caribbean regional and Guyana national CSEC Mathematics pass rates from 2016 to 2025.

Year	Caribbean Regional pass rate (%)	Guyana National pass rate (%)
2016	44.0	35.7
2017	46.3	38.7
2018	48.2	43.3
2019	47.3	41.1
2020	49.8	48.6
2021	47.9	38.1
2022	37.0	31.0
2023	43.0	34.0
2024	36.0	27.0
2025	38.5	32.0

The data suggests that Guyana's pass rates consistently were lower than the regional average for the period. There were some variations in performance in both the Caribbean and Guyana but a significant drop was seen from 2022, with the lowest pass rate in 2024. The disparity between the attainment of students in the region and the national performance continues to be evident in mathematics, indicating the continuing problems Guyanese students face in the subject [4]. This difficulty has been blamed on mathematics fear, lack of instruction materials, instruction methodology and lack of student involvement [5]. The application of technology is recognized as a growing recognition by teachers from the Caribbean as a better approach to teaching mathematics concepts [6].

The teaching and learning of mathematics in Guyana continue to be a priority because of its significance in supporting students' readiness for participation in a technologically advanced economy. The Government of Guyana and the Ministry of Education have undertaken a number of measures to enhance the quality of education, including the development of curriculum, teacher teacher training and the use of technology [7]. Access to information and communication technologies (ICTs) in schools has been enhanced and national development strategies have made digital literacy and technological competence a priority [8]. Even with these initiatives, there are still some students who are struggling with mathematics, as evidenced by mathematics assessments in the classroom and national assessments results. The challenges identified above demonstrate the need for innovative teaching methods that will impact student achievement and engagement [9].

This is especially noticeable at the New Amsterdam Secondary School where mathematics teachers still experience problems in the improvement of academic performance. The school's mathematics outcomes over the last five years (2019 to 2024) show an alarming increase in students not meeting expected standards in this subject with the grade ten students averaging 47.4%. Students often have difficulties in mathematical reasoning, problem-solving and conceptual understanding, leading to learning gaps that remain through the grade levels. Other challenges may be due to the lack of engaging instructional materials and the continued use of traditional pedagogical methods. As a result, concerns are rising about the effectiveness of the existing instructional strategies and a call for different strategies that would better respond to student learning needs and goals. However, limited empirical research has examined whether technology-supported mathematics instruction significantly improves student performance within the Guyanese secondary school context.

The researchers have seen this first-hand, as students are very drawn to technology and digital devices in today's world. The observation indicates that technology might offer the potential of boosting student engagement and enhancing learning in the mathematics classroom. Visualization, exploration, interaction and immediate feedback are crucial in good mathematics teaching and using technological tools can support these elements. Technology, however, has not been used optimally in mathematics lessons at New Amsterdam Secondary School despite the technology resources available.

This research is guided by the following objectives:

1. To assess the mathematics performance of students taught using a technological approach.
2. To assess the mathematics performance of students taught through traditional teaching methods.
3. To compare the mathematics performance of students in both instructional groups.

4. To determine whether the difference in mathematics performance between the two groups is statistically significant.

MATERIALS AND METHODS

The study employed a quantitative methodology with a focus on the quasi-experimental design due to limitations in manipulating variables such as age, gender, race, socio-economic background, and the inability to randomly sample subjects within the school context [10]. This design was deemed appropriate for the current structure of the school environment, as it does not allow for full control and manipulation of all relevant variables. The specific type of quasi-experimental design used was the Non-Equivalent Control Group design, which involved students taking a Standardized Assessment (SA), utilizing a pre-test and post-test approach [11]. In this design, the researcher utilized three groups: one control group and two experimental groups, without randomly assigning participants to the groups. The experimental groups received the specific treatment between the pre-test and post-test, while the control group did not receive any treatment.

The population used comprised three Grade Ten classes from New Amsterdam Secondary School in Region Six. Students were between the ages of fourteen and sixteen years old. The researchers employed a convenience sampling procedure, selecting specific groups of participants based on accessibility.

The two experimental groups (EGI and EGII) were exposed to a technological approach to learning mathematics, while the control group followed the traditional approach [11]. Both methods were administered by the researchers. Over the course of the study, each group received twelve lessons. The experimental groups were taught using a technology-based approach, with all lessons designed in Microsoft PowerPoint, utilizing the software's media features along with its animation and transition capabilities. The lessons included short video clips, images, and diagrams to aid in comprehension, student centered focus and reasoning. Evaluation exercises for these incorporated internet-based games, simulation software, and puzzles in each presentation. The lessons were delivered using a projector, laptop and Wi-Fi connectivity, and students participated in both independent work and peer group activities.

In contrast, the control group followed the traditional teaching method, which primarily involved the use of whiteboards, textbooks and dry erase markers. In a few instances, manipulatives were also used. This group received the same twelve lessons as the experimental groups but without the technological enhancements. The exact same content was covered, allowing for the influence of technology on students' performance to be compared directly.

DATA ANALYSIS

The pre-test and post-test scores for both the experimental and control groups were analyzed to compute the difference in scores which is, referred to as diff. The diff represents the difference between the post-test and pre-test scores for both the experimental and control groups. Two separate diff values were calculated: diff EGI, which compared the first experimental group with the control group, and diff EGII, which compared the second experimental group with the control group.

Microsoft excel served as the primary tool for analyzing the data and determined the p-value. In addition, an independent samples t-test was conducted to determine whether there was a significant difference between the groups. The mean and standard deviation were also computed to interpret the quantitative data.

RESULTS

Table 2 - showing the result of the pre-test and post-test for each group

Class	Pre-test EGI	Pre-test EGII	Pre-test CG	Post-test EGI	Post-test EGII	Post-test CG
0-5	23	20	26	0	0	12
6-10	4	5	3	0	1	15
11-15	1	1	2	10	13	3
16-20	0	0	0	18	12	1

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 06 June 2026
DOI: 10.47191/ijcsrr/V9-i6-59, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

The data in the table 2 illustrates a comparison of pre-test and post-test scores across three groups: the first experimental group (EGI), the second experimental group (EGII), and the control group (CG). The scores are divided into four ranges (0-5, 6-10, 11-15, and 16-20), allowing us to track the performance changes before and after the intervention.

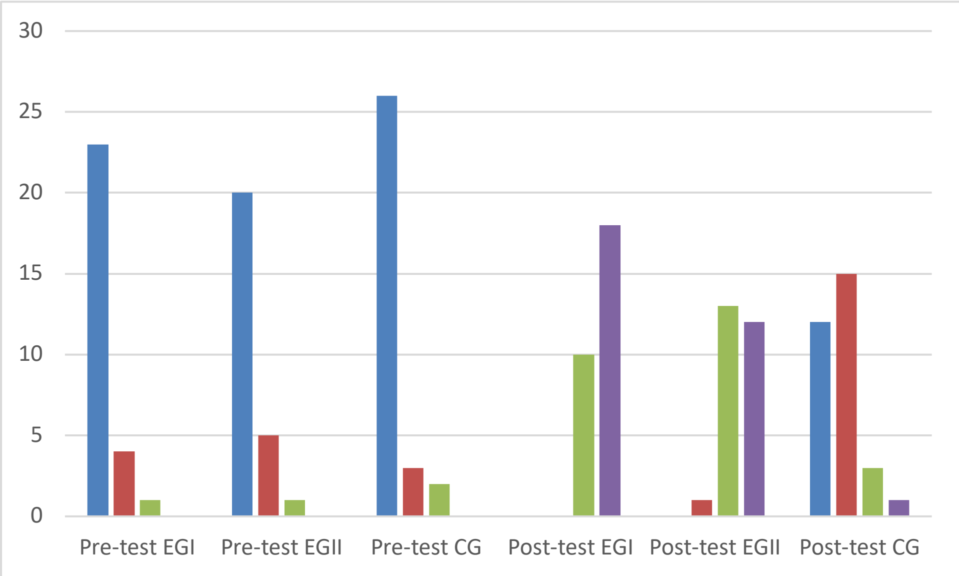

Figure 1 - Illustrates the distribution of students' mathematics performance levels in the Experimental Group I (EGI), Experimental Group II (EGII), and Control Group (CG) during the pre-test and post-test assessments.

A significant improvement in students' performance after intervention was shown by the results, with more students in the higher score categories in the post-test for both experimental groups. The control group, on the other hand, experienced relatively less growth with a greater percentage of students in the lower and middle tiers of performance. Following the intervention, the results of the post-test shown a marked improvement in the experimental groups (EGI and EGII), while the control group demonstrated limited progress. In the 0-5 range, both EGI and EGII had no students remaining, whereas 12 students in CG still scored in this lowest category, reflecting continued struggles in the control group. In the 6-10 range, EGI had no students, EGII had 1, while CG had 15 students, showing that many students in the control group made only slight progress. For the 11-15 range, 10 students in EGI and 13 students in EGII reached this category, while only 3 students in CG moved into this moderate score range, highlighting a stronger improvement in the experimental groups. In the highest range (16-20), 18 students from EGI and 12 from EGII achieved these top scores, a stark contrast to the control group, where only 1 student reached this level.
Table 3 and 4 shows the computed mean and standard deviation of the control group and experimental groups.

Table 3 - Comparison of SA Scores between Experimental Group A (EGI) and Control Group (CG)

	SA Scores	N	Mean	Std. Deviation
	EGI	28	11.286	3.041
DIFF	CG	33	4.452	2.803

The data presented in the table 3 compares the SA scores between EGI and CG. The table indicated that the students in the EGI group had a significantly higher mean increase score (M = 11.286, SD = 3.041) than the students in the control group (M = 4.452, SD = 2.803). This indicates that students who were exposed to the intervention had greater mathematics gains than students who were taught using a traditional approach. The standard deviations for both groups are relatively similar, suggesting a similar amount of variability in the improvement in scores between the two groups.

 *Corresponding Author: Jason Phillips

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 06 June 2026
DOI: 10.47191/ijcsrr/V9-i6-59, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Table 4 - Comparison of SA Scores between Experimental Group B (EGII) and Control Group (CG)

	SA Score	N	Mean	Std. Deviation
DIFF	EGII	26	10.231	4.072
	CG	31	4.452	2.803

The data presented in the table 4 compares the SA scores between EGII and CG. The results showed that the mean improvement score for students in EGII (M = 10.231, SD = 4.072) was higher than the mean improvement score for students in the control group (M = 4.452, SD = 2.803). This indicates that the instructional intervention used in EGII has contributed to higher mathematics achievement than the traditional method of teaching mathematics. The comparison of the experimental group and the control group shows that the experimental group had larger gains. However, the larger standard deviation suggests that there were more variances in students' gains in EGII than in the control group.

The independent sample T-tests between EGI and CG, and EGII and CG both had a p-value of less than 0.05. The p-value obtained between EGI and CG was 0.0000000000016 (correct to 13 d.p.) and the p-value between EGII and CG was 0.0000000487048 (correct. 13 d.p.). This indicated that the Null hypothesis: no significant difference exist between the technological approach and the traditional approach should be rejected. Since the p-value is (< 0.05), the alternative hypothesis is accepted. A statistical significance exist between technological approach and the traditional approach for the teaching of mensuration in grade ten at the New Amsterdam Secondary school.

Overall, the results indicated that the technological approach used with the experimental groups lead to substantial improvement in student performance, with many students shifting from lower to higher score ranges. In contrast, the control group, which followed traditional teaching methods, exhibited less significant progress, with many students remaining in the lower score categories. This suggests that the use of technology in teaching mensuration had a positive impact on the experimental groups' performance.

DISCUSSION

This study aimed at finding out if the use of technology would enable students of Grade Ten Mathematics at New Amsterdam Secondary School to outperform the students taught using the traditional approach. Students exposed to the intervention obtained significant positive gains in their mathematics achievement compared to students who learned in traditional approach as indicated by the results. Experimental Group I (M = 11.286; SD = 3.041) and Experimental Group II (M = 10.231; SD = 4.072) showed significant mean improvement scores compared to the Control Group (M = 4.452; SD = 2.803). In addition, the independent samples t-tests yielded p-values far from 0.05 indicating that the differences that were found are statistically significant. The results of this study show that technology implementation in teaching has a positive effect on the achievement of students in general and the improvement of their understanding of mensuration concepts [12] [13].

The results are consistent with the increasing international evidence that technology integration can improve the learning outcomes of mathematics. Deeper conceptual understanding is fostered by digital technologies that enable visualization, simulation, immediate feedback and interactive problem-solving [14] [15] [16]. Engelbrecht. et.al (2020**)** reported that in technology-enhanced learning environments, students' engagement and involvement in learning activities are enhanced, which results in better academic outcomes [17]. Likewise, Appavoo (2020) discovered that interactive digital learning tools effectively enhance students' mathematical reasoning and problem-solving skills, allowing them to interact with mathematical concepts while providing a dynamic way to explore and learn [18].

Within the experimental groups, there was a significant number of students moving from the lower score categories (0-5 and 6-10) to the higher score categories (11-15 and 16-20). This indicated the technology had helped in creating conceptual understanding and knowledge retention [19]. These results are consistent with the Cognitive Theory of Multimedia Learning that suggests how much more learners can learn when learning materials are presented in a combination of words, images, animation, and interactive media. In this study, the technological lessons that were used integrated the videos, diagrams, simulations, games and visual presentations so that the students learned through multiple cognitive means [20]. According to Mayer (2024), multimedia learning environment enhances understanding by minimizing cognitive overload and by establishing the relevance of abstract mathematical concepts and pictorial representations [21].

The results indicated, in addition, that there was technology that boosted students' motivation and involvement. The games, simulations, collaborative activities and multimedia exercises that students in the experimental groups played on the Internet during the intervention may have led to greater interest in mathematics learning. However, recent research by Serin (2017) shows that digital learning environments can boost student motivation, attention and persistence, compared to traditional teacher-centred learning methods [22]. The students' learning gains in the experimental groups were greater than in the control group which could be attributed to increased engagement.

Another significant result is that the two treatment groups had comparable improvement, even though the groups varied in the way they were composed. This uniformity improves the trustworthiness of the intervention and indicates that the benefits of technology-based teaching do not apply to a specific class or group of students. The findings are consistent with the research conducted by Bernand et.al (2023) which indicated that technology integration always had moderate-to-large positive effects on mathematics achievement irrespective of setting or student population [23].

The relative performance of the experimental group shows that some of the disadvantages of traditional teaching methods lie in the single use of traditional teaching. While there was some gain for students in the control group from pre-test to post-test, many students were still in the lower achievement levels. Typical teaching strategies include teacher-led explanations and problem solving exercises from the textbook, may not include enough opportunities for students to explore math concepts or may not cater to varied learning styles. The study by McClain and North. (2021) highlights the growing importance of implementing learner-centred learning environments, where students can interact, collaborate and engage digitally [24].

The results show that in general, the use of technology in mathematics education can positively affect students' achievement at secondary education level. The study has established empirical evidence that technology can be used to improve the teaching of mathematics to tackle the persistent challenges in mathematics performance in the context of Guyana. Schools should reflect on enhancing the learning outcomes of mathematics further by increasing the use of technology tools, teacher training programmes and digital learning resources in school and to better equip students for a society of technology [25].

CONCLUSION

Technology integration into grade ten mathematics curriculum at New Amsterdam Secondary School offers significant benefits in enhancing students’ achievement. The significant difference in SA scores between the Experimental Groups and the Control Group in this study reflects the potential benefits of the technological approach over the traditional methods of teaching mathematics. However, while technology can enhance achievement, traditional methods may still hold value for building fundamental skills and ensuring equitable learning where resource constraints or limited teacher expertise hinder effective use of technology.

REFERENCES

1. Pisa, O.E.C.D, "Results (volume I): the state of learning and equality in education," PISA, Paris, 2023.
2. M. Von Davier, A. Kennedy, K. Reynolds, B. Fishbein, L. Khorramdel, C. Aldrich and L. Yin, "TIMSS 2023 international results in mathematics and science," Boston College, TIMSS & PIRLS, vol. 10, 2024.
3. M. Antoninis, B. Alcott, S. Al Hadheri, D. April, B. Fouad Barakat, M. Barrios Rivera and E. Weill, "Global Education Monitoring Report 2023: Technology in Education: A tool on whose term?," UNESCO, Paris, 2023.
4. CXC, "Caribbean Secondary Education Certificate (CSEC) Mathematics Examination Report," CXC, Bridgetown, 2024.
5. G. X. Ji, P. W. K. Chan, A. McCormick, M. Won, S. Ali, M. Jimmy and D. Gurung, "Scholarly responses to 'UNESCO global education monitoring report 2024 Pacific t," International Education journal: Comparative Perspectives, vol. 23, no. 2, pp. 154-170, 2024.
6. K. T. Bergeson and B. Besehorner, "Modeling and Scaffolding the Technology Integration Planning cycle for Pre-Service Teachers: A Case Study," International Journal of Education in Mathematics and Science, vol. 8, no. 2, pp. 330-343, 2020.
7. Ministry of Education Guyana, "ICT in Education Policy Framework," MOE, Georgetown, 2021.
8. C. H. Chen, M. S. Jong and C. C. Tsai, "A comparison in-Service Teachers' Conceptions of Barriers to mobile Technology-Integrated instruction and Technology-Integrated instruction," Australasian Journal of Educational Technology, pp. 35-50, 2022.

9. P. Drijvers and N. Sinclair, "The role of digital technologies in mathematics education: Purposes and Perspectives," ZDM-Mathematics Education, vol. 56, no. 2, pp. 239-248, 2024.
10. C. Baker, "Quantitative research designs: Experimental, quasi-experimental, and descriptive.," in Evidence-based practice:An integrative approach to research, administration, and practice 2, Burlington, Jones & Bartlett Learning, 2017, pp. 155-183.
11. J. Phillips, S. Jagnandan, A. Jagnandan and B. Khan, "An Investigation of the effects of Technology-Enhanced Instructional Approaches on Students' Programming Skills at New Amsterdam Secondary School," International Journal of Current Science Research and Review, vol. 6, no. 7, pp. 3835-3841, 2023.
12. J. Y. Mensah, "The Effect of ICT Integration on Senior High Students' Motivation and Achievement in Geometry: THe Case of Gomoa West District," University of Education, Winneba, 2019.
13. R. Eyyam and H. Yaratan, "Impact of use of Technology in Mathematics Lessons on Student Achievement and Attitude," Social Behaviour and Personality, Vols. S31-S32, p. 42, 2014.
14. D. Maulidiya and M. Aziza, "Trends, challenges, and determinants of technology integration in geometry problem-solving: A sequential expanatory analysis," Indonesian Journal of Science and Mathematics Education, vol. 7, no. 3, pp. 577-597, 2024.
15. P. Drijvers and N. Sinclair, "Digital technology in mathematics education: Why it works (or doesn't)," ZDM-Mathematics Education, vol. 55, pp. 1-10, 2023.
16. [S. Bansilal and J. Naidoo, "Learners engaging with transformation geometry," South African Journal of Education, vol. 32, pp. 26-39, 2012.
17. J. Engelbrecht, M. C. Borba, S. Llinares and G. Kaiser, "Will 2020 be remembered as the year in which education was changed?," ZDM, vol. 52, no. 5, pp. 821-824, 2020.
18. P. Appavoo, "The impact of a technology-based approach for the learning of mathematics at secondary school level," Journal of e-learning and Knowledge Society, vol. 16, no. 4, pp. 76-85, 2020.
19. M. Goos, Technology integration in secondary school mathematics: The development of teacher professional identity, Springer Link, 2014.
20. E. M. Mulenga and J. M. Marban, "Is COVID-19 the gateway for digital learning in mathematics education?," Contemporary Education Technology, vol. 12, no. 2, 2020.
21. R. Mayer, "The past, present, and future of the cognative theory of multimedia learning," Educational Psychology Review, vol. 36, no. 1, 2024.
22. O. Serin, "Technology-integrated mathematics education at the secondary school level," journal of Education and Practice, vol. vol. 8 no. 17, pp. 92-100, 2017.
23. R. M. Bernard, E. Borokhovski, R. F. Schmid and R. M. Tamim, "Gauging the effectiveness of educational technology integration in education: what the best-quality meta-analyses tell us. In learning, design, and technology. An international compendium of theory, research, practice and policy," Springer International Publishing, pp. 3929-3952, 2020.
24. A. McClain and T. North, "Effect of Technology Integration on Middle School Math Proficiency: A Multiple Linear Regression study," International Journal of Education in Mathematics, Science, and Technology, vol. Vol 9, pp. 557-570, 2018.
25. J. Young, F. Gorumek and C. Hamilton, "Technology effectiveness in the mathematics classroom: a systematic review of meta-analytic research," Journal of Computers in Education, vol. vol 5, pp. 133-148, 2018.

Cite this Article: Phillips, J., Jagnandan, S., Jagnandan, A., Ali, B.S. (2026). Integrating Technology into The Grade Ten Mathematics Curriculum at New Amsterdam Secondary School: Enhancing Instruction and Student Outcomes. International Journal of Current Science Research and Review, 9(6), pp. 3538-3544. DOI: https://doi.org/10.47191/ijcsrr/V9-i6-59