

Technology Implementation Plan

Melissa Welz

New Jersey City University

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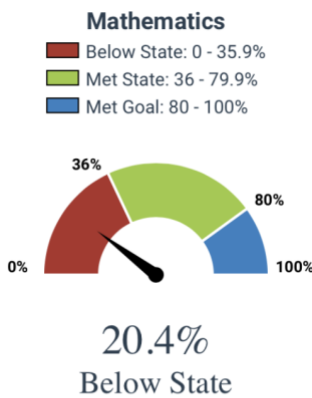
Dr. Tracy Amerman

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**Introduction**

Achieving academic success in mathematics is crucial for students' overall educational attainment. Integrating technology can offer innovative ways to engage students, enhance learning experiences, and cater to the diverse needs of learners. After the Covid-19 pandemic, the North Bergen School District has struggled with passing mathematical scores. Various investments have been implemented in aid of helping our students raise their mathematical test scores.

The North Bergen School District has long faced challenges with student achievement in mathematics, as measured by standardized tests. Despite multiple investments in recent years intended to improve math performance, the percentage of students meeting expectations on state math assessments has declined over the past two years. Specifically, the school district has



Note: Data from 2021-2022 New Jersey School Performance Reports ( New Jersey Department of Education, 2021,2022).

invested in technology tools like Chromebooks and personalized online math programs such as Savvas and Pearson’s enVision.

However, results from the New Jersey Student Learning Assessment-Mathematics (NJSLA-M) indicate math proficiency rates have decreased within the district during this time. Over the past two years, the percentage of North Bergen students scoring

"Meets Expectations" or "Exceeds Expectations" on these state math tests has gone down, suggesting these investments have not yet yielded improvements in math achievement.

Moving forward, North Bergen will need to closely analyze the implementation and effectiveness of its math instructional programs and support to identify strategies to reverse these

troubling trends on standardized assessments. Improving math outcomes remains an urgent priority for the district.

### **Identification of Needs**

The North Bergen School district is classified as a Title 1 school district. The district also has a 60% rate of special education students. There is a mixture of diverse learners, English language learners (ELL), and students with special needs. The district has a diverse student population with varying learning preferences, abilities, and challenges. It is crucial to provide differentiated instruction and resources to meet the unique needs of all learners.

ELL students may face language barriers that hinder their understanding and engagement in mathematics. Technology can facilitate language acquisition, comprehension, and content mastery. Students with special needs require additional support to overcome learning obstacles. Technology integration can provide personalized learning opportunities, assistive tools, and accommodations to enhance their mathematical skills. Due to the widespread differentiation, the district utilizes adaptive learning software, virtual manipulatives, and assistive technologies.

Tomlinson (2020) states, “ Just as students' physical development varies at any given age, their cognitive and intellectual development similarly progresses on different timetables”. Educators must recognize the range of skills and learning speeds within a classroom to effectively differentiate and scaffold instruction. Accommodating diverse learning needs allows students to feel challenged at their own level without being overwhelmed.

**Implementation Strategies**

The North Bergen School District collaborates with the technology department to assess infrastructure needs, ensure software compatibility, and provide technical support for seamless implementation. The administrators and supervisors in each building establish clear goals, allocate resources, and facilitate professional development opportunities for teachers to effectively integrate technology into their mathematics instruction. Teacher training is offered for comprehensive professional development programs to familiarize teachers with the selected technologies. Training also focuses on effective integration strategies, pedagogical approaches, and addressing the needs of diverse learners and students with special needs.

**Research**

In the North Bergen School district, they currently have employed two mathematics supervisors. Dr. Fahima Bach is the High School District Mathematics Supervisor. Our K-8th grade mathematics supervisor is named Candace Anakar. In a formal phone call and email response, Dr. Bach stated that she implements the following technological tools in assisting all high school staff mathematics teachers and students:

Technology devices that are available in North Bergen school classrooms are:

- Smart boards and interactive board
- Projectors
- Graphing calculators
- Chromebooks

These tools/programs enhance learning mathematics as they allow students to visualize math concepts and their applications. One major advantage of educational technology is its ability to increase student engagement and excitement about math. Tools like Kahoot and Savvas games present math content in an interactive, game-based format that appeals to students.

Teachers report increased participation and engagement when using these tools compared to traditional paper worksheets. Additionally, video lessons on YouTube and visual math apps like Desmos allow students to see math concepts visualized and demonstrated. This enhances conceptual understanding, as students can connect abstract formulas to real-world examples. Visual models like algebra tiles on Savvas further bridge this gap between the concrete and abstract.

### **Desmos**

Desmos is a versatile online graphing calculator that empowers students to explore mathematical concepts through dynamic visuals. Desmos offers an intuitive interface that enhances students' understanding of functions, equations, and graphing. Desmos allows students to experiment with functions, explore transformations, and visualize mathematical concepts in real-time, making learning more interactive and engaging. Students receive instant feedback on their mathematical calculations, which helps them correct mistakes and gain a deeper understanding of the subject matter. Desmos is accessible on various devices, ensuring that students can practice math both in and out of the classroom.

**Savvas Technology**

Savvas technology encompasses a wide range of resources, including graphing tools, algebra tiles, videos, and games. Graphing tools and algebra tiles enable students to visualize mathematical concepts, such as equations and inequalities, fostering a deeper understanding of abstract concepts. Videos and games provide a multimedia approach to mathematics, catering to diverse learning styles and engaging students through interactive and visually appealing content.

**Kahoot**

Kahoot is a game-based learning platform that can be used effectively in mathematics education. Kahoot turns learning into a fun and competitive experience, which motivates students to actively participate and review mathematical concepts. Teachers can create quizzes on Kahoot to assess students' understanding of specific topics, providing valuable feedback for instructional planning.

**YouTube**

YouTube is a valuable resource for supplementary mathematics content. Videos on YouTube provide visual explanations and demonstrations of mathematical concepts, helping students grasp abstract ideas with greater ease. A vast library of math-related videos is accessible for students, making it easier for them to find resources that cater to their specific needs.

**Kami**

Kami is a versatile digital tool that allows students to annotate and interact with PDFs, making it beneficial for mathematics education in the following ways. Students can annotate

math problems, solve equations, and write explanations directly on the digital materials, tailoring their learning experience to their preferences. Kami supports collaborative work, allowing students to share their annotations and collaborate on mathematical tasks.

In my ongoing research, I also contacted Candice Anakar who is the North Bergen mathematical supervisor of K-8th grades. Candace stated that the school district utilizes the enVision Program (our main instruction) that utilizes technology enhanced learning through acting as a hybrid. The math teachers in our district try to use all these technology programs and devices. Therefore, there is much hands-on experience with tangent manipulatives, especially in the lower grades. This can be used to connect with the digital tools that a teacher uses via projector or smart board through an interactive workbook that matches their consumable book.

In the enVision Program, there are videos built into every lesson that show examples of math tasks similar to what students explore and they are asked to discuss connections. Often there is tech enhanced Q&A used in the whole group (similar to NJSLA style questions) that is embedded for test taking strategies. The program offers extra practice with online remediation/enrichment called practice buddy and IXL.

Additional programs we use district wide are IXL and we were using SuccessMaker (SM will not be renewed). These are prescriptive programs that are helpful in identifying deficiencies and creating individual plans to supplement main instruction.

The middle school teachers use Desmos and Khan Academy. They also use other sites including Classkick, Quizzes, Plickers, Prodigy, MobyMax, etc. When the school district went virtual from 2021-2022, teachers utilized much use of online interactive whiteboards. Instructionally it is important for math teachers to take a step out of chromebooks. Teachers have found that students will often be lazy and open tabs to search for answers rather than think.

Conversation, challenges, and productive struggle is necessary to be successful in math.

Candace had mentioned that some parents and students have grown dissatisfied with the reliance on educational technology tools and online learning platforms. For instance, students at the Secondary School for Journalism in Brooklyn organized a walkout to protest being compelled to use software programs for self-directed instruction for extensive periods of time (Schaffhauser, 2019). This example highlights building frustrations among certain communities over perceptions that edtech tools are being implemented in ways that are pedagogically inadequate or detrimental to authentic teaching and learning. Further research could explore the factors driving rejection of educational technologies by pockets of parents and students, as well as how their concerns might be addressed through improved integration approaches, training, or customized learning experiences. Gaining a more nuanced understanding of student and parent objections can help school leaders make more informed decisions regarding optimal, equitable uses of instructional technologies.

### Costs

*Table 1. Estimated cost of materials paid by North Bergen School District*

<b><i><u>Math Online Programs</u></i></b>	<b><i>Cost per School Year</i></b>
<b><i>Savvas</i></b>	<b><i>\$50.00 per student = \$365,000</i></b>
<b><i>IXL</i></b>	<b><i>\$59,800.00</i></b>
<b><i>EdPuzzle</i></b>	<b><i>\$135.00</i></b>
<b><i>enVision Math</i></b>	<b><i>\$25,819.58</i></b>
<b><i>Formative</i></b>	<b><i>\$150.00</i></b>
<b><i>BrainPop</i></b>	<b><i>\$1980.50</i></b>
<b><i>Kami</i></b>	<b><i>\$4000.00</i></b>



<i>Classkick</i>	<i>\$156.00</i>
<i>Plickers</i>	<i>\$71.88</i>
<i>Prodigy</i>	<i>\$180.00</i>
<i>MobyMax</i>	<i>\$3795.00</i>

With all these programs, there should be dedicated time for technology integration training, collaborative planning, and ongoing support for teachers. This may involve regular professional development days and staff meetings. There are also several math coaches that travel to all schools to support staff to provide ongoing assistance, troubleshooting, and maintenance.

### **Measures of Success**

1. Standardized Test Scores: Analyze district-wide standardized Mathematics test scores to assess improvements over time, comparing pre- and post-implementation data.
2. Formative Assessment Data: Utilize formative assessment tools integrated within adaptive learning software to monitor individual student progress and identify areas for intervention.
3. Student Engagement: Collect qualitative data through surveys, interviews, or classroom observations to gauge students' engagement, motivation, and perceived usefulness of the implemented technologies.
4. Graduation and Advancement Rates: Track graduation rates and academic advancement of students, including those with diverse learning needs and special requirements, to evaluate the long-term impact of technology integration.

**Conclusion**

Integrating technology into mathematics instruction offers tremendous opportunities to improve achievement, engage diverse learners, support ELL students, and cater to the needs of students with special needs. By implementing the recommended technologies, providing appropriate support, and continuously assessing success, the district can foster an inclusive and effective learning environment that promotes mathematics achievement for all students.

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