**Technology Implementation Plan**

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The North Bergen School District conducted an analytical review of Partnership for Assessment of Readiness for College and Careers (PARCC) scores in Mathematics. The analysis of these PARCC test scores revealed that student performance in Grades 3-8 must improve in all strands of the Mathematics. There must also be a focus on subgroups, including Students with Disabilities (SWD) and English Language Learners (ELL). Intervention in the form of computerized supplemental math lessons will be provided to all students in Grades 3-8 during the scheduled Mathematics block. The goal of this technology implementation action plan is to improve PARCC test scores in Mathematics and meet the district’s goal for to prepare all students for college and career. The principles for the design of this action plan are founded on the Hexagon Exploration Tool (Blase, Kiser, & Van Dyke, 2013) The Hexagon Exploration Tool considers needs, fit, resources, evidence, readiness and capacity (Appendix A).

Software and Program Evaluation

In pursuant to the North Bergen school district’s objective to improve student performance and close achievement gaps within subgroups, the Mathematics department seeks to use alternative assessments to identify and measure areas and skills in need of improvement. Through a positive classroom environment, challenging differentiated instruction and meaningful feedback, students can show growth and sustain growth using alternative measures that compare a student’s starting and ending point in each academic school year.

A diagnostic test for Mathematics will be given to all students in Grades k-8 three times per year. The test will be given in September, January, and May. The diagnostic test consists of various subtests across the five strands of mathematics: Numbers and Operations, Measurement, Data Analysis, Geometry, and Algebra. The district proposes the use of this diagnostic assessment as a measure to demonstrate growth for all students over time. A student receives a score for each of the five strands of mathematics and a total score.

The reports show three bands in which a student may fall into. The bands are as follows:

* Red- signifies the percentage of students that are performing at least 0.25 or below their grade level (Emergent)

     ●   Blue- signifies students that are working at grade level capacity within that

strand (Proficient)

     ●   Green- signifies students that are working above grade level in that particular

strand (Above)

The goal is to have the red band decrease and the blue and green bands increase. In order to do this, the district proposes implementing blended learning in the form of an adaptive intervention mathematics program. LGL Math Edge is an adaptive intervention mathematics program that utilizes the results of the diagnostic assessment to provide a prescriptive program for each student (Capone, 2016). This allows students to work at their own pace on lessons they may normally have fallen behind in if they only received whole group instruction.

It is the expectation of the district that all students in grades 3-8 spend a minimum of 90 minutes per week on LGL Math Edge. Implementation begins in Grade 3 since the PARCC Assessment begins in Grade 3. Many students do not have the luxury of having a computer or internet access at their home, therefore this opportunity must be afforded to all students during their mathematics blocks. Teachers must incorporate a blended learning model in order for students to reach the goal of 90 minutes per week. LGL Math Edge provides vast amounts of data. Building administrators are expected to monitor the amount of time each student spends on LGL Math Edge by accessing the Usage Report. For example, there are four weeks in October. Building administrators would view the usage report to ensure that each student has at least 360 minutes, or six hours, that they were logged into LGL Math Edge. Building administrators are responsible for ensuring the fidelity of implementation of Math Edge. District level administrators will view the LGL Usage Report by building to ensure that building Administrators are monitoring the implementation of LGL Math Edge.

LGL Math Edge is relevant to all learners, regardless of race, ethnicity, socioeconomic status, or classification. The lessons are offered through multiple modes including text, video tutorials, and audio (Capone, 2016). Teachers are able allow extra time on task for any student on any lesson. The program has several PARCC-like features for accommodations, including highlighting and text-to-speech. LGL Math Edge lessons are available in English and Spanish, and are able to be switched from lesson to lesson. A teacher can also assign the lesson in English, and then assign the same lesson in Spanish if the data deems it necessary. This program can be accessed from anywhere there is internet access, allowing students to log in more than the required 90 minutes if they access the program from home or the library. The program also runs on handheld devices.

        The cost of this program is $18.50 per student license (Capone, 2016). Each building is responsible to the funding of the program. The district will order the licenses for each building based on enrollment, and use the building's Title I funds before they are released to the individual buildings. The district will incur the cost of district-wide Professional Development to train all Grade 3-8 Mathematics teachers on using this program. The cost of the district-wide Professional Development is $30,000. The Professional Development will run for five consecutive days in 90-minute sessions. All teachers of Grades 3-8 Mathematics are required to attend one session. A schedule will be provided to the school buildings by the district. The Professional Development includes logging in for teachers and students, a simulation lesson, accessing reports, and assigning personalized lessons. If a school building wishes to have more Professional Development for their staff, additional Professional Development may be purchased directly from the company using building funds. Additional Professional Development is offered by the company with packages beginning at $500.

LGL Math Edge Program will be evaluated by the diagnostic test. The diagnostic test is given to students three times per year: September, January, and May. The program will be deemed effective if the results from the diagnostic test show the red band for each grade level decreasing and the blue and green bands increasing between the September and May test administration. This will show if incorporating blended learning 90 minutes per week per student in the form of computerized supplemental Mathematics lessons impacted student achievement.

Hardware

The technology recommendations for the math department include the purchase and/or sharing of existing computers, Chromebooks and tablets in the School Building. New purchases will be based on the needs assessment. A formal bid will be used to describe the specification of the devices that need to be purchased as part of the District’s technology acquisition plan. The technology coordinator must select a provider for tablets, Chromebooks, or desktops to be used. Chromebooks will be the best option in terms of affordability and suitability for the implementation of the LGL Math Edge. The price range for Chromebooks goes from $199 to $300 and their specifications vary depending on the brand. For example, an HP Chromebook 11 G5 starts at $ 259, it features High Definition audio, dual speakers, a High Definition camera, Intel Dual Band 802.11a/b/g/n/ac WiFi and Bluetooth 4.2 connectivity.  The new Chromebooks also features media readers that support SD, SDHC and SDXC memory cards.  The manufacturer promises a battery life of up to 11 hours.  The Chromebook’s diameters are as follows; 11.25 inches wide, 8.07 inches deep and 0.72 inches thick and it weighs in at 2.62 pounds.  The Chromebook runs on a 43.7-watt-hour Li-ion polymer battery (Newman, 2016) and it runs on the Chrome OS operating system (Brown, 2014).

Research and Theory

Adaptive Learning systems rely on delivering customized instruction on technology devices. These programs target specific skills by customizing instruction to meet students’ learning objectives. Blended learning is revolutionizing K–12 education in terms of quality and cost, it is transforming classrooms from teacher-centered to student-centered by delivering a personalized instruction for each student at the same or lower cost (Horn & Staker,2011). A blended learning environment as an intervention to improve Math scores will provides each student the opportunity to work at his/her own pace, use technology and get performance feedback. Teachers and administrators will have the ability to capture students’ achievement data in Math and utilize technology to increase school-wide performance in mathematics (Watson, Murin, Vashaw, Gemin, & Rapp,2011).

LG MathEdge focuses on teaching problem-solving skills that students cannot only utilize to solve math problems, but also solve real-life situations that rely on critical thinking and problem solving skills. To improve students’ achievements in Mathematics, it is important to understand how students learn Mathematics. There are many learning theories that are relevant to the teaching and learning of Mathematics, including Cognitivism and Constructivism.

Cognitivism emphasizes on the role of environmental conditions and instructional designs play in promoting learning; more focus is placed on the role of continuous practice, feedback, demonstrations and illustrations on students’ learning (Ertmer & Newby, 2013).  Cognitivist theory is based on learners’ ability to create or construct new understanding through actively building upon prior knowledge and experiences using twenty first century perspective (Yoder,2014). Constructivism is founded on people constructing new knowledge upon their previous ones (Schunk, 2012). It stems from the work of Jean Piaget and Lev Vygotsky as well as other scientists’ work such as Jerome Bruner, Howard Gardner, and Nelson Goodman and contemporary scientists such as Ilya Prigogine, Humberto Maturana and Francisco Varela (Creswell,2014). Constructivism as a learning theory can help guide curriculum, instruction, and assessment across disciplines particularly in mathematics education.

Appendix A- Implementation Plan Using the Hexagon Tool

**Needs:**

-       Low PARCC scores in Mathematics

-       Contextual factors (socio economics, cultural diversity and learning styles)

-       Meet Student Growth Outcome (SGO) requirements

**Fit:**

-       PARCC alliance

-       School district’s mission

-       NJ CCSS and NJSLS

-       21st century skills

**Resources:**

-       Initial and ongoing Professional Development

-       Hardware and Software Support

**Evidence:**

-       Data analysis of test outcomes - Score Improvement in Diagnostic tests

-       Feasibility of implementation of Blended Learning

**Readiness:**

   - Commitment (staffing, curriculum, IT, infrastructure, supplies)

  -  Budget

  -  Informing parents and all stakeholders

**Capacity:**

-       Leadership in all areas

-       Curriculum, implementation task force

-       On going Professional Development

-       On going review of goals

**Appendix B -Action Plan Template**

**Goal 1: Prepare Students for College and Career**

**Objective 1:**  Provide Intervention and Enrichment for All Students in A Blended Learning Environment

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| **Implementation** | **Evaluation** |

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| **What needs to be done?** | **By whom and when?** | **What resources?** | **What evidence indicates progress?** | **How and when will evidence be gathered?** |
| Create opportunities for students to increase learning using technology | The Classroom teacher, Instructional Technology Specialist, Math teacher, Math Specialist. | Utilization of Chromebooks.  Computer program LGL Math Edge. | Diagnostic test given to students three times per year to monitor progress. | Evidence will be gathered after the completion of the tests. |
| Expand the use of software and hardware tools that are available in the district. | The classroom teacher, department coordinators. | Available hardware (Chromebooks and tablets), and software programs designed for math. | Daily use of technology in the classroom to enhance the learning of mathematics. | Evidence; lessons plans and artifacts related to students use of technology will be gathered at the end of each marking period. |
| Utilize technology to improve student learning. | Classroom teacher, Instructional technology specialist. | Utilization of Chromebook  Computer program LGL Math Edge, and available online programs. | Improved scores on the unit tests. | Evidence will be gathered on an ongoing basis by the classroom teacher. |

**Objective 2**: Advance the one-to-one initiative that provides a Chromebook enhance the mathematics curriculum.

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| **Implementation** | **Evaluation** |

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| **What needs to be done?** | **By whom and when?** | **What resources?** | **What evidence indicates progress?** | **How and when will evidence be gathered?** |
| Provide hardware to student and teachers that meet district guidelines | Superintendent of schools, department supervisors, school administrators. | School funding, and local funds. | Availability of hardware for students. | Observations will be carried out by department supervisors. |
| Internet training will be provided to all students, teachers and administrators to maintain a safe environment. | Classroom teachers, department supervisors, Instructional technologist specialist. | Hardware including Chromebooks, and available Google software. | Ongoing monitoring of the school network and continued training throughout the district. | Evidence will be gathered on a continuous basis to ensure the integrity of the network. |

**Goal 2: Increase the District’s scores on standardized tests**

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**Objective 1**:  Provide professional development for teachers and increase the implementation of technology in the K-12 classrooms.

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| **Implementation** | **Evaluation** |

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| **What needs to be done?** | **By whom and when?** | **What resources?** | **What evidence indicates progress?** | **How and when will evidence be gathered?** |
| Conduct a district wide needs assessment. | Conducted by supervisors and school administrators. | Utilization of surveys and interviews. | Progress monitoring would be ongoing throughout the school year. | Surveys and observations by the supervisors and administrators will be necessary to determine if the teachers are utilizing the technology. |
| Review and develop technology policies to implement emerging technologies. | Information technology specialist, school administrators and superintendent of schools. | Utilization of available technology information from reliable sources. | Implementation of new technology on a regular basis to keep teachers and students current with technology trends. | Evidence will be gathered through observations and professional development meetings. |

**Objective 2**:  Develop District Wide Educational Initiatives to Enhance the Use of Technology to improve student achievement.

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| **Implementation** | **Evaluation** |

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| **What needs to be done?** | **By whom and when?** | **What resources?** | **What evidence indicates progress?** | **How and when will evidence be gathered?** |
| Prepare online tutorials for students to access during off-school hours | Tutorials will be prepared by the classroom teachers and technology specialists. | Teachers and technology specialists will provide tutorials through Google Classrooms. | Monitoring of Google Classrooms by teachers and supervisors. | Evidence and monitoring will be ongoing throughout the school year. |
| Expand the utilization of technology programs. | Classroom teachers, school supervisors, school administrators | Continued research and implementation of new technologies. | Monitoring of student scores on standardized tests given three times per year. | Evidence will be gathered by supervisors three times per year to monitor improvement. |

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