Assignment 3

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Introduction

As the Belleville Board of Education prepares students to be college and career ready, it is imperative that a watchful eye is kept on the progress or any challenges that become a barrier to progress. For United States students to be competitive in the 21st century technology-based workforce of the future, it is critical for them to gain proficiency or above proficiency skills in mathematics. According to DeSilver for the Pew Research Center, students in the United States have made progress in the area of mathematics scores (2015). This same research notes that fifteen-year old students who participated in the 2012 Program for International Student Assessment scored in the middle range of all the participating countries demonstrating that there is still work to be done for our nation to compete in the 21st century. Other numbers pointing to the need of an intervention are from the Nation's Report Card (2015). This ongoing report details where students lack proficiency, have proficiency, or have surpassed proficiency in the acquisition of mathematical skills. In their 2015 report on mathematics, only 40% of fourth graders were at or above proficiency. The numbers fall in both eighth and twelfth grades with only 33% and 25% being at or surpassing proficiency respectively (Nation's Report Card, 2015).

Originally, forty-three states and the District of Columbia have implemented the Common Core Standards (Common Core State Standards Initiative, n.d.). In May of 2016, the New Jersey State Board of Education adopted the New Jersey Student Learning for math standards (State of New Jersey Department of Education, 2016). Rigorous mathematics programs that have a strong focus on individual topics which have cross-curricular implications are the tenets for the successful implementation of these standards. For any standard to be implemented to meet the needs of all students, careful and strategic planning of the best practices needs to occur.

District

The township of Belleville is located in Essex County, New Jersey. This urban community has a population of 35,926 (U.S. Census, 2010). The American Community Survey 5 Year Estimate 2006 – 2010 notes the median household income in New Jersey was $71,637 (U.S. Census, 2010). According to the same survey, Belleville, New Jersey's median household income was $60,127 falling 16.06% below the state's average (U.S. Census, 2010).

Belleville Township school district consists of one high school, one middle school, and seven elementary schools. The total school population is currently 4,301. For grades six through eight, students are currently performing below the state average in overall academic performance. Also, students' fall behind in the area of student growth performance compared to their peers throughout the state (State of New Jersey, 2013-2014). Through analysis of these statistics and summative/standardized test scores the district is looking to implement a technology-based mathematics program to enhance learning and increase test scores.

Blended Learning

Personalizing the delivery of instruction is gaining momentum as a means of reaching all students regardless of their academic, social or economic background (Clark & Mayer, 2011). One instructional strategy being used to provide instruction that is detailed to the specific needs of the learner is blended learning (BL). Stacker and Horn (2012) describe BL as the "engine that can power personalized and competency-based learning" (p. xxvi). The authors further define BL as "a formal educational program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home." Bonk, Graham, Cross, & Moore's (2006) simplified definition of BL "combining face-to face

instruction with computer-mediated instruction" is succinct and sufficient as a description in relation to the Teach to One(TTO) program.

TTO utilizes a rotational BL model, based on the original "School of One" program pioneered in 2009. Focus is given to students identifying their modality of learning, selecting in which way they learn best, in effect personalizing their learning. Utilizing pretest measures for leveling and end of activity assessments, students are placed on appropriate paths geared to their learning style, rate, and need for supervised instruction. Rotating stations allows students to choose from their personal playlist, selecting activities that are either online, small group, led by virtual tutors or in a face-to face peer or instructor led format. TTO's focus on formative and summative assessment, allows for the development and delivery of instructional material that is relevant to the individual learner, personalizing the experience to maximize student achievement.

Universal Design for Learning

TTO is developed on the basic principles of Universal Design for Learning (UDL). There are three basic principles of UDL which support the process of learning for all students according to the National Center on Universal Design for Learning (2012). First, offering multiple means of representation is imperative to successful implementation. Second, providing various means of action and expression can support the building of skills in the area of executive function. Students with strategic planning skills and the option of multiple tools can begin to guide their own learning. Lastly, allowing for numerous means of engagement provides students with the ability to become immersed in the learning process. The goal of this level of engagement is for students to remain engaged in the learning process. Though these principles and what they represent are important for all learners, supporting students with special needs requires the use of learning activities that are designed based on UDL principles. Assistive

Technology additions may also be required for added assistance beyond the design aspects developed within UDL activities for some diverse learners.

Assistive Technology

According to the Individuals with Disabilities Act Section 300.105, it is mandated that assistive technology devices and services be available to students with special needs in accordance with their Individual Education Plans (IDEA, 2004). Therefore, it is the responsibility of each district to assess each student's needs and provide the means for them to have access to education that is equal to their non-disabled peers. The Assistive Technology Industry Association defines, "assistive technology (AT) is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities" (ATIA, n.d.). This includes both low-tech and high tech-devices. Understanding that not all learners acquire and retain knowledge the same way warrants the investigation of devices and software that allow for learning for all.

The following areas of assistive technology are to be addressed for the successful implementation of the TTO Math intervention.

Assistive Technology Categories (United States Departments of Health and Human Services, n.d.)

- Communication: Alternative & Augmentative Communication (AAC) devices allow students with speech deficits the opportunity to have a means of expressive communication.
- Computer Access: Alternative input and output devices such as switches, Eyegaze, and magnification screens assist in providing students with

the special needs the opportunity to have access to the same educational technology as their non-disabled peers.

- Hearing & Listening Assistive Aids: The use of devices to amplify sound for students who are either hearing-impaired or deaf allow for equal access to learning.
- Ergonomic Equipment: Modifications of equipment, workstations, or seating that allow students with special needs the ability to work comfortably without stress from the repetitive hand movements that are often required for computer use.

English Language Learners (ELL)

According to the National Center for Educational Statistics, the United States average for English Language Learners in public education was at 9.3% for the 2013-2014 school year (Institute of Educational Sciences, 2014). This has been a steady increase over the years with some states recording more than 10% of their student population being ELL (NCES, 2014). In order for ELL to be college and career ready, it is imperative that any technology supplemental programs or interventions are implemented with their needs in mind. Students learning the English language can also exhibit struggles acquiring new math skills. Kim and Chang (2010) conducted research in 2010 and found that computer use for Math instruction had a positive effect on acquiring new Math skills for ELL.

Teach to One: Math

PARCC

In the 2014-2015, New Jersey Schools transitioned from its former, paper-based, standardized assessments to the Partnership for Assessment of Readiness for College and Careers (PARCC) in mathematics and English language arts (nj.gov, 2016). PARCC is a computer-based Mathematics and English Language Arts test given to students in grades three through eleven. Team with new learning standards driven by the Common Core State Standards, PARCC's

computer-based format not only introduced new standard-aligned questions, but it also introduced new technical operations students needed to be proficient on the test (Clark, 2016 & Murray, 2015). For example, PARCC test requires students to effectively use a computer, navigate in a digital environment, and carry out various computer operations. Technical operations such as dragging, dropping, and typing during the timed test were among a number of the digital processes that caused concern by parents and schools officials (Bowen, 2015 & Murray, 2015).

The emergence of PARCC increased the pressure to prepare students technically in New Jersey public schools because the assessment requires to have more advance computer skills than ever before (Gewertz, 2015). To develop students' technology skills and ensure preparedness for PARCC, schools are forced to redesign curricula and devise new methods of instruction. Studies show that students who lack technology skills are less prepared to perform well on standardized tests that require technical skills (Martin, Shannon & Wray, 2015).

What Is Teach to One: Math?

Given that our district currently assesses students using the PARCC and is realizing substandard mathematics scores, a program that focuses on improving mathematics with a digital component could be an ideal solution. In 2011, Joel Rose, co-founder a nonprofit organization NewClassrooms, to created an innovative digital program called "Teach to One: Math (TTO) (Madda, 2013). The idea behind Teach to One started in 2009 with School of One, a middle school math program which personalizes curricula and lesson plans for individual students in three New York City schools (Locke, 2015). Grounded on the idea that students entered the classroom at different levels of understanding and learn in different ways, Rose designed TTO

for multiple modalities of learning. TTO is a unique approach to instructional design for mathematics.

In 2013, Columbia's Teacher's College Center for Technology and School Change released data from a study on the effectiveness of Teach to One. Through tracking 2,264 students that participated in the TTO program, data showed that TTO students in grade sixth, seventh, and eighth grade surpassed those made by students nationally. In addition, although students enter the program well below the national average on the MAP assessment and are relatively socioeconomically disadvantaged, they showed higher gains than the national average gains (Madda, 2013).

How TTO Math Works and UDL

True to a UDL focus, TTO uses algorithms and classroom-specific information to organize daily math curriculum for individual students on a daily basis. For each student, the TTO program generates custom curriculum based on pre and post-assessments. This process culminates in what is called a playlist for each student. Using eighty different learning products, such as Khan Academy, YouTube, and others, TTO playlists define daily goals and learning patterns and present a schedule for teachers and students (Newcomb, 2016). Depending on each student's playlist, he or she may spend the first thirty minutes working on factoring binomials with a teacher, and the next thirty minutes working on that same skill using software at a different station (Locke, 2015). Following the lesson all students take a ten-minute online assessment of what they have learned. The TTO program then analyzes the data from the assessment using previous lesson and achievement and creates a custom schedule for the next day's math period for each student. This process is repeated for a set number of weeks with the

goal to master a set number of skills. If the student does not meet set goals, this may be reflected in the student's grades, and then the teacher's interventions are applied (Newcomb, 2016).

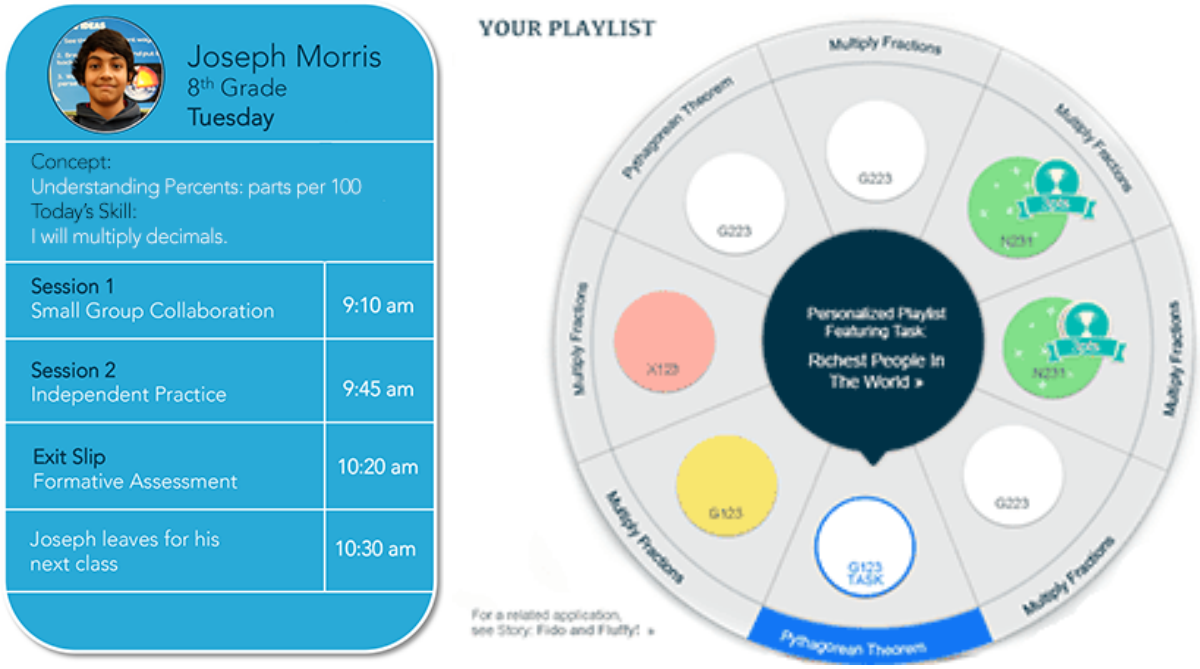
Modalities & **Schedule**

The TTO Math program ensures that each student receives a customized daily schedule based on his or her current learning strengths and needs, classroom resources, and available online lesson (Littman, 2016). Each math lesson uniquely targets a modality of learning that is specific to the student; therefore, the student is pushed to achieve at his or her pace and capacity. Sarah Powell, author of *Introduction To Middle School*, describes modalities as how students use their senses in the learning process (Powell, 2013). According to Powell (2013), four modalities are considered general: 1) visual (seeing), 2) auditory (hearing), 3) kinesthetic (moving), and 4) tactile(touching). The effectiveness of the TTO Math program is grounded on Powell's suggestions which states the more senses or modalities one can activate, the more learning will take place. TTO modalities include, teacher led, collaborative, virtual, independent, project based, and task session learning (U.S. Department of Education, 2016). Appendix I details each modality.

The TTO math program essentially targets various modalities of learning for each student that participates in TTO math. The sample student schedule below shows the concepts and skills to be learned by an 8th grader name Joseph. Joseph's schedule shows how the program customizes various modalities to help him achieve his learning outcomes. Joseph's schedule for the day concludes with an exit ticket. This exit ticket (Figure 1) is used to assess Joseph's understanding of the day's lessons and serves as key information to the program's scheduling for Joseph's subsequent math class. The image to the right is an example of a student's digital playlist (Figure 1). The playlist shows various concepts and skills, such as multiple fractions and

Pythagorean theorem, to be achieved by a student, and the progress the student has made toward achievement.

Figure 1
Exit Ticket and Playlist



Defining the Need

Network Infrastructure

A major component to effectively implementing the TTO Math program will be network infrastructure. Given the computer power necessary to run the program and use of online content, network bandwidth is a major component to ensure that each student and staff member has the ability to carry out all modalities that require Internet connectivity. In addition to bandwidth, TTO Math has outlined minimum network and system requirements to help administrators prepare the classroom environment prior to implementation of the program. Appendix II details the technology requirements set by TTO. Important cost drivers of the TTO Math program are

students, teachers, and the program itself. As shown in the budget section, students, in particular, will dictate the number of, teachers, computers, wireless access points, tablets, smartboards, laptops carts, headphones, and other devices needed to effectively run the program.

One-To-One Initiative

In 2015, Elizabeth Public Schools was in the process of establishing a new middle school, iPrep Academy, a lottery-based charter school using blended learning and 1-to-1 technology. Olga Hugelmeyer, superintendent of Elizabeth Public Schools, saw Teach to One as a perfect fit. Hugelmeyer was looking for the ability to create an individualized plan for every child, so that they are able to be successful by year's end and TTO had developed a model that made that possible (Locke, 2015). An important component to implementing this program for the Belleville School District will be a one-to-one laptop initiative.

Training

TTO Math utilizes innovative technology programs, online applications, and multiple modalities of learning to engage students, target unique areas of mathematics, and push students at their own pace. Therefore, the program requires a different approach to instruction, as the program provides an untraditional approach to learning for each student. With TTO's unique approach, coupled with increased use of technology in the classroom, training and support for teachers both in the form of pre-service and on-going will be critical to effective implementation.

To ensure preparedness teachers and students will participate in trainings prior to beginning the program. Prior to the launch of the program, teachers will participate in two weeks of training. During this two-week training session, teachers will be learning about the history of TTO, gain theoretical and hands-on practice with the program, review classroom best practices specific to TTO Math and learn how to best use the types of technology systems they will

encounter in the TTO Math classroom. In addition, teachers will be trained to train students during the first three weeks of school. During the first three weeks of school, teachers will train students on digital citizenship, standard classroom practices, review their schedules, and how to transition from modalities. During the school year, teachers will be provided on-going support and training during feedback sessions with instructional supervisors and technology trainings with district technology staff.

Support

An additional component to carrying out the TTO Math program will be technical support. The district will work to employ and train one district technology coordinator and technology technician to effectively manage the network, student Chromebooks, and other computing devices to ensure that the program runs smoothly. In addition to the district's technical staff, as part of the TTO Math, the district will provide and a part-time technology coordinator whose core objective is to manage the TTO Math database, support daily classroom setup, and support teachers during class time. TTO will also provide a site manager who will work with administrators and district technology staff to refine the program from an operational standpoint by making recommendation and provide support throughout the school year. A concerted effort between district technology staff and TTO personnel will be a critical component to successfully implementing and sustaining the TTO program.

Budget

A forecasted three-year budget for implementing the TTO Math program across the district for grades 3 through 8 is shown below in Figure 2. To implement the program, the district is projected to spend approximately $2.9 million over the three-year period. The first year of implementation will generate the highest expense ($1.7 million) due to procurement of

equipment and installation of networking devices. In addition, year one will generate the highest cost for professional development as teachers will receive two full weeks of professional development. Procurement of equipment, installation of devices, and professional development will decrease in year two and three. Therefore, the annual expense to maintain the program will decrease in year two and three.

Figure 2
Budget

Three-Year Teach-To-One Math Implementation Budget						
Item	**Qty**	**Unit**	**Total**	**Year 1**	**Year 2**	**Year 3**
Contract With TTO ($50K per 300 Students)	8	$50,000.00	$400,000.00	$400,000.00	$400,000.00	$400,000.00
Math Lab Chromebooks Gr 3-5 (100 per school)	700	$150.00	$105,000.00	$105,000.00	$15,750.00	$15,750.00
Chromebooks 1 to 1 Middle School	300	$150.00	$45,000.00	$45,000.00	$6,750.00	$6,750.00
Classroom Headphone (100 per school)	800	$10.00	$8,000.00	$800,000.00	$1,200.00	$1,200.00
Chromebook Cart (1 for every 30 Chromebooks)	34	$1,800.00	$61,200.00	$61,200.00	$6,120.00	$6,120.00
Training for 84 Gr 3-5 Teachers	21	$2,000.00	$42,000.00	$42,000.00	$13,860.00	$0.00
Training for 10 Gr 6-8Teachers	10	$2,000.00	$20,000.00	$20,000.00	$6,600.00	$0.00
District Developed Training Webinar (Used in Yr 3)	1	$0.00	$0.00	-	-	$0.00
Centralized Laptop Management (1 Per School)	8	$1,000.00	$8,000.00	$8,000.00	$0.00	$0.00
Black & White Printer (2 per school)	16	$300.00	$4,800.00	$4,800.00	$480.00	$480.00
Printer Supplies (monthly) (2 per school)	10	$800.00	$8,000.00	$8,000.00	$0.00	$0.00
Projector Screens (4 per school)	32	$100.00	$3,200.00	$3,200.00	$320.00	$320.00
Mobile Projectors for 2 Labs (4 per school)	32	$300.00	$9,600.00	$9,600.00	$960.00	$960.00
Mini-Computers (2 per school)	32	$800.00	$25,600.00	$25,600.00	$0.00	$0.00
Television for Scheduling (2 per school)	16	$500.00	$8,000.00	$8,000.00	$0.00	$0.00
Network Bandwidth (District Cost)	8	$1,920.00	$15,360.00	$15,360.00	$15,360.00	$15,360.00
Access Points (8 per school)	64	$600.00	$38,400.00	$38,400.00	$0.00	$600.00
WAP Controller (1 per school)	8	$2,000.00	$16,000.00	$16,000.00	$0.00	$0.00
Re-wiring drops for rooms (30 per school)	240	$150.00	$36,000.00	$36,000.00	$0.00	$0.00
Interactive Boards (4 per school)	32	$1,500.00	$48,000.00	$48,000.00	$0.00	$0.00
Speakers for transition (4 per school)	32	$200.00	$6,400.00	$6,400.00	$640.00	$640.00
Misc cost per/yr - devices and services (Per school)	8	$5,000.00	$40,000.00	$40,000.00	$40,000.00	$40,000.00
Total				**$1,740,560.00**	**$508,040.00**	**$488,180.00**
				100.00%	29.19%	28.05%
Note: The budget is based on 2400 students and 94 teachers						
Note: These are forecasted numbers						

Implementation

Date	Department	Training/Workshop/Program
July 2017	Technology Department/Administration	Develop the One-to-One Chromebook Initiative for Grades 3-8
August 2017	Technology Department, Curriculum and Instruction department of Belleville School District and the head math teachers at Belleville Elementary and Middle Schools	Train teacher two weeks prior to pre-service week. The training will include Chromebooks, Teach to One: Math, etc..
August 2017	Technology Department	Train teachers on using Chromebooks
August 2017	Technology Department	Distribute a Chromebook to each teacher during pre-service training
August 2017	Technology Department	Distribute a Chromebook to each middle student; each student must purchase Chromebook insurance and sign acceptable use policy
August 2017 – May 2018	Technology Department	Create how-to-videos for teachers on using Chromebooks; the videos will be posted within the county's learning management system within the Instructor Teach to One: Math Class
August 2017	Principals of Belleville Elementary and Middle Schools	Provide a presentation on the Teach to One: Math Program Initiative within school system's vision for the school year.
August 2017	Curriculum and Instruction department of Belleville School District and the head math teachers at	Train Math Teachers on the Teach to One: Math Program; Professional development will consist of two days (8:00-3:00 pm) of trainings during pre-service; the curriculum and instruction department and head math

	Belleville Elementary and Middle Schools	teachers will provide coaching/feedback throughout the school year; the coaching will take place every two weeks in every math class in grades 3-8
August 2017-May 2018	Technology Department, Curriculum and Instruction department and head math instructors	Develop videos, handouts, and lesson plans on Teach to One: Math for teachers and host them within the county's learning management system within the Instructor Teach to One: Math Class

Supporting Research

Basham, Hall, Cater, Jr., and Stahl (2016) in a study of personalized learning in K-12 environments point to its use with students with disabilities as a means by which they can not only be successful but thrive (p.127). The eighteen-month qualitative study viewed personalized learning through a systems approach to identify the characteristics that supported its use with all diverse learners. The authors state the need for a belief that all learners can be successful and that educators are responsible to support student success as necessary for building success. This can be accomplished with teachers acting as designers or engineers of student learning environments (Basham, Hall, Cater, Jr., and Stahl, 2016).

A pretest-posttest control-group design study was conducted on middle school math and science classrooms. Students were randomly assigned to their math and science classes with either 1:1 laptop access or without 1:1 laptop access. The study was conducted over a two-year period. The study focused on the way ". . . to increase efficiency of their current curricular and instructional processes in order to achieve greater success measured by traditional indicators such as standards test scores. . ." (Dunleavy and Heinecke, 2007, 10). The 1:1 students had an Apple iBook which contained Microsoft Office, Internet Explorer, and had access to the following via the wireless network: Glencoe/McGraw-Hill textbook resources, online textbook

access, online resources such as United Streaming, ProQuest, ERIC, PBS Videodatabase, Gale Group, etc.. The researchers compared the students fifth grade math and science standardized test scores to the students' eighth grade math standardized test scores. "The use of a pretest or covariate allowed the researchers to statistically remove any pre-existing achievement differences between the two groups before comparison, in order to ensure that any differences detected were due to the intervention" (Dunleavy and Heinecke, 2007, p. 11). After analyzing the data through SPSS, the researcher noted no significant differences on math achievement. However, the researcher noted an increase in male students English and writing achievement than for female students. This warrants further researcher since reading comprehension is key to understanding math concepts and problem solving skills.

A qualitative case study was conducted at a public elementary school. Elementary math teachers implemented and evaluated math software such as Success Maker, to help students improve their standardized test scores. "When educational software programs are aligned with curriculum, the outcome is (a) improved student achievement and (b) students develop educational skills" (Kiriakidis and Johnson, 2015, p. 56). Math software programs are developed to create math skills for students. The social learning theory defines how one can learn from "collaboration, personal interactions in society, and instruction" (Kiriakidis and Johnson, 2015, p. 57). Math teachers use this theory to "engage students in problem-solving activities" (Kiriakidis and Johnson, 2015, p. 57). "Learning through social interaction leads to cognitive growth and knowledge acquisition. For example, students who use math software, use prior knowledge of math concepts to construct new knowledge in math" (Kiriakidis and Johnson, 2015, p. 57). Math software implemented into math classes improve students' learning such as giving a student immediate feedback. Also, teachers are given online training opportunities

through the math software. The researcher interviewed the elementary math school teachers who implemented the math software. The researcher concluded that the math software was "a useful educational tool that motivated students and provided students with instant feedback. . . and was perceived as a resource helping students improve their proficiency" (Kiriakidis and Johnson, , 2015, p. 61). The teachers also noted that professional development opportunities are needed for successful integration. Professional development needs to target how to use the math software, integration of the software into the curriculum and teaching strategies (Kiriakidis and Johnson, 2015, p. 60).

At the David A. Boody Intermediate School in Brooklyn, New York, John Garuccio used Teach to One (TTO): Math in his math classes. Students within his class take a math quiz within the TTO program, and students complete an individual lesson generated from the math quiz scores within the TTO program. The Teach to One: Math program is created on the ". . . blended learning approach to math that combines small group lessons, one-on-one teaching, learning using software and online tutoring in the same classroom at the same time" (How, 2015, p. 10). Mr. Garuccio's classroom size is 150 sixth grade students. The class is divided into two thirty-five minute sections based upon ability. Students can switch sections daily based upon a daily assessment at the end of the class. The classroom has one math director, five teachers, two teaching assistants and a technology aide (How, 2015, p. 10).

During the 2012-2014 academic school years, Douglas Ready examined the standardized math exam scores after implementing the Teach to One: Math (TTO) program to seven schools in grades 6-8 in 2012-2013 and fifteen schools in grades 5-8 (Ready, 2014, p.4). The schools were in Chicago, New York City, Washington, D.C., Charlotte, North Carolina, and northern New Jersey. The schools were located in urban areas. Majority of the students were black,

Hispanic, Asian, and received free/reduced-price lunch (Ready, 2014, p.5). The TTO students test scores were compared to students national scores on the Measures of Academic Progress (MAP) assessment. Before implementing the TTO program, students had below average math scores. During the 2012-2013 school year, the TTO students "gained mathematics skills at a rate that was roughly 15% higher than the national average" (Ready, 2014, p. 3). Sixth and seventh graders achieved 1.14 years of growth. Eighth graders achieved 1.17 years of growth more than the national average (Ready, 2014, p. 8). Low-achieving TTO students showed at 37% math gain compared low-achieving students nationally (Ready, 2014, p. 10). "Special education TTO students gained skills that were comparable to the national norm (of all students, not only special education students) (Ready, 2014, p. 11). During the 2013-2014 school year, the TTO students gained "almost 47% above that national norms" (Ready, 2014, p. 3). Fifth graders obtained a 28% compared to the national average "while the sixth, seventh and eighth graders gained sills at rates there were 28%, 73% and 43% above their national norms" (Ready, 2014, p. 14). Low-achieving TTO students showed at 81% math gain compared low-achieving students nationally (Ready, 2014, p. 15).

Assessment

Assessment of the TTO initiative for the Belleville school district grades 3 through 8 will be summative and formative in design. Student growth will be based on their initial placement level and for each performance level within the TTO format. These scores will be analyzed and compared to students' state assessments scores for PARCC and Dynamic Learning Maps in order to evaluate the effectiveness of the program. Also, the students' scores will be compared and contrasted from their 2016-2017 standardized math scores to their 2017-2018 standardized math scores. The Curriculum and Instruction department of Belleville School District and the

head math teachers at Belleville Elementary and Middle Schools will analyze the data during June 2018 - July 2018. After the data has been analyzed, the data will be used to develop the math course design for the 2018-2019 school year.

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Appendix 1: TTO Math Modalities Description

Modalities

Teach to ONE Math

Traditional teacher-led class instruction is just one learning modality, or instructional approach. *Teach to One: Math* uses a variety of modalities to personalize instruction for students.

Teach to One: Math Modalities

Pick-up session modalities		
Teacher-led	Live Investigation	15–20 students work with a teacher to explore a particular mathematical concept or skill; teachers can use lessons provided by *Teach to One: Math* or use their own approaches
Collaborative	Small Group Collaboration	Three to six students work collaboratively to solve a math problem
	Peer-to-Peer	Two to three students teach one another strategies to solve a math problem
Virtual	Coached Virtual Instruction	A teacher-supported digital lesson provides instruction related to a particular skill
	Virtual Reinforcement	An independent, virtual lesson reinforces specific concepts and allows students to practice skills
	Virtual Live Tutor	A student works 1:1 with a live virtual tutor located anywhere in the world; students and tutors interact through voice and online chats
Independent	Independent Practice	Students work independently on printed lessons and worksheets to practice specific skills
Task session modalities		
Task sessions	T	Task sessions take place over multiple days. Students use a variety of related skills in real-world applications. For example, students might analyze the costs and benefits of purchasing a hybrid car and use the skills they acquire through this work (e.g., multiplication, estimation, calculating gas mileage) to defend a purchasing decision. Over the course of each task, teachers can draw on a variety of modalities as well as their own approaches.

Appendix II: TTO Infrastructure Minimum Requirements

	Quantity	Minimum Requirements	Recommended Model	NOTES
Laptops	1 for every student in the program + 10% for spares + 1 laptop for each projector/SmartBoard station + 1 laptop for printing station + for alarm software	OS: Windows 7 or OS X v10.5 / CPU 2.0 Ghz / 2 GB Ram. 1024 x 768 screen resolution. Minimum of a 13" display. Dual banded wireless N compatible wifi card	Prefer Windows OS	
Centralized Laptop Management	1 license per laptop	Deep Freeze (Faronics)		
Tablet laptops	12 for every math center + a few spares	OS: Windows 7 / CPU 2.0 Ghz, 2 GB Ram. Minimum of 12" display. Touchscreen plus stylus.	http://www.dell.com/us/enterprise/p/latitude-xt3/pd Dell XT3	Currently using HPs and Lenovos
Black & White Multifunction Printer	1 for every site	45 ppm print/copy speed, at least a 150,000 monthly volume (pages) and at least 3,000 paper capacity (sheets)	Sharp MX-M850 Need a finisher	High output printer, copy machine
Printer Supplies (toner, stapples)	18 toners (two per month, 3 packs printers of staples) [What's the right annual stock?]	Toner and staples to be printer compatible.	Dependent on purchased printers	
Screens	1 for every three sections Sections [need	HDMI input and 46" flat screen display, 1080P		1 per 3 sections
Mini-computers	1 per screen + 1 spare	ASUS EeeBox PC B202 or newer with HDMI and WGA and supports 1080P		used to power and launch the Big Board website
Tablets	1 per staff member (including student teachers and math directors) + 1 spare for every 10		Apple iPad 2 or better.	may want to include covers with hand straps for easier teacher use [Windows Surface Pro only as
Network bandwidth		40 Mbps (EVPL 40)		
Access points	1 per every 25 students in the space and adequate coverage for all classroom space	Bandwith Minimum 300Mbps simultaneous throughput per 25 students, 802.11n recommended / 128 bit encryption industry standard baseline for whatever authentication approach required by distinct IT guidelines / Roaming capabilities there are multiple approaches that provide "roaming" capabilities- the ability for a user (i.e., student) to seamlessly transition between Access Points. Check with your vendor to ensure that some sort of seamless roaming capability is provided.	Cisco AIR-LAP1262N-A-K9 Aerohive HiveAP 120	Wireless N capable model - fastest; handle students faster
WAP Controller	1 per school	A controller that supports the APs being used.	Cisco AIR-LAP1210 or equivalent	
Network connections	30 for every math center	Double hard wire connections every 12 feet throughout the space		more flexibility
SMARTBoards	4-6 per Math Center [1 per homeroom area/ min is 1 per two homeroom areas]	Wall mounted with attached projector or mobile SMARTboards (prefer mobile for greater flexibility)		Prometheum boards okay as well
Laptop charging carts	1 for every Math Advisory section in the math center	Outlets in the rear with rear access panel. Roll away doors instead of swinging doors	http://www.datumfiling.com/products/laptop-cart	
Tablet laptop charging carts	1 for every math center			
Mobile Projectors	3 for every math center		Based on school preference, additional projectors may be needed for each homeroom	Gap between number of homerooms and number of SMARTboards is the number of projectors
Headphones	1 for every student plus a few spares	non-ear buds (more hygenic)		If the school is ok with it, we should have students be reuqired to bring their own headphones. And we can keep a small set to cover when kids forget.
Headsets	12 headsets plus spares	Headsets need to have a uni-directionsal microphone. Headsets must either be USB, or be compatbile with the	Microsoft LifeChat LX-3000 - headset	
Speakers	4-6 for every math center	2.5 Watts, must be able to connect to a laptop, must connect to one central location so that alarms can be run		
Support	1 account for submitting support requests	Some school systems require a school email address in order to submit a support request. OTA's must have the ability to submit a support request directly.		