

Mathematics Curriculum Project:

A 3-Year Strategic Plan for Mathematics Technology Integration

at Luther Conant Elementary School, Acton, MA

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Luther Conant Elementary School Profile

The Luther Conant School is a kindergarten through grade six elementary school located in Acton, Massachusetts, a suburban town in Middlesex County about twenty-one miles northwest of Boston. Acton Public Schools, which has a total of five elementary schools, allows for “open enrollment” and because of this, schools are less oriented around neighborhoods than most towns. Children and parents have connections that reach out further than their neighborhoods due to the open enrollment.

The Luther Conant Elementary School was named for Luther Conant who taught for seventeen years in the school district, served on the school committee, and was town moderator for forty years. The school is a one story building that houses three sections of each grade totaling twenty classrooms due to morning and afternoon kindergarten sharing a classroom. The building layout was designed with five classrooms per building section with each set of five classrooms surrounding a pod area available for large and small group instruction.

The staff is comprised of twenty-nine licensed teachers. There are five hundred students in the school with class sizes ranging from twenty to twenty-six students. Asian students from predominantly Chinese or Indian backgrounds make up the majority of the population at 53.8%. 39.3% of students are Caucasian, and African American, Hispanic, Native American and multiracial make up the remainder of the population. In 2011-2012 there were 2.9% low income students, 5.8% ELL students and 14.3 % special education students enrolled.

The Luther Conant Elementary School has a very active Parent Teacher Organization (PTO) with a website offering information and explaining ways for parents to become involved. Luther Conant Elementary School has a school council comprised of parents and staff which meets monthly to focus on the school improvement plan.

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Strategic Plan: Background

Analysis of 2012 MCAS Scores

The Massachusetts Department of Elementary and Secondary Education (DESE) classifies schools on a scale of one to five with one being the best score based on their annual Progress and Performance Index (PPI) which according to the Department of Education website, “measures the improvement that a group makes toward its own targets over a two-year period on up to seven different indicators” (<http://profiles.doe.mass.edu/>). Luther Conant Elementary School is currently classified as a level two school due to not meeting gap-narrowing goals. However, based on overall MCAS performance, the Luther Conant Elementary School is in the ninety-second percentile when compared to other Massachusetts elementary schools. While this score is a satisfactory rating, there are specific groups that have room for improvement, notably “high needs students” and “students with disabilities.” Both groups have not met their growth target numbers toward narrowing proficiency gaps, as defined by the DESE, using the Cumulative PPI.

In regards to mathematics MCAS scores for 2012, the school had six warning/failures in third grade, nine warning/failures in fourth grade, four warning/failures in fifth grade, and one warning/failure in sixth grade. In 2012, 98% of eligible students participated in the mathematics MCAS, and while the overall student population met the target as well as Asian students, Caucasian students and students with disabilities did not. This illustrates the discrepancy between the school’s overall MCAS results and individual student performance.

For the Luther Conant Elementary School to be considered narrowing proficiency gaps, the cumulative PPI for both the "all students" group and “high needs students” must be 75 or higher. At this time, based on 2012 Accountability Data, “high needs students” had a score of 68

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and “students with disabilities” had a score of 58. Based on 2012 Achievement Data, the Luther Conant Elementary School must address “high needs students” and “students with disabilities.”

Both groups will be the major focus of our recommendations for the future. (See Figure 1)

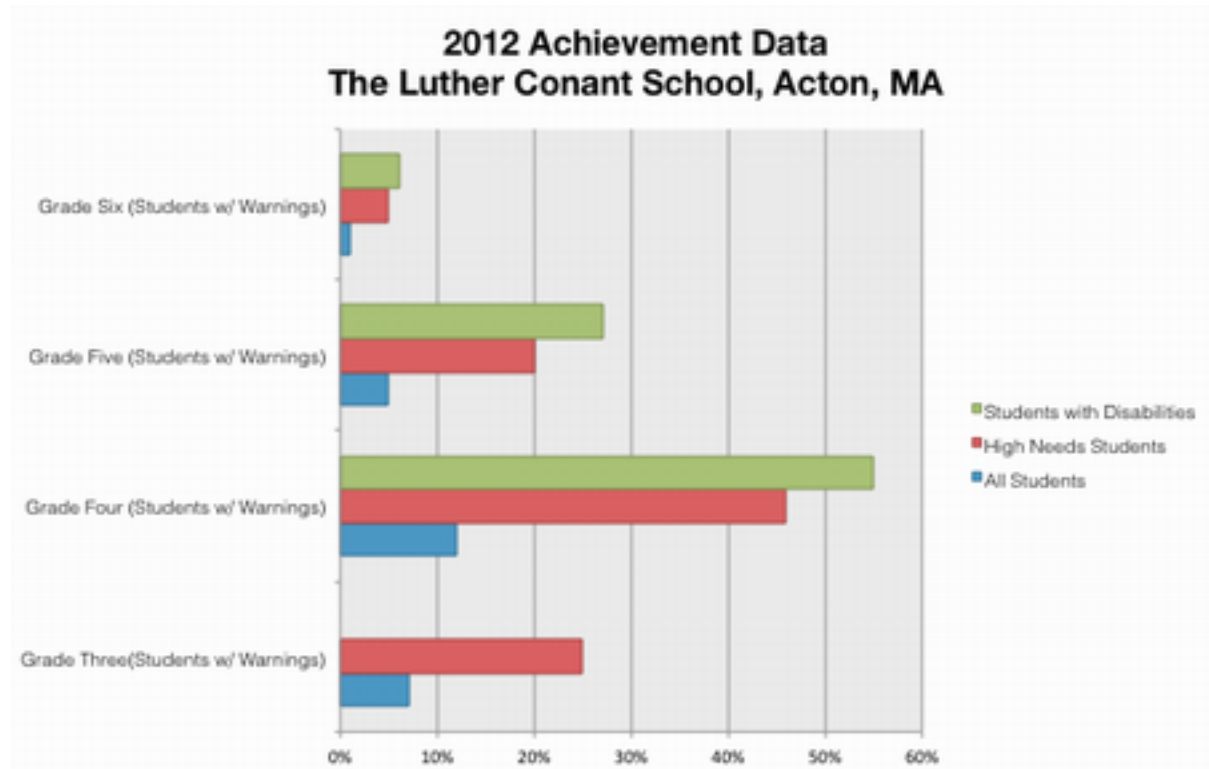


Figure 1. 2012 Achievement Data The Luther Conant School, Acton, MA.

We have identified deficiencies our plan will address by analyzing the 2012 item by item results of the MCAS test on the DESE website. We have listed any standards by grade that had an average score of less than 70%.

Grade 3:

- Standard 3.OA.1.04: Interpret products of whole numbers.
- Standard 3.NF.1.03: Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

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Grade 4:

- Standard 4.NF.2.03: Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.
- Standard 4.NF.3.06: Understand a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.
- Standard 4.NBT.2.05: Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

Grade 5:

- Standard 5.NBT.1.02: Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.
- Standard 5.MD.3.U5: Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

Grade 6:

- Standard 6.EE.3.09: Apply the properties of operations to generate equivalent expressions.

Mathematics Instruction

Each elementary school in Acton Public Schools selects its own programs for

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curriculum instruction and assessments to monitor student growth. At Luther Conant Elementary School grades kindergarten through fifth grade, each classroom teacher provides daily mathematics instruction to his or her class. In grade six, teachers departmentalize for mathematics, reading, and writing instruction; one teacher teaches math to all sixth graders four days a week, with the fifth day used as an assessment day in the students' homeroom.

Students with Individual Education Plans may receive mathematics instruction in a separate one-to-one or small group setting based on their special education needs. A part-time mathematics assistant is available to work with small groups of students on math lessons, reinforcement, or enrichment. However, due to limited time, the assistant cannot work with every class daily, and it is the classroom teacher's decision to use the math assistant in a way that best meets the needs of his or her class. Kindergarten classrooms have full-time teaching assistants who help with small and whole class instruction. Grades first through sixth all have part-time assistants who may or may not work with small groups for math instruction depending on the classroom and assistant's schedule. The role of an assistant is to work with students while in the room; classroom assistants are not used for paperwork and classroom organizational needs.

Grades kindergarten through first use a combination of TERC and Scott Foresman *Investigations*. Using hands-on and inquiry based approaches, students are guided to build on their knowledge of mathematical concepts. Rather than teaching memorized strategies, teachers help students develop their own strategies and approaches to mathematical situations in order to create a deeper understanding of the concepts.

Grades second through sixth have used Scott Foresman/Addison Wesley *Mathematics*. However, during the 2012-2013 school year, grade levels were required to supplement and substitute portions of the program with additional teacher found and created resources due

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to the change in the Massachusetts Curriculum Frameworks for Mathematics. Starting in the 2013-2014 school year, grades second through sixth will begin using Houghton Mifflin Harcourt's *On Core Mathematics* program that is aligned with the Common Core and Standards for Mathematical Practice. Students will have online access to the material as well as student workbooks. Since the materials that encompass this program are aligned with state standards and the student workbook is designed as a consumable, Luther Conant Elementary School has decided to move forward with this program in place of Scott Foresman/Addison Wesley *Mathematics* with the understanding that there will not be a significant loss of investment if the school decides to change to a newer, more improved program in the future as many publishers are currently developing mathematics programs and may further adjust them with the future release of PARCC and Smarter Balance mathematics assessments.

When instructing mathematics, teachers have the option to use their SMART Boards, Ladibug document cameras, and various types of manipulatives. Using these technologies is not required or monitored and may vary from class to class and grade to grade. Additionally, students who work in separate settings such as the communal pod space, math assistant room, and special education resource room do not have access to SMART Boards, classroom laptops, iPads, or document cameras.

Technology Resources and Infrastructure

According to Amy Bisiewicz, Director of Education Technology for Acton Public Schools, technology resources are provided and divided between the five Acton elementary schools by the oversight of the district's director of educational technology (personal communication, June 2013). The Acton Public School District has a \$200,000 technology budget and does not include personnel costs. Of this budget, \$78,000 is designated for the teacher

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Macbook lease program; each classroom teacher was provided a new MacBook Pro for the 2012-2013 school year while the teachers' older versions of MacBook that were previously leased by the district were purchased from Apple and added to upper elementary classrooms. \$10,000 from the budget is designated for printing supplies, and \$25,000 is designated for operational services.

During the 2012-2013 Acton Public Schools began using ABSchools Google Education email accounts and Google apps. Many teachers have created their own classroom websites using Google sites. Starting in the 2013-2014 school year, students in grades third through sixth will have email accounts through Google Apps for Education and access to a number of school apps.

During the 2012-2013 school year, the director of educational technology was allotted additional funds to support a new initiative titled Innovative Learning Program (ILP). Rather than disperse various technology tools across the five elementary schools, teachers interested in acquiring additional technology for their classroom completed proposal applications for the Innovative Learning Program. Through completing a question and answer style submission, teachers explained their reasons for their request and how the technology would meet students learning goals, allow for innovative learning, and prepare students as twenty-first century learners. Fourteen grants were fulfilled in APS requiring approved teachers to participate in a year-long professional development community involving innovative learning. Approved requests were for technology ranging from a few Amazon Kindles to half-class sets of Apple iPads to whole-class sets of Google Chromebooks.

In Luther Conant Elementary School, four teachers received acceptance for their proposals. Starting in the fall of 2013, the art teacher will have seven Apple iPads and one fifth grade class and one sixth grade class with each have a half-class set of iPads. An additional

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sixth grade classroom will have a whole-class set of Google Chromebooks. Some subjects are departmentalized at the sixth grade; this will allow all sixth grade students to have access to Apple iPads and Google Chromebooks starting in the fall of 2013.

The Luther Conant Elementary School's website provides links for students to use including reference, internet research, and online magazine and newspaper sites as well as online activities to help students learn technology skills, how to conduct research, and how to keyboard. The Educational Technology Department (EDTech) also hosts a technology website offering lesson ideas, how-to resources, assistive technology information, and postings of professional development opportunities.

All first through sixth grade classrooms have SMART Boards and Ladibug document cameras. Each kindergarten classroom has a teacher iPad and mounted projector. The school has 150 devices (Macs, iPads, PC's) of which 89 are designated as student computers. There is a mobile Mac laptop computer lab and a part-time technology integration specialist assigned to the school. There is 100% wireless coverage on an aging Aruba networking system that is six years old. The aging system limits the bandwidth and number of connections that can be handled. The wireless devices cannot utilize their faster speeds because of the wireless access point's (WAPS) limitations. The network is a 1 GB backbone with 10/100 edge switches.

The Director of Educational Technology has plans in place for the future and will be upgrading building switches in order to handle all the current and incoming wireless devices and importantly, bring educational technology into the libraries. She expresses that it would be great to see the libraries used as media centers and have wireless access to enhance learning so that technology skills can be acquired more often than just during designate computer class. She would like to see teachers feel more confident about using technology. Presently teachers are

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hesitant to try technology that they don't feel they have expertise in using.

Current District Professional Development

Acton Public Schools offers numerous professional development opportunities that are open to all district staff members. Each summer, during a tech week various teacher and technology department staff offer classes on various technology programs. During the school year, the tech department offers tech-minis, short 2-day, after school courses on various technology tools, along with more extensive semester-long technology courses. Technology courses cover topics such as using Ladibug document cameras, SMART Boards, Discovery Education, Google Drive, and iPads to enhance classroom instruction. Summer, spring, and fall courses on curriculum subjects such as mathematics are also regularly offered. During the 2012-2013 school year two examples of courses offered included formative mathematics assessments and using manipulative for instruction in fractions. While educators must obtain professional development credit as part of maintaining their licensure, participation in these programs is not contractually required. Sometimes, due to a lack of enrollment, classes must be canceled. While participation in most professional development earns staff professional development credit, some programs offer stipends.

During the school year, Acton Public School teachers meet for one whole-district professional develop day, and each grade level meets for one grade-level professional development day. The content covered for these days varies each year based on district and state initiatives. Luther Conant Elementary School holds one teacher staff meeting per month and one curriculum meeting per month before or after school. While the focus of monthly staff meetings often revolves around district and school based needs, the curriculum meeting is focuses on teacher, grade-level, and school goals; during the 2012-2013 school year, curriculum meetings

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focused on meeting the school's writing school improvement plan goal.

Three Year Strategic Plan

As a part of our group's strategic plan moving forward, the following recommendations are needed to improve deficiencies and MCAS performance gaps using the available budget as a guide. We believe technology is an essential tool for the improvement of the Luther Conant Elementary School's mathematics curriculum instruction and can greatly enhance teacher delivery of engaging, effective math instruction and, in turn, student success. In order to provide a technologically infused educational environment, every learning environment must be equipped with diverse technologies to support teaching and learning, and every teacher must be knowledgeable and skilled in the use of these technologies in daily instruction.

Our approach to improving math scores through technology is guided by these three main goals:

1. Maintain and enhance student access to technology at school and math applications as integrated with the current proven curriculum along with changes in the near future.
2. Provide teachers and students with the tools and support to effectively and efficiently use technology to positively impact and improve math learning.
3. Enable children to be successful with a variety of devices and function in a variety of technology environments both from home and at school.

If students are to succeed as twenty-first century learners, they must be technologically literate and have regular access to up-to-date technology that supports their learning. We have designed necessary add-ons to the existing math curriculum aided with educational tools that will improve the school's ability to meet the needs of the staff, students and families.

Research Summary

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The team does not present the following plan lightly. We understand the pressures that educators face on a daily basis when trying to effectively implement curriculum and balance the numerous demands required of a teacher. With that said, it is important to note that research shows that students across the nation are struggling in math and performance gaps continue to increase. Students struggle with the most basic of math concepts, and students with learning disabilities continue to fall further behind. Steps must be taken to ensure that these gaps are filled. (Hasselbring, et.al.)

For schools to close this achievement gap and meet the federal guidelines set forth by the No Child Left Behind (NCLB) Act, they must see that all students achieve academic proficiency. Technology-based innovations can form the basis of effective approaches to help students who have difficulty with math strive to achieve parity with their peers. (Hasselbring, et.al., p.1)

Educators strive to provide instruction that supports their students' abilities to develop a meaningful understanding of the processes required for solving mathematical problems. They do not want their students to simply memorize answers, but rather gain a true understanding of the material being presented.

Technology can change the nature of school mathematics by engaging students in more active mathematical practices such as experimenting, investigating and problem solving that bring depth to their learning and encourage them to ask questions rather than only looking for answers. (Goos, 2010, p. 68)

Students must develop a deeper understanding of mathematical concepts, and one way in which educators can do that is by using technology to enhance the math curriculum. With that said, high-quality professional development is a necessity. In order for educators to successfully

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implement technology in the classroom, they must be familiar with the content they are teaching, as well as aware of the technology they have available to use in their classroom. Educators must receive professional development consisting of:

sustained, rigorous, and cumulative programs that are directly linked to what teachers do in their classrooms. In concert with the idea of providing authentic experiences, these professional development programs need to provide inservice teachers with opportunities to collaborate in planning lessons, to practice and share new teaching methods, and to practice solving problems with peer teachers. Recognition of the success of peer-coaching and peer observations in their classrooms is essential. (Niess, 2006, p. 198)

If educators are provided with the type of professional development noted above, they will be better prepared to successfully utilize technology as a teaching tool within their classrooms. Technology teaching tools are abundant and the “identification of best practices necessary to effectively implement math instruction with the help of technology” (Hasselbring, et.al., p.1) is needed in order to efficiently and effectively implement the tools in the classroom.

The overarching goal of incorporating technology as an instructional tool is to improve student performance in math. Technology can transform students’ ability to access the math curriculum at your school. Goos (2010), describes the transformation that technology can have on educators and students using four similes. If technology is the *master*, technology can limit the possibilities educators and students see when problem solving. They struggle to see beyond what technology tells them. Technology can also turn into a *servant* when it is used primarily as a fast track to solving math problems, with little room for other activities to be included in the presentation of the content. If technology is a *partner*, then it allows the teacher and student to think about math in a variety of ways and opens up doors to new ways of thinking.

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Lastly, technology can be seen as an *extension of self*, when it is seamlessly incorporated into day-to-day learning experiences. Technology is no longer seen as a cumbersome tool that one has to use, but rather, it is a tool that is effortless and easy to manage. Technology will change teaching practices and allow students to explore different avenues for problem solving and accessing new material. This is the change we expect our Three Year Strategic Plan to have in Luther Conant Elementary School.

Year One Plan Overview:

- Build on using current technology and professional development system and address immediate discrepancy in technology access for out-of-class instruction
- Work with teachers who are receiving Apple iPads and Google Chromebooks to incorporate their use into math instruction
- Upgrade infrastructure to maintain online access
- Create school improvement goal around narrowing MCAS and overall performance gap; spend curriculum meetings focused on creating models around Ladibug camera and building math website resource
- Purchase 15 iPads for use in special education resource room, math specialist room, and pull-out spaces with special education and classroom assistants. (combination special education assistive technology, math materials and technology budget)
- Purchase a class set of ipads to be distributed to classroom, special education and specialist teachers
- Train all special education staff, math specialists, and other staff working with math pull-out groups on iPad math functions
- Design district professional develop day around iPad 2 training

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- Tech Tuesdays focuses on Ladibug and Google drive
- Create committee to examine and test math assessment similar to DRA2 reading assessment to track student growth from beginning to middle to end of year
- Create teacher group to pilot IXL Math and Study Island in class and develop plan for implementation in 2014-2015 school year
- Assist teachers interested in ILP with writing proposal submission in spring

Year Two Plan Overview:

- Continue to support ILP
- Continue to offer Tech Tuesdays
- Purchase 1-2 student iPads for teachers who were highly involved in Tech Tuesdays
- Evaluate iPad use with special education and small group instruction and order more or adjust teacher support as needed
- Purchase two class sets of Apple iPad 2's for use in grades kindergarten and first
- Purchase IXL and Study Island memberships, use common planning time and curriculum meetings to support teacher use, and evaluate IXL and Study Island memberships in spring
- Evaluate growth of high risk population with math MCAS data and teacher assessment data during curriculum and common planning time meetings
- Implement math assessment selected by committee during previous year; use curriculum meetings to support teachers in administering and scoring test, interpreting data, and applying the data
- Assist teachers interested in ILP with writing proposal submission in spring
- Evaluate iPad use in K-1 classrooms in spring

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- Allow time for teacher collaboration during curriculum meetings to review best practices

Year Three Plan Overview:

- Continue to support ILP
- Purchase two class sets of Apple iPad 2's to be shared in grades kindergarten through second grade
- Assist teachers interested in ILP with writing proposal submission in spring
- Evaluate iPad use in K-2 classrooms in spring
- Continue to train teachers on iPad, Study Island, IXL Math, and formative assessment use including instruction, assessment, management, and analysis during curriculum and common planning time meetings

Professional Development Plan

While the Acton Public Schools will continue to offer summer and semester-long professional development opportunities, additional efforts are recommended to increase participation in this optional professional development. The Acton Public Schools' technology department and mathematics coordinator will team up to develop two-day, two-hour math-tech mini-courses similar to the currently offered tech-minis. However, these courses will be designed with a focus on using current technology to improve mathematics instruction. Courses may focus on the online components of the *On Core Mathematics* curriculum, Ladibug document cameras, Web 2.0 tools, Google Drive, Discovery Streaming or SMART Board Notebook.

These courses called Tech Tuesdays will be designed as two two-hour meetings held one month apart on Tuesdays after school. Since the technology budget for the district is not divided between the schools; this program can be open to all Acton Public School teachers, including special education teachers. Meeting on Tuesdays will allow teachers to still participate in the

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lengthier professional development programs often offered on Thursday afternoons.

During the first two-hour meeting, teachers will learn how to best use the focused technology, create a shared Google Doc to brainstorm ways to use the tool with mathematics instruction, and individually create a mathematics lesson that implements the technology and is applicable to their current students. An additional Google Doc will be created as a question and answer form allowing teachers to post questions about using the tool and receive peer and technology and mathematics specialist feedback. Teachers will be encouraged to reference and add to these shared documents between the two class meeting times. Also between the meetings, teachers will implement the mathematics lesson in their own classrooms and write a reflection on the effectiveness and impact of the technology on the lesson. The teacher may choose to implement the tool in additional ways. During the second meeting, teachers will spend the first hour sharing their experiences using the tools and develop additional ways to improve mathematics instruction through the use of this technology. The second hour will be spent in breakout sessions where teachers create podcasts demonstrating some of the uses. These podcasts will be posted on the EDTech district website.

Teachers who attend these math-tech minis will earn Conant Bucks which when accrued will be used to purchase additional technology such as an Apple iPad, Google Chromebook, or website membership for the classroom. The success of this program will be measured by participant evaluations and level of participation. If found to be successful after the 2013-2014 school year, the course request ideas will be taken from staff for continued implementation of Tech Tuesdays.

Teachers taking part in the ILP program will continue the program's requirements of maintaining communication and sharing their technology application through their Google+

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community comprised of other participants across the district with the same ILP technology.

They will maintain shared Google documents related to their work and take part in monthly ILP meetings to help them reach their previously established goals. In the spring, new goals will be set for the upcoming school year with a focus on improving mathematics instruction and student understanding through the use of technology.

Continue to Support Current Programs

Each year, the district will continue to support the ILP based on the allotted funds made available through the Acton School Board's approved budget. The Acton Public Schools Technology Department will approve as many ILP proposals as possible. Teachers interested in applying for the ILP program for the 2014-2015 school year will receive support in completing the proposal forms from current participants and technology staff. Through the ILP, Luther Conant Elementary School will continue to add technologies such as Google Chromebooks and Apple iPads to its learning environments. Acton Public Schools will continue to support and replace teacher Apple Macbook laptops on a three-year cycle and buyback teacher laptops at a significantly reduced cost when leases expire. These former teacher laptops will be divided between classrooms for student use.

School Improvement Plan

Every year, Luther Conant Elementary School develops a school improvement plan with building-based goals. To ensure collaboration and focus on whole-school integration of technology into mathematics instruction, support teachers during the second year of implementation of the Massachusetts Curriculum Frameworks for Mathematics, and provide support to teachers in grades two through six who are working with the new *On Core Mathematics* program, the next three school years, a mathematics school improvement goal

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will be formed around narrowing the mathematics MCAS and overall performance gap shown through MCAS assessment data. The goals will focus on applying technology toward instruction, differentiated reinforcement and enrichment, access to math resources, and tracking of student progress.

The 2013-2014 goal will be based primarily on the integration of the Ladibug document cameras into classroom instruction and the creation of a mathematics resource website. To ease initiative fatigue and streamline focus, teachers will be encouraged to relate their personal teacher goals to this school improvement goal as well. Teachers and technology support staff trained in using the Ladibug document cameras will work with grade levels during the September staff curriculum meeting to ensure all teachers are comfortable implementing the technology for modeling math manipulatives.

Multiple teachers created their own Google sites classroom websites during the 2012-2013 school year. Additional website construction support will be provided for teachers in the 2013-2014 school year. Monthly curriculum meetings will be spent creating an extensive kindergarten through sixth grade math website that will provide resources for parents, students, and teachers. The main format and layout of the site will be created by the Technology Department. From the main page, teachers will have password-protected access to lesson plans and other instructional material to ensure all teachers have access to the same resources. The other two components of the site will include student resources for practice, homework, and review and parent resources that will include additional resources on changes to the mathematics curriculum and Massachusetts Curriculum Frameworks.

Teachers will have editing privileges on the Google site to create and edit the site. Teachers will use one of their three weekly common planning times to work on upcoming

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mathematics instruction units. As they create their units, teachers will use curriculum planning meetings to post the upcoming units' resources. Included in these posted website resources will be teacher created videos of math modeling with manipulatives. The Ladibug document camera will be used to create these videos. Creating these videos before instruction will allow teachers to practice using both the document camera and the manipulatives prior to instruction. Making these videos available on the math website will allow students and parents to view the same math models used in class from home. The math website will be modeled after Acton's Paul P. Gates Elementary School's grade six math website (<https://sites.google.com/a/abschools.org/gates-math-6>). The overall goal of the creation of the website will be to streamline materials into one location, allow for easy sharing of resources between teachers, and promote math support and communication at home.

Formative Assessment Committee

During the 2013-2014 school year, a committee consisting of representatives from administration, special education, and lower, middle, and upper grade levels will be created to determine the selection of a school-wide formative math assessment to track student progress in all grade levels through collection of data during the fall, winter, and spring. The committee will meet once a month after school. Meeting time will be spent researching assessment options that will be tested in the committee members' classrooms to weigh the pros and cons of the options available. By the spring of 2014, a selection will be made with a plan in place for digital collection, organization, and storage of assessment data. The selected formative assessment will be implemented school-wide during the 2013-2014 school year. Teachers will receive training in the administration, scoring, and digital data collection for this assessment during their September curriculum meeting. This data, along with MCAS and math unit assessment data, will

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be used to monitor student growth and drive curriculum instruction. Part of the 2014-2015 school improvement plan will involve the implementation of this assessment.

Wireless Access

During the 2012-2013 school year, there is strong need to update of the building's wireless access points, with an aim to provide high-speed wireless connection to the Internet at gigabit speeds. The limitations of the current Aruba wireless infrastructure will need to be replaced, using existing wiring and locations. This necessary bump in high-speed access to the Internet and local network files will allow Luther Conant Elementary School's current mobile computing needs to be addressed with appropriate bandwidth for the present and in the future.

In the near future, in order to take advantage of a Bring Your Own Technology (BYOT) plan, implementing a strong wireless network will provide seamless integration for future endeavors. In addition to an eye on the future, having proper wireless infrastructure provides a backbone to complete any further objectives in our current plan.

Making Technology Accessible for All Students

While a significant majority of students with special education needs related to mathematics receive their mathematics instruction outside of the classroom, very few technology resources are available for instructional use outside of the classroom. Through the purchase of fifteen iPads, instructors working with students receiving special education or intervention services will have access to technology for instruction. Remedial math and interactive math apps will be purchased for use. (Please see iPad Math Apps below.) Five laptops from the mobile computer lab will also be designated for special education instruction. Laptops and Apple iPads will be signed out using a Google Calendar accessible through school email accounts.

Creating the math resource website will allow all special education instructors access to

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the same resources used in the classroom. Instructors will be able to use the same video models and interactive sites students will use. Significant support will need to be implemented for instructors; therefore, the district professional development day will be used to train all support staff in the use of iPads and computers as assistive technology and instruction. An additional day of training will be implemented through the use of substitutes in September to provide an initial day of iPad training for those using the iPads directly with students. These hourly paid staff members will also be paid for participating in curriculum meetings focused on mathematics instruction through technology. Educators desiring additional support can request the building technology assistant take part in a few math lessons or schedule separate one-on-one meetings with the technology assistant. The effectiveness of the integration of technology into small group math instruction will be measured and assessed through student MCAS, formative, and other summative assessment data.

Apple iPad Program

During the 2013-2014 school year, every classroom, special education, and specialist teacher will receive a Apple iPad 2 and receive training during the November district professional development day. Teachers will be trained on the use of apps for instruction, practice, video-making, and formative assessment data collection purposes. Teachers will be expected to use the Apple iPads to enhance lessons through virtual manipulatives and providing students opportunities to demonstrate their understanding by creating recordings of their problem solving strategies through apps such as Educreations. Teachers needing additional assistance with implementation of the Apple iPad in their classroom can receive support while teaching from the building technology assistant or in one-to-one meetings during prep time. Based on the number of iPads currently in the building, 23 Apple iPads 2s will be purchased at the cost of

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approximately \$12,657.00 (<http://apple.com/education>).

Beginning in the 2014-2015 school year, the Technology Department will request an increase of approximately \$50,000 in the technology budget to allow for the purchase of class sets of iPads for use in classrooms across all five elementary schools. Class sets of iPads will be purchased two-class sets at a time and shared in lower grades until there is a 1:1 ratio of iPads to students in grades kindergarten through second grade which will occur in the 2017-2018 school year. Teachers will sign out the iPads using a Google calendar accessible through email.

Apple provides educational pricing for iPad 2 tablets when purchased in packs of ten, lowering the price from \$399.00 to \$379.00, per tablet. In addition, purchasing a two-year extended warranty for \$99.00, along with a \$24.99 case from Brenthaven (<http://brenthaven.com>) for protection from handling and drops will be key to ensure a successful Apple iPad program. Finally, in order to secure the Apple iPads from theft and to assist in charging overnight, the purchase of a Bretford mobile cart for \$1,079.00 is recommended (<http://cdwg.com>). The cost to complete the iPad 2 mobile cart is \$13,754.00.

Student access to Apple iPad 2 tablets will inspire creativity and hands-on learning with features not found in any other educational tool. Powerful built-in apps and a collection of hand-selected apps by the math specialist will allow students to engage with content in interactive ways. The iPads will also allow for differentiated practice, skills reinforcement, and enrichment allowing teachers to support students without the use of RTI since it is not present in the district. Teacher iPads will also be equipped with mirroring software and Splashtop Streamer, two programs currently used in Acton Public Schools. The mirroring software will allow the teacher to display the iPad image on the SMART Board to demonstrate the operation of apps to students as a whole while student follow along step-by-step on their individual iPads. Splashtop Streamer

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will allow the teacher to use the iPad to control the laptop displayed on the Smartboard. While students work in their math *On Core Mathematics* student books, the teacher can model work on the Smartboard using the iPad as he or she walks around the room monitoring student work. This will allow the teacher to adjust to the students' needs while progressing through the lesson.

The technology department will set up an App Volume Purchase Program (VPP) account with an initial \$200.00 balance to purchase the iPad math apps below and future apps. VPP provides an educational discount when purchasing 20+ apps at a time. This will make the apps the school is using readily available online as a resource for personal iPad use as well as similar links that can be used from laptops and other tablets.

The following apps are aligned with the Massachusetts Curriculum Frameworks for Mathematics. These apps are for students to access independently for additional practice and reinforcement of skills since Luther Conant Elementary School does not have a form of RTI in place. Teachers will monitor students for assistance needs. Some of these apps are free and some have a low cost. The cost of apps will be funded by the technology department; however, teachers will have the ability to add their own apps to the iPads should they choose to fund their own personal purchases. Educators using the iPads will maintain a shared Google spreadsheet to document the pros, cons, and application uses of each app for future reference.

Apple provides a free application for managing both the software and settings on iPads as well as the details of app purchases called Apple Configurator. Apple Configurator will be used exclusively for the management of this Apple iPad program.

- Math Puppy (Free)
- Hungry Fish (Free)
- Elevated Math (Free)

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- Bitsboard (Free)
- MathBoard (\$4.99, \$2.49 when purchasing 20 or more through VPP)
- Rocket Math HD (\$0.99, \$0.49 when purchasing 20 or more through VPP)
- Math Pro!!! (Free)
- Math Drills (\$1.99, \$0.99 when purchasing 20 or more through VPP)
- Math Slide: Tens and Ones (Free)
- Motion Math Zoom (Free)
- Educreations (Free)
- Virtual Manipulatives (Free)

Google Apps for Education Portal

Starting in the 2012-2013 school year, students from third through sixth grade will receive a school-issued, web-based Google Apps for Education account allowing for access to document creation, collaboration and file storage online as well as one-way e-mail access with faculty, which facilitates communication and collaborative learning. Teachers can administer math assessments with the student's Google Apps for Education account and Google Forms. Teachers will receive instant feedback on student strengths and weaknesses. A Tech Tuesday course will focus on the use of these apps for math and other curriculum area instruction and demonstration of student learning. Teachers working with students on Individual Education Plans and 504's will be required to maintain shared Google spreadsheets that will be used to monitor student behavior and performance from one learning environment to another. To ensure confidentiality full student names will not be posed on these documents, and they will only be accessible through password protected Google Drive.

Study Island Proposal

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Our team recommends that the school purchase a Study Island membership for all students, grades two through six for the 2014-2015 school year. However, during the 2013-2014 school year, volunteer teachers representing the lower, middle, and upper grade levels will initially pilot the program with their classrooms to become “expert teachers.” These teachers will meet on a monthly basis to discuss their use of the program and how to best utilize the program for differentiated instruction and student at-home practice. Together, they will create a projected plan of implementation at grades two through six for the 2014-2015 school year. This trial year will allow teachers in grades two through six to master the new *On Core Mathematics* program before being required to implement Study Island and thus avoid initiative fatigue. The expert teachers will receive Professional Development credit for serving on this committee and helping acclimate the remaining staff to the program during the 2014-2015 school year. They will work with teachers during curriculum and common planning time meetings. After a two-year span, in the spring of 2015-2016, student MCAS scores and formative assessment data will be analyzed to determine the effectiveness of the program.

We believe the school should order the MCAS Preparation program, specifically designed for Massachusetts students, grades two through six. The school should focus on buying a membership for the math portion, which according to the Study Islands website would cost \$3.70 per child (<http://studyisland.com>). Based on the current population, the total cost would be approximately \$1,362.00. This total includes the 348 children currently attending and entering grades two through six, as well as a buffer of an additional twenty subscriptions for newly enrolled students.

Study Island is created and organized specifically around the Massachusetts Curriculum Frameworks and Common Core Standards. Students are able to access the program wherever

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they can log on via the Internet. Software installation is not required, thus making the product accessible anywhere with an Internet connection. This will allow students to access the program in school and at home if they have Internet access.

Study Island is research-based. There is quantitative data that it has proven effective in increasing student learning and achievement. The program is based on state standards and allows students to interact with the program in a way that best suits their learning styles. Students can choose from standard test formats or interactive game formats. The content is dynamic and constantly changing, a variety and depth of problems are posed to users, and the format of the program is constantly changing, which makes it more engaging for students. Because of these features, students are prevented from memorizing answers and are able to create a deeper understanding of the material.

The program provides lessons and questions, which are specific to Massachusetts frameworks. Upon completion of a question or activity, the student receives immediate feedback and automated instruction. When students provide incorrect answers, they are shown the correct answer along with a detailed explanation of the correct response. If students continue to struggle with a specific concept, Study Island prompts them to work on remedial-level material for that concept.

Educators are able to access progress reports, which can enhance their ability to differentiate instruction in the classroom. Statistical data is provided for each student. The statistics measure progress, streamline the learning process, and can be customized by student, subject, class, grade and school. The data collected will improve instruction, differentiation and intervention.

IXL Math Proposal

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Our team also recommends that Luther Conant Elementary School purchases a subscription to IXL Math for the 2014-2015 school year. We propose following the same procedures for implementation that will be used for Study Island using the same committee of teachers to ensure both programs are integrated into the *On Core Mathematics* program in a seamless, effective manner. As with Study Island, IXL Math will be evaluated for effectiveness in the spring of 2016 based on MCAS results, formative assessment data, and teacher feedback.

Ordering fifteen classroom subscriptions, all students in grades two through six will have access to the program. According to the IXL Math website and based on the current student population, the approximate cost would be \$2,985.00 (<http://ixl.com>). This total includes the 348 children currently attending and entering grades two through six, as well as a buffer of an additional twenty subscriptions for newly enrolled students.

IXL Math is aligned with the Massachusetts Curriculum Frameworks for Mathematics. Software installation is unnecessary for this program; it is available through any computer with Internet access; therefore, students will be able to practice and review skills taught in class wherever they can access the Internet.

The content of IXL is constantly changing, and the possibilities for practicing skills are infinite. The math problems are presented in a variety of forms such as: word problems, visual representations, and interactive activities. The approach is multidimensional and works to keep students engaged and motivated in their learning. When students correctly complete a problem, they move onto another that is slightly more challenging. If they answer a question incorrectly, the program offers specific feedback and support. This design allows for differentiated practice by supporting advanced students with exposure to more challenging problems and by providing scaffolding to students who require more practice with remedial math skills. Not only does this

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benefit each student, but it is also beneficial to teacher who will spend far less time gathering material for homework thus being able to spend more time focused on planning curriculum instruction. IXL Math constantly re-assesses students in order to assure mastery of math topics using a proprietary algorithm designed to give the most accurate information on students' progress.

Educators receive reports and data on student performance with the ability to track whole classes or individual students, access data on proficiency in skills, and view class improvement and trouble spots. Teachers can use the program to provide extra practice and reinforcement for skills taught in school. Incentive plans can be created to support and encourage students to use the program frequently outside of school. Because the skills do not need to be completed sequentially, teachers can assign specific strands based on what is being taught in school. Parents are also able to access their child's progress, thus increasing the home-school connection.

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Appendices

Copy of correspondence between Amy Bisiewicz, Acton Public Schools Director of Technology and Sara Wilcox:

On Fri, Jun 28, 2013 at 10:17 AM, Amy Bisiewicz <abisiewicz@abschools.org> wrote:
My overall APS budget is \$200,000 (personnel costs are not included in this number) in which \$78,000 goes towards the teacher macbook lease, \$20-25,000 operational services, \$10,000-ish to printing supplies...I had another lease payment for \$50,000 that is off the books now, which is how i'm paying for some of the ILP technology....Prior to this development, I had about \$25,000 to spend in end of the year money, now I have more...

On Wed, Jun 26, 2013 at 11:52 PM, Sara Wilcox <swilcox@abschools.org> wrote:
Amy,
This is awesome! This gives my team a lot to work with. Our focus with this project is really going to be a plan of how Conant or another school with similar tech could use the technology to improve math performance. I don't really think we need to meet tomorrow based on all of this info. If you can't share the financial plan/budget, whatever it would be called, that is fine. If you can or have something basics you can forward to me that would be great as well. Thank you for all of you help; this is great information and exciting! I was just reminiscing with the Gates library specialist, Judy O'Brien, about how eight years ago during my first year at Gates she and I were determined to find a way to get a Smartboard into Gates. This progress is awesome!

Thank you!

Sara

On Wed, Jun 26, 2013 at 12:48 PM, Amy Bisiewicz <abisiewicz@abschools.org> wrote:
Here's some starting information, let me know if you need more insight or other data to assist.

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Conant currently has 150 devices (macs, iPads, PC's) in which 89 are designated as student computers. Next year, we'll be adding a 25 unit macbook cart (for 3-4 grades) and 15 iMac desktops for the computer lab. All kindergarten teachers have iPads and mounted projectors in their rooms (hoping that would take the place of smartboards) and all classrooms grades 1-6 have smartboards. Each teacher has an assigned Ladibug doc camera in their classroom.

Infrastructure: There is 100% wireless coverage on an aging Aruba networking system (5-6 years old). The reason they are aging is that the wireless access points (WAPS) only support b/g connectivity which limits the bandwidth and amount of connections they can handle. Currently all wireless laptops/devices we receive have "n" antennas built in, but they cannot utilize the faster speeds because of our wireless access points limitations. For the ILPs to be successful we will be purchasing new WAPS and mount them near the 1 to 1 classroom pilots! (you'll be getting one!). Our network is currently a 1GB backbone with 10/100 edge switches. However, we will be upgrading this over the summer to support 10GB backbone with 10 GB edge switches. The WAPS and security cameras will be on this new network which will operate as separate from our wired infrastructure. In planning this, we realized that the world has moved to wireless, so there will continue to be less demand on the wired network as the years go on, so it didn't make sense to overhaul all of the switches.

I didn't talk about financials here, is that something you are interested in as well?

On Tue, Jun 25, 2013 at 7:31 PM, Sara Wilcox <swilcox@abschools.org> wrote:

We are supposed to gather school information as soon as possible. We have to complete the course by July 8th.

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On Jun 25, 2013, at 10:15 AM, Amy Bisiewicz <abisiewicz@abschools.org> wrote:
yes i can help! What is your timeline for the information that you need?

On Mon, Jun 24, 2013 at 6:50 PM, Sara Wilcox <swilcox@abschools.org> wrote:
Hi Amy,

I am taking an instructional technology for teaching math graduate course through Framingham State this summer and am wondering if you can help me with the final project.

I am working with a group of teachers to create a mock plan for improving student AYP in math for an elementary school. We are supposed to act as if we are technology directors and using technology to improve math performance.

Would you be interested in allowing us to use Conant as a sample school? If so, I would need to find the following information about Conant or Acton:

- information on the technology resources and infrastructure within the school building
- overall technology plan funding for the school or district for a three-year period.

Thanks!

Sara

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