Making Learning Mobile 3.0

Falconer Elementary School
Project Evaluation Results
2014/15 School Year

The Double Bottom Line with Mobile Learning:
Closing the Homework Gap and Enhancing Student Achievement

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Making Learning Mobile 3.0:

The Double Bottom Line with Mobile Learning

Closing the Homework Gap and Enhancing Student Achievement

Results of the Project Evaluation Study

Prepared by Project Tomorrow® for Kajeet®

"I think having the tablets is great. I've been learning more and studying more than I used to and I think it is because of the tablets. If it wasn't for the tablets and the Internet, I would not be a very good student this year."

- 5th grade student

About the Study

The goal of the three year Making Learning Mobile (MLM) Project was to evaluate the benefits of mobile learning by providing every student and teacher with an Internet-connected tablet for use at school and at home. Specifically, this project was developed to evaluate how ubiquitous connectivity, in school and out of school, facilitated greater communication between teachers and classmates, extended the learning day, allowed students to develop digital citizenship skills within a safe and secure learning environment, and supported enhanced learning and greater student achievement. In its third and final year, the project was implemented during the 2014-15 school year with 5th grade students at an urban K-6 school, Falconer Elementary School, located on the northwest side of Chicago. Kajeet sponsored the three-year Making Learning Mobile project with funding from the Qualcomm® Wireless Reach™ initiative. This report documents the evaluation results with quantitative and qualitative data collected from the students and teachers involved with the third year of the study at Falconer Elementary School.

During the first year of the project (the 2012-2013 school year), the research focused on how the 5th grade students used the tablets at school and at home to support enhanced learning. A key finding from the first year was that the tablets increased student engagement in learning in the classroom, and the enhanced home access to learning resources positively transformed student behaviors and self-efficacy around learning. Another key finding from the first year implementation was increased awareness of the need for more teacher professional development, specifically around instructional strategies and tools to support mobile learning. A more detailed explanation of the research findings from this first year of the project is available at http://www.kajeet.net/hubfs/Making-Learning-Mobile-1.0-Falconer-Report.pdf.

For the second year of the project, the evaluation research continued to focus on student use of the devices as essential learning tools, but also incorporated a greater emphasis on the process of teacher adoption and integration into daily instructional process. A key finding from that evaluation study was the impact of the tablet usage on students' reading and writing proficiency. Additionally, since the second year of the project included a more focused approach to teacher professional development, the impact of that training represented a significant finding. The teachers' increased comfort using the mobile devices was evident by the level of integration of the tablets into everyday instruction and a new project based learning orientation within the 5th grade classrooms. Subsequently, this new classroom paradigm resulted in greater student self-efficacy and more self-directed learning taking place outside of class. A more detailed explanation of the research findings from the second year of the project is included in a report that is accessible at http://www.kajeet.net/hubfs/Making-Learning-Mobile-2.0-Report.pdf.

The third and final year of the study builds on the foundational findings from year one and year two to more fully explore the impact of using always connected mobile devices on teacher effectiveness and student learning, and how that capability enables new ways for both teachers and students to extend learning beyond the classroom experience or school campus.

Key Study Findings from Making Learning Mobile 3.0

The key findings from the third year of the implementation of Making Learning Mobile project include:

1. The tablet became an indispensable learning tool for the students; 69 percent of the 5th graders said they used the tablet everyday to support their learning this school year.

2. The tablets enabled greater communications between students and teachers. While only 6 percent of the students said they regularly emailed their teacher in 4th grade; in 5th grade 51 percent of the students reported communicating with their teacher at least weekly outside of class.

3. Students attributed many key benefits to the use of the tablets within their learning environment including development of college and career ready skills, developing new learning habits or behaviors and building up their self-efficacy as a learner.

4. Teachers' skill, motivation and readiness to integrate the tablets and connectivity within instruction impacts students' perceptions of the value and the effectiveness of the learning experience.

5. Purposeful integration of the tablets within math instruction resulted in higher student attainment and growth on the district's standardized assessment tests.

About the Study Participants

The Making Learning Mobile 3.0 project (MLM 3.0) was implemented with 5th grade students and their teachers at Falconer Elementary School within the Chicago Public School system. Falconer was chosen by the central office team for this project in year one based upon the strength of their pre-existing school site technology staff and the demographics of the student and family population within the school community. The school team agreed to continue the study into year three after the demonstrated success of the program in years one and two.

> *Chicago Public Schools:* Chicago Public Schools is a decentralized public school district with 681 schools and over 24,000 teachers serving a diverse student population of over 400,000 students in pre-kindergarten through 12th grade.

> *Laughlin Falconer Elementary School:* Falconer Elementary School is a Technology Magnet Cluster School located on the northwest side of Chicago. The school serves approximately 1,300 students in pre-kindergarten through 6th grade classes. Ninety-three percent of the school families are considered low income. Ninety-four percent of the students identify as Latino and 45 percent qualify as English Language Learners.

As part of the project implementation, 85 5th grade students at Falconer each received a Samsung Android tablet for their individual use at school and at home. Each tablet included a 4G LTE enabled education broadband to facilitate off campus student usage.   The ability for the students to take the tablet home and have Internet connectivity through that device to class websites and homework assignments was particularly significant. Allowing elementary students to take home school-provided mobile devices, especially with Wi-FI or 4G LTE connectivity, is a growing trend. A key component of the evaluation design therefore had to be assessing the impact of the off-campus access to both technology and Internet-based educational resources to support learning.

This year's 5th grade cohort of students within the study was for the most part highly representative of 5th graders nationwide and within other urban elementary schools with a few notable exceptions. Within this year's student cohort, there was a relatively equal distribution of boys and girls in the classes. The students identified Math and Physical Education as their favorite school subjects. However, in terms of technology access at home, the comparatives become more telling. Only one-third of the Falconer students (33 percent) noted that they have access to high speed Internet when they are at home. It follows that 37 percent of the students shared that prior to getting the tablet, they often had trouble getting online to do homework when they were outside of school. This supports the premise of the study and other national efforts around the need to close the Homework Gap. (More information about the Homework Gap is available at http://www.kajeet.net/resources). Using the Speak Up data as a comparative, 58 percent of 5th graders in urban communities around the country indicated that they had broadband Internet connectivity at home. Additionally, Falconer 5th graders appear to have less access to mobile devices (besides the project provided tablet) than other fifth graders, both nationally

and in urban communities (Table 1). It is particularly noteworthy that the Falconer students are twice as likely as other 5th graders however to have a feature-style cell phone that is not Internet enabled.

Table 1:   Personal access to mobile devices – not school provided

	Falconer 5th Graders	Urban 5th Graders	Nationwide 5th Graders
Tablet	50%	63%	64%
Smartphone	46%	51%	52%
Cell phone (no Internet)	26%	12%	14%

This lack of usage or familiarity with mobile devices may also help to explain differences in the Falconer students' self-efficacy around their technology skills. When asked to assess their technology skills compared to their peers, only 17 percent of the Falconer 5th graders considered their skills advanced (Table 2). Nationwide, 28 percent of fifth graders identify with that level and within urban communities, 26 percent of 5th graders see themselves as advanced tech users. The Falconer students however were more likely than their peers to consider their skills as average; 77 percent of the Falconer students chose that response compared to 59 percent within urban schools and 58 percent nationwide. Correspondingly, the Falconer students were less likely than other 5th graders to identify their skills at the beginner level; only 6 percent of the study cohort. Given that one of the study goals was to increase students' skills with using the tablets and online resources for research and academic tasks, the perceived skill level of the students is an important consideration, especially considering the lower availability the students have at home for using these types of devices as academic tools.

Table 2: Students' self-assessment of their technology skills

	All 5th graders nationwide N = 46,611	All 5th graders in urban schools N = 12030	Falconer 5th graders N = 85 -
Advanced	28%	26%	17%
Average	58%	59%	77%
Beginner	14%	15%	6%

Over the course of the three-year project implementation, the Falconer students have consistently self-reported less sophisticated technology skills at the beginning of the school year. To understand how this phenomenon may have been influenced by prior technology usage, the study polled students on their access to and use of technology to support schoolwork in their previous class at school in the fourth grade. A majority of the fifth graders in this study (51 percent) reported that they *rarely or never used* technology at home to support schoolwork or homework assignments while in 4th grade. Only 18 percent of the students said they *always or often* exercised that type of learning behavior during their previous school year. Usage at school was also not prevalent. Only one-quarter of the 5th graders said

that they regularly used technology to support learning in their 4th grade class. For the 5th graders in this study cohort, the Making Learning Mobile project therefore enabled a significant change in how the students experienced learning for three key reasons:

- *During this past academic year, each of the students in the three 5th grade classes was personally assigned a tablet computer to use at school to support learning.*
- *Additionally, the students could also use the Internet-enabled tablet outside of school for homework and school assignments.*
- *Correspondingly, their teachers were more likely to assign Internet-based homework and assignments when they knew that that access to the Internet was not a barrier for their students.*

This change in access to technology and digitally based resources outside of school also resulted in less students identifying their technology skills as at the beginner level. While 35 percent of the 5th graders indicated at the beginning of the school year that they knew less about using technology than their peers, only 17 percent held that same view at the end of the school year. Considering that three-quarters of district school administrators (75 percent) view technology skill proficiency as an essential college and workplace skill for student success, this finding validates the importance of student technology access on college and career readiness (Speak Up 2014 national results).

Current discussions around the Homework Gap focus on students' lack of access to safe and consistent Internet connectivity outside of school as a barrier to extended learning. While that infrastructure issue is a tangible obstacle, equally important is the attitude of the teachers regarding Internet-based homework or class projects. It is therefore significant that by eliminating the at home connectivity problem, the MLM project also provided a new environment for the 5th grade teachers to explore digital learning without concerns over digital equity. The difference in student usage of digital tools for learning in 5th grade vs. 4th grade may be attributable to this new condition. (For additional information on the relationship between teacher adoption of digital strategies and equity issues visit Teachers Know Best *What Educators Want From Digital Instruction Tools (2.0)* http://www.teachersknowbest.org/reports).

The demographic and technology profile of the Falconer students provides a compelling environment for studying the impact of the tablets on their learning lives at school and at home. A key component of the at home usage is parental support. Possibly reflecting greater knowledge amongst the parent community about this program this year, parental support for this year's 5th grade implementation was very high. According to the students, three-quarters of their parents supported the tablet project with 51 percent noting their parents were "*very supportive*." As an additional indicator of parental support, almost 100 percent of the parents in the 5th grade this year signed and submitted the permission forms for their child to participate in the study; only four parents did not. The Falconer family community is very tightly interconnected and just as the students themselves came into this school year with high familiarity about last year's program, the parents were very aware of the program components and the benefits available to their children by participating.

It is also noteworthy as a new trend within this study that the parents of this year's students were the most technology savvy of all three years. While 55 percent indicated on the Speak Up survey that their annual family income was less than $50,000, almost 9 of 10 said that they had a smartphone for personal use (87 percent). Additionally, 47 percent noted that they had a personal tablet that they used at home. This increased familiarity with using similar technology to what their children are using for schoolwork is most likely also a contributing factor to their overall support.

In a perfect study, our vision would be that the teachers who started with the three year implementation in year one would be the same ones for each subsequent year. Schools however are rarely perfect study environments and thus, the study approach has evolved to accommodate mobility within the teacher assignments. For the third year of the study, three teachers were involved with the project throughout the full school year. Each teacher brought to the study an individualized readiness to leverage the tablets and connectivity to affect student learning based upon prior experiences with this project and with digital tools in other contexts. Additionally, as we would expect, each teacher approached their instructional practice with different priorities and strategies. Rather than limiting the results of the study, these differences provided a rich framework for examining how teachers in real-world classroom settings approach mobile learning. For purposes of this evaluation report, we have identified the three teachers based upon their familiarity with the project, digital skills or readiness to use technology within instruction, and their approach to mobile device integration.

Based upon our work in evaluating teacher adoptions with mobile devices and other digital tools, Project Tomorrow has documented a three-phased spectrum of digital readiness. At the initial level, the teacher is gaining awareness of device features and functionality and tries to make sense of those capabilities can support his/her instructional practice. With that knowledge secured, the teacher begins to adopt the devices within a tried and true instructional model. This adoption process helps the teacher evaluate the impact of the device in focused settings and begins to understand about the potential need to redesign some instructional practices to better leverage the devices. At the most sophisticated level, the teacher is adapting both their instructional strategies and the devices to support innovative new learning environments that may not have been previously possible without the devices or connectivity. (More information about teachers' digital readiness and other Project Tomorrow research on this topic is available at http://www.tomorrow.org/publications/traac).

As a key element within the third year of the MLM study, we identified that each of our project teachers were at different levels within this spectrum of mobile learning readiness.

- o *Teacher 1 : Part of the study project for years 2 and 3; technology-advanced in skills compared to peers; high degree of device integration and adaptation observable within classroom instruction*

- o *Teacher 2 : Part of the study project in years 1 and 3: average level technology skills; targeted adoption of the mobile devices within specific instructional activities*

o *Teacher 3 : New to the project in year 3; average level technology skills; still developing awareness of how to integrate the devices in the classroom*

To address the varying levels of comfort and skills within integrating the tablets within instruction, the project continued a relationship with a highly regarded Chicago-based education technology consultant with deep expertise in mobile learning to provide ongoing coaching and mentoring with the 5th grade teaching team. The consultant introduced the teachers to various educational apps, provided consultation on classroom strategies for effective use and was a consistent resource for informal coaching and mentoring on instructional tools and methods. The teachers' strong personal commitment to professional development and their willingness to incorporate new strategies and resources into their classrooms is a hallmark of a successful and maturing mobile learning project.

Detailed Study Findings

Reflecting the maturity of the project implementation, the evaluation results from the third year of the project focused on three key aspects of the research questions.

1. What was the **typology of usage of the Internet-enabled tablets to support learning,** both in class and outside of school? This typology included student as well as teacher usage.

2. How did **students and teachers value the tablets within the learning process** and what benefits did they ascribe to the tablet and the enhanced connectivity?

3. What was the **impact of this program on students' learning experiences and overall academic achievement**? For this third component, we examined both attitudinal data as well as test score results, a new aspect of the overall study design.

Typology of Usage: How the Internet-enabled tablets supported student learning

Through Project Tomorrow's Speak Up research, we have identified four types of technology use that support student learning including usage both at school and at home. When discussing student technology use to support schoolwork and in particular mobile devices, the general assumption is, we are talking about teacher-sponsored, classroom-structured activities. Indeed, students and teachers are increasingly using mobile devices within the school day to support the formalized instructional process. However, we also have observed that students with access to mobile devices are often self-directing their learning process, both in and out of school using these devices and other digital tools. Within the MLM project, the tablets and the off-campus connectivity supported both teacher directed digital experiences as well as student-initiated learning. To understand how the Internet-enabled tablets supported student learning, we analyzed the data findings through the lens of the frequency of usage compared to their 4th grade experiences, the origin of activity (teacher or student), and for any gender differences in device usage.

In general, the 5th graders used their assigned tablets for a wide variety of academic tasks. **The tablet and the always-on access to the Internet became an indispensable component of these students' school day, as pervasive and commonplace as the pencil or 3-ring binder of another era.** The pervasiveness of the tablets within their learning lives is most evident by the frequency of usage both at school and outside of school. Across all three classes, the students reported using the tablets within the school day at least a few days a week. However, over two-thirds of the students (69 percent) identified that they used their tablet at school every day. Usage at home was equally universal with 56 percent noting daily use. Considering how use of technology and the Internet was not central to their learning process in 4th grade, this everyday usage constitutes a significant change in learning behavior.

The use of the tablets beyond school to extend learning was a significant finding from this project over all three years of the study. To understand how students leveraged their devices to support self-directed learning, first we need to examine the typology of overall tablet usage. Table 3 illustrates the types of academic tasks supported with the tablets, with differentiation by teacher-directed activities versus student-directed experiences.

Table 3: Typology of Tablet Usage: How Students Used the Tablets to Support Learning

Teacher-facilitated or sponsored academic tasks supported by the tablets	Student self-directed academic tasks supported by the tablets
Using Google for Education applications (88%)	Checking grades (98%)
Looking up online information in class (88%)	Looking up online information when at home (84%)
Playing educational games in class (86%)	Emailing my teacher with questions (84%)
Creating multi-media presentations (86%)	Emailing my classmates with questions (79%)
Taking online tests (80%)	Watching online videos to help w/homework (59%)
Reading online books or articles (74%)	Taking notes in class (51%)
Contributing to our class blog (74%)	Using the calendar function (51%)
Accessing information through Edmodo (64%)	Organize stuff I need for school (49%)

The teacher-directed or facilitated activities with the tablet are a direct reflection of the individual teachers' skills, motivation or readiness to integrate the devices into instruction. Correspondingly, for example, since Teacher 1 employed a wide array of mobile-enabled digital tools and resources within her instructional practice, the students in her class reported very high usage across all of the academic tasks. Teacher 2's approach however is more focused on specific academic areas rather than a full integration across all content areas. Her students reported higher self-directed usage than regular teacher-facilitated usage of the tablets. Comparatively, since Teacher 3 was still in the awareness-building phase during the 2014-15 school year, it is not surprisingly that her students reported more

involvement with teacher-directed activities. The following examples provide context to these differences in usage.

Teacher 1 leveraged the mobile devices to create a blended learning classroom environment that provided opportunities for students to self-direct learning in collaborative groups, while allowing the teacher time for one-on-one remediation activities with individual students. One such example was a student project to create Quizlet games about a science topic. Using the tablets and online resources, the students worked in collaborative groups of two or three to research science topics and then build a game that would quiz their classmates on their knowledge of that topic. During that activity, Teacher 1 could do spot assessments of students' content knowledge and work individually with certain students on other academic areas, thus increasing her productivity and effectiveness while providing her students with an engaging self-directed learning opportunity empowered by the tablets.

In Teacher 2's classroom, the mobile devices were used to support very specific learning outcomes and goals while at the same time helping the students develop information and media literacy skills. To help her students understand the context of a particular book they were reading in class, Teacher 2 assigned her students to use their tablets to do research on China and then develop a presentation to share with the class.   Appreciating that her students may lack familiarity with China, the lesson started with a whole class visit to China via Google Earth. Using their own tablets, the students explored the Great Wall and zoomed in on palaces. The act of personally "visiting China" with their fingertips highly engaged the students in learning more and set the tone for their further research work. The standards for dissemination of information via a presentation were high and students' both encouraged and commented on each other's work. The tablets in this case served as both a research tool and a way for students to develop stronger technology skills within the context of their curriculum.

While developing her own awareness of the potential of using the devices within instruction, Teacher 3 also allowed her students to explore and develop new learning behaviors around the devices as well. For example, while struggling with some vocabulary in a reading book, some students uncovered an online dictionary that would not only provide a definition but also speak the word aloud. The audio features of the tablet facilitated this process in a way that met the needs of the students at the moment when they needed that support, a key benefit for the many English language learners in the class. This newly found feature, enabled by co-learning between Teacher 3 and her students became a highly valued usage for the tablets in this class.

As observed in previous years of the study, it was difficult for the 5th graders to appreciate how the tablets would change their learning lives when the school year started. The students initially underestimated how they would use the tablets to create presentations, play educational games, or to

facilitate their use of Edmodo. The largest perception change was with communications with their teacher and classmates. Without any basis for this type of behavior, only one-third of the students envisioned that the tablet would help them establish a stronger connection with their teacher via email. Only 9 percent thought they would be able to communicate with classmates through the tablet. **A significant finding therefore of this study is that the tablets and the extended connectivity outside of school facilitated greater communications between student and teacher, and amongst students, thus creating a new learning culture within the 5th grade that was collaborative and participatory.**

When this cohort of students was in 4th grade, their communications with their teacher was limited to class time only.   Eight of ten students said that they rarely or never communicated with their teacher via email when in 4th grade. **In fifth grade, 51 percent of the students said they communicated with their teacher via email at least once a week.** Moreover, while some may see increased teacher-student communications having a gender component; girls were only slightly more likely than the boys were in the 5th grade to email their teacher with questions about homework or assignments (54 percent vs. 47 percent).   This increased connectivity with their teacher was a significant benefit articulated by the students. While the tablet and out of school connectivity provided a platform for this change in learning behavior, the teachers' encouragement of this activity is also noteworthy.

The teachers took advantage of the extended connectivity provided by the tablets through homework and projects that leveraged a wide range of online resources for student learning. The statistics provided by Kajeet, collected from the device monitoring systems in place within this project, illustrate how the students used their devices outside of school to continue learning beyond their 2:30 pm dismissal time. As has been standard throughout this project, the devices were automatically disabled for Internet access at 9 pm each evening to ensure that the students got needed rest and that the devices were used primarily for homework or other school related activities.

Key Kajeet usage statistics:
1. Students used their devices 7 days a week to support out of school learning with the peak usage times coming between 3 pm and 9 pm daily when 42 percent of the total data usage happened.

Table 4: Distribution of data used by students during the week

Day of Week	Total GBs of data used by the students per day of the week
Sunday	61.2
Monday	80.2
Tuesday	88.1
Wednesday	75.3
Thursday	79.4
Friday	73.1
Saturday	69.6

2. Students' use of the Internet connectivity at home corresponded with the types of digital tools supported by their teachers. Top educational websites visited included PBSkids.org, Edmodo.com, CoolMath-Games.com and Wikimedia for images to populate presentations.

Table 5: Top educational websites visited by the Falconer students using their tablets

Domain	Total Requests	% of Total Requests
pbskids.org	176733	45%
edmodo.com	88991	23%
coolmath-games.com	68848	18%
wikimedia.org	46921	12%

Additionally, the students' online searches demonstrate the depth and breadth of their interests. This also provides a snapshot of how the tablets and connectivity supported students' self-directed learning in addition to homework activities.

Table 6: Sample of top academic search terms used by students on the tablets

Google Search Term	% of all searches
Minecraft	14.13%
Student portal	11.44%
Google	8.05%
Kidblog	6.61%
Newsela	5.03%
YouTube	4.73%
Define	3.71%
Edmodo	3.05%

As you would expect, the 5th graders used their tablets and the always on connectivity to also search for information about interests outside of schoolwork. Some of the more popular "non-academic" search terms included the professional wrestler, *Roman Reigns*, *Riley Curry*, the young daughter of the Golden State Warriors' basketball star, Steph Curry and *silly birds*.

This statistical data on the student usage is valuable for two specific reasons relative to the continuing national discussion about the homework gap and at home connectivity. First, the results from these 5th graders validate that students will take advantage of out of school connectivity to support learning that

begins in school but does not need to end at the dismissal bell. Second, programs that allow students to have access to the Internet immediately after school or during the early evening homework time can meet student needs and provide a rationale for creative solutions to expanding at home connectivity for students.

By first examining how students and teachers were using the devices to support learning, we established a contextual basis for appreciating the value and benefits that the study participants placed on this usage. While some may conceptualize about the benefits of mobile learning, the students and teachers at Falconer Elementary Schools have had a front row seat in realizing very specific learning gains over this past school year.

"When we had to do a project on the tablet it was fun because we got to go online to search for information on the Internet. It was better to do this with the tablet because if we didn't finish it we could take it home and finish our work there."

- 5th grade student

Value of Extended Access: Benefits derived from the use of the tablets within instruction

The 5th graders at Falconer Elementary School involved in the MLM 3.0 project articulated three general sets of benefits associated with their use of the Internet-enabled tablets at school and at home. First, they believe that their access to mobile learning helped them develop important skills that they will need to be successful in middle school, high school, college and future jobs. Second, the inclusion of the tablets particularly within classroom instruction precipitated a change in their learning behaviors that resulted in increased learning opportunities. Third, their perception of themselves as astute learners was influenced by their ability to use the tablets for learning purposes. While the students in all three classes endorsed these types of benefits, differences in intensity in certain benefit statements reflects the way that their teachers employed the devices within their classroom.

The three general categories of benefits are further delineated with more specific values in Table 7.

Table 7: Students - benefits of have an Internet-enabled tablet to support learning

Benefit: Skill Development	Benefit: Change in Learning Behaviors	Benefit: Development of Self-efficacy as a Learner
Improved research skills (83%)	Greater interest in what I am learning (76%)	I am able to learn at my own pace (80%)
Improved technology skills (80%)	Spend more time mastering a skill or learning something (75%)	I am learning in a way that better fits my learning style (67%)
Better understanding of class content materials (65%)	Worked with classmates more (73%)	I have more control over my learning (67%)

Helped me develop critical thinking skills (60%)	More likely to complete homework assignments (68%)	I am more confident in my abilities (65%)
Enabled better test scores and grades (60%)	Participate more in class discussions (62%)	I like school more (63%)
	Learning doesn't stop at the end of the school day (51%)	
	Talk with my teacher more now (51%)	

As has been well documented in Speak Up national reports, students' perceptions of the value of using technology often has a gender component. This was evident also with the 5th graders at Falconer. The boys in the cohort were more likely to say that developing critical thinking skills, being able to learn at their own pace and continuing to learn after school were more important to them than to their female classmates. The girls placed higher value on learning in a way that fit their learning style and enjoying school more because of using the tablets. The girls also noted that they were more interested in what they were learning in class and more likely to complete their homework when using the tablet.

The students' valuation of how the tablets improved their learning experience cannot be divorced from how their teachers' integrated those devices within instruction. So, as noted in the examples above, Teacher 1 and 2 incorporated peer sharing or collaborative projects within their use of the tablets. Correspondingly, their students rated "working together with my classmates more often" as a significant benefit. Teacher 3's co-learning perspective on using the tablet showed up with her students' high marks on how the tablet facilitated increased communications with their teacher. Teacher 1's hands-on approach to learning such as the game creation probably contributes to her students' identification of the development of critical thinking skills as a top benefit.

The significant finding here is that the potential of mobile learning to transform the learning experience for students is probably more dependent upon the teachers' skills, motivation and readiness to integrate the devices than the type of device used. It follows therefore that when asked if all students should have access to a tablet with Internet connectivity to use both in and out of school, 84 percent of the students in Teacher 1's class agreed that this was important. Given the high degree of integration of the devices within the daily instruction in Teacher 1's class, it is not surprising that her students understand the benefits, but also realized the most significant impact on their learning.

"I would tell other students that using a tablet makes everything so much easier at school and at home. It is one of the reasons why I have good grades and I am doing much better in school this year."

- 5th grade student

Impact of Tablets and Connectivity: How the tablets and extended connectivity enabled greater student learning and achievement

Assessing impact can be tricky business especially with digital tools and resources. Many factors can contribute to student learning and achievement.   In this year's study, we examined achievement through two different lenses. First, as noted above, students ascribed improved self-efficacy as an important benefit to having the tablets. Correspondingly, we explore what that improved self-efficacy means in terms of students' impressions of their own academic outcomes. Second, appreciating that increasingly teachers and administrators are evaluating student outcomes through annual growth metrics, we analyzed the data results from the Northwest Evaluation Association's Measures of Academic Progress® (MAP®) assessment scores to identify correlations between changes in teachers' practices using the tablets for learning and student achievement.

As it has been for the three years of the project, the Falconer teaching team is very focused on improving students' literacy. With a high population of English language learners, this goal is highly significant for driving overall student achievement. To support that effort, the teachers leveraged the tablets in many ways to support enhanced reading and writing opportunities for their students. Table 8 documents the students' perceptions of how the tablets impacted their reading and writing success and overall perceptions of themselves as learners. In addition to providing the results from the entire student cohort, we also pulled out specifically the students from Teacher 1's class as a comparative.

Table 8: Students' self-perceptions of how the tablets impacted their academic success

Because of having the tablet …	All 5th grade students	Students in Teacher 1's class
I read more	42%	62%
I write more	46%	60%
My writing skills improved	46%	70%
My reading skills improved	49%	70%
I am more interested in what I am learning at school	61%	86%
I am a better student today	46%	61%

Critical reading and comprehension is considered by many to be the new gateway to higher learning potential. Noteworthy in this is the new effort nationwide to bring the importance of reading back to the forefront in education with the inclusion of an "R" for reading within the focus on science,

technology, arts, engineering and math as core subjects (STREAM). **It is a significant finding, therefore, that 47 percent of the boys in the 5th grade said that they were reading more because of their tablet, and 60 percent believe that their reading skills correspondingly improved.** The teachers' increased use of digital resources that provided non-fiction articles at the students' reading level (i.e., NewsELA) may be directly contributing to this heightened awareness of the students regarding the value of reading and the importance of skill development.

As noted in other data discussed in this report, the students in Teacher 1's class saw a very close relationship between their use of the tablet and their overall achievement, outpacing their peers in the other classrooms on these values. Their teacher's purposeful integration of the tablet across the curriculum is evident in the high percentage of students (86 percent or 26 of her 30 students) who said that a key outcome of having the tablet was that they were more interested in what they were learning at school. As research tells us, student engagement is often the precursor to enhanced achievement. In this case, the combination of the tablet, the expanded connectivity and a knowledgeable and motivated teacher resulted in stronger student efficacy and learning outcomes.

This case for strong student efficacy and learning outcomes is further bolstered by our examination of the Northwest Evaluation Association's Measures of Academic Progress® (MAP®) assessment scores in math for Falconer 5th graders in general and Teacher 1's students in particular. To provide context to the Falconer results, we also examined the scores for 5th grades at five other Chicago Public Schools (CPS), which serve a similar student population. Table 9 provides information about the student demographics at Falconer and the five other CPS schools included in the analysis.

Table 9: Demographics of the student populations at the schools included in the MAP score analysis

School Name	Latino/Hispanic	Low Income	English Language Learners
Falconer	93%	94%	45%
Azuela	95%	90%	34%
Barry	95%	97%	41%
Belmont-Craigin	93%	90%	70%
Burbank	91%	98%	50%
Haugan	83%	97%	59%

The NWEA scores for all schools within the district are publicly available through the CPS website. The data that was analyzed for this report is from the exams administered in spring 2014, fall 2014 and spring 2015.

In our analysis of the assessment data, we were particularly interested in two fundamental attainment related questions.

1. What percentage of students in the 5th grade at each school scored at or above the national average for their grade level?

2. What was the average RIT score in math for 5th graders at each school? (The NWEA uses a unique scale, the RIT (Rasch Unit) scale. Their scale is considered a stable equal-interval vertical scale, optimum for comparatives.)

Given those questions and this specific cohort of schools, it is significant that the school with the highest percentage of 5th graders scoring at or above the national average in math was Falconer. Additionally, Falconer had the highest average RIT score for their 5th graders in math.

Table 10: Comparative NWEA MAP score data from 5th grades in the targeted schools – spring 2015

Name of school	% at or above nat'l average	Average RIT score
Falconer	**50.6**	**220.7**
Azuela	47.3	220.4
Barry	41.2	218.4
Belmont-Cragin	28.0	214.0
Burbank	47.4	219.7
Haugan	44.9	220.0

While we cannot attribute the inclusion of the tablets directly as a factor driving these scores, however as noted in this report and previous reports on this project, the components of the Making Learning Mobile project including the professional development provided to the teachers, has helped to create a new culture for project-based and collaborative learning within the 5th grade.

To better understand how the accessibility of the tablets for student use both in class and beyond the school campus to extend learning impacted student growth in math we examined the class level scores for Teacher 1. Given that we have already identified Teacher 1 as having highly integrated the tablet and connectivity into her instructional practice, we examined the same NWEA MAP data from her students as a special cohort.

Within Teacher 1's class, her students' average RIT score in math in spring 2015 was 227, 6.3 points higher than the overall 5th grade at Falconer. The beginning of the year RIT score for the students was 213, thus this spring assessment demonstrated significant growth. Additionally, 50 percent of her students made their projected RIT growth from spring 2014 to spring 2015. Equally notable is that the average growth in RIT points within her class was 11.26 points. Overall, fifth grade growth at Falconer was 9.1 points in math. Thus, Teacher 1's students out performed their peers by 24 percent. **Teacher 1**

attributed her students' high attainment and growth to how the tablets and Internet connectivity enabled her to become a more effective teacher. In her own words:

"Math is my passion and I really focused on that in the classroom. I can't remember how I taught without the aid of the tablets. I was able to differentiate everything in math and reach all students because of the tablets and the 4G access at home. Consequently, I believe that the tablets really did help my students increase their scores on the Common Core NWEA MAP Testing."

- 5th grade teacher

The results from this year's evaluation study of the Making Learning Mobile project demonstrate that the students used their tablets and enhanced connectivity to support learning both in school and at home. The MLM 3.0 project validated the importance of off campus access to extend learning beyond the dismissal school bell. Additionally, the students' ascribed key benefits to the tablet usage included helping them develop important college and career ready skills, change their learning behaviors and develop greater self-efficacy as a learner. And while the students definitely attributed their tablet usage to higher student outcomes, their achievement data supports that premise as well. Most notably as a significant finding is the relationship between purposeful integration of the mobile devices within instruction and highly effective teaching and learning outcomes.

"I think it is really good that we had tablets to use this year in 5th grade because it is going to prepare us for next year. We can search things that 6th graders need to know and we can learn those things now on our own so that we are well prepared to be good students in 6th grade."

- 5th grade student

Ending Thoughts: A Three Year Reflection on Best Practices and Lessons Learned

The Making Learning Mobile project is a landmark digital learning project for several key reasons including the potential impact of the findings from the three years of research. More so than ever, school and district administrators are struggling today with how to increase student achievement while also ensuring that students have the right skills to be successful in college or in future jobs or careers. Many education leaders are exploring how to leverage digital tools and content to accomplish both of these critical tasks. While early results from many studies are promising, it is becoming increasingly apparent that providing students with safe, consistent and secure out of school access to digital resources is a critical component in this formula. The Making Learning Mobile project results provide education and policy leaders with compelling evidence about how extended learning opportunities for students that leverage out of school connectivity is not only possible, but also supports significant learning outcomes.

We are pleased to provide the following best practices and lessons learned, aggregated from the reports over the past three years, to address three specific goals. First, that the results of the three year project

provide input to inform new mobile learning initiatives and to help school and district leaders efficiently and effectively plan and scale those initiatives for maximum impact. Second, that the lessons learned in particular from the Making Learning Mobile project stimulate new discussions about how emerging and future solutions can address both in class and beyond school campus challenges that too often hold back digital learning today. Finally, that the results from the study and the corresponding reports demonstrate that innovation in education is not limited to specific types of schools or even particular community demographics. In this case, a unique partnership between Kajeet and Qualcomm, Chicago Public Schools and Project Tomorrow resulted in three years of transformative benefits for the students and teachers at a challenged school in the northwest side of Chicago. Moreover, while those results are significant and valuable, the outcomes of that innovative collaboration have much greater potential to affect student learning around the world for many years to come through the dissemination of the study findings, best practices and lessons learned.

- Increased student engagement in learning can help students develop new habits and behaviors for life-long, life-wide learning. A mobile device and extended connectivity that goes beyond the school campus enables students to activate new "muscles" for self-directed learning that provide a foundation for later success.
- When students use a tablet to support learning beyond the classroom, parents gain a firsthand appreciation for the value of home Internet connectivity as a new 21st century necessity for their children.
- Teachers' ability to fully leverage mobile devices and out of school connectivity to support student learning takes targeted professional development and just-in-time mentoring and coaching.
- Teachers teach differently when they know that every one of their students has access to digital content, tools and resources beyond the 2:30 pm dismissal bell. Enabling out of school access therefore is a precursor to helping teachers transform their instructional practices to meet the needs of students today and tomorrow.
- Evaluating the impact of mobile devices and out of school connectivity on student outcomes and teacher effectiveness is not easy, but it is also not impossible. It is also necessary to understanding the path to improving solutions and programs. The key is to be responsive to the emerging nature of this research and to work closely with school administrators and classroom teachers to uncover, unpack and articulate key benefits and impacts within the context of the classroom.
- Today's students, even fifth graders, have a plethora of good ideas about how they want to learn, and what tools they want to use to maximize their potential for future success. As demonstrated in this project, listening to the students and incorporating their ideas and values into the program implementation plan is an important step in developing a highly impactful mobile learning environment.

About Project Tomorrow

Project Tomorrow®, the national education nonprofit organization dedicated to empowering student voices in education discussions, prepared this program evaluation for Kajeet. Project Tomorrow has 19 years of experience in the K-12 and higher education sector and regularly provides consulting and research support to school districts, government agencies, business and higher education institutions about key trends and research in science, math and technology education.

The Speak Up National Research Project annually polls K-12 students, parents and educators about the role of technology for learning in and out of school and represents the largest collection of authentic, unfiltered stakeholder voice on digital learning. Since 2003, almost 4 million K-12 students, parents, teachers, librarians, principals, technology leaders and district administrators have shared their views and ideas through Speak Up.

About Kajeet

Kajeet, the only wireless service provider dedicated solely to providing safe, mobile connectivity for students, is bridging the digital divide in school districts across the country. Kajeet provides an affordable mobile broadband solution that connects low-income students to the resources they need to complete required assignments and projects outside of school. The Kajeet SmartSpot® solution, a portable Wi-Fi hotspot combined with the innovative Sentinel® cloud portal, enables administrators and teachers to provide CIPA-compliant, customizable filtered Internet access that keeps students focused on school work and provides off-campus Internet connectivity without worry of data abuse. For more information, please visit us at *http://kajeet.net* .

About Qualcomm® Wireless Reach™

Qualcomm believes access to advanced wireless technologies can improve people's lives. Qualcomm Wireless Reach is a strategic initiative that brings wireless technology to underserved communities globally. Wireless Reach invests in projects that foster entrepreneurship, aid in public safety, enhance the delivery of health care, enrich teaching and learning and improve environmental sustainability. For more information, please visit *www.qualcomm.com/wirelessreach*.

Study Research Questions

The following research questions were central to the design and implementation of the MLM 3.0 evaluation.

1. What is students' baseline familiarity with using a mobile device within instruction? How does the 4G mobile device affect the students' ability to use the Internet outside of school? Are the students using the devices for self-directed, interest-driven learning outside of school?

2. How does the access to the mobile devices affect home to school communications? What are parents' perceptions on the value of their child using a mobile device for learning? Did the parents have any concerns – were those concerns addressed?

3. How do the student and teachers use the mobile devices within the classroom?

4. What is the impact of these devices and related content on student performance? Does the inclusion of the devices affect grades, attendance or discipline issues? How do the devices affect the teacher's productivity?

5. What is the impact of the professional development support this year? In particular, what aspects or characteristics of the PD were the most helpful for the teachers? What additional PD do they think they need to move to the next level of mobile learning?

6. What instructional strategies are the most successful with the devices in year three of the project? How do those strategies compare to the year one activities? Why are those new strategies successful? How are the teachers leveraging their prior year experiences and previous professional development opportunities to increase their capacities for mobile learning? What are the barriers to greater usage?

7. How are teachers using the mobile devices and related content to facilitate the development of 21st century skills, such as problem solving, critical thinking, and collaboration?

8. How are students using technology to demonstrate their ability to collaborate, problem solve or think critically?

9. How is technology enhancing collaboration between students? Between student & teacher? Between teachers in a collaborative learning environment?

Study Methodology

As utilized in the first two years of the project, Project Tomorrow implemented a mixed methods research approach for MLM 3.0 collecting both qualitative and quantitative data to inform the development of an end of the year project evaluation report. In addition, the study team utilized publicly available aggregated student data from standardized district tests to compare achievement at both the project site and with like schools within the district.

The participating students completed surveys at the beginning and end of the school year to capture their attitudes and aspirations around the use of the mobile devices, to self-assess their digital citizenship skills, and to identify usage patterns of the devices for learning purposes. As part of this study, 85 5th grade students representing three different classes completed an online pre survey in October 2014 and an online post survey in May 2015. Project Tomorrow staff visited Falconer Elementary School three times during the school year to conduct interviews with the classroom teachers and various members of the school and district administrative staff, observe teachers' lessons with the devices in the classroom, and to conduct focus groups with students. Kajeet provided usage data specific to the use of the devices by Falconer students outside of school. This data was collected through the device monitoring processes that were in place for this project. In advance of the project start, Project Tomorrow secured Institutional Review Board approval for the study from an independent agency as well as approval from the Chicago Public Schools' Research Review Board. Following an informational meeting for both parents and students, both parents and students were required to sign permission/assent forms to participate in the evaluation study.

The various data collection mechanisms within the study design included:

Pre and Post surveys: Staff from Project Tomorrow provided the participating teachers with a URL survey link and the teachers administered the online survey during class time at the beginning and end of the school year.

Student Focus Groups: The study team conducted three sets of face-to-face focus groups with students at Falconer Elementary School in November 2014, February 2015 and June 2015. As was part of the methodology employed in year one, the focus groups were gender specific with one group consisting of 12 boys and a second group consisting of a similar number of girls.   Each focus group was typically 30-40 minutes in duration, and was audio taped for subsequent transcription and review. The same students participated in all three focus groups.

Teacher and Administrator Interviews: At the beginning of the school year, the study team conducted one-on-one interviews with the classroom teachers to evaluate their comfort level with using a mobile device within instruction and their expectations or concerns for the project during the upcoming school year. The team also interviewed the school principal and technology support team from the school site. Subsequent semi-structured discussions with the teachers in February and June provided additional data to inform the evaluation results.

Classroom Observations: The study team participated in several classroom observations, both at the beginning of the study period and at the end. The purpose of these observations was to evaluate the level of integration of the mobile devices and corresponding resources and to identify any changes in teacher practice upon increased familiarity with the technology. The classroom observations also provided additional context for the discussion around student use of the technology. For this study year, the team utilized a new classroom observation tool that was a derivation of a tool used by the district. The mobile learning observation tool was enhanced after its inaugural use in year 2. Given the

emerging nature of mobile learning, the tool was further refined in year 3 to capture the particular nuances associated with classroom instruction using mobile devices.

Speak Up Benchmarks: To provide additional context and perspective regarding the use of mobile devices within learning, the report includes where appropriate specific benchmarks from the Speak Up 2013 National Research Project findings. In addition to the pre and post surveys, the students within the study also completed the grade level appropriate Speak Up survey in fall 2013.   The annual Speak Up project collects and reports on the authentic, unfiltered views of K-12 students, educators and parents on the use of technology within a 21st century education. Since 2003, the annual research project has collected input from almost 4 million education stakeholders representing over 44,000 schools nationwide. The Speak Up national findings annually inform federal, state and local policies and programs around education issues. Speak Up is a national research initiative of Project Tomorrow.

Usage Statistics: The usage statistics from Kajeet provided new insights into the students' use of the devices outside of the school in terms of what website they visited, the time of day of that usage and usage patterns throughout the school year.

NWEA MAP Assessment Data and Scores: A new component of the study methodology was a comparative analysis of the students' attainment and growth using the NWEA MAP test data. Additionally, the scores of the fifth graders at Falconer were compared with scores from five (5) other elementary schools within CPS that served a similar student population. The school and grade level test data is publicly available at http://cps.edu/SchoolData/Pages/SchoolData.aspx.

About the NWEA MAP® Assessments and Scores

Measures of Academic Progress® (MAP) are interim assessments that measure growth, project proficiency on high-stakes tests, and inform how educators differentiate instruction, evaluate programs, and structure curriculum.

Computer adaptive MAP assessments reveal precisely which academic skills and concepts acquired and what they're ready to learn. MAP assessments are grade independent and adapt to each student's instructional level. Every item on a MAP assessment is anchored to a vertically aligned equal interval scale, called the RIT scale for Rasch UnIT—a stable measurement, like inches on a ruler, that covers all grades. (Source: https://www.nwea.org/resources/map-overview-brochure/)