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EVALUATION BRIEF

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Across the United States, educational policymakers, business leaders, and school administrators have championed the increased presence of technology in classrooms. Cited as a potential tool to increasing students' access to various learning opportunities, many states and districts have adopted innovative approaches to technological integration into schools, including 1-to-1 device distribution and digital curricula.

In the fall of 2002, the State of Maine implemented the largest 1-to-1 middle school laptop program in the United States, the Maine Learning Technology Initiative (MLTI), which provided each 7th and 8th grade student and teacher with a person technological device. Due to a one-time budget surplus, the state established the Maine Learning Technology Endowment following a task force investigation of the potential affiliated costs and benefits of investing in technology. MLTI was designed "to prepare students for a future economy that will rely heavily on technology and innovation" and to "transform Maine into the premier state for utilizing technology in kindergarten to grade 12 education in order to prepare students for a future economy that will rely heavily on technology and innovation" (Task Force of Maine's Learning Technology Endowment, 2001, p. vi). To aid in the adoption and implementation of technology in school settings, the MLTI program supports not only the provision of 1-to-1 devices, but also a broad range of structures and supports required to maintain the program, including the development of wireless infrastructures, professional development for teachers and administrators surrounding educational technology, and the creation of new positions for technical personnel and on-line support. These basic components were deemed necessary requirements by the MLTI program to aid in preventing logistical barriers and supporting the smooth integration of educational technology directly into the classrooms and curriculums of teachers.

Since its inception, the MLTI program has grown and changed to meet the emergent needs of schools in Maine. Throughout the course of the program, there have been two major changes. Perhaps the most notable area of expansion came in 2010 when MLTI established an

opt-in program for high schools. Unlike the middle school program, high schools had to provide additional local funding to participate in the MLTI program due to budget constraints at the state level. As a result, approximately 45% of high schools elected to participate in the program.

In 2013, MLTI experienced a second major change. To this point, all MLTI devices were exclusively Apple laptop computers, but in Spring 2013 MLTI expanded the options available to schools, allowing them to choose from among three options: MacBook Air laptops, iPads, and Hewlett Packard Probook 4400s. The preferred selection process resulted in the expansion of choice for schools in determining which technology device to implement in their middle and/or high schools. The preferred solution change substantially affected the MLTI landscape by altering the technology devices available to schools, resulting in variation in device selection participating MLTI schools. Table 1 highlights the selection by device and grade level.

Role of MEPRI

Since the MLTI program began, the University of Southern Maine, Center for Education Policy Applied Research and Evaluation (CEPARE), and the Maine Education Policy Research Institute (MEPRI) have cumulatively worked as the evaluator of MLTI. MEPRI has focused its efforts on assessing the MLTI program, evaluating the effects of relevant supports, and conducting research in the area of education and technology. These objectives were targeted to inform the State of Maine and MLTI on the effectiveness of the program. Thus, over the last 13 years, the MLTI evaluation has resulted in an increased understanding about the potential and observed impact of technology integration, as well as the persistent obstacles encountered by students and teachers. Cumulatively, this ongoing evaluation has the potential for informing the expansion of technology use in education settings across the United States.

The Present Report

The purpose of this report is to explore the expansion of the MLTI program that occurred in the 2013-2014 academic year. In June 2014, over 400 individuals from Maine public schools were solicited to participate in a survey examining their experiences with MLTI technology in their schools. In 2013-2014, for the first time since the inception of MLTI in 2002, the program shifted to a multiple-device solution, which offered schools the opportunity to

select from a range of device choices, including a MacBook Air, iPad, or HP Probook. Both the MacBook Air and the HP Probook were traditionally formatted laptops, while the iPad was a handheld tablet. Prior to the transition to a multiple device solution, all students and teachers enrolled in MLTI received a MacBook laptop.

The survey aimed to examine the levels of satisfaction affiliated with MLTI device selection, as well to assess the types of activities in which students and teachers engaged with their devices and how often. In the following brief, we summarize the findings of this survey, highlighting satisfaction and use levels by device type and the strengths and challenges summarized by school personnel about technology integration, and adoption. We conclude by offering suggestions for schools that are considering changing devices to help facilitate the technological and pedagogical transitions required for success.

Sample

Survey recruitment took two forms. First, e-mails were distributed to a curated list of principals and technology personnel, such as Technology Integration Specialists, Librarians, and Media Specialists. Second, a link to the survey was posted to the Association of Computer Technology Educators of Maine ACTEM) listserv, which has a distribution list of nearly 800 people. ACTEM's mission is "to enhance and influence education in Maine through the use of technology," and the listserv functions as a digital space for educational professionals to share information and resources surrounding educational technology and crowd source assistance in troubleshooting technical issues as they arise.

In total, 130 individuals responded from 121 different schools. Table 1 provides a summary of the respondents by position type.

Table 1: Respondents by Position Type

Role Type	N	Proportion
Principal	43	29%
Technology support role (network infrastructure, hardware, etc.)	79	54%
Technology integration role (Teacher, coaching, co-teaching, etc.)	12	8%
Librarian/Media Specialist	1	1%
Other	12	8%

Of the respondent sample, there was evidence of variation of device selection: 62% worked in a school that employed MLTI iPads, 33% opted for MacBooks, and 5% used HP devices. These rates of selection maintained fairly consistent across middle schools, combined middle and high schools, and standalone high schools, as seen in Table 2.

Table 2: Device Selection

	iPad	MacBook	HP Device
Middle School (n=89)	61.8%	30.3%	7.9%
Middle School/High School (n=22)	63.4%	36.4%	0.0%
High School (n=19)	57.9%	42.1%	0.0%
Total (n=130)	61.5%*	33.1%	5.4%

proportions sum to 100% across each row

Device Satisfaction

Due to the expansion of the MLTI from a singular device for all participating schools to a multiple device solution, a primary goal of the survey was to assess the overall perceived satisfaction among students, teachers, and administrators. A key assumption underlying the transition was that given the historical investment in the infrastructure and professional development provided to support educational technology, the transition would be more technical than substantive. Although we do not have historical data to compare individual levels of satisfaction with the initial devices, these data constitute an important understanding of how satisfied multiple stakeholders are with their school's choice. One question asked: "Overall, how satisfied would you say that these groups are with your device selection?" Table 3 summarizes the proportions of included groups (self, students, and teachers) that the respondents indicated were either "satisfied" or "very satisfied."

Table 3: Proportion of Individuals who were either "Satisfied" or "Very Satisfied" with Their School's Device Selection

	iPad	MacBook	HP Device
Self	46 (58.4%)	35 (85.4%)	2 (28.6%)
Teachers	32 (41.0%)	34 (81.8%)	5 (71.4%)
Students	48 (62.3%)	36 (87.8%)	5 (71.4%)

Respondents indicated that only 41% of teachers appeared to be satisfied with iPads in the first year of implementation. Although students were more satisfied (62%), the iPads showed, nearly consistently, the lowest rate of satisfaction of all device choices. The only exception to this was that only 29% of respondents who used the HP option indicated that they were satisfied with their school's choice; however, this finding should be considered carefully, as only 7 respondents used HP devices. In contrast, across all three groups, MacBook Airs were very highly rated, with satisfaction rates over 80%.

In addition to assessing overall satisfaction, the survey also included a number of questions about a range of individual and school-level constructs that may inform overall satisfaction. The data for these questions are summarized in Tables 4 and 5. Table 4 examines the technical compatibility and support for the devices, while Table 5 examines the questions more relevant to the perceived comfort and capabilities of students and teachers. As evidenced in Table 4, respondents had the highest levels of satisfaction with the MacBooks (ranging from 78-92%) as compared to either iPads (42-76%) or HP Probooks (14-57%). Perhaps the most noteworthy finding these data reveal is the high rates of dissatisfaction of iPad users with the compatibility with existing systems.

Table 4: Proportion of Individuals who were either "Satisfied" or "Very Satisfied"
with Their School's Technical Infrastructure

	iPad	MacBook	HP Probook 4400
Durability of the device	52 (66.7%)	33 (80%)	4 (57.1%)
Compatibility with existing systems	33 (42.3%)	35 (87.5%)	4 (57.1%)
Software included with the device	58 (74.3%)	32 (78.0%)	4 (57.1%)
Software available for the device	59 (75.6%)	37 (90.2%)	4 (57.1%)
Services provided for the device	53 (67.9%)	34 (85.0%)	1 (14.3%)
Network accompanying the device	53 (68.8%)	34 (82.9%)	4 (57.1%)

As previously stated, a working hypothesis that grounded the shift to a multi-device solution was that hardware selection would have little to do with individual satisfaction; however the data suggest that the transition was not quite as seamless as anticipated in practice. Specifically, changes to the policy were rooted in the belief that it would be a simple transition to a new technology, allowing teachers to continue using the digital resources they had adopted using the original MLTI machines.

Table 5 summarizes the data related to teacher and student familiarity and ease with their school's selected MLTI device. While respondents felt that the majority of students were comfortable with the both of the Apple devices (74% with iPads and 98% with MacBooks), there is evidence that they were perceived as being less comfortable with the HP option.

Table 5: Proportion of Respondents who were "Satisfied" or "Very Satisfied" with the Comfort and Capabilities of Teachers and Students with the Devices

	iPad	MacBook	HP Probook 4400
Ease of use for students	58 (74.3%)	40 (97.5%)	4 (57.1%)
Ease of use for teachers	42 (53.4%)	41 (100%)	3 (42.8%)
Teacher familiarity with the device	25 (32.0%)	39 (95.1%)	2 (28.6%)
Quality of student learning	44 (57.9%)	32 (82.0%)	3 (42.8%)

However, respondents reported that they believed that teachers felt that iPads (53%) and HP (43%) devices were easy to use, as compared to 100% of MacBook schools. Also, the data suggests that teachers at iPad and HP schools were not very familiar with the devices prior to their adoption as evidenced by teachers comfort levels and ability to integrate technology into their classrooms. While 82% of respondents from MacBook schools were satisfied or very satisfied with students' learning outcomes, only 58% and 43% of iPad and HP schools, respectively, selected this response. Thus, ease of use and familiarity with the device may have impacted the frequency and quality of use.

Another set of questions in the survey delved into respondents' sense of the school's personnel infrastructure—from teachers to administrators—and their overall comfort with and

ability to support the implementation and continued development of MLTI. Table 6 summarizes the response. For this series of questions, respondents were asked to estimate the frequency with which their schools participated in a number activities on the following scale: never, one to a few times a year, about once a month, about once a week, once a day, more than once a day, or not applicable. The data presented in Table 6 assess the proportion of respondents who indicated that at their school the following activities occurred once a week or more.

Table 6: Proportion of Respondents who Engaged in Communication Regarding Technology Use or Implementation "Once a week" or More

	iPad	MacBook	HP Probook 4400
Communicate with teachers regarding technology use or implementation	62 (78.5%)	30 (73.2%)	5 (83.3%)
Communicate with administrators in other schools or districts regarding technology use or implementation	24 (31.6%)	9 (23.7%)	1 (17.7%)
Communicate with district technology personnel	58 (73.4%)	32 (78.0%)	6 (85.7%)

Similarly, the following set of questions assessed other elements of the in-building supports surrounding the maintenance of MLTI devices and the preparation of the personnel to use the devices. Table 7 on the next page, presents the proportion of responses in which individuals felt that they "somewhat agreed, agreed, or strongly agreed" with the statements included in the row headings. Overall, in regards to both role expectations and support personnel, the responses were quite similar across the three types of device choices. However, one area in which MacBook schools demonstrated higher proportions of confidence was in teacher's pedagogical understanding. This echoes earlier findings, which suggested that teachers in iPad schools were less familiar and confident with the device and, subsequently, with pedagogical strategies with which to integrate the device into the classroom.

Table 7: Proportion of Respondents who "Somewhat to Strongly Agree" that the Personnel Capabilities of Their Schools Match MLTI Expectations

	iPad	MacBook	HP Probook 4400
I am clear about what is expected of me by the MLTI program in regards to my role in an MLTI school	69 (93.2%)	38 (92.6%)	7 (100%)
There is an appropriate amount of technology personnel in my district to deal with most issues related to the MLTI program	59 (79.7%)	29 (70.7%)	6 (85.7%)
Most of the teachers in my building are adequately comfortable with technology to be able to perform basic tasks and maintenance (e.g., troubleshoot printer problems)	49 (66.2%)	29 (70.7%)	5 (71.4%)
Most of the teachers in my building have the pedagogical expertise to be able to incorporate technology into their instruction in ways that enhance student learning	53 (71.6%)	34 (82.9%)	6 (85.7%)

Digital Instruction

In addition to assessing levels of comfort and overall satisfaction, the survey asked respondents to consider the resources and curricular contributions the MLTI devices made in their schools. The items considered everything from digital instructional resources (e.g., Khan Academy or TED Talks) to digital pedagogical strategies (e.g., flipping the classroom). These data suggest that the MLTI devices are being used across the state in a range of ways. However, there is still evidence that there is immense variation in the level of adoption and integration of the device at the school level. Table 8 summarizes the proportion of respondents who reported that over 50% of their schools' teachers employed these resources. One of the goals of MLTI is to expand students' access to digital curriculum and learning resources. Overall, the trends of digital use for educational purposes were largely similar for iPads and MacBooks. Although there is evidence of a small number of cases that employed digital resources as a core part of the learning strategy, the total proportion of teachers estimated to use the digital resources and strategies in the classroom was lower than expected. (How do we know this?)These data signal that, despite the fact that MLTI has been successful in closing the access gap surrounding technology in schools, there is continued work to be done in addressing *how* technology is integrated into the classroom.

Table 8: To your knowledge, how many teachers at your school are incorporating these types of activities or resources into their classroom instructional practices?

	iPad	MacBook	HP Probook 4400
Online/Digital instructional resources for lessons or content review	49 (62%)	26 (63%)	3 (43%)
Online educational games or simulations	34 (43%)	20 (43%)	3 (43%)
Flipping the classroom	16 (20%)	10 (24%)	2 (29%)
Distributing and/or collecting class materials through network or cloud file sharing	41 (52%)	20 (43%)	2 (29%)
E-books created by teachers or students	3 (3.8%)	0	0
Real-time, virtual communication with experts/professionals outside the school	5 (6.3%)	3 (7.3%)	2 (28.6%)
Virtual collaboration with students/classes	3 (3.8%)	7 (8.9%)	0

Considering the Benefits and Challenges of MLTI Devices

In the final section of the survey, respondents were asked to provide a qualitative response as to the perceived benefits and challenges of the device. A number of common themes may be drawn across each of the devices. Specifically, these issues manifested independent of the devices themselves. Sources of the challenges were identified as things such as network connectivity, limited professional development opportunities, and teacher resistance to constant change in technology. However, the responses suggest unique benefits and challenges that resulted from each device type, which are summarized below.

Apple iPads

The qualitative accounts of the challenges and benefits of the iPads were perhaps the most conflicting of the three device options. The respondents identified a number of perceived benefits to their schools' device selection, such as connectivity, mobility, and overall ease of use, especially on the behalf of the students. The best case can be summarized by a middle school technology specialist: "[The iPads allowed for] greater flexibility, ease of use, portability,

moved people from what they'd been doing and made them rethink how they used technology." Some examples of practical changes included the iPads available access to seemingly infinite apps, which were easily downloadable and could be instantly integrated into teaching practices. Similarly, in terms of enhanced learning opportunities, respondents noted that Cloud connectivity in combination with AppleTV allowed for students to share their work with the full class and become more active participants in their learning.

However, despite the advantages observed, the respondents shared a number of challenges that were posed by the iPads in the first year of integration. Perhaps the most consistent theme surrounded teachers' integration of the devices into their classrooms. Given MLTI's history, many teachers had identified learning strategies with previous MLTI distributed laptops that did not translate to the iPad. This was due, in part, to the lack of a Flash alternative, and issues with the connectivity to the school-based wireless networks and the AppleTV devices, as discussed earlier. As a result, the digital curricular tools that had been adopted had to be dropped, as some teachers determined that the iPads were "not a laptop, it's a media device."

Additionally, some teachers believed that the iPads were "treated as toys," and found that the devices resulted in extensive distractions for their students. In regards to the latter, the respondents referred specifically to differences in the iPads, which did not allow for monitoring of students' use, and, thus, the belief that students routinely used them for non-academic tasks. These issues were echoed in survey questions that solicited information regarding the frequency of technology-related disciplinary actions. Table 9 presents the proportion of respondents who indicated that it happened once a week or more. From these data, we see that representatives from iPad and MacBook schools reported identical rates of disciplinary issues due to internet misuse (46%), while HP schools reflected a far lower rate (14%). However, such trends did not hold when examining disciplinary issues related to the device itself. More than half of HP users (57%) indicated that school personnel dealt with disciplinary issues related to the device more than once a week. Similarly, this rate was 53% for iPad schools and 41% for MacBook schools.

Table 9: Proportion of Respondents who Engaged in Disciplinary Actions Regarding Technology Use "Once a week" or More

	iPad	MacBook	HP Probook 4400
Deal with disciplinary issues related to Internet misuse	36 (45.6%)	19 (46.3%)	1 (14.3%)
Deal with disciplinary issues related to general device misuse	42 (53.2%)	17 (41.5%)	4 (57.1%)

Overall, the qualitative responses illustrated a great deal of practitioner frustration with the new device. When assessing the overall benefit of the new iPad technology, perhaps the most notable response came from a middle school technology specialist: "The advantages seem to still be theoretical and not reality - the ability for content creation and [project based learning] devices were definitely not realized this year." Also, many responses cited a disconnect between what was promised by MLTI and what was delivered. Specifically, individuals were frustrated that CASPER Focus was promised and not available. A number of the administrators reiterated the issues experienced with the Apple IDs as noted in the previous MacBook section, one going so far as to refer to it as "the Apple ID nightmare."

MacBook Air

Similar to the survey questions, respondents from MacBook Air schools reflected high levels of satisfaction with their device selection. Repeatedly, individuals noted the speed of the MacBooks, which facilitated both teaching and learning. They also cited the extended duration of the battery as a substantial upgrade to the older model laptops. One Technology Support specialist identified the benefits, saying, "[There are] too many to list, as they are a huge step up!" Many others echoed this sentiment, noting that the laptops were "state of the art machines" and students and teachers effectively used them. One respondent noted that the students loved the machines too, which made them excited to use them. Some respondents identified the machines' durability as a benefit by some, while others noted it as a challenge. Specifically, one middle school technology support specialist from a middle school indicated that they may be developmentally inappropriate for younger students enrolled in MLTI because they were limited in their ability to take any impact.

Respondents did note some device-specific issues that arose throughout the school year, including the lack of a DVD drive and issues with connectivity, especially with regards to AppleTV. Perhaps the most oft-cited challenge was the system change to self-administration. In the year corresponding with the expansion of MLTI devices (2013-2014), Apple made a systemic shift that eliminated administrator rights in order to protect software updates. Instead, each student and teacher served as the administrator of their own device.One Technology Support specialist described this transition, making an apt analogy for the situation that resulted, saying, "[There was a challenge] converting to devices where students have admin rights. [The] previous environment had locked down laptops. We needed the lesson BEFORE the test. Needed a 'drivers education' course for students before giving them the keys." However, this type of offering is not an integral part of MLTI at the present time. Also, as noted earlier, several respondents cited connectivity issues with the school network early on in the year. As a result, at least one school noted that teachers became frustrated with the equipment and lost faith in how it could contribute to students' learning.

Hewlett Packard Probook 4400

First, it must be noted that only four of the seven respondents who indicated that their schools selected HP devices provided qualitative feedback on the benefits and challenges of the devices. Among the benefits identified by HP users was an enhanced suite of programs, and that users' familiarity with Microsoft Office made the transition fairly seamless for administrators, teachers, and students. There were mixed responses on the availability of programs to supplement student learning. While one individual noted that he believed that the software on the HP device was better than on a MacBook, another indicated that the new devices resulted in a loss of GarageBand and iMovie, and teachers struggled to find suitable alternatives. An additional challenge mentioned by three individuals was the delay at the state level in distributing the devices, which resulted in limited opportunities to work with teachers to prepare them to use the technology to its fullest potential. One respondent's frustration with the transition was especially apparent in his response. When asked to identify what the benefits of the device were, he noted, "Our head [of] technology like[s] them; otherwise there are no advantages, only significant losses."

Summary

The data heretofore presented highlight the strengths and challenges following the shift to a multi-device educational technology solution. In summary, the findings refute the assumption that expanding MLTI to a multiple device solution would be a simple "plug and go" change. Rather, the data suggest that administrators believe that teachers encountered a number of barriers in adopting new technology, for which they were not adequately prepared prior to the transition. For example, upon changing devices, some teachers struggled to find digital alternatives for learning tools they previously adopted using the MacBook given compatibility issues (e.g., the lack of a Flash alternative). Additionally, several administrators noted that in the change from laptops to iPads, teachers struggled to see the device as a learning tool, and viewed them, instead, to be toys that often distracted students from learning. However, despite these struggles, some administrators noted that the new devices provided increased opportunities for collaboration.

In combination, these findings highlight the need for the expansion of professional development and training opportunities for teachers and administrators as they prepare to transition to new technology. Additionally, the administrators indicate that the transition process must be timed better, allowing for schools and personnel to intentionally develop the systems and skills required to facilitate the transition. During the lead up period to integrating new devices, given the evidence of teachers' lack of confidence in and familiarity with the new technology, professional development opportunities should address two major categories of support: technical and pedagogical. The combination will help teachers to optimize the technology with their students, both in the classroom and beyond.