

Maine Learning Technology Initiative 2.0

2021–22 Evaluation Report

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Executive Summary

The Maine Department of Education launched the Maine Learning Technology Initiative 2.0 (MLTI 2.0) in 2021. The program seeks to eliminate the digital divide in Maine by ensuring students have equitable access to learning devices, professional learning opportunities, and technology infrastructure. The MLTI 2.0 initiative builds on the original MLTI plan that was first developed in 2001 to deploy 1:1 devices, provide broadband services, and offer professional learning opportunities (Maine Department of Education, n.d.). The Department developed an updated MLTI focusing on equitable access and use of technology to improve student-centered learning practices. The program is intended to prepare students to be innovative leaders in a digital economy and be high-quality, educated, and adaptable members of a global workforce (Maine Department of Education, 2020).

The MLTI 2.0 initiative has the following three main components:

1. Providing 1:1 computing devices beginning with Grades 7 and 8 in Year 1 and adding one grade (either older or younger) in Year 2 and one additional grade in Year 3.
2. Providing two state-level digital learning specialists and five MLTI digital ambassadors overseen by the digital learning specialists, who provide high-quality professional learning opportunities in support of digital learning and technology integration.
3. Providing a state technology infrastructure specialist to support districts in evaluating existing technology infrastructure and supporting districts' plans to develop additional programs for students in the technological infrastructure fields.

Maine public schools with students in Grades 7 and 8 that join the initiative receive an annual allocation to purchase devices for students and educators. Two hundred schools chose to participate in MLTI 2.0 in Year 1, June 2021 to May 2022, representing 94 percent of eligible public schools in Maine. The Department allocated a total of 25,884 devices for students and 4,060 devices for educators in the summer of 2021, at an estimated cost of \$13,736,952 (or \$459 per device). At full implementation in Year 3 (July 2023), the Department expects MLTI 2.0 will serve 56,000 students and 5,700 educators in Grades 5 through 10.

During Year 1 of the project, the purpose of the evaluation at this stage was to provide formative feedback to the Department and other stakeholders, including Maine legislators, members of the MLTI Advisory Board, and district technology leaders, about implementation of the three MLTI 2.0 components, conditions supporting technology integration, and teachers' use of technology and potentially useful supports or resources.

The American Institutes for Research® (AIR®) collected **extant statewide data** and **interviews and focus groups with MLTI staff** to describe program implementation; **teacher survey data** about the extent of student-centered learning and the technologies that teachers use in their instruction; and **interviews and focus groups** at seven schools to create school profiles of technology integration supports.

MLTI largely succeeded in its goal of providing devices to students and educators on a one-to-one basis. Nine in 10 schools distributed one device per student, and seven in 10 schools distributed one device per educator. Nearly two thirds of schools completed student and educator device distribution by October, although a minority of schools did not receive devices until the winter.

Recommendation: Focus on increasing the percentage of devices delivered during the summer and delivered on time and on helping schools increase efficiency and decrease effort in setting up and distributing devices.

School technology infrastructure appears to be sufficient for most uses of technology. Almost all of the MLTI schools for which the evaluation has data (71%) met the criterion for sufficient bandwidth set by the Department. Most profiled schools had high levels of technology infrastructure, indicated by access to devices and software, reliable wireless connectivity, and the absence of persistent problems with using technology. All schools had access either to a full-time or part-time technical support staff; in several schools, leaders expressed a desire to expand the capacity of technical support. At a minority of schools, respondents expressed a desire for staff focused on supporting technology integration.

Recommendation: With interested MLTI schools and other stakeholders, identify the core and advanced capacities that school technical staff need to support teaching and learning with technology as envisioned by MLTI and identify opportunities for technical staff in MLTI schools to acquire those capacities.

Recommendation: Collect data on bandwidth (Networkmaine-contracted or not) for all MLTI schools.

COVID-19 was a significant barrier for teachers' participation in MLTI-led professional learning opportunities on using technology to support student learning. Based on data from the teacher survey and school profiles, most teachers in MLTI schools did not participate in MLTI-provided professional learning opportunities. Those who did participate found it helpful. The MLTI team worked to address barriers to participation in these opportunities by providing asynchronous professional learning sessions. MLTI digital ambassadors also indicated shifting to

a greater focus on integrating specific technologies into educators' instruction, with a decreased focus on the features of specific devices or tools.

Professional learning in profiled schools typically occurred through informal collaboration or teacher-led workshops. Teachers expressed an interest in receiving sustained professional learning through which they can learn about emerging trends in technology and learn how to apply technology to their curricular goals.

Recommendation: We suggest that MLTI consider adding to its approach a process to (a) identify professional learning topics in teaching and learning with technology that are in high demand among MLTI schools, (b) identify MLTI school sources (and their references to sources) of high-quality opportunities on those topics, and (c) connect those wanting and providing the professional learning on those topics.

There was evidence of school leadership support for technology in profiled schools. For example, schools usually had a vision for technology use, with schools varying in the formality and communication of the vision. Schools also varied in the degree to which leaders encouraged innovation. Among schools with a high level of culture of innovation, teachers and administrators encouraged experimentation with technology and sought out resources to bring innovative technology uses to their schools.

Recommendation: Extend the MLTI approach to professional learning opportunities on teaching and learning with technology to include opportunities for school administrators. If MLTI adds the identification and connection process for professional learning opportunities suggested above to its approach, we suggest including professional learning opportunities for school leaders in it.

Teachers frequently used technology in the classroom in a variety of ways for student-centered learning. Teachers had adequate access to the programs and software they need to integrate technology for student-centered learning and report few barriers to access. Half to two thirds of surveyed teachers asked students to use technology on at least a monthly basis in ways that emphasized the development of communication, collaboration, critical thinking, and creativity skills. They reported relatively frequent use of productivity tools, course management tools, personalized learning tools, and communication tools. Surveyed teachers were generally satisfied with the tools they have. Few teachers identified specific technologies for which they lack access. Teachers and school administrators are looking for support in learning, experimenting with, adopting, adapting, and developing innovative uses of technology in learning and teaching.

Recommendation: With MLTI teachers and school administrators, explore how MLTI as a whole can support innovation in learning and teaching with technology and develop a plan based on the results. We suggest that the plan can be connected to or integrated with the MLTI approach to professional learning.

Introduction

The Maine Department of Education's Office of Innovation launched the Maine Learning Technology Initiative 2.0 (MLTI 2.0) in July 2021. The program seeks to "close Maine's digital learning gap by creating, developing, and continuously improving the redesigned program's inter-related dependent components into supports, measures, services and activities that build a foundation of a State and local partnership focused on the equitable integration of technology into engaging and effective educational experiences" (MLTI Advisory Board, 2020, p. 5). The program's components include 1:1 devices for students and educators, professional learning, and infrastructure support. The MLTI 2.0 initiative builds on the original MLTI plan developed in 2001 to deploy 1:1 devices, provide broadband services, and offer professional learning opportunities (Maine Department of Education, n.d.). The Department developed an updated MLTI focusing on equitable access and use of technology to improve student-centered learning practices of critical thinking, collaboration, creativity, and communication skills. The program is designed to prepare students to be innovative leaders in a digital economy and be high-quality, educated, and adaptable members of a global workforce (Maine Department of Education, 2020).

The MLTI 2.0 initiative has three main components:

1. Providing 1:1 computing devices beginning with Grades 7 and 8 in Year 1 and adding one grade (either older or younger) in Year 2 and one additional grade in Year 3. Given that Maine already funds 1:1 computing devices in Grades 7 and 8, the funding in Year 1 allowed schools to update the devices currently available to students in those grades.
2. Providing two state-level digital learning specialists to oversee five MLTI digital ambassadors, each of whom provide high-quality professional learning in support of digital learning and technology integration. The two digital learning specialists develop and manage the execution of the statewide vision for professional learning about how to use technology for teaching and learning. The five digital ambassadors directly connect with educators and provide professional development.
3. Providing a state technology infrastructure specialist to support districts in evaluating existing technology infrastructure and supporting district plans to develop additional programs for students in the technological infrastructure fields. The MLTI 2.0 team includes a state-level technology infrastructure specialist who provides guidance to schools and districts about how to leverage different funding sources to expand their technology infrastructure.

MLTI 2.0 provides grant funding to any Maine public school that agrees to be in the program. Schools may use funding to provide MLTI-approved devices to students and educators. Two hundred schools participated in MLTI 2.0 in Year 1, July 2021–June 2022, representing 94 percent of public schools in Maine that offer Grades 7 or 8.¹ The Department allocated a total of 25,884 devices for students and 4,060 devices for educators in the summer of 2021, at an estimated cost of \$13,736,952 (or \$459 per device).² Schools could choose between the Apple MacBook Air, Apple iPad, CTL Convertible Chrome Laptop, Dell Chromebook, Dell Latitude, and WCA Windows HP ProBook. In future years, MLTI 2.0 will expand to grade levels beyond the initial implementation in Grades 7 and 8. Schools will be eligible to update devices for one additional grade (older or younger) in Year 2 and one additional grade in Year 3. At full implementation in Year 3 (July 2023), the Department expects MLTI 2.0 will serve 56,000 students and 5,700 educators in Grades 5 through 10.

The MLTI 2.0 logic model summarizes the key components of the initiative and their anticipated influence on schools, teachers, and students (Exhibit 1). As depicted in the logic model, the program components will lead to three school-based outcomes: more equitable access to educational technology, more equitable participation in high-quality professional development opportunities, and more equitable school-level support for use of educational technology. Enhancing these school-based outcomes will influence teacher attitudes toward technology and promote more frequent use of technology for student-centered instruction (Argueta et al., 2011; Hur et al., 2016; Liu et al., 2017; Miranda & Russell, 2012; Moeller & Reitzes, 2011). The logic model includes school-level factors adapted from the Future Ready Schools framework (U.S. Department of Education, Office of Educational Technology, 2016), the presence of which is expected to support the integration of technology in instruction. These factors include the following:

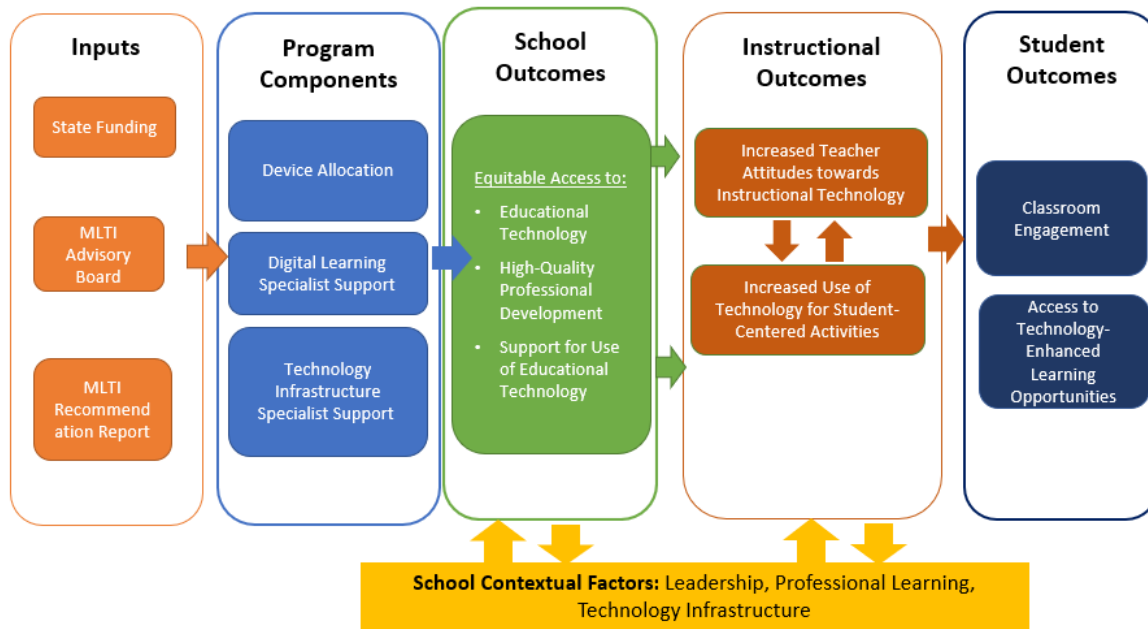
- *School leadership*, such as promoting a shared vision for teaching and learning using technology and a culture of trust and innovation
- *Professional learning*, which encompasses job-embedded professional development and collaboration in a learning community
- *Technology Infrastructure*, including wireless connectivity, network bandwidth, and technical support staff that ensure reliable use of technology

¹ Source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2020-21 v.1a.

² Total allocations were based on the number of students enrolled and staff employed by school, with a 2% buffer in case of enrollment or staffing changes. The Department allocated an additional 424 devices for students and 74 devices for staff in the fall of 2021 to accommodate changes in enrollment and staffing. Source: Administrative data on device allocations provided to AIR by the Department.

The Maine Department of Education anticipates that these instructional changes will provide students with increased access to technology-enhanced learning opportunities and foster greater classroom engagement.

Exhibit 1. Logic Model for MLTI 2.0



Evaluation Approach and Questions

During Year 1 of the project, the purpose of the evaluation was to provide formative feedback to the Department and other stakeholders about how MLTI 2.0 components were implemented and how teachers and students used technology and what types of supports or resources would be useful. Using extant data and data from a teacher survey, focus groups with students and teachers, and interviews with school administrators and technology leads, the Year 1 evaluation addressed the following five evaluation questions (EQs):

1. To what extent are the key components of MLTI 2.0 implemented as intended? What are facilitators of and barriers to implementation?
 - a. Annual allocation for 1:1 computing devices?
 - b. Opportunities for professional learning that emphasize student-centered approaches to technology integration?
 - c. Support for district technology infrastructure and technological infrastructure programs?
2. What are stakeholder opinions about the quality and usefulness of these components?

3. To what extent and in what ways are schools establishing conditions that support integration of technology into instruction?
4. To what extent and in what ways are educators using technology to support student-centered learning? What barriers and facilitators have educators encountered?
5. What are promising technology tools or models for supporting student-centered learning?

AIR obtained extant statewide data and conducted interviews with Department staff to describe implementation of key program components related to device, MLTI 2.0 professional development, and technology infrastructure support (EQ 1). AIR conducted teacher surveys to gather feedback about the quality and usefulness of MLTI 2.0 components (EQ 2), the extent of technology integration (EQ 4), and technology tools that teachers use to support student centered learning (EQ5). We also conducted interviews and focus groups at seven schools to create school profiles that describe three domains of supports for technology integration: school leadership, professional learning, and technology infrastructure (EQ 3).

In subsequent years, the evaluation will address the extent to which MLTI 2.0 reduces the digital divide. We will also examine whether participation in the initiative is associated with changes in teacher beliefs and instructional practices, as well as with changes in student engagement.

EQ 1. To what extent are the key components of MLTI 2.0 implemented as intended? What are facilitators of and barriers to implementation?

This section addresses the extent to which the three key components of MLTI were implemented as intended. The three components include annual allocation for 1:1 computing devices, professional learning opportunities that emphasize student-centered approaches to technology integration, and support for district technology infrastructure. This analysis uses extant data sources from the Department or available publicly (Box 1). In addition, AIR conducted interviews and focus groups with six members of the Department’s MLTI team who oversee the implementation of these three key components. The interviews and focus groups focused on the implementation of MLTI’s key components and provided additional context about the Department’s activities, successes, and challenges in Year 1.

BOX 1. EXTANT DATA METHODS

AIR analyzed extant data from Maine Department of Education to help assess program implementation statewide. The analyses describe access to technology (i.e., whether schools are receiving new devices as intended) and support for district technology infrastructure.

Data Sources

Data on access to technology. The Department provided administrative records on device allocations, device purchasing records from vendors, and responses from a Device Deployment Survey administered by the Department to each school. Of the 200 schools participating in MLTI 2.0, 151 completed the Device Deployment Survey (a 76% response rate). To examine whether survey response varied by school characteristics, schools that completed the survey were compared with schools that did not on several school-level demographics (e.g., free or reduced-price lunch, locale, per-pupil expenditures). Only per-pupil expenditure was significantly correlated with school response; schools with lower per-pupil expenditure were more likely to respond to the survey. The Department also provided administrative records on student enrollment and the number of educators by school and grade level. AIR used these data to describe the number of devices received or distributed per student or educator, the types of devices schools received, and the timing of device distribution.

Data on professional learning opportunities. AIR requested logs of professional development provided by the initiative's six digital ambassadors, who provide professional learning opportunities related to digital learning and technology integration. Due to a revision in the log form, these records were not available for the Year 1 evaluation but will be collected for future evaluation years.

Data on support for district technology infrastructure. The Department provided administrative records from Networkmaine on school-level contracted network bandwidths. These data were used to assess the percentage of MLTI participating schools with bandwidths of at least 1,000 megabits per second among the 71% of MLTI participating schools with available data from Networkmaine. To examine whether Networkmaine participation varied by school characteristics, MLTI participating schools with available data from Networkmaine were compared with those without data from Networkmaine on several school-level demographics (e.g., free or reduced-price lunch, locale). School size, locale, and the percentage of students with disabilities were significantly correlated with school participation in Networkmaine.

Compared with nonparticipating schools, participating schools are smaller, more rural, and enroll a lower percentage of students with disabilities.

Definitions

Devices per person. Ratios of devices to students (or educators) are defined as the number of devices a given school received for students (or educators) in 2021–22 divided by the number of eligible students (or educators) in that school. Due to variation resulting in part from fluctuations in student and staff counts over the data collection period, we consider ratios greater than or equal to 0.95 to indicate that schools received devices on a one-to-one basis (i.e., approximately one device per student or educator).³

Completion of device distribution. Finishing receiving devices for students (or educators) is defined as receiving 100% of all devices that were allocated for students (or educators) in 2020–21. Finishing distributing devices for students (or educators) is defined as distributing 100% of all devices that were received for students (or educators) in 2020–21.

Implementation of 1:1 Allocation of Devices

The 151 of 200 MLTI schools that responded to the Device Deployment Survey reported receiving a total of 22,399 devices for students and 2,881 devices for educators. We assessed the extent to which MLTI implemented 1:1 allocation of devices in three ways, each using data from the Department’s Device Deployment Survey:

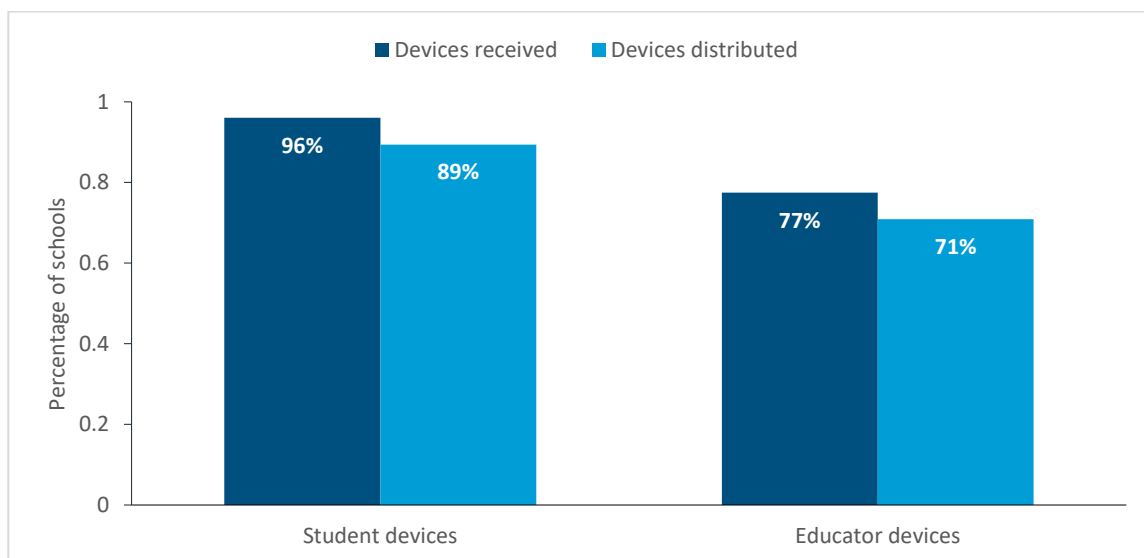
1. **Student-to-device ratio and educator-to-device ratio for devices received.** We consider ratios greater than or equal to 0.95 to indicate that schools received devices on a 1:1 basis (see Box 1).
2. **Student-to-device ratio and educator-to-device ratio for devices distributed.**
3. **Timing of device receipt and distribution,** that is, the month in which schools finished receiving and finished distributing devices to students and to educators.

³ Some variation in device-to-person ratios (e.g., device-to-person ratios of greater than 1:1) may result from fluctuations in student enrollment and staff counts over the period when data on enrollment were collected, staffing, and devices were collected. We received data on student enrollment and educator employment in January 2022, and schools responded to the Device Deployment Survey in June 2022. Using 95% confidence intervals around 1 (which would signify a ratio of exactly 1:1) based on the standard error of the mean device-per-person ratios for students and educators, we determined that ratios in the range of 0.95 to 1.05 should be considered to be 1:1.

Devices Received and Distributed Per Student and Per Educator

Almost all schools received student devices on a one-to-one basis, and most received educator devices on a one-to-one basis. Ninety-six percent of schools reported receiving approximately one device per student and three in four schools reported receiving approximately one device per educator (Exhibit 2). The lower percentage for educator devices primarily reflects the 12 schools (8%) that reported receiving no devices for staff.⁴ Only six schools (4%) reported receiving fewer than 0.95 devices per student, with a minimum of 0.7 devices per student. Among schools that received any devices for educators, but not on a one-to-one basis, all schools reported receiving at least 0.5 devices per educator.

Exhibit 2. Percentage of Participating Schools That Received and Distributed Devices to Students and Educators on a One-to-One Basis



Note. $N = 151$ schools. The sample is limited to schools that responded to the Device Deployment Survey. Because of variation in enrollment and staffing, we use 0.95 as the criterion for 1:1 device distribution (see Box 1).

Nearly nine in 10 schools distributed devices to students on a one-to-one basis, and about seven in 10 distributed devices to educators on a one-to-one basis. The percentage of schools that distributed devices on a one-to-one basis is lower than the percentage of schools that received devices on a one-to-one basis primarily because some schools did not distribute any of the devices they received for students or staff. In particular, six schools (4%) received but did not distribute any devices for students, and five schools (3%) received but did not distribute any

⁴ The Device Deployment Survey did not ask respondents to provide information about why schools did not receive devices for staff, but email communications received from staff at a portion of schools that did not receive staff devices (who wrote to the Maine DOE and AIR in response to the request to complete the Device Deployment Survey) suggest that these schools chose not to order devices for educators during the 2021-22 school year.

devices for educators (see Exhibit 2). Two of these schools—which received but did not distribute any devices for both students and educators—indicated in open-ended responses that delays in receiving devices led them to postpone distribution until the 2022–23 school year. Other schools did not explain why they did not distribute these devices in 2021–22.

Timing of Device Receipt and Distribution

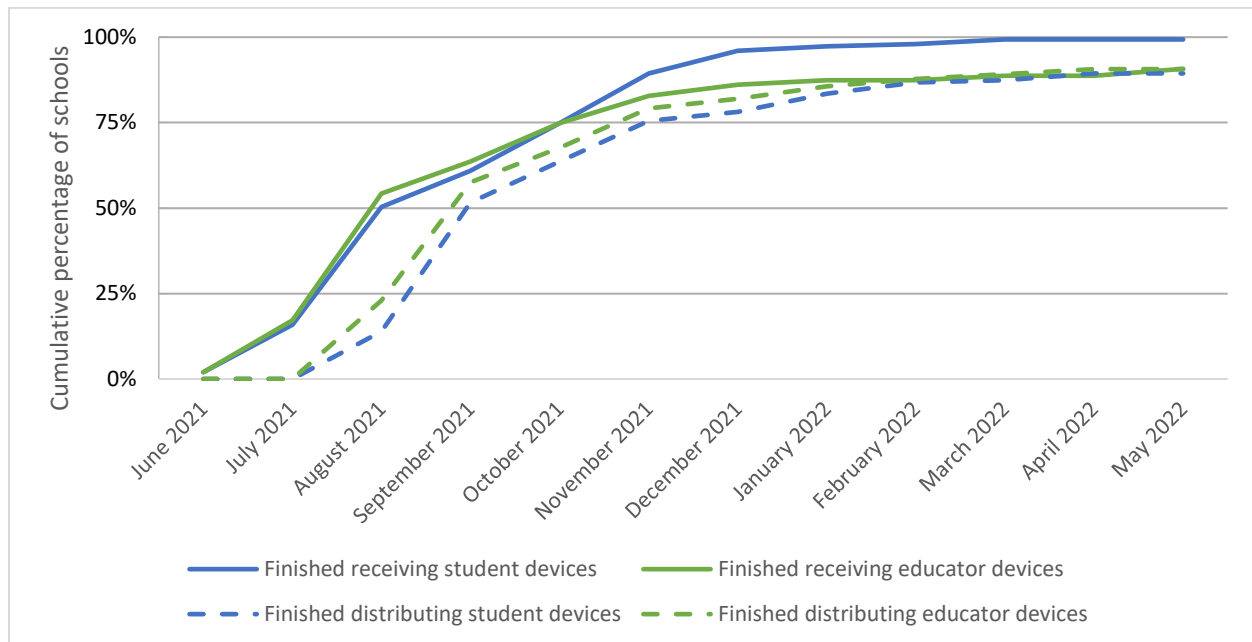
We examined the month in which MLTI schools finished receiving their allocated devices and the month they finished distributing them to students and to educators. We considered August 2021 to be a critical month by which to complete receiving devices in order to begin distributing them when school started in September 2021. Similarly, we considered September 2021 to be a critical month by which schools completed device distribution, to allow students and staff to begin using them with the start of the school year.

About half of schools (50% and 54%, respectively) received all devices allocated for students and educators by the end of August. About three quarters of schools (74 %) finished receiving student and educator devices by the end of October (Exhibit 3). About three quarters of schools received all devices for students and educators in the first quarter of the school year, and nearly all received them by the end of the year. More than 99% of schools (all but one school) received all of the devices allocated for students by the end of May, while 91% of schools received all of the devices allocated for educators by the end of May.⁵

More than half of schools (52% and 58%, respectively) finished device distribution to students and educators by the end of September. About two thirds of schools finished distributing devices for students and educators (64% and 68%, respectively) in the first quarter of the school year (i.e., by the end of October). Nearly all schools finished by the end of the year. By the end of May, about nine in 10 schools (89% and 91%, respectively) had finished distributing devices to students and educators.

⁵ Not all schools ordered all of the devices that were allocated to students or educators. In particular, 12 schools (8%) received no devices for educators; email communications with a portion of these schools indicate that they chose not to order these devices.

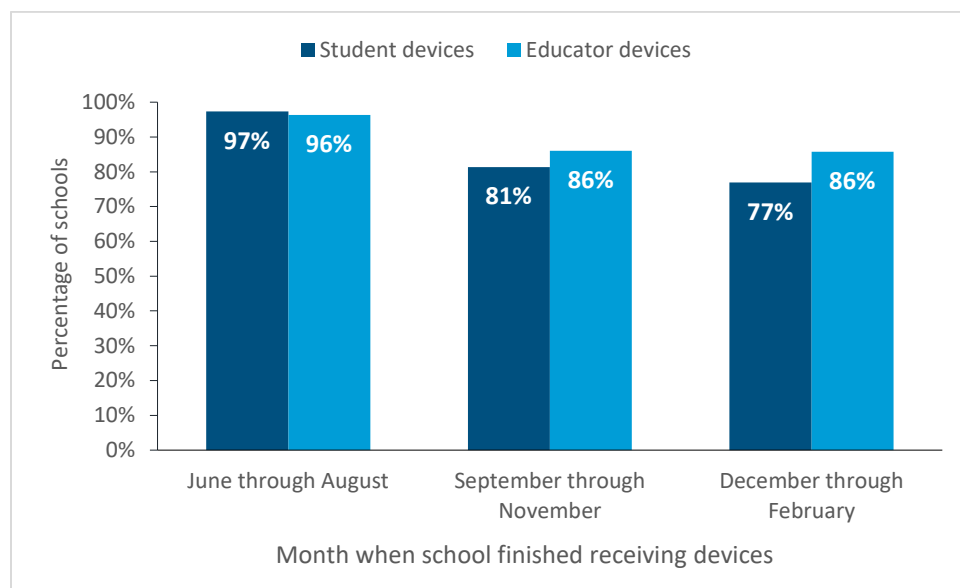
Exhibit 3. Cumulative Percentage of Schools That Finished Receiving or Distributing Devices for Students or Educators, by Month



Note. For receiving student devices, receiving educator devices, and distributing student devices, $N = 151$ schools. For distributing student devices, $N = 139$ schools due to the exclusion of schools that did not receive devices for educators. Finishing receiving devices is defined as receiving 100% of all devices allocated for students or staff. Finishing distributing devices is defined as distributing 100% of all devices received over the course of 2021–22 for students or staff.

Receiving devices earlier in the school year was associated with a greater likelihood of finishing device distribution. Nearly all schools (97%) that received student devices in June through August finished distributing all devices by the end of the year, compared with about 77% of schools that finished receiving student devices in December through February and 81% that finished receiving devices in September through November (Exhibit 4).

Exhibit 4. Percentage of Schools That Finished Device Distribution by Month When School Finished Receiving Devices



Note. Schools that did not finish receiving devices are excluded. Sample sizes in terms of the number of schools are as follows: Student devices—June through August = 76, September through November = 59, December through February = 13; Educator devices—June through August = 82, September through November = 43, December through February = 12.

Barriers to Implementation of 1:1 Allocation of Devices

In open-ended responses to the Device Deployment Survey, 40 of 151 schools (26%) reported that they encountered delayed shipments or other issues with the ordering or delivery process. Eighteen schools (12%) specifically stated that these issues delayed device distribution. Seven of 21 schools that received but did not finish distributing devices (either for students or for educators) by June 2022 cited shipping delays as the reason for delayed distribution. For example, respondents from three large schools in a single school district each reported deploying only about 6% of the devices they received due to delayed shipments at the time of responding.

Two other schools that distributed none of the student or educator devices they received in 2021–22 indicated that they pursued alternative solutions to provide students and/or educators with devices after the MLTI devices arrived later than expected. For example, one school purchased non-MLTI devices during the 2021–22 school year and planned to distribute MLTI devices during the 2022–23 school year.

During interviews for school profiles, school administrators and technology coordinators at all seven schools indicated that the device distribution process went smoothly. However,

administrators and technology coordinators at four of seven schools shared that there were aspects of the device distribution process that were tedious or took up some time, including programming the devices for the students (one school) and the summer inventory and maintenance process (three schools).

Implementation of Professional Learning Opportunities

Most teachers reported that they did not participate in professional development provided by the MLTI team. About 69% of respondents to the teacher survey reported they did not participate in professional development from the MLTI team this year. About 9% of teachers indicated they did participate in professional development from the MLTI team, and another 21% reported they did not know whether they received professional development from the MLTI team.

The COVID-19 pandemic was a barrier to the five digital ambassadors providing professional development to as many educators as they had hoped. Members of the MLTI team reported in interviews and focus groups that remote learning caused significant demands on educators' time and prevented them from participating in-person professional development at schools. MLTI team members also indicated that it was difficult to determine professional learning needs due to disruptions in instructional continuity. One Department staff member stated,

There's no teacher and staff continuity because of teachers being out and then substitutes coming in. But also with students there's no continuity. So I think that's really hard for them to draw us in to help with planning a unit or a project when there's no feeling of being able to predict and being able to have that routine set up.

As a result of these challenges, the Department prioritized efforts to build relationships with school staff and provide information about the services they offer. Additionally, Department staff pivoted toward making professional development as accessible and sustainable as possible. The MLTI team found that educators more frequently participated in asynchronous professional development (i.e., webinar recordings) that can be viewed at any time than synchronous sessions, and have focused on developing the former. One staff member said,

We have turned to offering more asynchronous resources, doing our own sort of research and development of areas that we know are growth for ourselves, where we anticipate there will be demand going forward.

For instance, the digital ambassadors have developed a Remote Learning Toolkit to provide guidance to educators on remote instruction. Digital ambassadors also placed greater emphasis on

integrating technologies into educators' instruction to facilitate learning, as opposed to focusing on how to use particular devices and applications, in response to feedback from school staff.

Implementation of Support for Technology Infrastructure

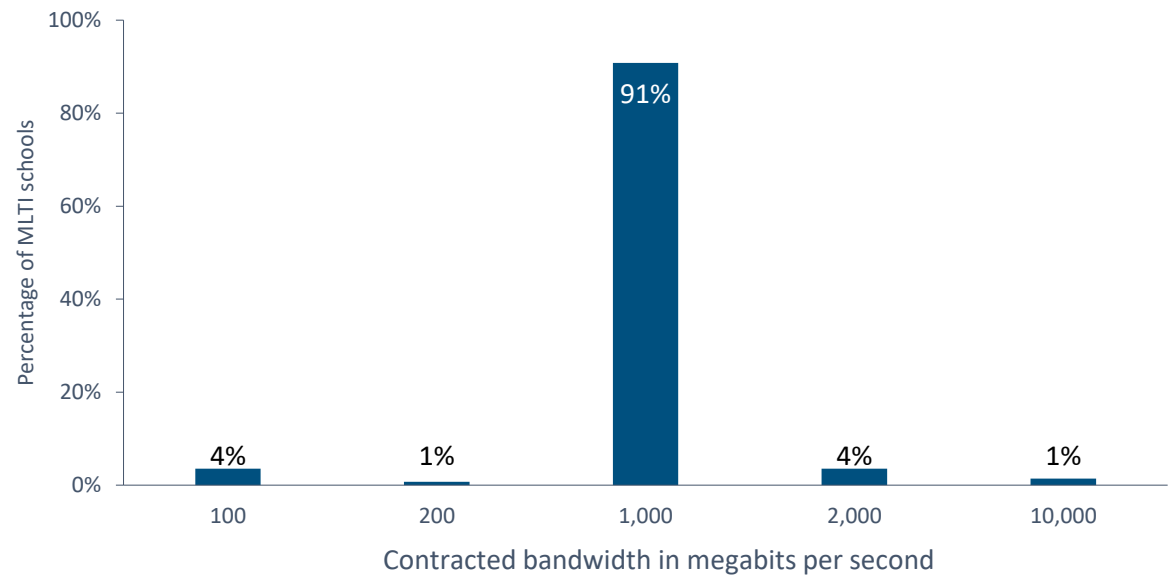
The role of the state technology infrastructure specialist is to work with MLTI schools and districts to evaluate existing technology infrastructure and the development of their infrastructure plans. This position is also expected to work with schools and districts to develop additional programs for students in the technological infrastructure fields (Maine Department of Education, n.d.). The technology infrastructure specialist was hired on April 1, 2022. During the final 3 months of Year 1, he conducted six site visits with districts to discuss infrastructure plans and funding sources.

The technology infrastructure specialist assisted schools with applications to infrastructure funding sources. For instance, the technology infrastructure specialist stated during an interview that he showed school and district leaders how to use Emergency Connectivity Funds, E-Rate, and other grant opportunities to update their technology. He said that 591 schools across the state applied for Emergency Connectivity Funds, comprising 218 funded requests for \$9 million and 334 pending requests for \$36 million. The technology infrastructure specialist provided this support to schools participating in MLTI as well as schools that are not participating in the initiative. Additionally, the technology infrastructure specialist stated that he connected school and district technology leaders across the state to share trends and best practices in education technology, cybersecurity, student data privacy, and other topics. As with the assistance with funding applications, this support included schools participating in MLTI as well as schools not participating in the initiative. The technology infrastructure specialist intends to conduct more school visits in 2022–23 to assist schools in identifying areas to further develop their infrastructure.

Contracted network bandwidth among MLTI schools participating in the Networkmaine consortium. The Department has set a network bandwidth criterion of 1 gigabyte per second (Gbps) for schools in the state. Networkmaine provides internet access to 141 of 200 (71%) participating MLTI schools.⁶ According to data from Networkmaine, 96% of MLTI schools that participate in the Networkmaine consortium have a contracted bandwidth of at least 1 Gbps (Exhibit 5). Information on the network bandwidth of the remaining 29% of MLTI schools was not available to the evaluation team.

⁶ Networkmaine is a unit of the University of Maine System that is responsible for the design and operation of Maine's research and education network (MaineREN), which delivers high-speed internet and technology services to support education, research, public service, government, and economic development throughout the state. In December 2020, Networkmaine announced a partnership with the Maine Department of Education to upgrade network connections at preK–12 schools to gigabit speeds, in part to accommodate increases in video conferencing during the COVID-19 pandemic.

Exhibit 5. Contracted Network Bandwidths of MLTI Schools Participating in the Networkmaine Consortium



Note. The sample includes 141 MLTI schools with data available from Networkmaine. Data were provided by the Networkmaine consortium.

Summary of Implementation of MLTI 2.0 Components

MLTI distributed devices on a roughly one-to-one basis to both students and educators at the average participating school according to AIR’s analysis of data from the Device Deployment Survey. Nearly nine in 10 schools distributed devices to students on a one-to-one basis, and about seven in 10 distributed devices to educators on a one-to-one basis. Most schools received and distributed all devices for students and educators in the first quarter of the school year. Later delivery of devices appeared to be associated with longer distribution times, highlighting the importance of early delivery. Fewer than 10% of teachers surveyed knew that they had participated in MLTI-provided professional development, and approximately 70% knew that they had not. The COVID-19 pandemic was a major factor limiting participation. The MLTI team has worked to address this and other barriers to participation in these opportunities by providing asynchronous professional learning sessions. The MLTI digital ambassadors developed professional learning opportunities focused on instructional practice, and prepared a toolkit to support teachers in providing virtual instruction. An important addition to Department staff capacity was the addition of a state-level technology infrastructure specialist who has helped connect schools to funding sources and other school technology leaders across the state. Among the MLTI schools participating in the Networkmaine consortium, nearly meet the Department’s network bandwidth criterion of 1 Gbps.

EQ 2. What are stakeholder opinions about the quality and usefulness of the MLTI 2.0 components and areas for improvement?

This section reports findings about stakeholder opinions of MLTI 2.0 program components. In this year of the evaluation, our data sources address professional development resources provided by MLTI. This section presents findings about teachers' ratings of the helpfulness of MLTI resources, barriers to their use of or participation in professional learning provided by MLTI, and preferences for future professional learning opportunities. The findings are based on an analysis of data from the teacher survey (Box 2, survey in Appendix B) and school administrator interviews and teacher focus groups in seven schools conducted in April and May of 2022.

BOX 2. TEACHER SURVEY METHODS

Instrument and Data. The survey included 63 items consisting of both Likert-type rating scales and frequency scales about the following topics:

- Usefulness of professional development (PD) activities (4 items) (adapted from Gerdeman et al., 2021)
- Perceived barriers to PD (4 items) (adapted from OECD, 2018)
- Frequency with which teachers ask students to use technology in student-centered activities related to the following:
 - Collaboration (4 items)
 - Critical thinking (4 items)
 - Creativity (5 items)
 - Communication (6 items) (Clarity Technology and Learning Survey, 2017)
- Useful tools for supporting student-centered learning (1 item, open ended)
- Time spent in PD overall (3 items) (adapted from Clarity Technology and Learning Survey, 2017)
- Helpfulness of technical support (6 items) (adapted from Clarity Technology and Learning Survey, 2017)
- Frequency of use of educational software and tools (16 items)
- Usefulness of the of educational software and tools (varies)
- Typical use of two or three tools perceived as most useful (1 open-ended item)

- Barriers to use of educational software and tools (varies)
- Educational software and tools to which teachers would like access (1 open-ended item)
- Confidence in ability to integrate technology (3 items; included for pilot testing for the Year 2 evaluation)
- Belief in the usefulness of technology (3 items; included for pilot testing for the Year 2 evaluation)

Survey sample. AIR used a stratified random sampling approach to select 24 schools across the nine superintendent regions with probability of selection weighted proportionally to the number of schools in each region (i.e., more schools were sampled from regions with more schools overall). Based on statewide distributions, the sample was balanced to have equal representation from schools with low, middle, and high proportions of students eligible for FRPL, include schools from each quartile of school size, and include schools from urban, suburban, and rural locales. AIR sampled these schools from the population of schools that signed the MLTI opt-in agreement. All seventh- and eighth grade teachers in sampled schools were invited to participate in the survey.

Response rate and nonresponse bias. Of 362 estimated possible respondents at those 24 schools, 196 teachers responded to the survey (181 complete and 15 partial responses) from 23 schools.⁷ To test for systematic bias in nonresponse, AIR examined if the proportion of teachers responding at each school varied by school level characteristics (i.e., percentage of students eligible for FRPL, percentage of students with disabilities, per-pupil expenditure, number of teachers per school, or region). There were no significant correlations between school-level response rate and any of these school characteristics.

Composition of survey measures. Replicating methods from a previous study of technology integration (Margolin et al., 2019), the study used descriptive methods to summarize responses to items about frequency with which teachers ask students to use technology in ways that promote collaboration, communication, creativity, and critical thinking, as well as frequency of use of different technology tools within different categories. For the former, we calculated the proportion of teachers who frequently use technology to promote each skill, defined as asking students at least monthly to use technology in at least two different ways to promote the skill. For the latter, where there were fewer tools per category, we calculated the

⁷ We calculated the estimated number of staff per school based on records in the NCES Common Core of Data.

proportion of teachers who frequently use tools in each category, defined as either the teacher or their students using at least one tool in each category at least monthly.

Opinions of 1:1 Allocation of Devices

AIR interviewed principals and technology coordinators and conducted focus groups in seven schools about conditions supporting technology integration (as described in the EQ3 section). Generally they stated that MLTI improved access to technology within their school.

Administrators and technology coordinators at all seven schools said that MLTI helped them provide devices for more students. A teacher at one school said, “I don't know if we would be capable of having that one-to-one capability for our students, if we didn't have that MLTI piece.” Teachers at three of seven schools said that MLTI freed up funds to expand 1:1 devices to additional grade levels or pass older computers to other grade levels. Teachers at two schools also reported that access to computers expanded the types of learning opportunities and activities teachers could use for students in the classroom. A technology coordinator at one school said, “MLTI, by providing us devices, so we have enough to be one to one, allows the staff more flexibility in terms of what they offer in their lesson plans within the classroom.”

Opinions of MLTI Professional Development

Seventeen of 192 surveyed teachers (9 percent) indicated that they participated in professional development from MLTI this year. The findings below should be treated very cautiously because of the small sample. The survey presented teachers with four items about their perceptions of the quality of MLTI professional development.

- All 17 teachers agreed or strongly agreed that the professional development was useful for familiarizing them with a variety of instructional delivery approaches and helping them understand how to offer instruction that addresses individual students' needs.
- Sixteen of the 17 teachers agreed or strongly agreed that MLTI's professional development offerings were useful for improving their instruction and implementing technology use in the classroom.

Eighty-seven teachers (45% of those surveyed) responded to an open-ended item asking what additional professional development opportunities teachers would like to have. The following were the most frequent types of responses:

- Nine teachers wanted more training in the Google Suite (Docs, Slides, Classroom).

- Seven teachers wanted to learn about new types of technology. One teacher said they would like to have professional development “focused on the latest technology used by educators.”
- Seven teachers wanted more resources; one teacher requested “a library of resources” and another mentioned the use of online links shared with staff.
- Four teachers requested more time to “practice using” technology.
- Three teachers requested professional development geared toward teaching students’ internet safety.

EQ 3. To what extent and in what ways are schools establishing conditions that support integration of technology into instruction?

In this section, we describe levels of school support for technology integration, which include domains of school leadership, professional learning, and technology infrastructure. Based on interviews and focus groups with school staff and students, the evaluation team constructed profiles of seven schools based on the domains (Box 3). This section presents findings across these seven schools.

BOX 3. SCHOOL PROFILE METHODS

We created profiles based on interviews and focus groups with staff and students of seven schools. The aim was to understand how school staff perceive their schools’ leadership, professional learning, and technology infrastructure as supports for integrating technology. We also wanted to understand how students perceive their schools’ technology infrastructure and how they use technology for schoolwork.

School Sample

We sampled eight schools from a list of all Maine public schools that participated in the MLTI program. We balanced the sample to have roughly proportional representation of schools based on statewide distributions by locale and by percentage of students from low-income families and to include schools from eight of nine different superintendent regions. Because

one school did not respond to our request for participation, the resulting sample includes seven schools.

Data Collection and Analysis

The research team conducted virtual video interviews with each school's principal and designated school technology leader as well as virtual video focus groups with teachers and with students. In total, AIR conducted seven principal interviews, seven technology leader interviews, six teacher focus groups, and six student focus groups.

School Technology Integration Supports Framework

AIR developed a technology integration support framework to guide interview and focus group protocol development and qualitative data collection and analysis. This framework describes three major domains and dimensions of school-level processes that prior research indicates are critical for supporting technology integration. The framework for our evaluation focuses on the following domains and dimensions of technology integration support:

Domain	Dimension
Technology Leadership for Technology Integration	Shared Vision
	Culture of Innovation
Professional Learning for Technology Integration	Job-Embedded Professional Development
	Collaboration
Technology Infrastructure	Access to Technology
	Access to Technical Support

Based on the qualitative data, AIR analysts assigned each school to a level from 0 to 2, low to high, for each dimension in a domain. After assigning dimension levels, we summed the dimension levels to reach a domain level. Thus, for each of the three domains (which comprised two dimensions), the possible scores ranged from 0 to 4. Finally, we summed across domains to calculate an overall school level for technology integration support.

Appendix C provides a detailed description of the site profile methodology and summarizes school profile levels assigned for each school.

Leadership of Technology Integration

Staff in five of seven schools described moderately high leadership of technology integration in their schools.⁸ Staff at one school described high leadership and staff at one other school described moderately low leadership.

More schools had high levels in the culture of innovation dimension than the shared vision dimension. Staff at four of seven schools described high levels of culture of innovation. Our analysis suggests that school leadership in these four schools usually had a vision for technology use; schools varied in the formality and communication of the vision and the level of support for innovation. Staff who described a high level of culture of innovation pointed to teachers and administrators supporting innovation and experimentation with technology and seeking resources or initiatives to bring new technology and ideas for using it to their schools. Exhibit 6 provides the seven schools' dimension and domain levels for leadership of technology with further description of the schools by dimension following.

Exhibit 6. Domain and Dimension Levels for the Leadership Domain

School	Dimension level for shared vision	Dimension level for culture of innovation	Domain level for leadership
School A	1	0	1
School B	2	1	3
School C	1	2	3
School D	1	2	3
School E	2	1	3
School F	1	2	3
School G	2	2	4

Note. Dimension levels ranged from 0 to 2. Domain levels ranged from 0 to 4.

Shared Vision for Use of Technology

Three schools had a high level of shared vision for use of technology. School leaders and teachers at these schools explained that their schools had technology plans that were developed with teacher and staff input and communicated clearly to everyone in the school. For example, staff at two schools described committees that included teachers who helped develop the school's technology plan or vision.

⁸ Students were not asked about this domain.

Four schools had a moderate level of shared vision for technology use. Staff at these schools stated that they had an informal vision for technology or had aging plans that had not been revised recently. Teachers and administrators at one school explained they had a 1:1 device policy, but expectations for technology use were not well-articulated to teachers. For two other schools, teachers and administrators described their school visions slightly differently. Staff at another school stated that they did not have an “an up-to-date” technology plan. The principal explained, “I don't believe we have an up-to-date technology plan or anything like that, but...we have a tech director who is incredibly gifted at pushing the envelope of what we can do in the classrooms.”

Culture of Innovation

Four schools had high levels of culture of innovation. At these schools, teachers reported that they felt strongly encouraged by school administrators to experiment with technology use in the classroom. In two schools, teachers said that school administrators provided strong encouragement and actively sought out resources for technology innovation. One teacher said, “I feel like we're encouraged to a very high degree...to think outside the box, use [technology] as a tool for enhancing our curriculum [and] pushing the curriculum boundaries to new heights with what we can imagine.” Further, teachers at these schools said that they felt comfortable asking school administrators to approve new ideas or requests for technology. For instance, a teacher at one school stated their administration helped them look for grants and funding opportunities for their ideas.

Staff at schools with a high level of culture of innovation described concrete examples of trying innovative ideas or being involved in technology initiatives other than MLTI. School administrators at one school explained that they had funding for programmable robots that students used to learn about coding and programming. Another school purchased hotspots that families could use and were available for teachers to bring on field trips or career trips for high school students. Staff at two schools discussed using digital or web-based curriculums for some subjects.

Two schools had moderate levels of a culture of innovation. At these schools, teachers characterized school administrator support for innovative ideas as moderate rather than strong. Teachers reported that encouragement to try new ideas and integrate technology often came from other teachers and less frequently from school administrators. Teachers at one school explained that they sometimes experimented with technology use in the classroom, but school administrators were not strongly active in their support for it.

One school had a low level of culture of innovation. At this school, administrators and teachers did not identify examples of a culture of innovation, such as participation in technology initiatives and experimentation with using technology in students' learning opportunities.

Professional Learning about Technology Integration

Staff in four of seven schools described moderately high levels of professional learning in their schools, and staff at three schools described moderate levels of professional learning.⁹ More schools had high levels in the collaboration dimension than the job-embedded professional development dimension. Staff at five of seven schools described high levels of collaboration and staff at none of the schools described high levels of job-embedded professional development. Our analysis suggests that teachers participated in some professional development about technology integration, but it had not occurred on an ongoing basis or been integrated into existing school routines. Staff who described a high level of collaboration provided examples of teachers having frequent collaboration opportunities with their peers to discuss technology and its incorporation in their lessons. Exhibit 7 provides the seven schools' dimension and domain levels for professional learning. A detailed description of the schools by dimension follows.

Exhibit 7. Domain and Dimension Levels for the Professional Learning Domain

School	Dimension level for job-embedded professional development	Dimension level for collaboration	Domain level for professional learning
School A	0	2	2
School B	1	1	2
School C	1	2	3
School D	1	1	2
School E	1	2	3
School F	1	2	3
School G	1	2	3

Note. Dimension levels ranged from 0 to 2. Domain levels ranged from 0 to 4.

⁹ Students were not asked about this domain.

Job-Embedded Professional Development About Technology Integration

Six of the seven schools had moderate levels of job-embedded professional development.

Teacher focus group participants described participation in technology-focused professional development provided by their school, district, vendors, or other sources. School leaders and teachers reported that teachers participated in a moderate amount of technology-related professional development, but there have been some barriers to teachers' ongoing participation. Administrators and teachers from five schools indicated that the COVID-19 pandemic prompted teachers to learn how to use virtual learning technology, but also decreased teacher participation in professional learning on technology integration. Two technology coordinators believed that this decrease was attributable to the effects of the COVID-19 pandemic.

Responses from these schools suggest that professional development was not consistently embedded into existing school routines. For example, one principal reported that teachers could attend professional development trainings through MLTI or elsewhere so long as they had coverage for a substitute teacher. During focus groups, teachers provided examples of in-person professional development opportunities that were previously available but were no longer available. These included a summer institute that was led in conjunction with MLTI and the Association of Computer Technology Educators of Maine conference.

Staff at one school described low levels of job-embedded professional development. School leaders and teachers did not mention ongoing professional development about technology or training opportunities that were embedded in existing school routines. During the focus group, teachers only described formal professional development that was offered prior to the COVID-19 pandemic. Additionally, one teacher said, "There hasn't been a huge effort to sort of organize everybody to get trained on common tools and things like that." One principal described an annual professional development day that was led by staff members who were asked to present on a topic that would be helpful to their peers.

Staff at all schools reported that the professional development they attended focused on how to use particular applications or devices. When asked about the content of technology-focused professional development, respondents from all schools named specific applications or devices, such as PowerSchool, Google Classroom, or visual display boards. Teachers did not mention that they had participated in MLTI professional learning opportunities.

Staff at all schools stated that they would prefer that professional development is aligned to their curricular goals and provides opportunities for practice. Teachers from five schools expressed that although they appreciate current professional development opportunities on technology, the format of having one-time sessions on a particular topic made it difficult to

remember how to put it into practice later. Several respondents made suggestions such as having digital folders of training materials, small-group practice sessions, and recorded trainings so that teachers could later review what they had learned. Additionally, teachers from two schools suggested differentiating professional development by subject matter or by teachers' level of experience with technology. Teachers from two schools expressed interest in opportunities to network with teachers about useful technology approaches. As one teacher said, "There [are] a lot more things that we could have the kids be doing that we don't know about."

Teacher Collaboration About Technology Use

Five schools had high levels of teacher collaboration. School leaders and teachers at these schools described high levels of collaboration, indicated by teachers engaging in informal collaboration and teacher-led professional development. Staff at four schools spoke extensively about their informal collaboration, teacher-led professional development, and time for collaboration. At these schools, staff described having go-to technology "experts" (often, but not always, part of the technology department) whom they could access for questions or ideas on using software or devices. These teachers were often seen as the most tech-savvy by their colleagues and could assist others in effectively using the available technology in their classrooms. Teachers used formal collaboration time (such as grade-level or content team meetings) to support each other in instruction and planning, and often discussed technology implementation during this time. As one teacher put it, "we're doing the learning and teaching of ourselves."

Of the five schools with high levels of collaboration, staff at three schools indicated that teachers often led professional development sessions. Respondents described leveraging in-house knowledge to further develop staff expertise, such as having Google-certified teachers lead trainings on Google products, or having teachers attend a tech conference to then share their knowledge later with school staff. A technology coordinator from one school said, "I think that professional development that is delivered by other teachers is way more interesting and powerful than by vendors."

Two schools had moderate levels of teacher collaboration. At these two schools, administrators and teachers described moderate amounts of collaboration opportunities to discuss technology integration. Staff at these two schools stated that time was a barrier to teacher collaboration about technology use. At one school, both the technology coordinator and a teacher indicated that while informal collaboration took place, it "doesn't happen as often as [they would] like."

Technology Infrastructure

School leaders, teachers, and students in five of seven schools described high levels of technology infrastructure. The remaining two schools had a moderate level of technology infrastructure. Most schools (six of seven) had high levels of access to technology, indicated by sufficient technology hardware, software, and wireless connectivity. All schools had high levels of access to technical support, as indicated by having a technology coordinator or other staff member who help troubleshoot technical issues in a timely manner. Exhibit 8 provides the seven schools' dimension and domain levels for technology infrastructure. Additional details of the schools by dimension follows.

Exhibit 8. Dimension and Domain Levels for the Technology Infrastructure Domain

School	Dimension level for access to technology	Dimension level for access to technical support	Domain level for technology infrastructure
School A	1	2	3
School B	2	2	4
School C	2	2	4
School D	2	2	4
School E	2	2	4
School F	1	2	3
School G	2	2	4

Note. Dimension levels ranged from 0 to 2. Domain levels ranged from 0 to 4.

Access to Technology

Five schools had high levels of access to technology. Staff and students at five schools described wireless connectivity that was sufficient for classroom use without frequent interruption, and sufficient access to technology with 1:1 devices for students and teachers. Four of these schools also reported having supplemental technology beyond computers, such as SMART boards or 3D printers. Administrators at all five of these schools reported that they supported students' home access to technology via hotspots. School leaders, teachers, and students at three of seven schools described some challenges with internet in specific rooms or areas of the school. Other technical issues included other “outdated” technology (e.g., projectors; two schools), unpredictable software glitches (one school), or understanding software compatibility of the device (one school).

Two schools had a moderate level of access to technology. These school had a moderate level because, although they an adequate number of technology devices and hotspots for home access, they had higher levels of technical issues. Teachers and students more frequently reported issues with the functionality of devices and slow internet within the school. For example, in one school a teacher reported that the computers did not work reliably in her room, although other teachers in the school did not appear to have the same problem.

Administrators and teachers at all schools suggested ways to improve their use of technology. While respondents from all stakeholder groups at all schools described sufficient access to computers for MLTI grade levels, administrators and teachers reported wanting more supplemental technology (e.g., SMART boards, 3D printers, robotics; five schools) and additional Wi-Fi hotspots for families without internet access (two schools).

Access to Technical Support

School leaders, teachers, and students at all schools described high levels of access to technical support. School leaders, teachers, and students at three of seven schools said that they had a technical support staff member within their school. All stakeholder groups at four of seven schools said the technical support staff split their time between their school and other schools or buildings in the district. Administrators, teachers, and students discussed various ways of contacting technical support, including ticket systems (five of seven schools) or calling or emailing the technology coordinator (seven of seven schools). The technical support staff at all schools provide support around technical issues with devices, internet, or software.

Though satisfied with the technical support, administrators at every school expressed interest in additional technical support staff. Principals or technology coordinators noted that additional staff would help cover times when someone is out of office or expand capacity to offer professional development focused on technology integration. A technology coordinator at one school said it would be helpful to have one person responsible for technical support and a separate person for technology integration who could show teachers what they can do with their devices. At another school, a principal discussed the possibility of expanding technical support by training students or teachers on “some common problems and how to fix them.”

Summary of School Technology Supports

Most of the seven profiled schools had moderately high or high levels of support in each of the three domains of leadership support, professional learning, and technology infrastructure. When summing across the domains, six of seven schools had high overall levels of support for technology integration (indicated by a sum in the range of 9 to 12). Within this group, the schools that had scores in the end of the range tended to have moderate levels of leadership support. One school had moderate overall levels of support (indicated by a sum in the range of

5 to 8). Within each domain, the profiled schools typically had moderately high levels of leadership support and high levels of technology infrastructure. Within the professional learning domain, schools had either moderate or moderately high levels of support. Exhibit 9 depicts each school's level of technology integration support for each domain and overall.

Exhibit 9. Domain and Overall Levels for Technology Integration Supports by School

School	Leadership Support	Professional Learning	Technology Infrastructure	Overall
School A	1	2	3	6
School B	3	2	4	9
School C	3	3	4	10
School D	3	2	4	9
School E	3	3	4	10
School F	3	3	3	9
School G	4	3	4	11

EQ 4. To what extent are educators using technology to support student-centered learning?

This section presents findings from the teacher survey on the extent to which teachers are using technology to support student-centered learning. As specified in the MLTI 2.0 Guiding Principles (Maine Department of Education, 2020), these learning activities are intended to promote collaboration, communication, creativity, and critical thinking skills. The section also reports teacher opinions about technology integration, such as their comfort with and concerns about using technology.

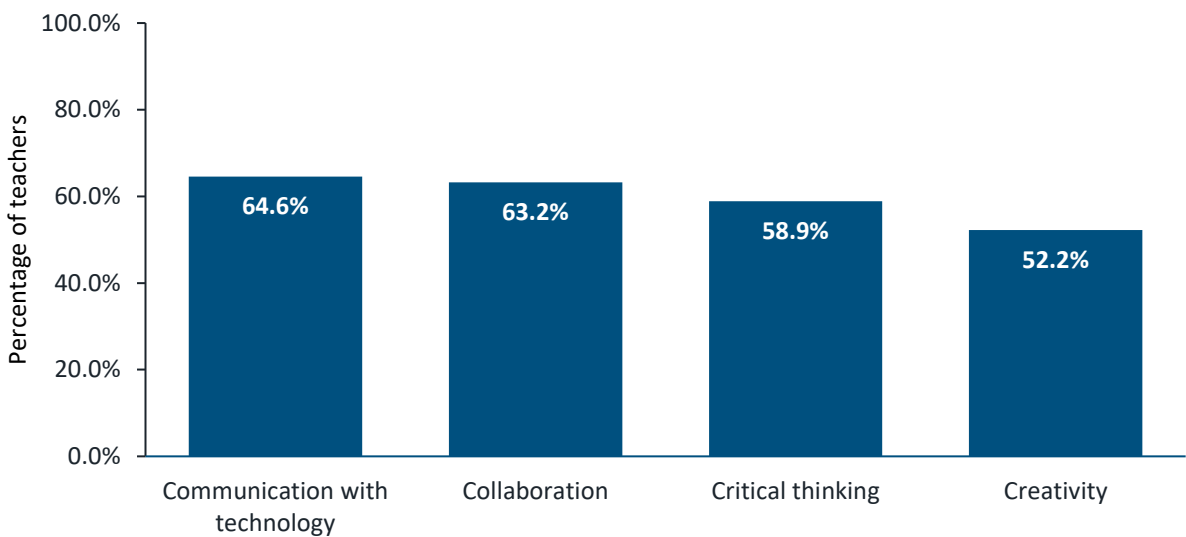
Frequency With Which Teachers Emphasized Student Use of Technology for Collaboration, Communication, Creativity, and Critical Thinking

The evaluation team examined the frequency of teacher responses to the survey items addressing technology use for the development of collaboration, communication, creativity, and critical thinking. The survey included four to six examples of student activities (using technology) that promote these skills (see Box 2). The survey asked teachers to rate how frequently they asked most of their students to participate in these activities. The evaluation

team calculated the proportion of teachers who emphasized each skill, which we defined as asking students at least monthly to use technology in at least two different ways for each skill.

About six in 10 surveyed teachers (59% to 65%) reported that they emphasized students’ use of technology for communication, collaboration, and critical thinking. About half (52%) of teachers emphasized creativity (Exhibit 10).

Exhibit 10. Percentage of Surveyed Teachers Emphasizing Student Use of Technology for Communication, Collaboration, Critical Thinking, and Creativity



Note. *N* = 187. Percentages refer to the percentage of surveyed teachers who reported that they asked students to use classroom technology at least monthly for at least two activities related to each of four categories (collaboration, critical thinking, creativity, and communication with technology).

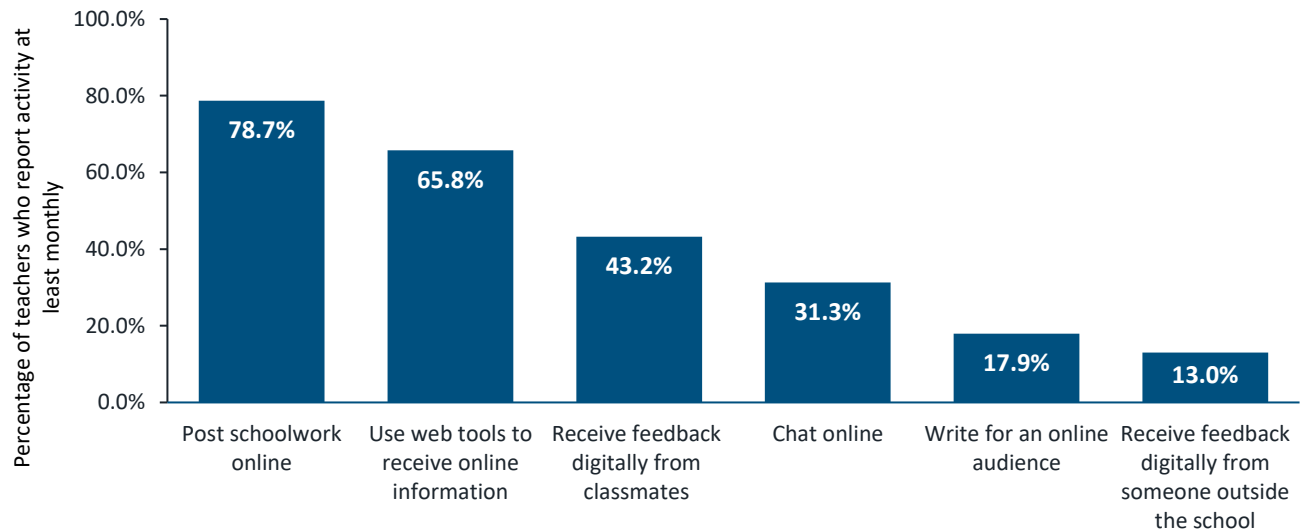
With respect to emphasizing students’ use of technology through activities that develop communication skills, the survey results are as follows:

- 79% of teachers posted schoolwork online.
- 66% of teachers emphasized student technology use, at least monthly, to use web tools to receive online information.
- 43% of teachers emphasized student technology use, at least monthly, to receive feedback digitally from classmates.
- 31% of teachers emphasized student technology use, at least monthly, to chat online.
- Fewer than 20% of teachers emphasized student technology use, at least monthly, to interact digitally with outside audiences, including:
 - writing for an online audience (18%) and

- o receiving feedback digitally from someone outside their school (13%).

See Exhibit 11.

Exhibit 11. Percentage of Surveyed Teachers Asking Students at Least Monthly to Use Technology to Communicate in Various Ways



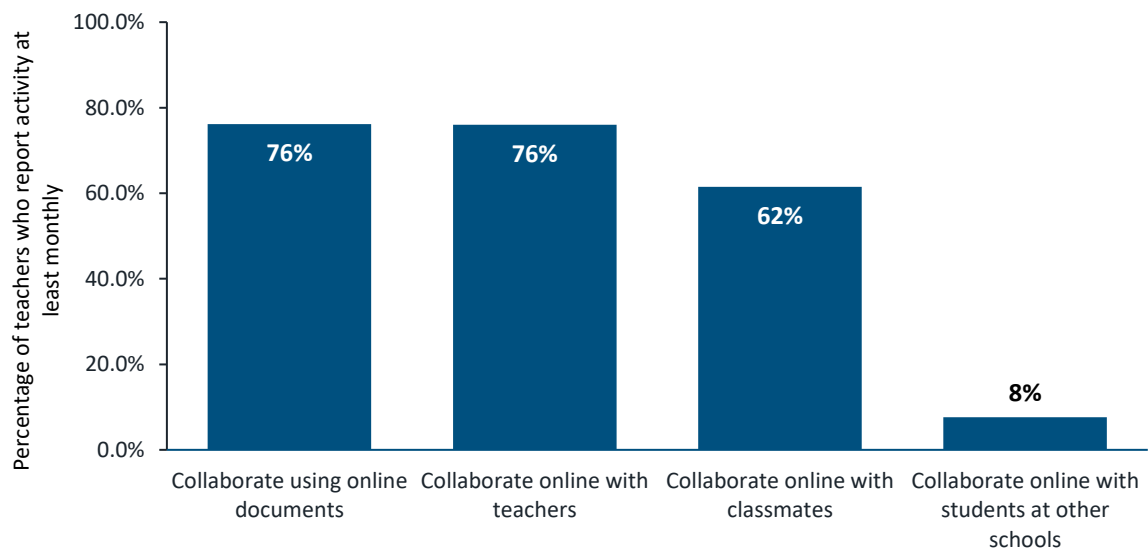
Note. $N = 187$. Percentages refer to the percentage of surveyed teachers who reported asking students daily, weekly, or monthly to participate in each use of technology for communication. The survey item stem asked, “How frequently do you ask a majority of your students to...”

With respect to activities that develop collaboration skills:

- Three quarters of surveyed teachers reported emphasizing student technology use, at least monthly, to collaborate using online documents and to collaborate online with teachers.
- 62% of surveyed teachers reported emphasizing student technology use, at least monthly, to collaborate online with classmates.
- 8% of surveyed teachers reported emphasizing student technology use, at least monthly, to collaborate with students in other schools.

See Exhibit 12.

Exhibit 12. Percentage of Surveyed Teachers Asking Students at Least Monthly to Collaborate in Various Ways



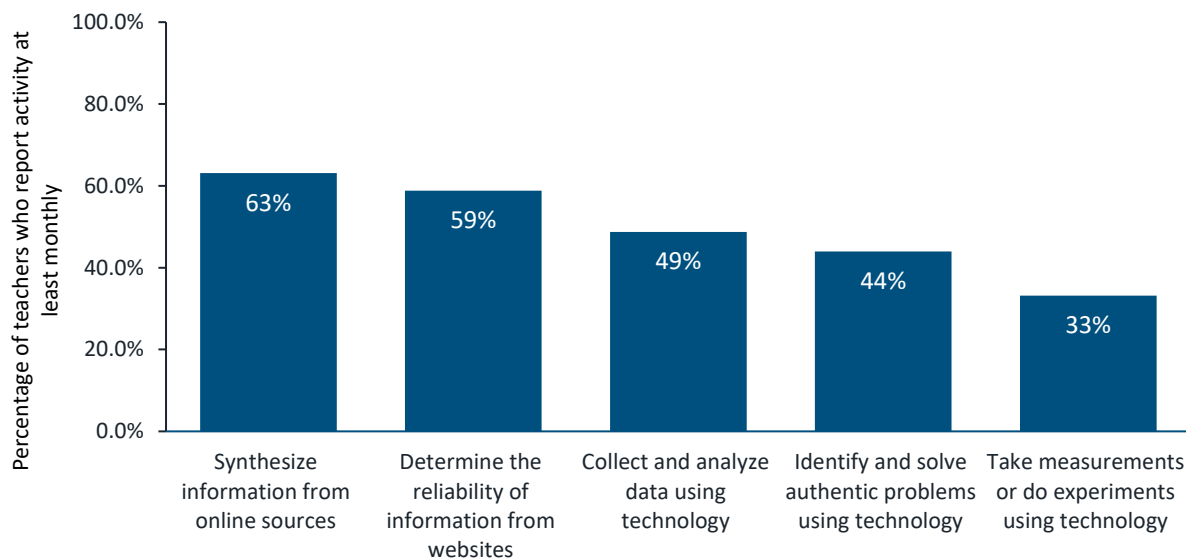
Note. *N* = 187. Percentages refer to the percentage of surveyed teachers who reported asking students daily, weekly, or monthly to participate in each use of technology for collaboration. The survey item stem asked, “How frequently do you ask a majority of your students to...”

With respect to critical thinking skills, survey responses showed the following:

- 63% of surveyed teachers reported that they emphasized student technology use, at least monthly, for critical thinking by synthesizing information from online sources.
- 59% of surveyed teachers reported that they emphasized student technology use, at least monthly, to determine the reliability of website information.
- 49% of surveyed teachers emphasized student technology use, at least monthly, to collect and analyze data.
- 44% of surveyed teachers emphasized student technology use, at least monthly, to identify and solve authentic problems.
- 33% of surveyed teachers emphasized student technology use, at least monthly, to take measurements or do experiments using technology monthly.

See Exhibit 13.

Exhibit 13. Percentage of Surveyed Teachers Asking Students at Least Monthly to Use Technology for Critical Thinking in Various Ways



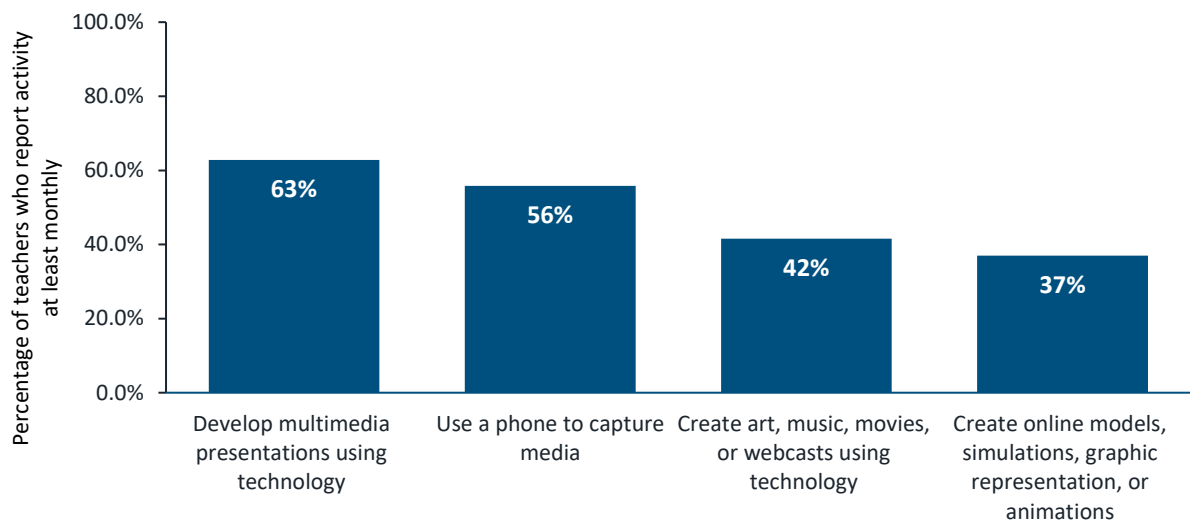
Note. $N = 187$. Percentages refer to the percentage of surveyed teachers who reported asking students daily, weekly, or monthly to participate in each use of technology for critical thinking. The survey item stem asked, “How frequently do you ask a majority of your students to...”

With respect to activities that develop creativity skills, survey responses showed the following:

- 63% of surveyed teachers asked students at least monthly to develop multimedia presentations.
- 56% of surveyed teachers asked students at least monthly to use a phone to capture media.
- 42% of surveyed teachers asked students at least monthly to use technology to create art, music, movies, or webcasts.
- 37% of surveyed teachers asked students at least monthly to create online models, simulations, and animations.

See Exhibit 14.

Exhibit 14. Percentage of Surveyed Teachers Asking Students at Least Monthly to Use Technology to Create Various Types of Products



Note. *N* = 187. Percentages refer to the percentage of surveyed teachers who reported asking students daily, weekly, or monthly to participate in each use of technology for creativity. The survey item stem asked, “How frequently do you ask a majority of your students to...”

Teachers participating in focus groups recognized the value of technology for instruction, but expressed concerns about technology misuse and overuse.

Participants in focus groups and interviews described their opinions about the value of using technology to support instruction. Teachers from all seven schools stated that they value technology for teaching and learning. Teachers from six schools described technology as integral to their work. For example, teachers stated that technology is “integrated now into everything we do” and that they “could not imagine doing this job without it.”

Teachers or principals from five of seven schools also described out-of-policy uses of technology by students as a challenge (for example, accessing “inappropriate” content). As a result, teachers need to monitor students’ screens while students use computers during class time.

Teachers from three schools also expressed concerns of overloading students with screen time. These teachers described times when they purposely do not use technology in their classrooms. One teacher stated that it was “nice to have a balance” between technology and more traditional instructional methods.

School staff and students described variation among teachers in their comfort with technology.

Teachers and principals from all seven schools described how the pandemic forced them to learn how to use technology quickly. Principals, technology specialists, and teachers from five of seven schools noted that most of their teachers were comfortable using technology in the classroom, although some were hesitant to experiment with new technologies or applications of technology. This hesitation resulted in somewhat less technology being used, or technology only being used for certain assignments or skills by some teachers. One principal mentioned that a barrier teachers face with integrating technology into instruction is “giving up the old,” and thus they tend to use traditional instructional methods they are comfortable with. Another principal described wanting to see “more creative and more complex use of technology...[but] teachers are probably the limiting factor in that.” Students from these five schools made a similar point. Students described all teachers as capable of using technology but said “some are better than others.”

Summary

Surveyed teachers frequently used technology in the classroom in a variety of ways for student-centered learning. Half to two thirds of surveyed teachers emphasized using technology in the development of communication, collaboration, critical thinking, and creativity skills. The most frequent uses of technology within these categories, respectively, were posting schoolwork online, collaborating using online documents, synthesizing information from online sources, and developing multimedia presentations. School staff stated in interviews or focus groups that teachers valued technology in education, but that some teachers had concerns about out-of-policy or overuse of technology by students. In most schools, staff and students stated that there was variation among teachers in their comfort and willingness to experiment and innovate using technology.

EQ 5. What are promising tools or technologies for supporting student-centered learning?

This section presents evaluation findings about promising tools and technologies for supporting student-centered learning on four related topics: tools teachers report they use in instruction, teachers’ assessments of tool instructional utility, additional tools teachers would like to access, and finally, barriers teachers report encountering in accessing and using these tools.

For clarity, we organized findings about technology tools into the following seven broad categories:

1. **Productivity tools** (including word processing, presentation, and data processing [spreadsheet] tools)
2. **Course management tools** (including learning management software and behavior management systems)
3. **Personalized learning tools** (including interactive assessment software, online lessons for “flipped classroom” approach, and software to support personalized and self-paced learning)
4. **Communication tools** (including **virtual** communication tools and online discussion forums)
5. **Programming and analysis tools** (including geography or mapping software and computer programming software)
6. **Simulations and educational games** (including simulation software and game-based software)
7. **Video and music tools** (including software for video or photography editing and music production or editing)

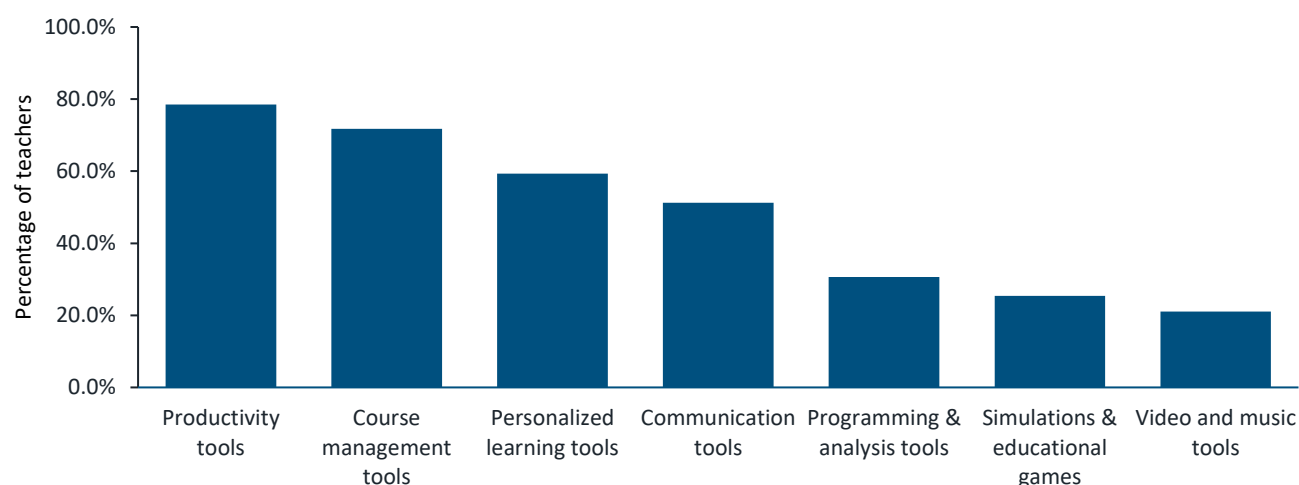
Surveyed Teachers’ Rated Frequency of Use of Technology Tools

For each of the four categories of productivity, course management, personalized learning, and communication, over half of surveyed teachers used at least one technology tool in the category at least monthly (Exhibit 15).

- Over seven in 10 used at least one technology tool at least monthly within the categories of productivity (79%) and course management (72%).
- At least half used at least one tool at least monthly within the categories of personalized learning (59%) and communication (51%).

About 30% or fewer teachers reported using at least one tool at least monthly in the remaining three categories: programming and analysis tools (31%), simulations and educational games (25%), and video and music tools (21%).

Exhibit 15. Percentage of Surveyed Teachers Who Reported Using at Least One Tool at Least Monthly in Each Category



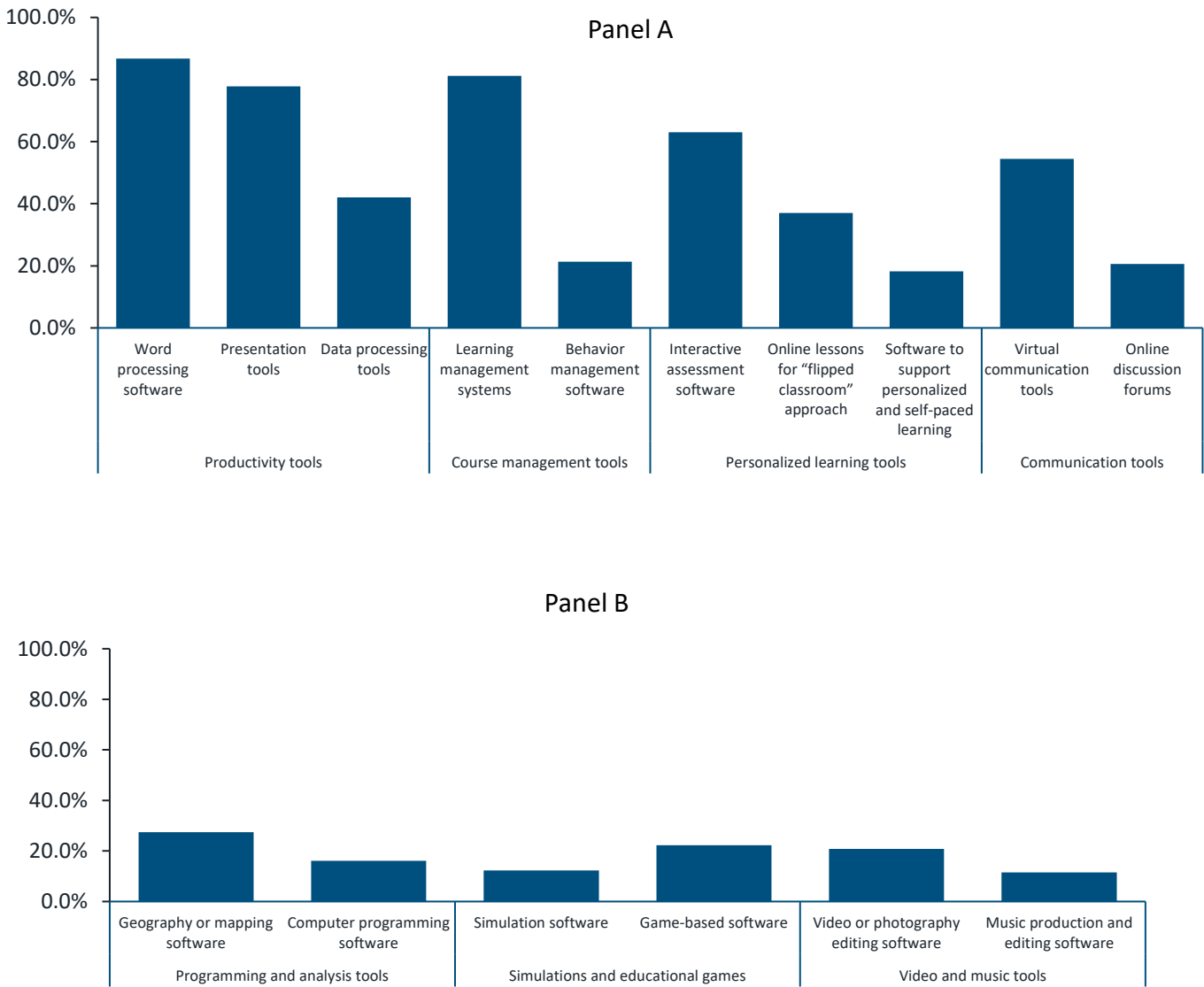
Note. $N = 209$. Percentages indicate the percentage of teachers who reported using at least one tool at least monthly in each category. The survey item stem asked, “Please indicate about how often you use the following software...” Response options included Daily or almost daily; Weekly; Monthly; Less than monthly; Don’t use.

Within the four categories of tools teachers reported using most frequently, the following were the most frequently used tools (Exhibit 16, Panel A):

- Among productivity tools, using word processing and presentation tools (87% and 78% using at least monthly)
- Among course management tools, using learning management systems (81%)
- Among personalized learning tools, using interactive assessment software (63%)
- Among communication tools, using virtual communication tools (54%)

Surveyed teachers indicated they used tools in the other three categories—programming and analysis tools, simulations and educational games, and video and music tools—relatively less frequently. Fewer than 30% reported using specific tools in these categories at least monthly (Exhibit 16, Panel B). The tools in these three categories tend to be more specialized to content areas than tools in the more frequently used categories. For instance, computer programming software has more specialized uses than word processing software, which tends to have broader uses.

Exhibit 16. Percentage of Surveyed Teachers Who Reported Using Specific Tools at Least Monthly



Note. *N* = 183. Percentages indicate the percentage of teachers who reported using each technology tool at least monthly. The survey item stem asked, “Please indicate about how often you use the following software...” Response options included Daily or almost daily; Weekly; Monthly; Less than monthly; Don’t use.

Teacher Ratings of Usefulness of Technology Tools

The survey asked teachers to rate the usefulness of each technology tool they indicated that they used. Among teachers who used the tools in the categories of productivity, course management, personalized learning, and communication, between 82% and 100% rated them as either *somewhat useful* or *very useful*, and between 40% and 87% of teachers rated them as

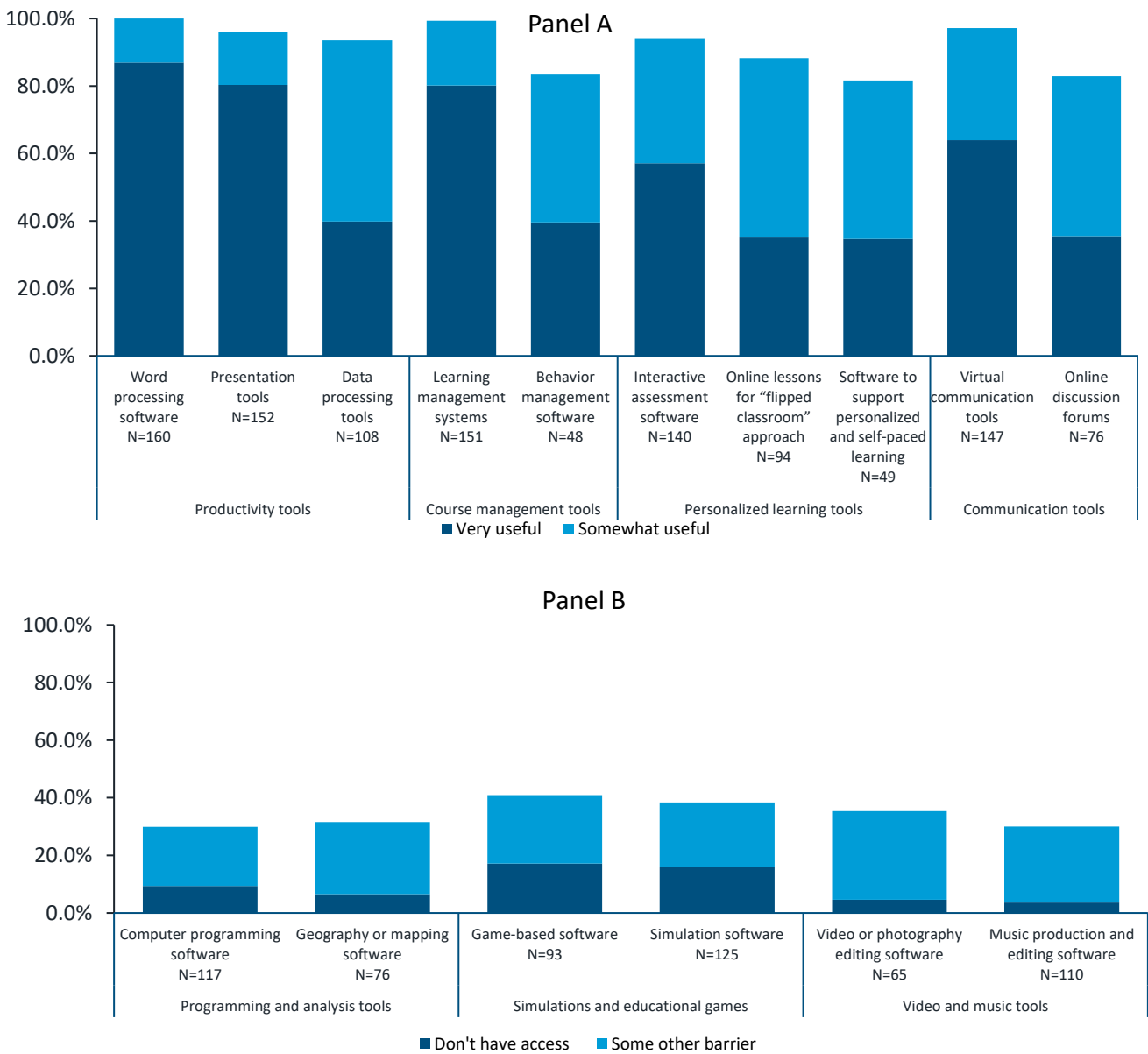
very useful (Exhibit 17, panel A). The tools that had the highest percentage of ratings of *very useful* were as follows, organized by category:

- Productivity: word processing software (87%) and presentation tools (80%)
- Course management: learning management systems (80%)
- Personalized learning: interactive assessment tools (57%)
- Communication: virtual communication tools (64%).

These were the same tools with the highest percentage of teachers using them at least monthly (see Exhibit 16, panel A).

Among teachers who used programming and analysis tools, simulations and educational games, and video and music tools technology tools, between 77% and 90% of teachers rated them as at least *somewhat useful*, and between 31% and 43% of teachers rated them as *very useful* (Exhibit 17, Panel B).

Exhibit 17. Percentage of Surveyed Teachers Rating Specific Technology Tools as Very Useful or Somewhat Useful



Note. The *N* values represent the number of teachers who reported using the technology tool and who answered the usefulness question. Teachers who reported using technology tool at any frequency were asked, “For the tools you said you use with your students, rate how useful they are in supporting your instruction.” Response options were Not useful, Somewhat useful, and Very useful.

How teachers use technology tools. The survey asked teachers to describe how they used the two or three technology tools they find the most useful. Sixty-six teachers responded to describe their use of specific tools. The five tools described by the most teachers were word

processing (42 responses), learning management systems (41), presentation tools (35), virtual communication (25), and personalized learning (24). Exhibit 18 summarizes the specific uses teachers described for each tool.

Exhibit 18. Teachers' Uses of the Technology Tools They Perceived as Most Useful

Technology tool	<i>N</i> respondents	Specific uses (number of teachers mentioning)
Word processing	42	• Composition of poems, short stories, essays, etc. (12) • Teachers create assignments (5) • Teachers create assessments (2) • Teachers create rubrics and offer feedback (2)
Learning management system	41	• Post assignments (18) • Track missing work (6) • Use as a gradebook or feedback platform (4)
Presentation	35	• Students create presentations (12) • Teachers present lecture notes or instructional material (7)
Virtual communication	25	• Provide remote learning (10) • Teachers attend meetings (e.g., IEP meetings) (8) • Connect students with people outside the school (e.g., meet with local author) (2)
Personalized learning	24	• Review material with classroom (3) • Formative assessment (check for understanding) (3)

Note. A total of 66 teachers responded to the prompt, “For the 2 or 3 tools you find *most* useful, please describe how you use them.” The total number of respondents for each tool does not equal the number of teachers mentioning specific technology uses because the latter column excludes teachers who described only the name of the tool they used.

See Appendix D for a more complete description of teacher uses for each type of technology tool, organized by the seven categories.

Barriers to Use of Tools

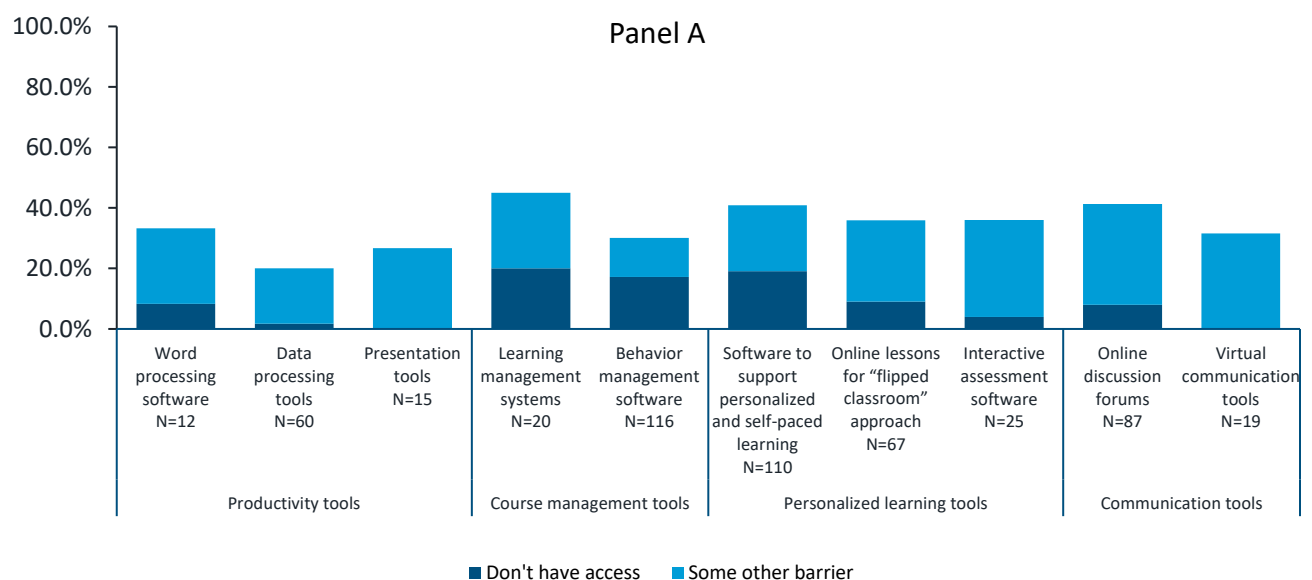
For each tool that teachers indicated they never used, the survey prompted teachers to identify the “barrier to use” of the tool.

- For all 16 tools, most teachers indicated they were “not interested” in using the tool.
- Across all 16 tools, relatively few teachers who never used the tool (0% to 20%) indicated that *lack of access* was a barrier (Exhibit 25). A relatively high proportion of teachers reported *lack of access* as a barrier for the following tools:

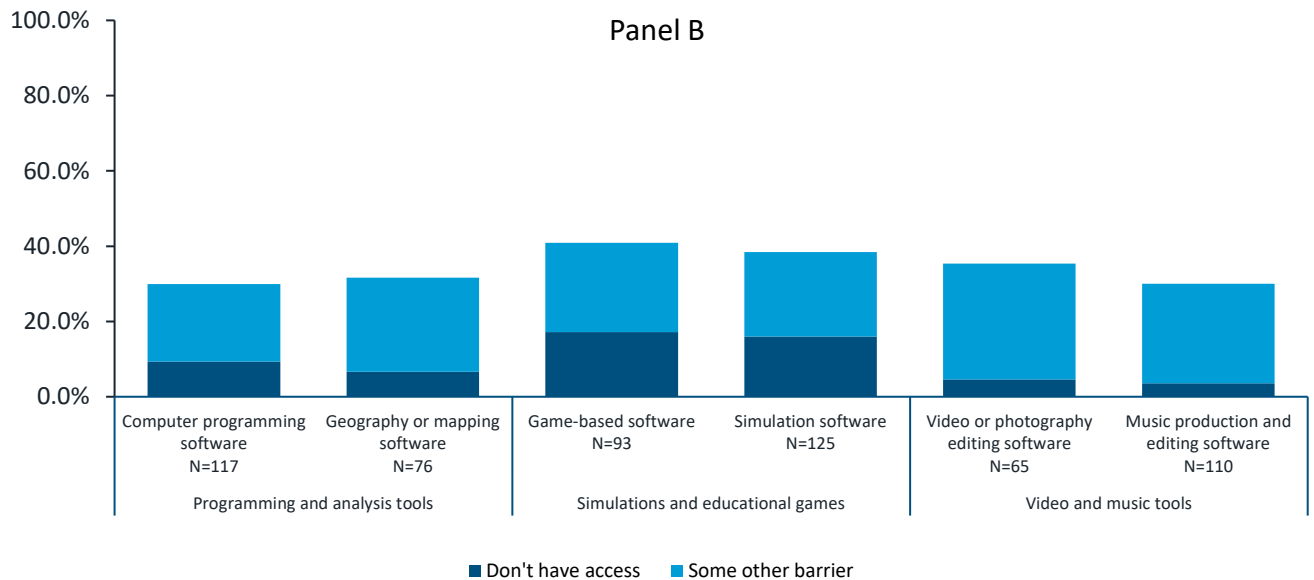
- Software to support personalized and self-paced learning (19%)
- Behavior management systems (17%)
- Game-based software (17%)
- Simulation software (17%)¹⁰
- Across 16 tools, between 13 and 33% of teachers indicated “other barriers.” Teachers provided 188 open-ended responses describing these *other barriers*. Most frequently, the descriptions of *other barriers* responses indicated that the tool was not applicable to respondent’s subject area (54% of responses), the respondent lacked familiarity with the tool (16% of responses), the respondent needed training to be able to use it (15%).

See Exhibit 19 Panels A and B for these results.

Exhibit 19. Percentages of Teachers Reporting Barriers to Using Categories of Technology Tools



¹⁰ Although 20% of teachers who never used learning management systems described lack of access as a barrier, we excluded it from mention because only 20 teachers stated they never used this tool.



Note. The *N* values represent the number of teachers who reported never using the technology tool and answered the barriers question. Teachers reporting they “never” used a technology tool were asked, “For the tools you said you don’t use with your students, what are the barriers to use?” One response not displayed in the chart is “Not interested.”

Technology tools for which teachers seek access. Of the 220 teachers who took the survey, 45 (20%) responded to an open-ended item asking what other software and tools they would like to access. Of those, 27 (12% of those surveyed and 60% of those responding to the question) stated that they did not need access to additional tools. Eighteen (8% of those surveyed and 40% of those responding to the question) identified at least one additional tool they would like to access to, including the following:

- Four identified video editing software
- Three identified software that lets students create and edit images
- Three identified software that would allow for checks of student computers to ensure safe and appropriate use of technology

Other tools identified included assessment tools, behavior management tools, specific math and reading tools like DeltaMath and Espark, and access to video game consoles.

Summary

Surveyed teachers reported that the tools they used most frequently are in categories of productivity, course management, personalized learning, and communication. In particular, teachers reported frequent use of word processing software, presentation tools, learning management systems, interactive assessment software, and virtual communication tools. Most

teachers also rated those same tools as very useful. A minority (30% or fewer) of surveyed teachers reported frequent use of tools in the categories of programming and analysis, simulations and educational games, and video/music. Surveyed teachers said they generally have access to the technology tools they need. Relatively few teachers identified lack of access as a barrier to use of technology, and few expressed a desire for access to tools beyond those that they already have available.

Discussion and Recommendations

Building on two decades of previous experience with supporting 1:1 device allocation, MLTI 2.0 seeks to expand access to digital devices across a broader range of grades than the previous version of the program, provide high-quality professional learning in support of digital learning and technology integration, and support robust school technology infrastructure in schools throughout the state. The Year 1 evaluation of MLTI 2.0 focused on providing feedback to the Department on the implementation of the initiative's components, ways teachers and students are using technology resources provided by MLTI 2.0 or otherwise, and supports or resources that would be useful for promoting technology integration. The evaluation used data from extant statewide data, a teacher survey, and interviews and focus groups with administrators, teachers, and students at seven participating schools. This section discusses the evaluation's findings and makes recommendations to MLTI based on the findings.

MLTI largely succeeded in its goal of providing devices to students and educators on a one-to-one basis. Nine in 10 schools distributed one device per student, and seven in 10 distributed one device per educator. Moreover, device distribution was typically prompt. Nearly two thirds of schools completed student and educator device distribution by October. Administrators and technology coordinators generally reported that the device distribution process went smoothly. However, some schools reported that delayed shipments and other issues with the ordering or delivery process slowed down device distribution or led schools to put off distributing devices until the following school year. Schools that received devices in the summer months were more likely to distribute all devices than schools that received them in the fall or winter. MLTI can build on its success with 1:1 device allocation in a number of ways. For instance, one approach would be to identify schools that have developed promising practices and connect them to other schools. The Department also might provide support to address delivery and distribution delays through a “help desk” system.

Recommendation: Focus on increasing the percentage of devices delivered during the summer and delivered on time and on helping schools increase efficiency and decrease effort in setting up and distributing devices.

School technology infrastructure appears to be sufficient for most uses of technology. Almost all of the MLTI schools for which the evaluation has data (71%) met the criterion for sufficient bandwidth set by the Department. Of the seven profiled schools, five had high levels and two had moderately high levels of technology infrastructure. Most schools reported reliable wireless connectivity and all had responsive technical support staff. These findings suggest that the schools have the technical conditions in place for teachers to use the devices and to benefit from professional development. Administrators at several of the profiled schools expressed an interest in increasing the capacity of their technical support staff.

Recommendation: With interested MLTI schools and other stakeholders, identify core and advanced capacities school technical staff need to support teaching and learning with technology as envisioned by MLTI and identify opportunities for technical staff in MLTI schools to acquire those capacities.

Recommendation: Collect data on bandwidth (Networkmaine-contracted or not) for all MLTI schools.

COVID-19 was a significant barrier for teachers' participation in MLTI-led professional learning opportunities on using technology to support student learning. Based on data from the teacher survey and school profiles, most teachers in MLTI schools did not participate in MLTI-provided professional learning opportunities. Those who did participate found it helpful. While MLTI digital ambassadors did develop synchronous professional learning opportunities, they shifted some of their focus to development of asynchronous training resources. MLTI digital ambassadors also indicated shifting to a greater focus on integrating specific technologies into educators' instruction, with a decreased focus on the features of specific devices or tools. The teacher survey suggests that this shift is well aligned with teachers' interest in professional development aligned with their curricular goals. Further, the seven profiled schools had high or moderately high levels of professional learning focused on instructional practice using technology to support student learning. This finding suggests that they and at least some other MLTI schools are potential sources of such professional learning opportunities or links to providers of them that the schools have found useful.

Recommendation: We suggest that MLTI consider adding to its approach a process to (a) identify professional learning topics in teaching and learning with technology that are in high demand among MLTI schools, (b) identify MLTI school sources (and their references to sources) of high-quality opportunities on those topics, and (c) connect those wanting and providing the professional learning on those topics.

There was evidence of school leadership support for technology in profiled schools. For example, school leaders usually had a vision for technology use, although they varied in the

formality and extent of communication of the vision. The MLTI team has an opportunity to build on or strengthen the leadership support that is already present. For example, the team could provide professional learning opportunities on the development and communication of a vision for technology integration as well as on processes for continuous improvement of the realization of that vision.

Recommendation: Extend the MLTI approach to professional learning opportunities on teaching and learning with technology to include opportunities for school administrators. If MLTI adds the identification and connection process for professional learning opportunities suggested above to its approach, we suggest including professional learning opportunities for school leaders in it.

Teachers frequently used technology in the classroom in a variety of ways for student-centered learning. Teachers had adequate access to programs and software they need to integrate technology for student-centered learning and reported few barriers to access. Half to two thirds of surveyed teachers asked students to use technology on at least a monthly basis in ways that emphasized the development of communication, collaboration, critical thinking, and creativity skills. They reported relatively frequent use of productivity tools, course management tools, personalized learning tools, and communication tools. Surveyed teachers were generally satisfied with the tools they have. Few teachers identified specific technologies for which they lack access. Teachers and school administrators are looking for support in learning, experimenting with, adopting, adapting, and developing innovative uses of technology in learning and teaching.

Recommendation: With MLTI teachers and school administrators, explore how MLTI as a whole can support innovation in learning and teaching with technology and develop a plan based on the results. We suggest that the plan can be connected to or integrated with the MLTI approach to professional learning.

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Appendix A. Total Devices Received and Time to Receive Devices by Device Type

Exhibit A1. Number of Schools Receiving Devices of Each Type, and Number of Devices Received of Each Type

Device type	Number of schools that received this device type		Number of devices received	
	Student devices	Educator devices	Student devices	Educator devices
Apple MacBook Air	49	70	6,593	1,445
Apple iPad Generations 8 and 9	32	30	4,466	649
CTL Convertible Chrome Laptop	59	28	9,896	535
Dell Chromebook 3100	5	0	1,088	0
Dell Latitude 5320	3	6	251	120
WCA Windows HP ProBook	3	5	105	132
No devices	0	12	0	0
Total	151	151	22,399	2,881

Note. Sample is limited to the 151 schools that responded to the Device Deployment Survey. Data are from the Maine Department of Education, Device Deployment Survey.

Appendix B. Teacher Survey Protocol

Introduction

1. Which school do you currently work at? *

*[Required. Single select; response options: Drop down menu of MLTI schools and “*Other school not on list”]*

2. What grade(s) do you currently teach? *

[Required. Multi-select; response options: Kindergarten, 1st grade, 2nd grade, 3rd grade, 4th grade, 5th grade, 6th grade, 7th grade, 8th grade]

Professional development

3. Did you receive professional development provided by the MLTI team this year (e.g., ambassadors, Emma or Jon, SLAM, device vendors)?

- a. Yes
- b. No *[if selected, skip to item #6]*
- c. I don’t know *[if selected, skip to item #6]*

4. Overall, the professional development opportunities provided by MLTI during the past school year have:

[Response options: 1 Strongly agree, 2 Agree, 3 Disagree, 4 Strongly disagree]

Been useful for improving my instruction.

- c. Helped me implement the technology used in my classroom.
- d. Familiarized me with a variety of approaches to instructional delivery.
- e. Helped me understand how to offer instruction that addresses individual students’ needs.

5. How strongly do you agree or disagree that the following barriers affect your participation in MLTI professional development? Please mark one choice in each row.

[Response options: 1 Strongly agree, 2 Agree, 3 Disagree, 4 Strongly disagree]

There is a lack of administrative support.

- g. The professional development offered is not relevant to my needs.
- h. The MLTI professional development offered is of poor quality.
- i. MLTI professional development is not readily accessible to me.

6. How many total hours have you spent in the past 12 months participating in each of the following professional development settings focused on educational technology? The professional development can be from any source.
- [Response options: None, Less than 1 hour, 1 to 5 hours, 6 to 10 hours, 11 to 20 hours, 21 or more hours]*
- a. Formal, whole-group professional development (e.g., in-service days, professional development workshops)
 - b. Individual, 1-on-1 professional development (e.g., mentoring, coaching)
 - c. Informal, self-organized professional development (e.g., communities of practice, blogs, social media)
7. What additional professional development focused on educational technology would you find useful? *[Response option: Open response]*

Use of technology in the classroom

8. How frequently do you ask a *majority* of your students to do the following?
- [Response options: Daily or almost daily, Weekly, Monthly, Less than monthly, Never]*
- a. Collaborate using online documents (e.g., Dropbox, Google Docs)
 - b. Collaborate online with classmates (e.g., group projects)
 - c. Collaborate online with students at other schools (e.g., service projects, science fairs)
 - d. Collaborate online with you (e.g., provide formative feedback)
 - e. Post schoolwork online (e.g., use Google Classroom or Padlet)
 - f. Use web tools to receive online information (e.g., Twitter, news feeds)
 - g. Write for an online audience (e.g., reviews, blog posts, comments)
 - h. Receive feedback digitally from classmates
 - i. Receive feedback digitally from someone outside the school (e.g., an outside expert, a student in another class or school)
 - j. Chat online (e.g., Skype, Google Hangout, FaceTime)
 - k. Use a phone to capture media (e.g., photo or video)
 - l. Develop multimedia presentations using technology
 - m. Create art, music, movies, or webcasts using technology
 - n. Create online models, simulations, graphic representations, or animations

- o. Determine the reliability of information from websites
- p. Synthesize information from online sources
- q. Take measurements or do experiments using technology
- r. Identify and solve authentic problems using technology
- s. Collect and analyze data using technology

Supports for the use of technology in the classroom

9. How helpful are the support personnel (e.g., IT staff) at your school in assisting with the following?

[Response options: Excellent, Above average, Below average, Poor, Not applicable]

- a. Internet speed and connectivity problems
- b. Computer device operation (e.g., desktops, laptops, or tablets)
- c. Instructional software and tools
- d. Other technological problems disrupting instruction

10. Please indicate about how often you use the following software or applications with your students. *[Response options: Daily or almost daily; Weekly; Monthly; Less than monthly; Don't use]*

- a. Video or photography editing software (e.g., iMovie)
- b. Music production and editing software (e.g., GarageBand, Anchor.fm)
- c. Word processing software (e.g., Word, Google Docs)
- d. Presentation tools (e.g., PowerPoint)
- e. Data processing tools (e.g., Excel)
- f. Virtual communication tools (e.g., Zoom)
- g. Online discussion forums (e.g., Flipgrid, iNaturalist)
- h. Behavior management software (e.g., ClassDojo)
- i. Geography or mapping software (e.g., Google Maps)
- j. Learning management systems (e.g., Google Classroom)
- k. Online lessons for “flipped classroom” approach (e.g., Khan Academy)
- l. Computer programming software (e.g., Scratch)

- m. Interactive assessment software (e.g., Poll Everywhere, Kahoot!)
 - n. Software to support personalized and self-paced learning (e.g., Zearn, ASSISTments)
 - o. Simulation software (e.g., Gizmos, PhET)
 - p. Game-based software (e.g., Minecraft Education)
 - q. Other (write in)
11. a. For the tools that you said you use with your students, rate how useful they are in supporting your instruction. *[Carry forward #10 any “use” responses; Response options: Not useful, Somewhat useful, Very useful]*.
- b. For the 2-3 tools you find most useful, please describe how you use them. *[Open response]*
12. a. For the tools you said you don’t use with your students, what are the barriers to use? *[Carry forward #10 “Don’t use”; Response options: 1-Not interested, 2-Don’t have access, 3-Some other barrier]*
- b. Explain in more detail any barriers you experience in accessing software or tools. *[Open response]*
13. What other software or tools (not named previously) would you like access to, and for what purpose? *[Open response]*

Beliefs about the use of technology in the classroom

14. To what extent do you agree or disagree with the following statements?
[Response options: 1 Strongly agree, 2 Agree, 3 Disagree, 4 Strongly disagree]
- a. I can motivate students to use technology in a positive way.
 - b. I can provide students with technology-based activities to exercise their knowledge and skills.
 - c. I can provide students with technology-based activities related to my content area.
15. How strongly do you agree or disagree with the following statements?
[Response options: 1 Strongly agree, 2 Agree, 3 Disagree, 4 Strongly disagree]
- a. Technology use in the classroom enhances student learning.
 - b. I think that learning is more engaging when using technology.
 - c. I want to learn more about effective technology use for teaching.

Appendix C. School Profile Methodology and Findings

We created profiles, based on interviews and focus groups with staff and students, of seven schools to understand how school staff perceive their schools' leadership, professional learning, and technology infrastructure as supports for integrating technology. We created a detailed school technology integration support framework to describe schools' levels of support for technology integration in the domains of leadership, professional learning, and technology infrastructure.

School Sample

We initially sampled eight schools from a list of all Maine public schools that participated in the MLTI program provided by the Department. Profile schools were purposefully selected from that set of schools minus the 24 schools selected to participate in the teacher survey. We randomly selected a single school from each of seven superintendent regions, and a single school from the combination of two other superintendent regions (i.e., York and Cumberland) with similar demographic and regional characteristics. Based on statewide distributions, the sample was balanced to have equal representation of schools from the lower two and upper two quartiles of the distribution of students eligible for free or reduced-price lunch, and a roughly proportional distribution of schools from city and suburban (two schools), town (two schools), and rural (four schools) locales. We planned to create eight school profiles, but one school did not respond to our request for participation. The school profile analysis includes seven schools.

Data Collection and Analysis

The research team conducted virtual, approximately 45-minute, video interviews with each school's principal and designated school technology leader as well as virtual, approximately 45-minute, video focus groups with teachers and with students. School leader interviews and teacher focus groups focused on topics related to school leadership, professional learning, technology infrastructure, and use of technology for student-centered learning activities. Student focus groups primarily focused on topics related to technology infrastructure and technical support and use of technology for student-centered learning activities. In total, AIR conducted seven principal interviews, seven technology leader interviews, six teacher focus groups, and six student focus groups. We were unable to conduct a teacher focus group at one school because teachers did not agree to participate in the focus group. At another school, we

were unable to conduct a student focus group because the administrator declined to distribute parent consent forms and schedule a time for the focus group.

The AIR research team analyzed the qualitative data and identified common themes related to the three domains of the school technology integration support framework. Analysts then used these findings to determine schools' level on each domain of the school technology integration support framework.

School Technology Integration Supports Framework

AIR developed a technology integration support framework to guide interview and focus group protocol development and qualitative data collection and analysis. This framework describes three major domains and dimensions of school-level processes that prior research indicates are critical for supporting technology integration. AIR used the Future Ready Schools Framework to guide the school profiles because the framework focuses on school conditions for supporting technology (U.S. Department of Education, Office of Educational Technology, 2016). In consultation with the Maine Department of Education, we decided to focus on the subset of the Future Ready Schools framework dimensions that aligned most closely to the MLTI. Exhibit C1 depicts the domains and dimensions of the school technology integration support framework.

Exhibit C1. Domains and Dimensions of the School Technology Integration Support Framework

Domain	Dimension	Definition
Technology Leadership for Technology Integration	Shared Vision	The school has a formal vision and set of expectations for use of technology in teaching practice. This vision is up-to-date and has been communicated clearly to teachers so that there is schoolwide understanding of the vision.
	Culture of Innovation	School leaders encourage a culture among teachers of experimenting with technology in their instruction. School staff engage in technology-related initiatives and share ideas about how to incorporate technology.
Professional Learning for Technology Integration	Job-Embedded Professional Development	Professional development about technology integration is offered to teachers on an ongoing basis and incorporated into existing school routines.
	Collaboration	Local teams of teachers conduct shared inquiries into technology integration and lesson planning.

Technology Infrastructure	Access to Technology	The school provides access to technology hardware, software, and wireless connectivity that is sufficient to support classroom technology without disruption.
	Access to Technical Support	The school has access to a staff member with dedicated time to addressing technical issues encountered by staff and students.

Based on the qualitative data, AIR analysts assigned each school to a level from 0 to 2, low to high, for each dimension in a domain. The levels reflect each school's level of technology integration support:

- **A level of 0** indicates that interview and focus group participants provide little or no evidence of a dimension in their responses. Participants may not agree about the presence of the dimension at their school.
- **A level of 1** indicates that participants provide some evidence of a dimension in their responses. Participants may or may not agree about the presence of the dimension at their school.
- **A level of 2** indicates that participants provide extensive evidence of a dimension in their responses. Participants generally agree about the presence of the dimension at their school.

After assigning dimension levels, we summed the dimension levels to reach a domain level. We weighted each dimension and domain equally in determining the levels because prior research indicates similar importance in technology integration and because the MLTI 2.0 initiative weights these domains equally (U.S. Department of Education, Office of Educational Technology, 2016).¹¹ Thus, for each of the three domains (which comprised two dimensions), the possible scores ranged from 0 to 4.

We summed across domains to calculate an overall level for the school's technology integration support, once again weighting the domains equally. The total possible number of points ranged from 0 to 12. We categorized schools according to three levels of supports:

- **Low (0–4).** Schools in this range generally have a low or moderately low level of support in at least two of the three domains in the framework.
- **Medium (5–8).** Schools in this range generally have moderately low to moderately high levels of support for at least two of three domains.

¹¹ As we continue the evaluation, we can work with the Department to determine whether individual domains and dimensions carry more importance and should be weighed differently.

- **High (9–12).** Schools in this range generally have high or moderately high ratings for at least two of three domains.

Table C2 shows each school’s level on each domain of the school technology integration supports framework. Each school has been deidentified to protect the identities of interview and focus group participants.

Exhibit C2. Domain and Overall Levels for Technology Integration Supports by School

School	Locale	Percentage of students eligible for FRPL	Leadership	Professional learning	Technology infrastructure	Overall
School A	Town	High	1	2	3	6
School B	Rural	High	3	2	4	9
School C	City	Low	3	3	4	10
School D	Rural	Low	3	2	4	9
School E	Rural	High	3	3	4	10
School F	City	High	3	3	3	9
School G	Rural	Low	4	3	4	11

Note. FRPL is free or reduced-price lunch.

Appendix D. Open-Ended Survey Responses About Most Useful Technology Tools

The survey asked teachers to describe how they used the two or three technology tools they find the most useful. Sixty-six teachers responded and described the use of tools across all seven categories.

Teachers used productivity tools such as Google Docs and Google Slides to support skills related to writing, creativity, and collaboration.

- Among the 42 teacher survey respondents who explained how they used word processing tools, 12 teachers specifically mentioned writing assignments such as poems, short stories, and essays.
- Among the 35 responses to the open-response item about the use of presentation tools, teachers specifically described using presentation tools for student presentations. Twelve of 35 teachers mentioned using presentation tools for this reason. Seven of the 35 teachers described using presentation tools to project lectures and teaching materials as well.
- During focus groups, teachers and students from six of seven schools explained how Google Docs and Slides allow for increased collaboration among students. These respondents noted that these tools make it easier to “partner up” to complete group assignments. Additionally, students from five of the seven schools stated that Google Slides allows them to work creatively.

Teachers frequently mentioned the use of course management tools such as Google Classroom and Class Dojo to organize and assign assignments, manage student behavior, and provide grades and feedback on student work.

- Of the 41 respondents who described their use of a learning management system, teachers frequently mentioned using Google Classroom. Eighteen teachers described using it to post assignments for students, six described using it to track missing work, and four described using it as a gradebook and to provide feedback. During focus groups, teachers from six of the seven schools mentioned that posting work to Google Classroom allows students to work collaboratively.
- Among the seven teachers who described their use of behavior management tools, teachers described using platforms such as Google Forms and Class Dojo for monitoring students and tracking behavior.

Teachers use personalized learning tools, like Kahoot! and flipped classroom, to assess student learning, review materials, and offer supplementary examples.

- Among the 24 teachers who described use of personalized learning tools, 11 specifically mentioned using platforms like Kahoot!, Quizlet, and Quizizz. Five respondents described that these tools are used to review material. Three teachers described using these platforms as a formative assessment to check students' understanding of concepts.
- Among the 12 teachers describing online lessons for flipped classrooms, teachers mentioned using platforms like Khan Academy and IXL. Teachers said that students used these access pre-recorded videos that provide new examples, introduce students to new concepts, and help to differentiate instruction.

Teachers described using communication tools, such as Zoom and Google Meet, to continue virtual learning when needed, attend meetings, and develop enriching experiences for students.

- Among the 25 teachers who described their use of virtual communication tools, 10 respondents described using these tools for remote learning. Eight stated that communication tools allow them to attend meetings, specifically IEP meetings and meetings with parents. Two highlighted how tools like Zoom and Google Meet allow them to connect with people or groups outside the school. One teacher mentioned virtual meetings with a local author and another mentioned using Zoom to “collaborate with another kindergarten class in the district.”
- Six teachers responded to the open response item about useful online discussion tools. They described using tools, such as FlipGrid, as a way for students to communicate with each other, and with the teacher.

Teachers use video and music software for class projects and creating instructional materials.

- Among the 16 teachers describing their use of video editing software, teachers described students using iMovie and QuickTime Player for projects such as trailers, book advertisements, and highlight videos. Teachers themselves use these tools to create instructional materials, such as videos for flipped classroom instruction and creating pdf documents. Few teachers described their use of music editing and production software.

Teachers use programming and analysis tools as supplementary tools for instruction.

- Among the 10 teachers who described their use of geography and mapping software, five teachers used these tools to help students better understand the location of a significant place. Three teachers explained how students used these tools to explore other countries as part of various assignments. Few teachers described use of computer programming tools.

Teachers use simulations and educational games primarily for science instruction.

- Five teachers described their use of simulation software such as PhET. These teachers used these tools in science classrooms.

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