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Executive Summary

In the Arlington Public Schools (APS) 2011-17 Strategic Plan, the community set a goal to ensure that every student from grade 2 through 12 has a personal digital learning device (1:1) to support instruction. The aim of transitioning to 1:1 is to support technology-rich learning environments that create engaging, relevant and personalized learning experiences for all learners regardless of background, language or disabilities. In order to better understand the current state of the project, APS partnered with the Friday Institute Research and Evaluation (FIRE) team at North Carolina State University to conduct a small-scale study. The purpose of the study was to identify implementation successes and challenges and to signal opportunities for program growth moving forward. The following is a summary of study findings for research questions developed in collaboration with APS, as well as recommendations and next steps for the APS 1:1 project.

Study Findings

Q1. How, and to what extent, are devices used to support teaching and learning?

- **Students use digital devices approximately half of the school day.** Classroom observations and reports by teachers and students indicate that devices are used on average for roughly half of the school day across APS, with time utilizing devices more extensive in the upper grades. Student use of devices was observed in 37% of elementary classrooms visited, compared to 47% middle school and 62% of high school classrooms.

- **Devices are most frequently used for assessment, digital resources, and productivity.** Commonly reported and observed use of devices to support teaching and learning included: monitoring and assessing student understanding, finding or accessing online content and resources for assignments, and creating written pieces or products to demonstrate learning. Some students and teachers, however, did describe cases of misuse of the devices at school and raised concerns that devices are a distraction from academic activities.

- **Other commonly reported uses included home access and non-academic activities.** Students, teachers, and parents reported that students take their devices home and that this is generally beneficial to students. Students and parents highlighted the value of being able to track assignments and grades in real-time. Many parents expressed concerns, however, that students spend too much time using devices for non-educational activities.

Q2. What are the impacts on students as a result of transitioning to personal digital learning devices?

- **Use of technology has helped promote engaging, personalized learning environments.** The majority of teachers, students, and parents agreed that using technology in school has: 1) made learning more interesting for students, 2) made it easier for students to collaborate with other students, and 3) enabled students to learn about things they are personally interested in.

- **Perceived areas of greatest student impact include technology, collaboration, and self-directed learning skills.** With respect to student learning, surveyed teachers identified that devices had the greatest impact on student learning with regard to technology skills, self-directed learning skills, and collaboration skills. Some teachers, however, expressed doubts about the value of the 1:1 for student learning, highlighting the loss of instructional time due to distraction and device issues, as well as the additional planning time required.

- **Many parents expressed ambivalence or doubts about the value of the 1:1 device project.** When asked if 1:1 student device access is important to their child(ren)’s success in school, 51% of parents agreed, 34% “disagreed” or “strongly disagreed,” and 15% were undecided. Concerns were highest among parents of elementary children and focused primarily on screen time and lack of interaction with physical learning resources.
Q3. What factors are facilitating or impeding efforts to promote learning using student devices?

- **School-based supports have been critical for facilitating effective and appropriate use of digital devices.** Principals and teachers reported that Instructional Technology Coordinators (ITCs) have been essential in supporting effective device use, particularly efforts focused on supporting classroom instruction and providing professional development (PD) opportunities. Teachers also expressed that they gained valuable instructional and technical support from their peers.

- **Lack of time, shared vision, and professional development are significant barriers to effective use of the digital devices.** The majority of teachers reported the following conditions as significant obstacles to their efforts to promote learning with the devices: excessive time needed to develop content for technology-based instruction (58%); inadequate opportunities for teacher input on how technology is used (54%); and lack of a shared vision for the use of student devices in support of teaching and learning (52%).

- **Teachers would most benefit from PD on using devices to support creativity and learner-centered strategies, as well as app and subject specific supports.** When asked about specific professional development support, the following three topics were identified as areas of greatest need: use of technology to model and facilitate learning experiences that advance creativity and innovation; personalize learning activities that address students’ diverse learning styles, working strategies; and support learner-centered teaching strategies.

**Recommendations & Program Modifications**

The following recommendations are intended to support program improvement moving forward. These recommendations are informed by explicit suggestions put forth by study participants, as well as a holistic synthesis of the findings:

- Develop and communicate a shared vision and plan for promoting learning with devices.
- Offer more professional development opportunities on both technical skills and pedagogical skills.
- Provide teachers more unrestricted time to create, practice, and experiment with technology.
- Support students, teachers, and parents to achieve safe, flexible, and appropriate use of devices.
- Create a plan for monitoring and improving technical support and materials.

Informed in part by preliminary findings shared during Phase I of the study, APS has implemented several modifications to the Digital Learning Device Project in the 2019-20 school year. Specifically, APS has:

- Increased the number of technicians to provide more immediate technical support at the school level;
- Created a loaner device program to create an environment of zero downtime for students;
- Initiated pilot of iPad keyboards in the middle school to address productivity concerns;
- Deployed Apple Classroom to support teachers in management of devices;
- Developed a website that communicates alignment of available digital resources with instructional goals.
Introduction

In the Arlington Public Schools (APS) 2011-17 Strategic Plan, the community set a goal to ensure that every student from grade 2 through 12 has a personal digital learning device to support instruction. The Strategic Plan states that APS should create vital and engaging, technology-rich learning environments; provide an infrastructure for learning; and utilize state-of-the-art technology that creates engaging, relevant, and personalized learning experiences for all learners regardless of background, language or disabilities. After piloting, deployment, and full implementation of the 1:1 device project, APS partnered with the Friday Institute for Educational Innovation at North Carolina State University to conduct a small-scale study to help gauge initial progress of the initiative.

The APS Digital Learning Device Project

In support of the APS Strategic Plan, the 1:1 project aims to facilitate technology-rich learning environments that create engaging, relevant and personalized learning experiences for all. APS took a phased, methodical approach to implementing deployment of personal devices for every student in grades 2 through 12. In the first phase of the project, APS upgraded the network infrastructure, moved the devices from computer labs to the classroom, provided professional development to teachers, and explored a variety of digital devices through pilot programs in each school.

APS has selected two types of devices, iPad Airs for elementary and middle schools and MacBook Airs for high school. The devices were selected based on three primary criteria:

1. Effectiveness in supporting APS’s instructional programs
2. APS’s ability to efficiently and effectively manage the devices
3. Total cost of ownership

Analysis conducted as part of the 2012-13 pilots led the division to the conclusion that an iPad tablet was a viable instructional option for elementary and middle school levels, and that high school students needed the additional functionality provided by a full notebook.

In the 2014-15 school year, the project moved into the deployment phase to begin putting personal devices in the hands of students. APS completed its grade-by-grade rollout of devices to every student in 2017.

Digital Learning Device Study

APS partnered with the Friday Institute Research and Evaluation (FIRE) team in September 2018 to support formative improvement efforts on the personal digital device project. The FIRE team is a team of researchers from diverse professional backgrounds committed to applying mixed methods research approaches for supporting educational innovations and providing research and evaluation services. The intent of the partnership was to collaboratively design and conduct a study that would assess the current state of digital teaching and learning in APS, identify implementation successes and challenges, and signal opportunities for program growth moving forward.

Guiding Questions and Study Design

The study was guided by the following study questions related to the program model and outcomes:

1. **Device Use**: How, and to what extent, are student devices used to support teaching and learning?
2. **Impact on Learning**: What are the perceived impacts on students as a result of transitioning to student devices?
3. **Barriers & Supports**: What factors are facilitating or impeding efforts to promote learning using student devices?
Thoroughly addressing these questions required a mixed methods approach, which incorporates quantitative and qualitative data from a variety of sources. Specifically, the FIRE team used a mixed methods convergent design, in which different but complementary data are collected concurrently and/or sequentially.¹ This design is appropriate for study contexts in which a single data set is not sufficient, different questions need to be answered, or each type of question requires different types of data. The intent in using this design is to bring together the differing strengths and nonoverlapping weaknesses of quantitative methods (e.g. large sample size, trends, generalization) with those of qualitative methods (e.g. rich detail and depth). By using this design, the study can “increase the interpretability, meaningfulness and validity of the constructs and inquiry results by both capitalizing on inherent method strengths and counteracting inherent biases in methods or other sources.”²

The study was broken into two phases. Phase I consisted of planning, data collection, and preliminary reporting and took place from September 2018 to January 2019. More specifically, Phase I entailed: identifying key research questions; identifying or adapt existing data collection instruments; collecting qualitative and quantitative data; and providing preliminary analyses and summaries of data to assess implementation and guide decisions. Phase II took place from July 2019 to December 2019 and entailed: analysis of qualitative data; creating an internal data dashboard for exploring trends in survey data, particularly among sub-groups; conducting follow-up data collection exploring key findings; and creating a final summative report detailing study findings.

**Data Sources**

Table 1 below provides a summary of data sources collected during Phase I and Phase II of the study. Data sources are described in more detail on the following page. Surveys and protocols can be found in Appendix A.³

**Table 1. Data Collection Activity**

<table>
<thead>
<tr>
<th>Data Collection Activity</th>
<th>Administration</th>
<th>Participant Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Survey</td>
<td>February 2019</td>
<td>882</td>
</tr>
<tr>
<td>5-12th Grade Student Survey</td>
<td>February 2019</td>
<td>8,519</td>
</tr>
<tr>
<td>Parent Survey</td>
<td>February 2019</td>
<td>1,693</td>
</tr>
<tr>
<td>Classroom Observations</td>
<td>February 2019</td>
<td>410</td>
</tr>
<tr>
<td>Principal and Asst. Principal Focus Groups</td>
<td>March 2019</td>
<td>11</td>
</tr>
<tr>
<td>Instructional Technology Coordinators Interviews</td>
<td>March 2019</td>
<td>10</td>
</tr>
<tr>
<td>Teacher Focus Group</td>
<td>March 2019</td>
<td>12</td>
</tr>
<tr>
<td>Student Focus Group</td>
<td>March 2019</td>
<td>~40</td>
</tr>
<tr>
<td>Follow-up Teacher Phone Interviews</td>
<td>November 2019</td>
<td>6</td>
</tr>
</tbody>
</table>

³ Two evening focus groups times were offered to parents; however, only one parent attended.
**Teacher Survey.** The online APS 1:1 Teacher Survey was developed by the FIRE team in collaboration with APS and directly distributed by the FIRE team to all teachers from kindergarten through 12th grade in February 2019. The survey consisted of 89 closed and open-ended items covering the following topics: device impacts on students; supports and barriers to effective use of devices; professional development needs; frequency and nature of instructional use of devices; the most valuable aspects of having devices; and the most challenging aspects of having devices. Each teacher was administered a randomly generated sub-set of approximately one-third of the items to reduce the burden on any individual respondent. The sub-set of items took approximately 10 minutes to complete.

**Grades 4-12 Student Survey.** The online APS 1:1 Student Survey was developed by the FIRE team in collaboration with APS and distributed by APS to all principals in February 2019 for administration to students. The survey consisted of 43 closed and open-ended items covering the following topics: device impacts on student learning experience; the most valuable aspects of having devices; the most challenging aspects of having devices; the frequency and nature of use of devices for learning; and the frequency of student-centered learning experiences. Each student was administered a randomly generated sub-set of approximately one-third of the items to reduce the burden on any individual respondent. The sub-set of items took approximately 10 minutes to complete.

**Parent Survey.** The online APS 1:1 Parent Survey was developed by the FIRE team in collaboration with APS and distributed by APS to parents in February 2019. The survey consisted of 35 closed and open-ended items covering the following topics: device impacts on student learning experience; the most valuable aspects of having devices; the most challenging aspects of having devices; the frequency and nature of use of devices for learning; and recommended policy changes. Each parent was administered a randomly generated sub-set of approximately one-third of the items to reduce the burden on any individual respondent. The sub-set of items took approximately 5 minutes to complete.

**Classroom Observation Checklist.** The digital APS 1:1 Observation Checklist was developed by the FIRE team in collaboration by APS and completed by school administrators and lead staff in grades K-12 during regularly scheduled walkthroughs. On average, the observations lasted for 6.3 minutes and APS staff documented: whether digital devices were being used by students; for what purposes the devices were being used; and which knowledge/skill domains were being addressed by the device use activity.

**Principal and Asst. Principal Focus Group.** Two, in-person focus groups were conducted with 11 principals total on March 14th, 2019. One focus group was conducted with elementary school principals, and the other was with secondary school principals. Participants consisted of a convenience sample of school administrators invited to participate in the study by APS. The focus groups lasted approximately 40-50 minutes and were designed to collect information supplementing survey and classroom observation data. The focus group protocol explored the following topics: how devices were being used to support teaching and learning; factors facilitating or impeding effective use of devices; and perceived impacts on students as a result of transitioning to 1:1.

**Instructional Technology Coordinator Focus Group.** Two, in-person focus groups were conducted with 10 Instructional Technology Coordinators (ITCs) total on March 14th and 15th of 2019. One focus group was conducted with elementary school ITCs, and the other was conducted with secondary school ITCs. Participants consisted of a convenience sample of ITCs invited to participate in the study by APS. The focus groups lasted approximately 40-50 minutes and were designed to collect information supplementing survey and classroom observation data. The focus group protocol explored the following topics: how devices were being used to support teaching and learning; factors facilitating or impeding effective use of devices; and perceived impacts on students as a result of transitioning to 1:1.
Teacher Focus Group. Two, in-person focus groups were conducted with 12 teachers total on March 15th, 2019. One focus group was conducted with elementary school teachers from a variety of grade-levels, and the other with secondary school teachers from a variety of subject areas. Participants consisted of a convenience sample of teachers invited to participate in the study by APS principals. The focus groups lasted approximately 40-50 minutes and were designed to collect information supplementing survey and classroom observation data. The focus group protocol explored the following topics: how devices were being used to support teaching and learning; factors facilitating or impeding effective use of devices; and perceived impacts on students as a result of transitioning to 1:1.

Student Focus Group. Four, in-person focus groups were conducted with approximately 40 students total on March 14th and 15th of 2019. Two focus groups were conducted with elementary school students, one with middle school students, and one with secondary school students. Participants consisted of a convenience sample of students invited to participate in the study by APS principals. The focus groups lasted approximately 40-50 minutes and were designed to collect information supplementing survey and classroom observation data. The focus group protocol explored the following topics: how devices were being used to support teaching and learning; factors facilitating or impeding effective use of devices; and perceived impacts on students as a result of transitioning to 1:1.

Phase II Teacher Phone Interviews. Six, semi-structured “follow-up” phone interviews were conducted with teachers in November 2019. The interviews were approximately 30 minutes long; and the goals of these phone interviews were to capture detailed stories about individual uses of digital devices for instruction. The teachers were selected through a strategic sampling process that aimed to interview teachers from a variety of subject-areas and across school-levels. The teachers were identified both by FIRE team staff through a review of Phase I survey and focus group data, and by APS ITCs based on their field knowledge. Results from these phone interviews were used to produce study vignettes.

A summary of the results from the data collection activities is presented below, organized by the three study questions.

Study Findings

1. How, and to what extent, are devices used to support teaching and learning?

   Key Findings

   • **Students use digital devices approximately half of the school day.** Classroom observations and surveys indicate that devices are used on average for roughly half of the school day across APS, with time utilizing devices more extensive in the upper grades.

   • **Devices are most frequently used for assessment, digital resources, and productivity.** Commonly reported and observed use of devices to support teaching and learning include: monitoring and assessing student understanding, finding or accessing online content and resources for assignments, and creating written pieces or products to demonstrate learning.

   • **The 1:1 project has facilitated student learning at home and outside the classroom.** Students, teachers, and parents reported that students take their devices home and that this is generally beneficial to students. Students and parents highlighted the value of being able to track assignments and grades in real-time. Many parents expressed concerns, however, that students spend too much time using devices for non-educational activities.
**Students Use Digital Devices Approximately Half of the School Day**

APS staff conducted classroom observations using a protocol designed by the Friday Institute to capture whether or not devices were in use during observation periods and how they were being used by students. Teacher survey participants were also asked to estimate “approximately what percentage of time are student devices (i.e. laptops or tablets) used in your classroom?” On average, teacher respondents reported that student devices were being used during 62% of classroom time. Students were similarly asked on a survey, “Approximately what percentage of your time at school are you using your device for school-related activities?” On average students reported that they were using their device in this way 54% of the time. Additionally, 43% of classroom observations completed by school administrators and staff indicated that students were using devices during the observation period.

![Student Device Use](image)

**Figure 1.** Estimated percentage of time student devices are in use as reported by teachers and students, and as the percentage of classrooms observed in which students were using their devices.

Survey responses and observations were also examined for any trends or patterns among grade levels and Title I status of schools. APS staff observed substantial differences in device use across elementary, middle, and high schools; teachers and students, however, were fairly consistent in their perceptions of time utilizing devices. Key subgroup findings are presented below:

- **Student devices were more frequently observed being used by students in the upper grades.** The proportion of classrooms in which students were using devices during the observation period increased with each corresponding school level, ranging from 37% of observed elementary classrooms to 47% in the middle grades and 62% of high school classrooms.

- **Student and teacher perceptions of time utilizing devices, however, was fairly consistent across school levels.** Among students, the average time spent utilizing devices during the school day was just over half for elementary (53%), middle (54%), and high school (55%) students. Elementary (61%), middle (63%), and high school (63%) teachers were also consistent in the reported percentage of time student devices were used in their classroom.

- **Teacher surveys and observations highlight potential discrepancies in student device use in Title I schools.** Although teachers in Title I elementary schools reported a slightly larger percentage of classroom time (63%) in which student devices were in use compared to non-Title I schools (60%), a smaller percentage of Title I classrooms (33%) were observed in which students were using devices, as compared to classroom observations in non-Title I schools (39%).
Devices are Most Frequently Used for Assessment, Digital Resources, and Productivity

In classrooms where technology was in use by students, APS staff were asked to select from a list of 18 items any instructional activities in which students were engaged. Teachers, students, and parents were also presented the same set of instructional activities on surveys and asked, “How often are [students/you] engaged in the following activities?” Table 2 below shows the five most frequently observed/reported activities. Collectively, the findings suggest that students most frequently use devices for taking quizzes and assessments; searching the internet for information or materials; accessing digital content and reference materials; and creating presentation products such as videos, slides, and reports.

Table 2. Five most frequently observed/reported instructional activities utilizing technology.

<table>
<thead>
<tr>
<th>Staff Observed (% of classrooms)</th>
<th>Teacher Reported (% of participants responding activity occurs “Frequently or “Very Frequently”)</th>
<th>Student Reported (% of participants responding activity occurs “Frequently or “Very Frequently”)</th>
<th>Parent Reported (% of participants responding activity occurs “Frequently or “Very Frequently”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital Content (51%)</td>
<td>Quizzes/Assessments (61%)</td>
<td>Quizzes/Assessments (75%)</td>
<td>Other not listed (69%)</td>
</tr>
<tr>
<td>2. Internet Search (23%)</td>
<td>Digital Content (56%)</td>
<td>Internet Search (67%)</td>
<td>Digital Content (53%)</td>
</tr>
<tr>
<td>3. Online Reference (21%)</td>
<td>Online Reference (55%)</td>
<td>Progress Tracking (65%)</td>
<td>Internet Search (52%)</td>
</tr>
<tr>
<td>4. Presentation Products (18%)</td>
<td>Internet Search (55%)</td>
<td>Online Reference (61%)</td>
<td>Online Reference (45%)</td>
</tr>
<tr>
<td>5. Skill Practice (16%)</td>
<td>Presentation Products (46%)</td>
<td>Presentation Products (58%)</td>
<td>Presentation Products (44%)</td>
</tr>
</tbody>
</table>

Note: Three instructional activities were collapsed into a single category labeled above as “Digital Content” and include accessing readings, multimedia content, and structured curriculum materials.

As highlighted in Table 2, APS staff, students, and parents also identified common instructional activities distinct from other reporting groups. Specifically, APS staff highlighted the use of devices to solve problems with clear solutions, such as multiple-choice practice problems or vocabulary drills (Skill Practice); students noted keeping track of their own learning progress through use of an online gradebook or portfolio, for example (Progress Monitoring); and parents reported other activities not included in the list. Specific examples of each are briefly described below:

- **Middle and high school students use devices to help keep track of assignments and grades.** Students often commented that having a device allowed them to easily keep track of their assignments, check in on their grades, and just “keep track of what’s next and what you have to do.” They noted learning management systems, such as Canvas or Google classroom, facilitated this but also had some downsides, with one high school student commenting that it has “increased my stress because there’s no barrier between school and home now” (see Health Concerns p. 20).

- **Parents reported concerns about home use of devices for non-academic purposes.** When asked to describe other activities not listed on the survey, parents expressed concerns about “non-academic” and “distracting” activities such as playing video games or watching people play video games, watching non-educational YouTube videos or movies, and video calling or messaging friends.
• Use of devices for deeper analysis and problem solving likely occurs less frequently than rote activities. When describing activities involving skill practice, APS staff noted the use of apps like DreamBox or Kahoot! for independent practice or group review. While some teachers and students sometimes described more sophisticated activities involving devices, such as virtual labs in science or lessons in math using Desmos, those involving collaborative problem-solving, data analysis, or open-ended investigations were reported and observed less frequently.

    Teachers, students, and parents were asked to respond to closed survey items, open-ended survey items, and focus groups questions designed to explore how, and to what extent, digital devices are being used for instruction. With respect to technology supported activities common across all reporting groups, qualitative findings from focus groups, interviews, and open-ended survey items are summarized below and accompanied by a participant quote to help illustrate further the ways in which digital devices are frequently used to support teaching and learning. Additional participant quotes describing common instructional activities can be found in Appendix B.

    Assessment & Feedback. Aggregate findings from surveys and focus groups demonstrate that one of the most common uses of the devices is for helping teachers to quickly gauge student learning, providing immediate feedback on academic performance, and communication between teachers and students on student progress. Teachers described using a variety of applications, like Canvas, Kahoot, and Quizlet to quickly assess student comprehension of a topic or a lesson and using the results for instructional decision-making, a practice highly correlated with increases in student learning. Teachers also explained that applications like Google Classroom and Canvas enable them to give individual feedback on assignments to students more easily and communicate information about their child’s academic work to parents.

    “I think it’s been helpful for our teachers for collecting data because our kids are able to get online. They’re taking quizzes online, tests online, whether they’re doing it through like a Google form and where the answers are just populating a spreadsheet, or they’re doing it through Canvas, they’re able to quickly access the results and if they need to adjust their teaching... so, I think that’s been really helpful, as far as productivity for teachers, and getting quick feedback.” – High School Principal

    Reference & Research. Teachers, students, and parents all described the value and convenience of a having a digital “library at their fingertips, though sometimes a messy one.” They described using devices to facilitate research for assigned activities or projects. Devices also enabled students to access information of their own choosing, such as researching a topic of personal interest or helping them better understand a concept they were confused about in class. Additionally, teachers, students, and parents described that the devices reduced the need to go to the library, which takes a lot of time and often requires money for and access to transportation.

    “One-one devices are invaluable to students to gather information through the web that not long ago would require physical dictionaries, encyclopedias, or magazines and newspapers, which were not always available. Many resources on the web help them to find the best ways to address and apply critical thinking and problem-solving skills when completing assignments.” – High School Teacher

    Digital Content & Materials. Teachers and students noted using the devices to access assignment materials and online curriculum resources such as digital textbooks. For subject areas that either do not have textbooks, have difficulty accessing the digital textbook, or simply choose not to use the district textbook, student devices have enabled teachers to curate content from a variety of source and assemble their own curriculum (See Technology Use Vignette, pg. 13). Students also reported independently locating instructional content online because they “learn math better watching the video about how to do something.”

    “The most valuable aspect of having a device is having access to content online to enhance the classroom curriculum” – Elementary Parent
Learning Products & Practice. Teachers, students, and parents also reported that the devices provide new ways for students to practice and apply what they’ve learned; analyze, evaluate, and synthesize information; and demonstrate what they’ve learned through the creation of products such as presentations, movies, reports, etc. Applications on the devices were used to help students practice memorization and other skills for remembering. Respondents described ways that the devices can be used to see and experience phenomena that could not be seen or experienced otherwise – like data visualizations or other simulations.

“The tools that are available on the devices allow my students to choose the ways to access, engage with, and express their learning that works best for them. For instance, last year, one of my second graders created a movie trailer to show their learning about a famous American of their choice. Another second grader decided to build a website complete with tabs, information, and embedded images to express their learning. They learn that their communication will look and sound different depending on the medium they are using, and that they need to adjust their work based on the tool or format they are using.” – Elementary Teacher

The technology use vignette on the following page illustrates one teacher’s experience using devices to support classroom instruction and student learning.

Other common uses included home access and non-academic activities

The teacher, student, and parent open-ended responses to questions about the use and value of the devices revealed findings in addition to those collected by closed-ended survey questions. The open-ended responses showed that teachers, students, and parents noticed that the devices are useful and valuable for peer communication and for continuing learning at home. The teachers and parents also described that students use the devices for social and gaming activities during the times they are supposed to be using them for learning activities.

Home Access. When asked about the most valuable aspect of personal learning devices, teachers, parents, and students all frequently mentioned home access to instructional materials and learning resources. Respondents described how the ability for students to complete assignments at home, with everything in the same place and format as at school, was extremely beneficial. It helped students stay organized and seamlessly pick-up at home where they left-off at school. Lecture notes, videos, and other materials could be accessed and re-read or re-watched by students, as well as by parents seeking to support their child’s learning. Additionally, respondents explained that absent students use the devices to easily access missed assignments and communicate with teachers.

“I like [taking the device home], because at home when I have homework and I don’t understand some of the words, I look at my iPad and look them up. I also like it, because you can study and play math games, which helps you with your math. [For example,] Reflex really helped me with the factors a lot. Now, when I see a math thing, I’m like, ‘I know that!’” – 6th Grade Student

Non-Academic Use & Misuse. Some parents and teachers, however, did describe frequent use of devices for non-academic purposes and in some case student misuse of the devices. Teachers explained that students can be found using the devices for socializing, playing games, or browsing for entertainment during instructional time at school. Some parents similarly noted that they had issues when the devices came home. Parents found that some students would spend hours on their device, doing non-educational activities – and their parents experienced difficulty managing their students online because of district controls.

“Our kids are getting around the safety walls and everything … they’re good at that … so we have to monitor that obviously, training teachers how to monitor that. But it’s also our responsibility to do the education and the communication. It’s a tool. We have to teach them how to use it appropriately … We do a lot of internet safety. We do a lot of safety work with students … We just have to monitor it and educate them I think.” – Elementary Principal
Technology Use Vignette: Creating a Digital “Textbook” for a Unique Student Population

Summary: An elementary school science teacher shares his story about content supports for his one-to-one Spanish Immersion classroom.

Mr. Padilla is a science teacher at Claremont Immersion Elementary School and teaches all of his classes in Spanish. Although many of his students’ first language is Spanish, approximately half of his students are native English speakers. Because of his unique context, Mr. Padilla spends a lot of time curating or creating a large share of the instructional resources used to address his local and state curriculum standards.

“I’m teaching Spanish and we don’t have a lot of resources, so I need to find them. We have the textbook but it’s actually a high level in Spanish, so I need to modify my lessons to target my objectives and standards in the language that they can understand. I need to rephrase everything it’s easier for me and for them to understand my lesson.”

Using Canvas to help organize and deliver instruction in his classroom, Mr. Padilla refers to his device as his “textbook” and preloads all of his lessons into Canvas so students can easily access the class materials. By keeping everything in Canvas, Mr. Padilla’s students can easily access all of their work when at home and parents can also see what their child is working on. Allowing devices to go home also allows parents to use Canvas to communicate with Mr. Padilla, since some do not have access to email at home.

“I use Canvas. I post everything in Canvas. That way I can communicate with the parents [and] they finally know what’s going on. So I post everything. [It is] easy for me to post my assessments, my resources, my student guide, games or every link I can. I link them into Canvas so it’s easier for me and for them to follow me. It is easier for me and easier for them…all the vocabulary or the extra resources [that] support the learning, it’s going to be in Canvas. That way the parent can see...we can communicate since some don’t have the power to send me an email, they have everything there [so it is] easier for the parents.”

Mr. Padilla is currently teaching a unit on ecosystems. They are conducting research online, using BrainPOP and lessons through Nearpod, and will later create a movie about food chains. After their research is complete, students will create a draft of what their movie will be about and will use the iPads as needed to help translate words from English to Spanish, since the movie has to be done completely in Spanish.

“[They are going to create] a movie about it now – eco sustainable food chains – with their food chain. We need to show the vocabulary, everything that they use whatever they want to do. We use the resources, the tools that BrainPOP had, but before that they need to do like scratch paper now right now the draft and create what they going to do before that second step.”

What helps make all this manageable is the fact that he only teaches one subject area and has great support from his school-based ITC. His ITC helps in the classroom by teaching lessons and is helping students gain access to BrainPOP activities.

“If I ask her, yes she’s there for me. Today, she was there to introduce making a movie, more like the technology part. I often co-teach with her and the children look [to her] for help.”

Mr. Padilla also stated that his students are more engaged when they are using the iPads and prefer to work on them, instead of using paper and pencil.

“Today we’re actually not going to use the iPad and they were mad because they need to draft the movie on paper and use the iPads later. The kids just love technology because it’s easier for them. In my case it’s more because they can translate right there [on the device] English to Spanish. So that is more motivating because you know that technology is so accessible for them so they like it... and everything is [in Canvas] so they’re engaged.”
2. What are the perceived impacts on students as a result of transitioning to student devices?

**Key Findings**

- **Use of student devices has improved student engagement and personalization of learning.** The majority of teachers, students, and parents agreed that using technology in school has: 1) made learning more interesting for students, 2) made it easier for students to collaborate with other students, and 3) enabled students to learn about things they are personally interested in.

- **Transition to 1:1 has had the greatest impact on student technology, collaboration, and self-directed learning skills.** With respect to student learning, surveyed teachers reported that devices had the greatest impact on student learning with regard to technology skills, self-directed learning skills, and collaboration skills. Some teachers, however, expressed doubts about the value of 1:1 for student learning, highlighting the loss of instructional time due to distraction and device issues.

- **Many parents expressed ambivalence or doubts about the value of the 1:1 device project.** When asked if 1:1 student device access is important to their child(ren)’s success in school, 51% of parents agreed, 34% “disagreed” or “strongly disagreed,” and 15% were undecided. Concerns were highest among parents of elementary children and focused primarily on screen time and lack of interaction with physical learning resources.

*Use of technology has helped facilitate engaging and personalized learning environments*

Surveyed teachers, students, and parents were asked to indicate the degree to which they believe “using technology in school” has impacted various aspects of student learning environments. Out of the 11 aspects listed, the majority of teachers, students, and parents agreed that using technology in school has: 1) made learning more interesting for students, 2) made it easier for students to collaborate with other students, and 3) enabled students to learn about things they are personally interested in. See Figure 2 on the following page.

While teachers, students, and parents were in general agreement about areas where the use of technology has had the greatest impact, parents were much less sanguine about the ways in which technology has changed learning environments compared to teachers and students overall. Across all 11 aspects of learning environments, only 44% of parents on average “agreed” or “strongly agreed” that technology use enhanced these characteristics. Much larger average proportions of teachers and students, however, agreed that technology use enhanced these qualities of learning environments (75% and 68% respectively). Moreover, when parents were asked explicitly if 1:1 student device access is important to their child(ren)’s success in school, the results were fairly polarizing. Roughly half (51%) of parents agreed with this statement, 34% “disagreed” or “strongly disagreed,” and 15% remained neutral.

Survey responses and observations were also examined for any trends or patterns among grade levels and Title I status of schools. The findings below provide some additional insight into parent sentiment, highlight differences between science teachers and other core subject areas, and illustrate discrepancies between high school teachers and students:

1. **High school students responded more positively than their teachers relative to elementary and middle school.** Whereas high school teachers (72%) on average responded slightly less positively than their elementary (78%) and middle school (75%) colleagues, high school students (77%) reported a higher proportional of agreement on average than their middle school (64%) or elementary peers (64%).

**NC STATE** Friday Institute for Educational Innovation
2. **Negative parent sentiment was higher in elementary grades, particularly in non-Title I schools.** Across all items, parent agreement on the positive impact of technology sharply declined from high school to elementary. For example, 68% of high school parents agreed 1:1 was important to their students’ success in school compared to 56% and 36% among middle and elementary school parents respectively. On the same item, 48% of elementary Title I school parents agreed, compared to 34% among parents in non-Title I schools.

3. **Science teachers generally responded less positively than other core subject area teachers.** On most items, the percentage of science teachers who “agreed” or “strongly agreed” has had a positive impact was less than teachers in math, ELA, and social studies. For example, less than half (45%) of science teachers agreed that use of technology has helped improve the quality of student work, compared to 66% of ELA teachers. One possible explanation may be difficulties ITCs and science teachers reported in accessing the district provided online science curriculum (see Software Issues).

Using technology in school has...

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Students</th>
<th>Parents</th>
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<tbody>
<tr>
<td>Made learning more interesting...</td>
<td>85%</td>
<td>75%</td>
</tr>
<tr>
<td>Eased student collaboration...</td>
<td>80%</td>
<td>73%</td>
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<td>Enabled students to pursue interests...</td>
<td>84%</td>
<td>71%</td>
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<tr>
<td>Enabled students to get help...</td>
<td>77%</td>
<td>74%</td>
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<tr>
<td>Helped students enjoy school more.</td>
<td>79%</td>
<td>69%</td>
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<tr>
<td>Enabled students to learn at their own pace.</td>
<td>84%</td>
<td>67%</td>
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<tr>
<td>Improved the quality student schoolwork...</td>
<td>66%</td>
<td>77%</td>
</tr>
<tr>
<td>Performed better on quizzes and tests.</td>
<td>71%</td>
<td>60%</td>
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<tr>
<td>Helped students communicate with teachers.</td>
<td>64%</td>
<td>65%</td>
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<tr>
<td>Helped students get better organized.</td>
<td>69%</td>
<td>64%</td>
</tr>
<tr>
<td>Understand connections to real-life...</td>
<td>69%</td>
<td>55%</td>
</tr>
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![Figure 2. Percentage of positive agreement among teachers, students, and parents.](image_url)

To understand further the teacher, student, and parent perceptions of the impacts personal devices are having on learning environments, surveys and focus groups asked respondents to provide open-ended thoughts on the most valuable aspects of the devices and the impacts they have had on student learning (exact wording of questions can be found in Appendix A). Themes are summarized below and accompanied by a participant quote to help to illustrate further the ways in which digital devices impact student learning environments. Additional participant quotes describing common instructional activities can be found in Appendix B.

**Student Engagement.** When asked about the ways in which digital devices have been valuable and have supported student learning, teachers reported noticing increases in student engagement as result of the technology. The teachers noticed that students are more interested and motivated to learn and work, including when they are able to conduct their own research on topics of personal interest. The faculty also reported that the devices allows all students to be actively engaged during group work, since they can all contribute to the group product simultaneously.

“If they’re engaged, and they’re interested, then they’re accessing the learning – I think that that’s the goal. That’s what we want. We want kids to see the relevance in what they’re doing, and if that device is helping them in doing that in any way, I think that’s okay … Yes, there are downsides, but I think for me, I see a more positive impact than negative.” – Secondary Principal
Communication & Collaboration. When reflecting on changes in student learning brought about by the 1:1 device program, many teachers reported that student collaboration stills have improved as a result of the devices. It is easier for students to collaborate with each other – they can easily share documents and work together outside of class time. This, in turn, leads to deeper learning of the material by increasing and enhancing the social construction of learning. Teachers, parents, and students all frequently mentioned that devices are valuable for peer communication and collaboration. Students can use the devices to collaborate on assignments and co-create products and also to communicate with each other and teachers about these assignments and work outside of the school day.

“Students are working in partners to learn about human rights. They are reading resources found from research on the Internet and are completing a guided graphic organizer in Google Docs. One partner’s iPad has the reading pulled up, while the other partner’s iPad has the Google Doc visible. The students are collaboratively collecting and organizing the information.” – Middle School Teacher

Personalized Learning. When asked about the impacts digital devices have had on student learning, teachers recounted the ways that these devices have enabled learning opportunities to be more tailored to each student’s unique needs. Teachers described that the 1:1 devices allow each student to work at their own pace. In addition, students are more frequently able to pursue topics of their interest, which increases their engagement and motivation. Likewise, digital technology makes it possible for teachers to create a wider variety of learning activities that address a broader spectrum of learning level and learning styles. Similarly, the technology makes it easier for students to choose from a variety of formats to communicate what they have learned – reports, presentations, videos, etc. When students can pick the way they synthesize their own learning, they are often able to be more successful because they can choose the method that they know works best for them.

“Employing one-to-one devices allows teachers to create personalized, open-ended modes for students to access, engage, and express their learning using LMS programs, multi-path (multi-level) explorations within a master topic, and self-guided exploration. Such an availability of resources is not possible with traditional teaching models or even shared devices.” – Elementary Teacher

As noted in the introduction to this report, the APS Strategic Plan 2011-17 Strategic Plan set a goal to ensure that every student from grades 2 through 12 has a personal digital learning device to support instruction. The Strategic Plan states that APS should create technology-rich learning environments that creates engaging, relevant, and personalized learning experiences for all learners regardless of background, language, or disabilities. The classroom vignette presented in the previous section helped to illustrate the potential for personal digital learning devices to create engaging experiences, regardless of their backgrounds and language. The vignette presented on the following page highlights how the transition to 1:1 has facilitated one teacher’s goal to provide relevant, personalized learning experiences tailored to students’ interests and needs.
Student Impact Vignette: Technology-Enabled Personalized Learning

Summary: A secondary English teacher discusses how transition to 1:1 has facilitated personalization of learning for her students and greater choice and voice in how, when, and what they learn.

Jennifer Goen teaches English to juniors and seniors at H-B Woodlawn, a secondary program for grades 6-12 designed to provide students with more control over their education. Ms. Goen describes H-B Woodlawn as a unique, democratic school in which students have a voice in school governance:

“We have a weekly town meeting where students and teachers talk about all the business, and students’ votes are the same as the teacher vote… We have an open process for voting on which classes we offer and what our school looks like. Students have input on every almost every single level of our operation.”

Consistent with H-B Woodlawn’s emphasis on student choice and voice in student governance, Ms. Goen also strives to provide her students a say in what, when, and how they learn. She describes two different approaches to personalization. The first is focused on “the idea of computer-based personalization” to practice grammar and help prepare students for the Standards of Learning test at the end of the year:

“I think there are different takes on what personalization means and can be. For example, I can set up computers and my students can decide where they are in their skills and then they are all working at different paces on the same basic curriculum… One of the ways that I teach grammar is using NoRedInk. I choose the [grammar skills] we’re focusing on, but students can go at their own pace and choose how much to practice to prepare for the standardized quiz at the end.”

Ms. Goen emphasizes that personalization also means taking into account students’ interests and providing choice in the content that they learn. She describes how 1:1 has enabled her to expand the topics and readings available to students in her research methods classes:

“I used to teach research where we were all reading a book and we would all do a similar topic, like researching the Vietnam era or something. Instead of doing that, now any kid can choose any topic. As an example of this, my fourth quarter project has students choosing an underrepresented group of Americans and thinking about what their history is through literature through documents and through fiction. And I have a list of probably 100 different readings for each group of people… students from various cultures can choose topics that are closely related to their experience.”

Having taught in APS for 14 years, Ms. Goen recalls trying to integrate technology prior to 1:1 and how personalization and “seamless instruction” is possible now that students have their own personal device:

“I do have some books, but I am really only able to offer the diversity of the readings and topics because a lot of it is happening online… When I first came, we had a computer lab and I would integrate technology as well as best I could. I did have a laptop cart in my room, but you have to boot up, log into your account, connect to the network, and I’ve lost 10 minutes… and I only have them for 45 minutes.”

Personalized learning has always been a “hope and goal” for Ms. Goen, and she believes that personalization not only allows her to teach important college and career skills but do so in a way that is relevant, engaging, and meaningful for students:

“I can teach the skills that I want to teach, regardless of the content they choose… finding credible sources, using databases, summarizing and synthesizing sources… I can work with their interests and hopefully get a more motivated student and tap into their personal passion and excitement for what they’re going to do with their lives.”
**Areas of Greatest Impact include Technology Skills, Self-Directed Learning, and Content Mastery**

On teacher surveys, participants were asked to identify up to three areas in which they “believe one-to-one student device access has had the greatest impact on student learning.” Out of eight areas listed (see Appendix A for a detailed description of each area), teachers most frequently selected that devices had the greatest impact on student: technology skills (50%); self-directed learning skills (41%); and collaboration skills (28%). On the classroom observation form APS classroom observers were provided the same list of eight learning areas and were asked to select all areas that the observed activities were addressing. The classroom observers identified “mastery of academic content” more often (58% of observations) than any other learning area, followed by technology skills (50%) and information literacy (26%). The discrepancies in the results, particularly among differences between perceived impact on Mastery of Core Academic Content, suggest an area for further investigation by APS.

Survey responses and observations were also examined for any trends or patterns among grade levels and Title I status of schools. The findings below provide some additional insight into parent sentiment, highlight differences between science teachers and other core subject areas, and illustrate some discrepancies between high school teachers and students:

- **Math teachers were more likely to attribute mastery of core academic content to 1:1.** Consistent with observers and contrary to teachers in other core subject areas, 43% of math teachers indicated that mastery of core academic content was one of the greatest impacts of transitioning to 1:1. This may be attributed to math resources such as DreamBox and Desmos that teachers and student frequently cited using to support learning.

- **Teachers in Title I schools were more likely to report an impact on technology skills, though less likely to report 1:1 has improved collaboration.** Results were fairly consistent among teachers regardless of their school’s Title I status with a couple of exceptions: technology and collaboration skills. The majority of teachers in Title I schools (61%) reported that improvements in technology skills has been one of the biggest impacts of transitioning to 1:1, compared with 49% of teachers in non-title schools. With respect to impact on collaboration skills, however, only 18% of teachers in Title I schools selected this area, compared with 29% of their non-Title I peers.

**Learning Domains in which 1:1 has had the Greatest Impact**

![Learning Domains Graph](image)

*Figure 3. Percentage of classrooms in which observers indicated use of technology addressed learning areas; percentage of teachers who selected each learning area where use of student devices has had the greatest impact.*
To understand further the study participants’ perceptions of the impact personal devices are having on students, surveys and focus groups asked respondents to provide open-ended reflections on the most valuable aspects of the devices and the impacts they have had on student learning (exact wording of questions can be found in Appendix A). Themes from these reflections that are related to changes in student knowledge and skills are described below. Additional participant quotes describing impact on student skills can be found in Appendix B.

**Technology Skills.** Being able to work with the devices has enabled students to learn how to use word processing and productivity tools, navigate applications and websites, effectively search the internet and communicate online, and practice digital citizenship and computer coding. In addition, teachers explained that students are better able to troubleshoot technology issues on their own as a result of the program. Among students that have limited access to technology at home, teachers also commented that 1:1 has helped to close the “digital divide.”

“It allows my students that economically don’t have access to technology at home to have the ability to “keep up” with their peers in technical knowledge and experience... It allows my students that struggle with literacy to have equal access [to literature at home].” – Elementary Teacher

**Self-Directed Learning.** Many teachers described improvements in students’ abilities to monitor and drive their own learning, which educators attributed in part that the ease of access to information, assignments, feedback, and grades, enables student to continuously monitor their work. Students and ITCs reported similar impacts, including improved independence in seeking out assistance on assignments and learning new topics or skills on their own.

“There was a student who I don’t think had Internet access at home except through the school... and he wanted to learn how to do [video production]... So he went and found these techniques that people, professionals were showing on YouTube, and then he’d come to me and we would break it down, and we would work on it. That allowed him to shoot ahead, and the stuff he did was fantastic, but he was a handful in class. He was able to use his device to move ahead, and then come to me and ask me about certain things, and then we could work on it.” – High School ITC

**Information Literacy.** Teachers, ITCs, parents, and students reported improvements in students’ ability to locate information online, either for school or for non-academic purposes. This is likely facilitated in part by instructional shifts towards personalization and greater student independence in seeking resources to aid their learning or explore topics of personal interest. Teachers noted, however, that students need additional supports in better evaluating the quality of information they find and “need to be steered to the right sources, otherwise it’s all Wikipedia or Google Translate.”

“One-to-one student device access has helped students find and use the information resources that are most effective for their specific learning style. By providing a variety of options for learning content – videos, websites, presentations, online courses, etc. – and letting students use the sites that are most helpful to them – students have become more aware of the effectiveness of online content and more aware of how they learn most effectively.” – High School Teacher

**Mastery of Academic Content.** Though to a lesser extent than technology and self-directed learning skills, many teachers felt transition to 1:1 has led to improvements in student learning of academic content. They described that students are able to access a variety of information on topic areas in a variety of formats. Additionally, educators explained that academic knowledge has increased because the teachers can use the devices to provide learning opportunities that meet each student where they are, and similarly students can use them for self-directed learning.

“1:1 devices greatly improve the mastery of core academic content. Via videos, online conferences, and online docs, I’m able to meet all students where they are and provide remediation and extension as needed.” – Elementary Teacher
The Digital Learning Device Project is Especially Polarizing Among Parents

As highlighted in the previous section, roughly half (49%) of parents remained neutral or disagreed entirely when asked if 1:1 student device access is important to their child(ren)’s success in school. Moreover, when asked to select areas where use of student devices has had the greatest impact, roughly 1 in 6 teachers indicated “none of the above” or selected a specific area and described how 1:1 has negatively impacted those skills. To better understand these responses, open-ended survey responses (see Appendix A) were examined for common themes and are summarized below. Additional quotes from study participants can also be found in Appendix B.

Neutral or Negative Impact. Attributed in part to student distraction and other factors described in more detail below, some teachers and parents believed that the use of student devices inhibited the development of content mastery and academic skills or caused students to regress in select areas. Parents worried that students’ social skills, handwriting, and ability to focus have declined because students are “glued to devices.” Teachers also commented on interpersonal skills and added that because of “canned [software programs] that do not promote thinking” and the ease of looking up “answers”, it’s harder for “students to retain any information… or think deeply/critically” about a subject or problem. Middle school teachers also reported that students lacked certain technology skills because of limitations of the iPads.

“Students are less able to speak to each other, to collaborate meaningfully, and to engage in class when laptops are readily present. I very much appreciate the laptops when I have them do research or when I have a sub. Otherwise, learning with the laptops isn’t any better than without and is probably worse because of social and behavioral problems they encourage.” – High School Teacher

Student Distraction. One of the primary concerns among teachers and parents was the potential for distraction that devices can cause. Teachers and parents frequently commented that activities such as games, videos, and social media have made it difficult for students to sustain focus on academic tasks. Some students indeed admitted to playing (non-educational) games during class or forgetting to charge devices, which along with other technical issues reported by teachers, served as a distraction from lessons and resulted in lost instructional time.

“Many students are unable to self-regulate non-academic activity on their laptops (gaming, social media, music, and videos). Student distraction is making students less engaged during instructional time (they check their grades, their calendars, or do work for other classes instead of listening to the class they’re in).” – High School Teacher

Lack of Physical Interaction. While acknowledging the convenience of online resources, parents in particular expressed concern that students were missing out on the physical aspects of learning, such as handwriting assignments or taking physical notes, interacting face-to-face with teachers and peers, and visiting a library or reading a book offline. Parents expressed concerns that devices are being used, with little or no benefit, as a substitute for “real world” activities.

“Getting them learn handwriting and be a creator instead of a consumer… The screen is not for everyone. And learning to organize is not easily done on a computer - the skills and fundamentals must be taught elsewhere first - in the physical world.” – Middle School Parent

Health Concerns. A general and very common concern expressed among parents was the amount of time students spent “staring at screens.” More specifically, parents worried about, or directly attributed to device use, adverse physical effects such as eyesight damage, headaches, neck strain, back pain, and poor posture. To a lesser extent, parents and students also cited concerns about device addiction, and additional anxiety or stress caused by “always being connected.”

“The most challenging part about having a computer is spending the correct amount of time on it because I always get headaches and pain in my eyes because we are always on our computer.” – High School Student
3. What factors are facilitating or impeding efforts to promote learning using student devices?

**Key Findings**

- **Instructional Technology Coordinators and knowledgeable colleagues are critical supports for effective use of digital devices.** ITCs provided instructional support in the classroom in addition to technical support and professional development opportunities for teachers and staff. Teachers also leaned heavily on their colleagues and want more time to work and plan together.

- **Lack of time, shared vision, and professional development are the significant barriers to effective use of the digital devices.** Teachers do not have enough time to learn and redesign their instruction to incorporate digital devices most effectively. Teachers have experienced confusing or nonexistent messages about the vision and goals of the digital device program, weakening the effectiveness with which they are able to use the devices.

- **Teachers would most benefit from PD on using devices to support creativity and personalization, as well as app and subject specific support.** Teachers want support and training in the use of devices to advance student creativity and innovation and to personalize learning activities that address students’ diverse learning styles, working strategies, and abilities.

*Instructional Technology Coordinators and Colleagues are Critical Supports to Effective Use*

**Instructional Technology Coordinators.** Findings suggest that teachers and principals found the assistance from their ITCs to be a critical support. Teachers reported that their ITCs provided valuable professional development and guidance in the classroom. A large portion of teachers stated that the best professional development they received was provided by their ITC. In addition to providing professional development to teachers and staff, ITCs came into the classroom and helped guide lessons. They did note that there were not enough ITCs for all of the schools and that their role became more technical support than instructional support.

“*I think our ITCs are amazing. But they’re spread a little too thin to effectively support the teachers, because we, for example, of a high school of 2,000 we have one ITC. Our ITC does support the teachers, but they have to deal with every technical issue the kids have.***” – Secondary Principal

**Knowledgeable Colleagues.** In addition to the support from their ITCs, teachers found their colleagues to be an extremely valuable resource. Teachers used planning time to learn more about what other teachers were doing in the classroom and how they could implement tools and new technology into their own classes. Planning time and working with other colleagues were listed as some of the most useful supports teachers have received for effectively leveraging student devices, and teachers desired more time to work together and learn from each other.

“*[The most useful supports have been] talking with other teachers and planning together. Having one team member pilot something and then having others jump on board based upon the success of that pilot.*” – Elementary Teacher

The teacher vignette on the following page illustrates more concretely the role school-based supports have played.
Teacher Support Vignette: The Importance of School-Based Supports

Summary: A middle school social studies teacher shares his story about the biggest supports for his one to one classroom, his school-based ITC and colleagues.

Mr. Paparella, who is a veteran 7th grade middle school social studies teacher at Kenmore Middle School, reported that his ITC, Michael Goodman, drives the one to one initiative at his school.

“The school ITC is an amazing instructor of teachers regarding how to use the technology. He’s an active proponent of how we come to understand the use of iPads in the classroom...He’s been the one that brought the SMART boards and the projectors.”

Mr. Paparella believes his ITC is not just a critical support at his school but also across the district as well. Other schools in APS are looking to Kenmore MS as a model on how to implement a successful one to one initiative.

“He was very proactive in seeking out the right technology for our student demographic. Our students now have interesting capabilities and because of his work, I think the whole county has benefited. I know he’s been a proponent of a lot of the things we do at Kenmore in our culture of technology and at other schools and I know that not all the other schools have the same kind of technology culture that we have [and] I would say he is the source for a lot of all these changes that have benefited us all.”

In addition to bringing different devices and technologies to the school, the ITC also led trainings to support these new technologies. He led trainings and trained other teachers so they could learn to support each other as well.

“Because he’s trained so many people, he doesn’t need to train more because everyone else is already very comfortable with it and can step in and train. So, a lot of his time is spent with maintenance of our systems, making sure that connectivity is working.”

In addition to training each other, teachers supported one another by sharing curriculum resources and other classroom tips.

“One of our Kenmore social studies teachers did an amazing job of creating most of our lessons all in SMART Notebook software, allowing so many lessons that were formerly teacher-directed instruction from the front of the classroom to now be very interactive, student-paced lessons. Well, I wanted to do that too, but I didn’t have the SMART boards. So, over time, we adapted almost all of those lessons into a PDF format that students used on their own devices.”

Commenting on the opportunities provided by the district, he noted that one major barrier to leveraging professional development offered by the district during the school year is the amount of time and effort needed to plan for a substitute teacher.

“There are options and opportunities, usually through the department… but everyone who’s ever been a teacher knows it is so much more work just to prepare for a day away from your classroom. There’s the sub lessons and the planning and then when you get back the stuff that you wanted them to do may not have gotten done. I mean most of us wait to do doctor appointments until the summer because it’s just been a nightmare to be out of the classroom. I think offering summer help would be great, and the Social Studies Department usually offers that kind of support... But, to leave during the school day isn’t easy.”

Reflecting back on trainings and professional development he received, Mr. Paparella said working with his fellow colleagues and ITC has been the most useful form of instructional support.
Lack of Time, Teacher Input, and a Shared Vision are Significant Barriers to Effective Device Use

Teachers were asked to respond to a series of closed survey items, asking, “Please indicate whether the following conditions exist in your school and the degree to which each is an obstacle to your efforts to promote learning using student devices.” As shown in Figure 4 below, the majority of surveyed teachers reported that the following three conditions were barriers to a “moderate” or “great” extent:

1. **Time:** Excessive time needed to develop content for technology-based instruction;
2. **Teacher Input:** Inadequate opportunities for teacher input on how technology is used;
3. **Shared Vision:** Lack of a shared vision for the use of student devices in support of teaching and learning.

Teacher Reported Barriers to Promoting Learning Using Student Devices

![Bar chart showing the percentage of teachers indicating each barrier as a moderate or great extent]

Figure 4. Percentage of teachers who indicated the listed conditions as obstacles to a “moderate” or “great extent.”

Teacher-reported barriers were pretty consistent across grade-levels, Title 1 Status of schools, and subject areas with a few notable exceptions:

- **Problems associated with hardware was a bigger concern at the middle school.** Over half of middle school teachers (57%) reported hardware issues compared to 34% of elementary teachers and 37% of high-school teachers. These concerns may be centered on the selection of iPads for middle school students and the lack of a hardware keyboard and other features of a traditional laptop (see Hardware & Software issues below).

- **Teachers in Title I schools may feel less empowered in how technology is used.** While slightly less than half of elementary teachers (48%) in non-Title I schools indicated inadequate opportunities to provide input into how technology is used, 59% of teachers in Title I schools indicated this was a barrier to a moderate or great extent.

- **Math teachers expressed concerns about lack of alignment with online content.** Approximately 50% of math teachers surveyed indicated the lack of alignment with the content students learn online, compared to 17% of science teachers, 19% of language arts teachers, and 38% of social studies teachers.
To illustrate further the factors that have functioned as barriers to the effective instructional use of digital devices, teachers and ITCs were asked to write openly or talk about these barriers. Specifically, teachers were asked to identify the most challenging aspects of each student having their own device and the greatest barrier they face in effectively leveraging student devices to support learning. Themes from these open-ended responses are summarized below along with illustrative quotes from study participants. Additional participant responses for each barrier described can be found in Appendix B.

**Time & Training.** Teachers frequently cited a lack of time as a major barrier to effectively leveraging devices to support learning. Specifically, teachers cited a lack of time to plan for integration of technology into instruction, collaborate with peers, explore new apps and instructional approaches, and align technology-based lessons with curriculum standards. Teachers noted that “technology-based lessons (like student-created projects) often take an inordinate amount of time” due to factors such as a lack of curriculum materials, knowledge of resources and effective practices, and sufficient training on software applications (see professional development needs in the following section).

“The limited time teachers have to learn to use the devices, in order to further help students. Teachers are learning on their own time a large number of programs that change too often… Not enough time or opportunities for veteran teachers to learn more about technology.” – High School Teacher

**Shared Vision & Input.** Teachers, ITCs, and to a lesser extent parents, perceived a combined lack of vision, direction, and program coherence as significant issues with the Digital Learning Device Project. Teachers described experiencing confusion at the alignment of the device program with other strategic goals set by the district, and a lack of clarity around the instructional goals intended by the device program. Moreover, teachers felt they did not have enough input into or say into decisions made at the district level, such as how software programs are selected or other district initiatives or “changes coming down the pipeline.”

“APS needs to create a clear and comprehensive strategic plan and vision for why these devices are being used, including the goals and objectives and what problem is attempting to be solved by giving every student a device. Additionally, APS should analyze the potential negative consequences of utilizing 1-to-1 devices. If this is determined to be the best strategy to address gaps or needs identified by students, teachers, administrators, or families, then commensurate professional development should be conducted to allow teachers to adopt standardized and integrated approaches to implementation. As of now, this is completely haphazard across classes, schools, and the district.” – Middle/High School Parent

**Hardware Issues.** Teachers described frequent disruptions and loss of instructional time created by lack of back-up or loaner devices in classrooms – if a student’s device is not functioning for any reason, the teacher has no ability to provide a substitute device for students to use temporarily. If a student forgets their device, if the device is broken, or if the battery is dead, the teacher can provide no immediate fix. Loaner computer stations and charging stations were brainstormed as potential solutions. Teachers also reported challenges related to the iPad devices themselves, particularly in middle school where the functionality of traditional laptops (e.g. hardware keyboards) was perceived as essential for learning with technology at that grade level.

“The biggest challenge is when students don’t have them charged! It would be so helpful to have a charging station in each classroom although I completely agree that we should be teaching students to be responsible with their devices. When we rely on them heavily in class, which we do, it is a detriment when a student’s device is broken or not charged.” – Middle School Teacher
Software Issues. Several themes emerged with respect to software challenges cited as a barrier to the effective use of digital devices: content filtering, software usability, and app approval. Participant feedback on content filters was somewhat contradictory, with study participants citing content filtering as both insufficient and overly restrictive. For example, teachers and parents described scenarios in which students are accessing restricted internet sites and games despite the content filters in place. Conversely, teachers and students reported that restrictive filtering hampered instructional activities such as research projects. In addition, study participants reported software usability issues or bugs, such as accessing digital textbooks. Finally, elementary and middle school teachers described issues with the app approval process for iPads including unanticipated changes in available apps or delays in the app approval process.

“Between 2017 and 2018, sweeping changes were made in regards to what apps could be used and how they could be accessed. The app catalog was restricted to each school, rather than the county. For many teachers this made finding high-quality apps even more difficult because we weren't able to see what other schools were using. This year, 1:1 devices were completely removed for 2nd grade, seemingly without opportunity to provide teacher feedback (such as this survey) showing a severe lack of teacher input.” – Middle School Teacher

Internet Access. To a lesser extent, teachers and students described issues accessing instructional resources that require the internet both at home and at school. Specifically, teachers occasionally mentioned experiencing challenges with slow or down internet access. Less frequent findings included teacher responses that described challenges created by unequal home access for students. Concerns were expressed over the unfairness created by designing student learning that requires home internet access, while many students still do not have access to internet once they leave school. Furthermore, some students shared that their home networks are often restricted from accessing programs they need to complete assignments.

“Not all students have access to the internet at home, and there are not enough APS-provided hotspots to go around. We can't, as a school system, require students to check or complete homework that requires internet if we don't provide internet to all students. This is an enormously important equity issue that isn't being sufficiently addressed. New textbooks are increasingly e-textbooks and students without internet at home never have access to these at home.” – Middle School Teacher

Teachers Would Benefit from PD Focused on Creativity, Personalization, and Specific Applications

To explore professional learning needs, teachers were asked to respond to a series of closed survey items, asking, “Please indicate whether you would benefit from professional development or supports (e.g. resources, coaching, etc.) in each of the following areas related to technology use or personalized learning.” Of the ten areas listed, survey results indicate that teachers feel they would benefit the most from professional development in the following areas:

1. Use of technology to model and facilitate learning experiences that advance creativity and innovation;
2. Use of technology to personalize learning activities that address students' diverse learning styles, working strategies; and
3. Use of technology to support learner-centered teaching strategies (e.g., project-based or cooperative learning, self-directed inquiry).

Notably, six out of the ten areas listed were identified by over half the respondents as being areas in which they would benefit from professional learning. The remaining three areas focused on feedback and assessment were still endorsed as being beneficial by over 40% of the teacher.
When teachers were asked open-ended survey and focus group questions about other types of support they still needed to effectively use the devices in their classrooms, many described professional development needs related to specific technology applications or integration of technology into specific subject areas. When asked open-ended questions about the barriers to effective instructional use of the devices and additional support that would help address these barriers, teachers also frequently cited a lack of training and professional development. The effective use of digital devices for teaching and learning is a complex skillset that requires a reasonably large amount of practical knowledge and specific pedagogical skills and understandings. Without this knowledge, guidance, and time to practice and develop these instructional proficiencies, teachers are left feeling ill-prepared and unable to use the devices to their fullest potential.

**Canvas.** A common request among teachers was more, or more convenient, opportunities for training on the Canvas Learning Management System (LMS), including training on specific topics such as “use of Canvas to address differentiation and personalization for students.” Some teachers also commented on the quality of available opportunities for Canvas and having to supplement school and district provided supports with available online resources. One teacher suggested that a model Canvas course would be helpful for understanding what’s possible with the LMS:

“A model Canvas example setup for an APS ELA class, science, history, and math class. Canvas has lots of options, but it is not intuitive and it would be great to have a model course that we can copy and adapt as we learn this new LMS.” – High School Teacher

**Specific Apps & Subjects.** Teachers commonly explained that they and their colleagues need support doing the complex work of integrating this powerful tool into pedagogy – beyond simply using devices for digital worksheets. In support of this, however, they reported a need for basic training on using specific applications and software curated by the district. In addition to training on specific applications, teachers also desired training for integrating technology into specific content areas, particularly math and language arts.

“I think the problem is that we did put a lot of devices in the hands of teachers, but I don’t think we are supporting them enough in changing in their practice.” – Secondary ITC
Recommendations & Program Modifications

Recommendations

The following recommendations are the result of a synthesis of all the data collected as a part of the APS 1:1 Device Program study: student, teacher, and parent surveys; student, teacher, staff, and administrator interviews and focus groups; and classroom observations. There are two types of recommendations below. First, there are recommendations that are suggestions put forth by study participants that emerged directly from the data. Second, there are recommendations that are a result of a holistic synthesis of the findings – opportunities for improvement that are clearly demonstrated by the totality of findings.

Craft and communicate a clear vision and pathway for change to all faculty and staff. A holistic analysis of the data reveals that one of APS’s strongest opportunities for growth is in the communication of a clear vision and pathway for change to all faculty and staff. The 1:1 digital device program is significantly changing the instructional and learning landscape in classrooms. APS teachers expressed a desire for a more clear understanding of the goals and purposes behind the provision of the 1:1 devices (i.e. a vision), and an articulation of the program’s coherence with district instructional goals and what steps teachers should be taking to evolve (i.e. a pathway for change, a roadmap). The data also suggest that the majority of teachers have not yet begun to use the devices regularly to transform problem-solving and content learning opportunities for students on a consistent basis. A shared vision and clear pathway for change could begin to facilitate this important and complex instructional shift.

Provide more professional development on both technical skills and pedagogical skills. All of the data sources taken together, especially the teacher survey and focus groups, indicate that APS can continue to improve the 1:1 device program by providing more and different professional development for teachers. Teachers requested more training on basic technical skills required to effectively use the devices, both hardware and software – everything from basic applications for learning or classroom management, especially Canvas, to complex design or data visualization programs that may be used in high schools. Teachers also expressed a desire for training and support in the more complex use of the devices to advance pedagogical goals, such as to facilitate inquiry-based or personalized learning.

Provide teachers more unrestricted time to create, practice, and experiment. Any time a professional is faced with the dual task of learning how to apply a new, complex tool and a new, multifaceted interface to their work, they will need time and space to practice and experiment on their own. APS teachers requested the need for such time with regard to the use of digital devices for the complex work of teaching. The district could further improve the 1:1 program by providing teachers unrestricted time to apply what they will have learned to their work. This would be a great way for teachers to leverage any new professional development to work toward achieving the district’s vision, using the APS’s new pathway for change as a guide.

Support students, teachers, and parents to achieve safe, flexible, on-task use of the devices. A high-level reflection of the study findings identifies a singular challenge experienced by students, teachers, and parents alike – the challenge of supporting students to safely and effectively use the devices and to maximize time on task. Teachers and parents shared that they struggled to keep students on task when using the devices; and all participants discussed inefficiencies created by the frequency of firewalls placed on websites and programs. Although it is impossible to prevent all off-task behavior or any accessing of inappropriate or irrelevant websites, the district has an opportunity to improve support for students, teachers, and parents in this regard. Less restrictive firewalls accompanied by digital citizenship lessons for students, classroom management training for teachers, and guidelines for parents would be places to start. Best practices used by districts around the country should be explored as well. Finally, supporting faculty to advance the sophistication of the instructional use of the devices will increase the frequency with which students are excited about the learning opportunities on the devices, making them less likely to choose off-task behavior instead.
**Create a plan for monitoring and improving technical materials and support.** Finally, the study results also showed an important overall finding: there are not enough technical materials and support staff present in the school buildings. Teachers described frequent loss of instructional time due to missing, broken, or un-charged devices for students. They also explained that instructional time is lost due to technical problems and glitches that cannot be quickly resolved. APS can improve the device program by 1) increasing the technician to school ratio; 2) providing schools with more loaner-devices that students and teachers can use in a pinch; and 3) setting up charging stations throughout schools and classrooms. Guidelines for home-charging and responsible use for students and families would help students be more prepared for school. Finally, improving the regular collection of data on technical problems could help the district better prepare for problems – being ready to triage short-term issues and anticipating any larger technical problems that are emerging.

**Recent Project Modifications**

At the request of the Friday Institute, APS provided information on recent modifications to the project for inclusion in this report. Informed in part by preliminary findings shared during Phase I of the study, and in alignment with the last recommendation provided above, APS has implemented several modifications to the Digital Learning Device Project for the 2019-20 school year. These modifications primarily focus on addressing technical issues and are described in more detail below.

**Technical Support.** APS has added 5 additional technicians for the 2019-20 school year to assist with a range of technical issues, and plan to add 5 more before the 2020-21 school year which will bring the total up to 24 technicians. The intent is to relieve ITCs of some of the troubleshooting and technical support they are providing (see Findings section) so they can focus predominantly on supporting teachers’ instructional practice.

**Loaner Device Program.** To address issues with long wait times for students in need of device repairs, APS has created a loaner device program to create an environment of zero downtime for students. Students will now have the ability to hand in their broken devices and immediately receive a working device. Students will use the temporary “loaner” device while their personal device is being repaired.

**Device Management.** For the 2019-20 school year, APS has also deployed Apple Classroom to assist elementary and middle school teachers in managing learning activities that take place on devices. Apple Classroom is an iOS app that provides teaches the ability to launch apps and websites on any student device, transfer files or documents, and project student work. Teachers will also be able to monitor which apps students are working in, mute student devices, assign a shared iPad to students, reset student passwords, and view summaries of students’ activities.

**iPad Keyboard Pilot.** As described in section of this report addressing factors supporting or impeding efforts to promote learning, many middle school students and teachers expressed frustration with some of perceived limitations of iPads, including the lack of a hardware keyboard. In response, APS has initiated small pilot of iPad keyboards in the middle school to address productivity concerns. Anecdotal evidence suggest hardware keyboards may be primarily benefiting students for whom using an on-screen virtual keyboard was reported as difficult.

**Resources Alignment.** APS has developed a website to communicate alignment of available digital resources with instructional goals. Specifically, the APS Digital Resources webpage lists approved APS digital resources along with a short description of each resource and the personalized learning competencies it supports, such as student voice, mastery learning, individualized instruction, etc. All of the resources have been selected and vetted in accordance with APS Policies and Policy Implementation Procedures.
Appendices

Appendix A: Data Collection Instruments & Protocols

Survey Items

APS 1 to 1 Teacher Survey

STUDENT IMPACT

The following questions are intended to help Arlington Public Schools better understand the extent to which technology is supporting student learning.

Please indicate your level of agreement with the following statements about this school year.

<table>
<thead>
<tr>
<th>“Using technology in school has …”</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tbody>
<tr>
<td>Made learning more interesting for students.</td>
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<td>Helped students enjoy school more.</td>
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<td>Helped students get better organized.</td>
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<td>Enabled students to learn at their own pace.</td>
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<td>Enabled students to learn about things they are personally interested in.</td>
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<td>Helped students communicate with me better.</td>
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<td>Made it easier for students to collaborate with other students.</td>
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<td>Helped students do better quality schoolwork.</td>
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<td>Helped students do better on quizzes and tests.</td>
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<td>Helped students think more about the subjects I am teaching.</td>
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<td>Helped students achieve deeper understanding of content standards.</td>
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<td>Helped students understand how information they learn in school relates to real-life situations.</td>
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<td>Enabled students to get help on schoolwork when the teacher is not immediately available.</td>
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Overall, in which of the following area(s) do you believe one-to-one student device access has had the greatest impact on student learning? Select up to three.

- Mastery of Core Academic Content. Students build an academic foundation in subjects like reading, writing, math, and science. They understand key principles and procedures, recall facts, use the correct language, and draw on their knowledge to complete new tasks.

- Critical Thinking and Problem-Solving. Students know how and when to apply creativity, logic, quantitative reasoning, and scientific inquiry to formulate theories, offer coherent explanations, make well-reasoned arguments, and solve problems.

- Information Literacy. Students know how to find, organize, and synthesize information, including evaluating the quality and usefulness of information for addressing the issue or problem at hand.

- Collaboration Skills. Collaborative students work well in teams. They communicate and understand multiple points of view and they know how to cooperate to achieve a shared goal.

- Effective Communication. Students communicate effectively in writing and in oral presentations. They structure information in meaningful ways, listen to and give feedback, and construct messages for particular audiences.

- Self-Directed Learning. Students develop an ability to direct their own learning. They set goals, monitor their own progress, and reflect on their own strengths and areas for improvement. They know how to seek help or find solutions when encountering difficulties. self-motivation, independence, social skills, and personal responsibility, etc.).

- Technology Skills. Students demonstrate proficiency in, and appropriate use of, computers and applications, as well as an understanding of ethical behavior and safety issues in an interconnected digital society.

- Other. Other general knowledge or skillset not listed here.

- None of the above. I do not believe one-to-one student device access has had any net impact on student outcomes.

Please explain your selections.
The following questions are intended to help Arlington Public Schools better understand the extent to which conditions in your school or district may be facilitating or hindering the use of technology and personalized learning approaches.

**TECHNOLOGY USE**

Please indicate whether the following conditions are an obstacle to your efforts to promote learning using student devices, i.e. laptops and iPads.

If the condition does not exist in your school, please mark “Not applicable.”

<table>
<thead>
<tr>
<th>Condition</th>
<th>Not at All</th>
<th>To a Small Extent</th>
<th>To a Moderate Extent</th>
<th>To a Great Extent</th>
<th>*Not Applicable</th>
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<tbody>
<tr>
<td>Inadequate technology skills among students</td>
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<td>My own limited technology skills</td>
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<td>Inadequate opportunities for teachers to provide input on how technology is used</td>
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<td>Lack of support from technology specialists or other staff who can provide technical support</td>
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<td>Lack of flexibility in deciding how I can use technology in my instruction</td>
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<td>Slow Internet connection or inadequate bandwidth</td>
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<td>Inadequate opportunities to participate in professional development related to technology use</td>
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<td>Lack of high-quality content for technology-based instruction (e.g. Discovery Ed, i-Ready, etc.)</td>
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<td>Lack of alignment between the content students learn online and the content that I am trying to teach</td>
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<td>Problems with hardware, such as insufficient computing power or lack of compatibility with software</td>
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<td>Excessive amounts of time I need to spend developing content for technology-based instruction</td>
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<tr>
<td>Lack of a shared vision for the use of student devices (i.e. iPad or laptops) in support of teaching and learning</td>
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PERSONALIZED LEARNING

Please indicate the extent to which each of the following conditions is an obstacle to your efforts to promote personalized learning for students.

If the condition does not exist in your school, please mark “Not applicable.”

<table>
<thead>
<tr>
<th>Condition</th>
<th>Not at All</th>
<th>To a Small Extent</th>
<th>To a Moderate Extent</th>
<th>To a Great Extent</th>
<th>*Not Applicable</th>
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<tbody>
<tr>
<td>Lack of support from school administration</td>
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<td>My own limited knowledge of how to effectively personalize instruction</td>
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<td>Too many students for whom I am responsible</td>
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<td>Too much diversity in achievement levels among my students</td>
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<td>Too much variation in age or maturity among my students</td>
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<td>Lack of flexibility in the curriculum I am required to teach (i.e., need to teach specific material in a specific time frame)</td>
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<td>Pressure to cover specific material as a result of state or district standards or testing requirements</td>
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<td>Excessive amounts of time I need to spend developing personalized content</td>
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<tr>
<td>Inadequate opportunities to participate in professional development related to personalizing learning</td>
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<td>Inadequate data to help me personalize students’ instruction</td>
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<tr>
<td>Lack of high-quality content or materials</td>
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<tr>
<td>An inadequate amount of time to prepare personalized lessons for all students</td>
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<td>High levels of student absenteeism</td>
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<td>High levels of student disciplinary problems</td>
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<tr>
<td>Scheduling constraints</td>
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</table>

PROFESSIONAL DEVELOPMENT
Please indicate whether you would benefit from professional development or supports (e.g. resources, coaching, etc.) in each of the following areas related to technology use or personalized learning:

<table>
<thead>
<tr>
<th>Area</th>
<th>Definitely Not</th>
<th>Probably Not</th>
<th>Might or Might Not</th>
<th>Probably Yes</th>
<th>Definitely Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of technology to model and facilitate learning experiences that advance student creativity and innovation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Use of technology to support learner-centered teaching strategies (e.g., project-based or cooperative learning, self-directed inquiry)</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Use of technology to personalize learning activities that address students’ diverse learning styles, working strategies, and abilities</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Use of technology to collect and analyze student assessment data</td>
<td>0</td>
<td>0</td>
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<td>Use of technology to provide feedback on learning to students and families</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Performance-based student assessment</td>
<td>0</td>
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<tr>
<td>Research-based best practices related to technology-enabled personalized learning</td>
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<tr>
<td>How to locate and evaluate resources for supporting technology-enabled personalized learning environments</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Classroom management strategies for a technology-enabled personalized learning environment</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Other not listed here... (Please briefly describe.)</td>
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</tbody>
</table>

Overall, what have been the **most useful supports** teachers have received for effectively leveraging student devices?

[ ]

Overall, what do you believe is the **greatest barrier** to effectively leveraging student devices to support learning?

[ ]
The following questions are intended to help APS better understand the activities students are engaged in when using technology, as well as the extent to which teachers may be using personalized learning strategies as part of their instructional practice.

PERSONALIZED LEARNING

Please think about your students’ experiences with all core academic subject areas this year (e.g. math, science, language arts, social studies). How frequently do students have access to the following experiences in school?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students have opportunities to choose what instructional materials (such as books or computer software) they use in class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students have opportunities to choose what topics they focus on in class</td>
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<tr>
<td>Students are provided a variety of materials or instructional approaches to accommodate individual needs and interests</td>
<td></td>
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<tr>
<td>Students connect what they are learning with experiences they have throughout the rest of the school day or outside of school</td>
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</tr>
<tr>
<td>Course content is adapted to meet students’ needs by providing additional assignments, resources, and activities for remediation or enrichment</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Students are assigned projects that extend over several weeks or months</td>
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<tr>
<td>Students are assigned projects that are interdisciplinary (e.g., combining science and literature)</td>
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</tr>
<tr>
<td>Students have opportunities to provide input into the design and focus of project work</td>
<td></td>
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</tr>
<tr>
<td>Different students work on different topics or skills at the same time</td>
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<tr>
<td>Students are given the chance to work through instructional material at a faster or slower pace than other students in this class</td>
<td></td>
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</tr>
<tr>
<td>Students keep track of their own learning progress</td>
<td></td>
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</tr>
</tbody>
</table>
## TECHNOLOGY USE

Please indicate how often students are engaged in the following types of activities when using their laptop or tablet in your classroom:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using structured curriculum materials online</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Watching videos, animations, or simulations</td>
<td></td>
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</tr>
<tr>
<td>Adjusting parameters of simulations and observing the results</td>
<td></td>
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</tr>
<tr>
<td>Solving problems with clear solutions (e.g., multiple-choice math problems or vocabulary drills)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Solving multistep, open-ended problems or conducting investigations</td>
<td></td>
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</tr>
<tr>
<td>Receiving immediate feedback on problem solutions</td>
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<td>Receiving feedback about strengths and weaknesses from an automated system</td>
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<td>Receiving help from an online human acting as a teacher, tutor, or mentor</td>
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</tr>
<tr>
<td>Taking assessments</td>
<td></td>
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</tr>
<tr>
<td>Engaging in discussions or collaborative problem-solving with other students in the school</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Engaging in discussions or collaborative problem-solving with other students not from the same school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using online reference materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searching for relevant materials on the web</td>
<td></td>
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</tr>
<tr>
<td>Keeping track of their own learning progress (for example, by using an online gradebook or portfolio)</td>
<td></td>
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</tr>
<tr>
<td>Producing presentation products (e.g., videos, slides, multi-media, reports, etc.)</td>
<td></td>
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<td>Visually representing ideas (e.g., through concept mapping, graphing, reading charts, graphics, etc.)</td>
<td></td>
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</tr>
</tbody>
</table>

Approximately what percentage of time are student devices (i.e. laptops or tablets) used in your classroom?
Student devices in a primary role for instruction: ______
Student devices in a supporting role for instruction (e.g. electronic note taking): ______
Student devices not in use: ______
Total: ______

In what ways, if any, are student devices being used to support personalized learning in your classroom?

[            ]

With respect to your instructional practice, what is the most valuable aspect of each student having their own device? Please explain.

[            ]

With respect to your instructional practice, what is the most challenging aspect of each student having their own device? Please explain.

[            ]
APS 1 to 1 Student Survey

DEMOGRAPHICS

What is the level and name of the school you attend? Select from the menu below.

School Level (elementary, middle, or high)

[ ] DROPDOWN

School Name

[ ] DROPDOWN

What is your current grade-level?

[ ] DROPDOWN

STUDENT IMPACT

Please indicate whether you agree with the following statements:

<table>
<thead>
<tr>
<th>Having my own personal computing device (i.e. laptop or tablet)</th>
<th>Yes, I agree</th>
<th>No, not really</th>
<th>I’m not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has made learning more interesting.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is important to my success.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Has helped me enjoy school more.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Has helped me get better organized.</td>
<td></td>
<td></td>
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<tr>
<td>Has enabled me to learn at my own pace.</td>
<td></td>
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<tr>
<td>Has enabled me to learn about things that I am personally interested in.</td>
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<td>Has helped me communicate better with my teachers.</td>
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</tr>
<tr>
<td>Has made it easier to work with other students.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Has helped me do better quality schoolwork.</td>
<td></td>
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<tr>
<td>Has helped me do better on quizzes and tests.</td>
<td></td>
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<tr>
<td>Has helped me think more about the subjects I am learning.</td>
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<tr>
<td>Has helped me understand how information I learn in school relates to real-life situations.</td>
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<td>Has enabled me to get help on schoolwork when a teacher is not immediately available.</td>
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</table>

What is the most valuable aspect of having your own device to use at home or school? Please explain.

[ ]

What is the most difficult or challenging aspect of having your own device to use at home or school? Please explain.

[ ]
How often are you engaged in the following types of activities when using your device (i.e. laptop or tablet):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
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</thead>
<tbody>
<tr>
<td>Using structured curriculum materials online (e.g. textbooks, tutorials, online lessons, etc.)</td>
<td></td>
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</tr>
<tr>
<td>Reading</td>
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</tr>
<tr>
<td>Watching videos, animations, or simulations</td>
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<tr>
<td>Exploring or analyzing data using spreadsheets, simulations, etc.</td>
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<tr>
<td>Solving problems with clear solutions or answers (e.g., multiple-choice math problems or vocabulary practice)</td>
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<td>Receiving help from an online human acting as a teacher, tutor, or mentor</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using online reference materials (e.g. news articles, encyclopedias, dictionaries, etc.)</td>
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<td></td>
</tr>
<tr>
<td>Searching for relevant materials on the web</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>
How frequently do you have the following experiences in school?

<table>
<thead>
<tr>
<th>Experience</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
<th>Very Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am given opportunities to demonstrate my strengths and weaknesses so that teachers can adjust instruction to address them.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My teachers take into account my interests and experiences when deciding what I will work on.</td>
<td></td>
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</tr>
<tr>
<td>My teachers and I work together to set personal goals for my own learning.</td>
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<td></td>
</tr>
<tr>
<td>I have opportunities to choose what instructional materials (such as books or computer software) I use in class.</td>
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<td></td>
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<tr>
<td>I have opportunities to choose what topics I focus on in class.</td>
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<td></td>
</tr>
<tr>
<td>I work on different topics or skills than what my classmates are working on at the same time.</td>
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</tr>
<tr>
<td>I am given the chance to work through instructional material at a faster or slower pace than other students in the class.</td>
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</tr>
</tbody>
</table>

Approximately what percentage (%) of your time at school are you...

- ______ Offline, not on your device?
- ______ Using your device for school related activities?
- ______ Using your device for non-school related activities? Please provide some examples, including non-school activities you might use your device for at school.
APS 1 to 1 Parent Survey

DEMOGRAPHICS

For each child in your family who attends Arlington Public Schools (APS), please indicate their school and grade level below.

Note: Your responses will be combined with the responses of other survey respondents to prevent identification of individuals. Any potentially personally identifiable information will not be shared with APS.

<table>
<thead>
<tr>
<th>Student Information</th>
<th>School</th>
<th>Grade (K-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child 2</td>
<td></td>
<td></td>
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<tr>
<td>Child 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child 4</td>
<td></td>
<td></td>
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<tr>
<td>Child 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STUDENT IMPACT

The following questions are intended to help Arlington Public Schools better understand the extent to which technology is supporting student learning.

To what extent do you agree with the following statement?

One-to-one student device access (i.e. a laptop or tablet for each student) is important to my child(ren)’s success in school.

- **Strongly agree**
- **Agree**
- **Neither agree nor disagree**
- **Disagree**
- **Strongly disagree**

Please indicate your level of agreement with the following statements about this school year.

<table>
<thead>
<tr>
<th>Using technology in school has …</th>
<th>Strongly agree</th>
<th>Somewhat agree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made learning more interesting for my child(ren).</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Helped my child(ren) enjoy school more.</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Helped my child(ren) get better organized.</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Enabled my child(ren) to learn at their own pace.</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Enabled my child(ren) to learn about things they are personally interested in.</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Helped my child(ren) communicate with their teacher.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Made it easier for my child(ren) to collaborate with other students.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Helped my child(ren) do better quality schoolwork.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Helped my child(ren) do better on quizzes and tests.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Helped my child(ren) achieve deeper understanding of content standards.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Helped my child(ren) understand how information they learn in school relates to real-life situations.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Enabled my child(ren) to get help on schoolwork when the teacher is not immediately available.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Overall, what is the most valuable aspect of your child(ren) having their own personal device to use at home and school?**

[ ]

**Overall, what is the most challenging aspect or biggest concern with your child(ren) having their own personal device for home and school?**

[ ]

**What changes, if any, would you suggest for student device use or related policies to better support student learning?**

[ ]

**TECHNOLOGY USE**

The following question is intended to help APS better understand the activities students are engaged in when using technology at home.

Please indicate how often students are engaged in the following types of activities when using their laptop or tablet at home. Please leave blank if unsure.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
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<td>Using structured curriculum materials online</td>
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<td>□</td>
<td>□</td>
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<tr>
<td>Watching videos, animations, or simulations</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Activity</td>
<td>Score</td>
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<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Exploring or analyzing data (e.g., spreadsheets, simulations, etc.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Solving problems with clear solutions (e.g., multiple-choice math problems or vocabulary drills)</td>
<td>0</td>
<td>0</td>
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<td>Receiving help from an online human acting as a teacher, tutor, or mentor</td>
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<td>Taking quizzes, tests, or assessments</td>
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<td>Engaging in discussions or collaborative problem-solving with other students in the school</td>
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<td>Engaging in discussions or collaborative problem-solving with other students not from the same school</td>
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<td>Using online reference materials</td>
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<tr>
<td>Searching for relevant materials on the web</td>
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<tr>
<td>Keeping track of their own learning progress (for example, by using an online gradebook or portfolio)</td>
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<tr>
<td>Producing presentation products (e.g., videos, slides, multi-media, reports, etc.)</td>
<td>0</td>
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<tr>
<td>Visually representing ideas (e.g., through concept mapping, graphing, reading charts, graphics, etc.)</td>
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<td>Other not listed here… (Please briefly describe.)</td>
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**Note:** Each activity has a corresponding score, indicating the level of engagement or participation. The table above lists various digital learning activities and their respective scores.
Focus Group and Interview Questions

APS 1 to 1 Instructional Technology Coordinator

Thank you so much for meeting with me today.

The purpose of this interview is to supplement classroom observation data and survey data that we’ve collected on teachers, students, and parents perceptions of the impact of transitioning to 1:1. The study has three priority areas: 1) Device Use, 2) Barriers & Supports, 3) Student impact: Specifically, we’re interested in learning:

1. Device Use: How, and to what extent, are devices used to support teaching and learning?
2. Barriers & Supports: What factors may be facilitating or impeded effective use of devices?
3. Student Impact: What are the perceived impacts on students as a result of transitioning to 1:1?

With your permission, I would like to record this conversation to aid my note taking. I may use some quotes from this conversation for reporting purposes, but I won’t use any specific names of participants, students, parents, or schools.

Thank you for giving us your time; this interview should take between 40 and 50 minutes.

Device Use
1. How are teachers typically using devices to support student learning?
   a. What uses of the devices do you think have been especially effective?
      i. How widespread are these practices?
   b. What uses do you think have been ineffective?
      i. How widespread are these practices?
2. As a whole, how often are teachers using the devices?
3. If you had a magic wand, and could make any changes to district policy about student device use, what changes would you make?

Barriers & Supports
4. What supports have teachers received to support the effective use of devices? Either formal supports from the school or district or informal supports?
   a. What supports do you feel have been the most effective?
   b. What supports have been the least effective?
   c. What supports are still needed?
5. What supports have principals received to support the effective use of devices? These might be either formal supports from the school or district or informal supports.
   a. What supports do you feel have been the most effective?
   b. What supports have been the least effective?
   c. What supports are still needed?
6. What are the biggest challenges teachers face in using the devices effectively? (teacher, student, school, district factors)
   a. What has been done to address these issues?
   b. What still needs to be done to address these issues?

Student Impact
7. Overall, what has been the most beneficial aspect of students having their own device to support learning?
8. What impact, if any, do you feel 1:1 access has actually had on student learning? Explain.
9. What impact, if any, do you feel 1:1 access has actually had on student learning? Explain.
APS 1 to 1 Principal Focus Group

Thank you so much for meeting with me today.

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      i. How widespread are these practices?
   b. What uses do you think have been ineffective?
      i. How widespread are these practices?
2. As a whole, how often are teachers using the devices?
3. If you had a magic wand, and could make any changes to district policy about student device use, what changes would you make?

Barriers & Supports
4. What supports have teachers received to support the effective use of devices? Either formal supports from the school or district or informal supports?
   a. What supports do you feel have been the most effective?
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6. What are the biggest challenges teachers face in using the devices effectively? (teacher, student, school, district factors)
   a. What has been done to address these issues?
   b. What still needs to be done to address these issues?

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APS 1 to 1 Teacher Focus Group

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Thank you for giving us your time; this interview should take between 40 and 50 minutes.

Device Use

1. Kinds of Use
   a. What do you think have been the some especially effective use of the devices to support student learning?
      i. How widespread are these practices?
   b. What uses do you think have been ineffective?
      i. How widespread are these practices?
   c. How do teachers decide what activities should be online or offline?
      i. Kinds of activities?

2. Frequency
   a. As a whole, how often are teachers using the devices?
   b. If you had a magic wand, and could make any changes to district policy about student device use, what changes would you make?

Barriers & Supports

4. What supports have teachers received to support the effective use of devices? Either formal supports from the school or district or informal supports.
   a. What supports do you feel have been the most effective?
   b. What supports have been the least effective?
   c. What supports are still needed?

5. What supports have principals received to support the effective use of devices? These might be either formal supports from the school or district or informal supports.
   a. What supports do you feel have been the most effective?
   b. What supports have been the least effective?
   c. What supports are still needed?

6. What are the biggest challenges teachers face in using the devices effectively? (teacher, student, school, district factors)
   a. What has been done to address these issues?
   b. What still needs to be done to address these issues?

Student Impact

7. Overall, what has been the most beneficial aspect of students having their own device to support learning?
8. What impact, if any, do you feel 1:1 access has actually had on student learning? Explain.
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APS 1 to 1 Parent Focus Group

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Thank you for giving us your time; this interview should take between 40 and 50 minutes.

Device Use

1. How are your children typically using your devices for at school? At home?
2. How often are students using their devices at home?
   a. School?
   b. Personal use?

Benefits & Challenges

3. What’s are most challenging aspects, or your biggest concerns, about your kids having their own device?
4. What’s are some of the benefits of students having their own device?

Student Learning

5. Do you think the devices are helping your kids learn in school? Why or why not?
6. Have the devices helped your children learn other things or helped you in other ways besides schoolwork?
APS 1 to 1 Student Focus Group

Thank you so much for meeting with me today. The purpose of this interview is to supplement classroom observation data and survey data that we’ve collected on teachers, students, and parents perceptions of the impact of transitioning to 1:1. The evaluation has three priority areas: 1) Device Use, 2) Barriers & Supports, 3) Student impact. Specifically, we’re interested in learning:

1. Device Use: How, and to what extent, are devices used to support teaching and learning?
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With your permission, I would like to record this conversation to aid my note taking. I may use some quotes from this conversation for reporting purposes, but I won’t use any specific names of participants, students, parents, or schools.

Device Use
1. How often are you using your devices at school? At home?
2. What are you typically using your devices for at school? At home?
3. Aside from schoolwork, what else do you use your device for?

Barriers & Supports
4. What’s the most challenging part of having your own device?
5. What’s the best part of having your own device for school? For home?

Student Learning
6. Do you think the devices have helped you learn what you’re supposed to learn on school? Why or why not?
7. Have the devices helped you learn other things or helped you in other ways besides schoolwork?
Observation Protocol

OBSERVATION CONTEXT

Observer: ____________________________________________

Date: ________________________________________________

School: ________________________________________________

Grade(s): ________________________________________________

Content area: ____________________________________________

Teacher: ________________________________________________

Time in: ________________________________________________

Time out: ________________________________________________

Student groupings (select all that apply):

[ ] Independent work
[ ] Learning stations
[ ] Small groups
[ ] Whole group
[ ] Partners
[ ] Other (please specify) _______________________

TECHNOLOGY USE

Is technology in use by teachers?

[ ] Yes
[ ] No

Is technology in use by students?

[ ] Yes
[ ] No

Technology is being used by the students for … (select all that apply):

[ ] Adjusting parameters of simulations and observing the results
[ ] Engaging in discussions or collaborative problem-solving with other students in the school
[ ] Engaging in discussions or collaborative problem-solving with other students not from the same school
[ ] Keeping track of their own learning progress (for example, by using an online gradebook or portfolio).
[ ] Producing presentation products (e.g., videos, slides, multi-media, reports, etc.).
[ ] Reading
[ ] Receiving immediate feedback on problem solutions
[ ] Receiving problem-solving help from an automated tutoring system
Receiving feedback about strengths and weaknesses from an automated system
Receiving help from an online human acting as a teacher, tutor, or mentor
Searching for relevant materials on the web
Solving problems with clear solutions (e.g., multiple-choice math problems or vocabulary drills)
Solving multistep, open-ended problems or conducting investigations
Taking assessments
Using online reference materials
Using structured curriculum resources online
Visually representing ideas (e.g., through concept mapping, graphing, reading charts, graphics, etc.)
Watching videos, animations, or simulations
Other not listed here

Which of the following general knowledge/skill domains do you believe the activities identified above are addressing? (Select all that apply.)

- Mastery of Core Academic Content. Students build an academic foundation in subjects like reading, writing, math, and science. They understand key principles and procedures, recall facts, use the correct language, and draw on their knowledge to complete new tasks.

- Critical Thinking and Problem-Solving. Students know how and when to apply creativity, logic, quantitative reasoning, and scientific inquiry to formulate theories, offer coherent explanations, make well-reasoned arguments, and solve problems.

- Information Literacy. Students know how to find, organize, and synthesize information, including evaluating the quality and usefulness of information for addressing the issue or problem at hand.

- Collaboration Skills. Collaborative students work well in teams. They communicate and understand multiple points of view and they know how to cooperate to achieve a shared goal.

- Effective Communication. Students communicate effectively in writing and in oral presentations. They structure information in meaningful ways, listen to and give feedback, and construct messages for particular audiences.

- Self-Directed Learning. Students develop an ability to direct their own learning. They set goals, monitor their own progress, and reflect on their own strengths and areas for improvement. They know how to seek help or find solutions when encountering difficulties. self-motivation, independence, social skills, and personal responsibility, etc.).

- Technology Skills. Students demonstrate proficiency in, and appropriate use of, computers and applications, as well as an understanding of ethical behavior and safety issues in an interconnected digital society.

- Other. Other general knowledge or skillset not listed here.

Please explain your selection(s).

[ ]
Appendix B: Themes and Select Quotes

Q1. How are devices used to support teaching and learning?

<table>
<thead>
<tr>
<th>Assessment and Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>• “The ability to give feedback immediately is huge. If the student is doing something in Google slides, and they are clearly not understanding the conceptual understanding … I can give them feedback in voice or text on the Google slide itself, and then the student has it on their devices.” – Secondary ITC</td>
</tr>
<tr>
<td>• “[With the devices] I am able to get immediate feedback from formative assessments, which I can turn and use immediately for follow up small groups.” – Elementary Teacher</td>
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<td>• [Students can be] showing mastery on objectives when they’re at home doing a flipped lesson, and so the teacher will know even before they walk in the classroom the next day, ‘Oh, they mastered that objective. They go to the next objective.’ … Then the teacher can easily regroup students according to strategy, they can tier lessons, they can have students move on to the next level.” – Elementary Principal</td>
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<td>• “As a resource teacher who’s moving to different classrooms all the time, [students] can finish something up, submit it to them and then I can still be giving feedback and corresponding even when I don’t see them. That’s really powerful.” – Elementary Teacher</td>
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<td>• “[The laptops] have made it much easier for me to use … digital self-assessment and reflection.” – Middle School Teacher</td>
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<td>• “I am able to provide written or recorded feedback quickly and efficiently from anywhere.”– Elementary Teacher</td>
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<tr>
<td>• “They can share their learning process with peers, teachers, and parents through the device in real time, which would be impossible to replicate without the devices. This supports the feedback loop and formative assessments.” – Elementary Teacher</td>
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<th>Reference &amp; Research</th>
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<tr>
<td>• “My iPad helps me with project and to learn or research things I don’t know.” – Elementary Student</td>
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<td>• “I can have more access to resources when I am doing a research project and can have access to tools to help me stay organized.” – High School Student</td>
</tr>
<tr>
<td>• “Using the databases provided by APS, students have been able to research and synthesize information using read aloud features, videos based on content, and vocabulary support that do not exist with print texts. The databases provide differentiation to support a wide variety of reading readiness.” – Elementary Teacher</td>
</tr>
<tr>
<td>• “One-one devices are invaluable to students to gather information through the web that not long ago would require physical dictionaries, encyclopedias or magazines and newspapers of which were not always immediately available. Many available current resources on the web help them to find the best ways to address and apply critical thinking skills and problem-solving skills when completing assignments.” – High School Teacher</td>
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<tr>
<td>• “[The most valuable aspect of having a device is] access to a greater depth of resources.” – Parent</td>
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<tr>
<td>• ”[One of the main learning benefits] is research, being able to think critically about information that they’re researching.”- Elementary Principal</td>
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<tr>
<td>• ”[The device enables] the research. So many of the resources and information are at their fingertips.”- Elementary Principal</td>
</tr>
<tr>
<td>• “Students are working in partners on a human rights WebQuest. They are reading resources found from research on the Internet and completing a guided graphic organizer in Google Docs. One partner’s iPad has the reading pulled up while the other partner’s iPad has the Google Doc visible. The students are collaboratively collecting and organizing the information.” – APS Staff Observer (Middle School)</td>
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Digital Content & Materials

- “It also gives me access to databases that I don’t have accounts in.” – Middle School Student
- “I’d say I like the online videos that are out there – for operations and stuff they help a lot. In some ways I learn math better watching the video about how to do something, than just in class with the teacher.” – High School Student
- “For my IB classes, they now have the online textbooks. So when they give us a card, you can put it onto the website and then access textbook online. A lot of stuff I use my computer for that’s on my textbooks and not like actual textbook, because they give us one of those too.” – High School Student
- “If I’m struggling in certain subjects such as math, I can look up how to do the problem.” – 9th Grade Student
- “Students can conduct simulations for science that they could not do in an actual lab setting for safety purposes, expense or class size.” – Middle School Teacher
- “[The most valuable aspect of student 1:1 devices] … is accessing information … For example, with the life cycle of butterflies, being able to watch on video and see how the caterpillar actually goes into the day formation, splits, and the chrysalis forms around it, and then how it emerges from the chrysalis and flaps its wings. We used to have actual caterpillars in the classroom, which was amazing, but if they did it overnight, you missed it.” – Secondary Teacher
- “[The most valuable aspect of student 1:1 devices is] having extra materials available to master a learning objective.” – Secondary Teacher
- “We have certain subject areas that have no textbooks, so our teachers are using them pretty heavily for a substitute.” – Secondary Principal
- “Access to a greater depth of resources… content online to enhance the classroom curriculum” – Elementary School Parent

Learning Products & Practice

- “I like that it allows us to play math games furthering are math skills.” – 5th Grade Student
- “[My] students used online databases to research their topic and collaboratively created a slideshow presentation on Google. They embedded videos found on Discovery Education and images from the databases. They then presented the material to the class. ’ – Elementary Teacher
- “Apps such as Reflex Math, Quizlet, and Brainpop allow students to efficiently learn, memorize, and practice skills and vocabulary that underlie core content.” – Elementary Teacher
- “[The digital device] provides a tool for creativity and developing presentation and communication skills.” – Elementary Parent
- “Students create, share and collaborate on presentations. Students think and create products that demonstrate their knowledge with many options and platforms that allow for differentiation and better communication.” – Elementary Teacher
- “Students conduct research to complete research projects. They are more confident preparing multimedia projects and communicating their findings during presentations.” – Elementary Teacher
- “I would add some of the things that I’ve seen that are happening at our school, is that kids are using them to actually demonstrate learning. There are some stop-motion videos that I love. You should see one the students made about the Nitrogen Cycle … It’s great.” – Secondary Principal
- “Students are working through various practice problems (from recall, then application, to abstraction); students are progressing through an LMS mastery path; students are referring to previous “notes” on an informational .ppt to guide their exploration.” – Classroom Observer
Home Use

- “At home I use my iPad for practicing for the SOL [Standards of Learning Assessment] and also to do my homework or to do my work.” – Elementary Student
- “If I’m absent, I can go to Google Classroom or Canvas to see what I missed that day and the homework that I need to do that is due the next day. Also, if I need help on something that is on my homework, I can go onto Canvas or Google Classroom to see what strategy might help me.” – Middle School Student
- “I’ve benefitted exponentially since receiving a personal laptop. I’m able to store all files on one space … I’m able to easily take, keep, and study notes on the cloud and access them on my phone. If I’m working on a project and the bell rings, I can close my laptop and start where I left off at home!” – High School Student
- “I don’t need to go to the library to turn in online assignments, which helped me save money to get my own device at the end of the year.” – High School Student
- “I will post the flipped classroom video of how to draw certain circles, for examples, and then I will have parents saying, ‘Thank you – my kids are doing this at home and I don’t know what it is.’ [The devices] are giving parents information about what we’re learning in the classroom.” – Elementary Teacher
- “I work with struggling readers who need time in text who don’t have access to books at home, so their iPad provides them access to online text at home.” – Elementary Teacher
- “Makes it easy to check homework and upcoming assignments from home, communicate with teachers via email, and lets them reinforce learning at home (e.g. Reflex math, Dreambox).” – Elementary Parent
- “It was great for my 8th grader to watch math videos, submit homework online, and access information on the web.” – Middle School Parent
- “When a child is sick and unable to attend school or misses for some other reason, he or she can keep up with schoolwork more easily.” – High School Parent

Non-Academic Use

- “The hardest thing about having an iPad (electronic)s not being tempted to play on it. For example, there are sites we can visit that allow us to play games even though it isn’t allowed.” – Elementary Student
- “See, the thing is they block all these websites, but we always find a way to get to them anyways.” – Middle School Student
- “[The biggest challenges is] making sure students follow the rules outlined in the provided agreement-- ie, coming to school with an device, charging the device, not watching non-educational videos or playing games when they are asked to work independently.” – Middle School Teacher
- “I’ve often been impressed by the extent to which some students know how to game, find workarounds to avoid detection, hack, hide, make memes, etc. but they still can’t find the day’s agenda or assignments on Canvas.” – High School Teacher
- “Students will often use their devices for non-academic purposes (play video games, watch movies, etc.) and it is difficult for teachers to monitor this activity.” – High School Teacher
- “Playing ‘educational games’ that have non-educational incentives/rewards built in – very confusing to students, who are told that games aren’t appropriate usage of school devices, and very dangerous in feeding into the quick-gratification trap” – Elementary/Middle School Parent
- “The tablet is often used for non-educational purposes that is disguised as legitimate screen time” – Middle School Parent
- “He has figured out how to defeat the user controls so that he can install games and watch movies on his APS device.” – High School Parent
Q2. What are the perceived impacts on students as a result of transitioning to 1:1?

### Student Engagement

- “The most valuable aspect of having my own device to use is that it is...” – 5th Grade Student
- “Student engagement, motivation, and overall understanding has improved...” – Elementary Teacher
- “I think that for us, [the most valuable aspect of the devices] especially is ...” – Elementary Principal
- “If they're engaged, and they're interested, then they're accessing the learning...” – Secondary Principal
- “On occasion, he seems to indicate more interest in a subject when he can complete an interactive assignment.” – Parent

### Personalized Learning

- “The most valuable aspect is that I can meet the diverse needs of learners as if I am a team of teachers,...” – Elementary Teacher
- “Students are able to access similar information at different levels. Students are able to interact with each other and the content in ways they find engaging. Students are able to...” – Middle School Teacher
- “I am implementing Personalized Learning in my classroom and it wouldn't be as seamless without personal devices. I am able to organize my classroom content so that it is easily found, communicate effectively, provide direct feedback on...” – High School Teacher
- “I think the main point of it is, it allows us to do things that we were not previously able to do in personalizing instruction. Technology is not the only tool in personalized learning...” – Secondary ITC
- “They can have a mastery path that's set for them, so they can move beyond when the teacher would have had to do, one on one instruction for that kid at the expense of everyone else, now you have a way to actually reach those kids.” – Secondary ITC
Communication & Collaboration

• “Being able to communicate easier … I can show my thoughts and use presentations to help visualize my ideas.” – Elementary Grade Student

• “The most valuable aspect of having my own device to use at home or at school is that I have easy access to work when I’m sick, or when a teacher is out, and I can email my teachers with questions even if I’m not at school.” – Middle School Student

• “Having assignments on Canvas has been helpful… my teachers can directly message me through Canvas when they need to make an announcement about assignments. I also wouldn’t be able to work on assignments at home because I don’t have a computer at home.” – High School Student

• “I find it particularly useful for collaborative writing and also to conference with students to edit.” – Elementary Teacher

• “Students are working in partners on a human rights webquest. They are reading resources found from research on the Internet and completing a guided graphic organizer in Google Docs. One partner’s iPad has the reading pulled up while the other partner’s iPad has the Google Doc visible. The students are collaboratively collecting and organizing the information.” – Middle School Teacher

• “It levels the playing field when it comes to access to technology. Everyone has the same device, so everyone can collaborate effectively. No one is left behind in an assignment because they don’t have a device to do their work on and turn in.” – High School Teacher

• “[The devices] allows them to collaborate and interact with classmates outside of class. Provides a tool for creativity and developing presentation/communications skills.” – Elementary School Parent

• “My son can collaborate with all of his peers on the same system, without exception, which in itself has been very effective.” – High School Parent

Technology Skills

• “Many of our 2nd graders have devices at home, but with no rules and restrictions. By being 1:1, we allow students to take ‘ownership’ and responsibility for a piece of technology and teach them how to become safe digital citizens, and how to use technology as a tool, and not as a toy. Further, having the iPads as also helped students with mastery of the state’s newest Computer Science standard by allowing them to practice coding. Students are learning skills in 2nd grade that they will not have to worry about learning in the future, making them more available in older grades to focus on the content, and not the mechanics, of the technology they use.” – Elementary School Teacher

• “Students access to a personal device has given them the opportunity to gain new knowledge of how to utilize their technology skills. Having a personal device at school has also pushed teachers to teach the students to become more aware of ethical behavior and safety issues with their device.” – Middle School Teacher

• “Many students that do not have devices in their home, are able to keep up with technological advances.” – Middle School Teacher

• “In the visual arts, students have been able to develop more skills in technology-based design programs and can work on these at home with a one-to-one device. Students can access directions, examples and check their progress and teacher comments at home more easily.” – High School Teacher

• “[Most valuable aspect of 1:1 is] greater technology proficiency and responsibility and life skills; technology is an integral part of American life, learning how to use it and how it is best used is very important; having a common platform provides a basis for the student body to build a core skill set that is transferable to other platforms (laptops, desktops, robots, different operating systems...)” – Elementary/Middle School Parent

• “Students were finishing a task on formatting and style then worked on HTML Project which included completing a research article summary.” – APS Staff Observer (Middle School)
Self-Directed Learning

• “I can get my work done without the help of a teacher.” – Middle School Student
• “I went on YouTube and I watched things based on different cultures all the time, just because sometimes it will be in my search engine … I’m kind of interested. It just broadened my span of the world.” – High School Student
• “I’d say I like the online videos that are out there, for operations and stuff they help a lot. In some ways, I learn math better watching the video about how to do something, than just in class with the teacher.” – High School Student
• “Students learn to think critically about which tools would be best for which type of learning (and learn that sometimes, a digital tool is not an appropriate choice at all). They also develop these critical-thinking and problem-solving skills when engaging with and learning to use different tools. All of this leads them to become more self-directed learners… Students undoubtedly need to be taught the skills of goal-setting and reflecting (and my second graders are still working on those), but having access to these devices gives them even more opportunity to develop these crucial lifelong skills.” – Elementary Teacher
• “Students have made huge independent gains and have learned to drive their own learning for part of their day. Teachers are able to direct students to credible information to reinforce knowledge. Students can then learn or work at their own pace.” – Elementary Teacher
• “The iPad at the middle school level have enabled teachers to set up instruction that can be self-paced and self-directed. Not all teachers take advantage of this, but when they do, the iPad allows students to work at their own pace.” – Middle School Teacher
• “Students have become self-directed learners. If they miss a class, they know the notes are posted on Canvas and their assignments can be found there as well. They also monitor their own progress since they have an immediate way to access Synergy.” – High School Teacher

Information Literacy Skills

• “Information literacy is especially important in research and internet searches, so students are getting more exposure to more information sources with technology and are able to evaluate and use it more effectively than ever before.” – Elementary Teacher
• “The students have learned how to find and gather information and then are able to express their findings in various platforms.” – Elementary School Teacher
• “Students know how to find, organize, and synthesize information using databases. They can find answers to their questions before asking another student or teacher.” – Elementary Teacher
• “I believe have 1:1 iPads has helped students become more literate in evaluating information they receive through multiple electronic venues. They have become more likely to examine sources for bias.” – Middle School Teacher
• “Students can successfully research topics and find information using their iPads.” – Middle School Teacher
• “The English language learners I work with often do not have the opportunity to get online other than on their phones and need to learn how to use computers to find resources that will improve their communication, academic performance, and accelerate their learning through self-directed practice.” – High School Teacher
• “One-one devices are invaluable to students to gather information through the web that not long ago would require physical dictionaries, encyclopedias or magazines and newspapers of which were not always immediately available. Many available current resources on the web help them to find the best ways to address and apply critical thinking skills and problem-solving skills when completing assignments.” – High School Teacher
### Mastery of Core Academic Content

- “...in regard to the math applications such as DreamBox and Reflex math, I am certain that they apps have helped student master foundational skills from 1st grade to 5th grade. The DreamBox application requires critical problem solving that requires students to go deeper into the math curriculum.” – Elementary Teacher
- “One-to-one devices greatly improve the mastery of core academic content. Via videos, online conferences, and hyperdocs I’m able to meet all students where they are and provide remediation and extension as needed. One-to-one devices also greatly improve self-directed learning. Students have many more choices in terms of what they want to learn more about, how they want to learn it, and how they want to show what they know. In addition, one-to-one devices greatly improve critical thinking and problem-solving. The students can readily access online resources to help them solve real-world problems independently and via collaboration platforms.” – Elementary Teacher
- “One-on-one self-paced learning help students deepen understanding of content.” – Middle School Teacher
- “Students master skills through practice on websites such as IXL where it tells them when they’ve mastered a skill. Students can use other apps and search websites to help them get information they don’t have.” – Middle School teacher
- “Technology increases critical thinking and complex reasoning when I plan lessons that use the Desmos activity-builder. These lessons are some of my most interesting. The technology allows students to grapple with more sophisticated questions involving relationships between graphs, tables, equations, and videos/animations of scenarios. I am able to program hints and scaffolds into the Desmos activities to help students with the complexity. In contrast, my paper-based assignments tend to focus more on just 1-2 representations, both because of space limitations and because on paper it’s much harder to provide scaffolds that are available only when students need them. On the other hand, technology also reduces complexity when my students work on Khan Academy, because it lets them focus on a single skill at a time, and it provides hints, videos, and unlimited practice.” – High School Teacher

### Neutral or Negative Impact

- “Students have become savvy at using technology, but their reasoning, writing, and problem-solving skills have declined since they have started using 1 to 1 devices.” – Middle School Teacher
- “I think it’s great that APS has the resources to provide these devices, but I think the results have not lived up to the promise. Laptops would be better for middle schoolers in terms of learning how to type, which is a critical school, job, and life skill. I think it would be better if we had a classroom set of devices versus one per student. I think devices are good for game-based learning and saving on paper, but I think they are also a shortcut that allows teachers to cover more ground (personalized learning) by putting kids in front of a screen—which I think is problematic.” – Middle School Teacher
- “I think the presence of laptops has been a net negative. The cost in distraction and diminishment of socialization has been significant, and the benefits have been nominal.” – High School Teacher
- “I believe that the 1:1 has not helped all students in these areas. The higher achieving students have improved in many of these areas as they take full advantage of the technology at their fingertips. On the other hand, lower achieving students either get distracted by the computers or still have not figured out how to use the information to their advantage. Many still do not check electronic messages from teachers and I’m shocked at how many students are not capable of using the Microsoft Office applications such as Word and Excel. We threw these devices at them without proper training.” – High School Teacher
- “I do not think giving a student a personal device for home and school has been valuable at all. Indeed, I think it has been harmful. My child, and I suspect he is not alone, has misused the device as a tool to play games, watch movies and YouTube videos, and engage spending hours on Social Media instead of homework. Having free range access to the internet is a mistake.” – High School Parent
**Device Distraction**

- “The MOST DIFFICULT challenge of having a personal device at home is it sometimes distracts me, or I get obsessed with a game and start playing it for a really long time and then I stop, and my eyes hurt a little bit. And, when I'm texting like a million different group chats at once and I just get annoyed.” – Middle School Student
- “[The devices are] distracting - easy to switch over to non-school activities.” – High School Student
- “Students have the ability to use other apps than the ones intended/assigned at the moment, so sometimes the student devices become more of a distraction than a learning tool.” – Elementary Teacher
- “One-to-one devices has not improve the quality of the students’ work because: 1) they rely on information feeding, 2) spelling and grammatical aids make them think they don’t have to remember it themselves, 3) rely on online translators to do their work instead of having them use their second language skills.” – Middle School Teacher
- “The heightened level of distraction and loss of instructional time due to forgotten/dead/malfunctioning devices has had a NEGATIVE impact on all other areas.” – Middle School Teacher
- “Student distractions with video games and non-APS related practices. Some students are too distracted by their devices to engage in learning.” – High School Teacher
- “The personal device is a constant source of distraction in that the child is able to access other websites, games, etc. This is very challenging for a middle school student to resist!” – Middle School Parent
- “For high schoolers it opens up a world of distractions that forces parents to monitor children more, academically not less which is the natural progression as a child goes through high school.” – High School Parent

**Lack of Physical Interaction**

- “I feel like it would’ve been better if we did all homework with paper instead of submitting it online because I think writing it down helps us learn better the to type something on a computer and type it.” High School Student
- “I am very concerned that students spend too much time on devices. Reading time with conventional books and reading books online have both declined.” – Middle School Teacher
- “I notice that students do not retain information as well when reading and writing on the computer. It is very difficult for many students to remain on task. Human interaction is reduced. I do not think that having the laptops open from start to finish of classes is conducive to learning.” – High School Teacher
- “Generally speaking, younger children do better engaging with the real, 3-D world than being glued to devices. So many kids can’t function as well in the 3-D world because they spend so much time on screens. Some of our children get so much exposure to screens at home, and best practices are 30 minutes per day for young children; it would be fantastic if schools were screen-free or reduced-screen zones to help combat the screen epidemic that’s happening in society at large.” – Elementary Parent
- “Handwriting is most important. After device my kids stopped writing on paper. They become lazier. There are many advantages to doing work on paper and reading core books... Paperwork homework is more helpful for Parents too, to be in touch with kids and tracking is easy what they done. They are using more internet solutions to figure out the problems instead of asking help with Parents or teachers... Students should only get laptop for coding, Computer science studies or learning applications. Not for basic studies.” – Elementary/Middle School Parent
- “They don’t learn offline skills, less organized, even more screen time, more distractions, written note taking skills lost, not clear that online note taking is equivalent.” – Middle/High School Parent
Health Concerns

- “I feel like it increased my stress because there’s no barrier between school and home now. Teachers will literally post an announcement on Canvas at eight or nine o’clock and be like, ‘Oh yeah I forgot to add this link. Make sure you do this.’ After you’re all the way done with your homework.” – High School Student

- “The lack of monitoring of the devices causes students to: not sleep at night due to gaming, not complete school/homework due to no longer using paper/pencil to complete, blue light vision problems, parents unable to engage in school activities/homework with students, not good for students with Executive Functioning Disorder which is a lot of our current population… They should be used for some activities and able to be turned off by schools during the day when student focus is required.” – High School Teacher

- “…my son is myopic, and his doctor has instructed him to limit device usage to one hour per day, at home and school combined. Over usage of devices at school has a negative effect on children’s vision.” – Elementary Parent

- “The excessive use of technology in the classroom has also had physical effects on my daughter as she has had almost daily headaches/ migraines since our relocation here and the use of iPads in schools has been such a focus. The number and intensity of her migraines is directly proportional to the amount of iPad time she has had in the classroom.” – Elementary Parent

- “Having an additional device in the home has required a different approach for our younger child, where it wouldn’t have otherwise been the case. We realize that we must purchase a keyboard for the school-issued iPad because otherwise our child is hunching over to type on the screen. Regular use of this is terrible for one’s eyesight, spinal development and lends itself to weakened vestibular strength (which leads to all sorts of ailments and challenges).” – Middle School Parent

- “Electronics are a distraction and play a role in depression. Blue light is not good for overall health. Too much reliance on devices has had serious negative health effects on my kids.” – Middle/High School Parent
Q3. What factors are facilitating or impeding efforts to promote learning using student devices?

**Instructional Technology Coordinators**

- “Having ITC lead instruction directly with students, as I learn material. This allows the students to be active participants in learning and teaching each other too. They do not have to wait for my expertise to use or learn the technology in this format.” – Elementary Teacher
- “Our principal and ITC have been incredibly supportive in our access to these devices and our choices of how and when we use them. It has made it easier to not feel pressured to use it all the time but also feel freedom to choose what is best for each of our students, i.e. no regulations that it HAS to be used during math workshop or specific applications MUST be used, etc.” – Elementary Teacher
- “Our ITC has been a huge help with keeping up with all of the damaged and lost devices.” – Middle School Teacher
- “School based ITCs [are the most useful supports] though they are always over burdened by trouble shooting problems.” – High School Teacher
- “My school’s ITC is my biggest support. Teachers/students were given devices, Canvas but NO time to learn how to use all of these. Without my ITC coming to my room, working with me and kids, I would not use student macs.” – High School Teacher
- “Our ITC is extremely helpful and knowledgeable, and I have gotten a lot out of his after school and preservice instruction. He makes time during our planning time when possible, but he is constantly in demand. He deals with all of the computer issues for our very large school AND tries to teach the instructional staff on how to best use the technology. It would be helpful to have at least one more ITC in the large comprehensive high schools.” – High School Teacher

**Colleagues & Peers**

- “I’ve enjoyed PD from fellow teachers or meetings with our ITC on different ways to incorporate technology into learning.” – Elementary Teacher
- “Talking with other teachers and planning together. Having one team member pilot something and then having others jump on board based upon the success of that pilot.” – Elementary Teacher
- “I joined a team of experienced teachers who effectively integrated technology into daily instruction in a MEANINGFUL way.” – Elementary Teacher
- “[The most useful support has been] collaboration with other teachers during planning time.” – Middle School Teacher
- “When teachers share amazing sites or applications.” – Middle School Teacher
- “Other teachers who are tech wizards have shared helpful sites and ways to use technology in the classroom.” – High School Teacher
- “Because much of the support does not address the specific needs of World Language teachers, I have by far learned the most through my own learning at conferences… However, principals and our content supervisor are limited in the professional leave they can offer teachers to attend such conferences. Also, I am part of a learning community with over 5,000 French teachers on Facebook and learn about new uses for student technology there. Even when we have sessions for APS PD, we often do not have the time built in for collaboration.” – High School Teacher
- “The most useful supports have been the knowledge of other teachers… It would be helpful to do more to engage the teachers in a discussion of goals for personalized learning opposed to making decisions from a top down approach.” – High School Teacher
Time & Training

• “Rich technology-based lessons (like student-created projects) often take an inordinate amount of time [to develop]” – Elementary Teacher

• “I think a lack of my own knowledge with certain programs or resources–I spend a lot of my own time making sure I’m proficient enough to help students. It’s worth it, but time-consuming.” – Elementary Teacher

• “So many apps have just one specific purpose and I do not have the time or inclination to play around with it, create a lesson and use it for my students just for the sake of technology.” – Elementary Teacher

• “Teachers don’t have the education on how to use Canvas, iPads/apple programs, specific apps...time to learn these things.” – Middle School Teacher

• “My beginning students of English have a digital divide problem. They need a lot of technical support to help them use devices effectively and that is time consuming, especially when new students enter with literacy issues.” – High School Teacher

• “Time! it takes so much time to change lessons every year to support every change coming down the pipeline. I need more planning!!” – High School Teacher

• “We haven’t really been supported at all. Teachers have had to figure out hardware and software on their own (not good) and determine how to implement it in their classrooms (good).” – High School Teacher

• “Time and proper, efficient training. The Canvas trainings do not meet my needs, I do not have time during the day to play to learn how to use all the options the most effective way. I was NEVER trained on how to use my textbooks through Canvas. Some of my textbooks don’t come up on canvas. We need time and teacher guided professional development.” – High School Teacher

Shared Vision & Input

• “The lack of IT support and planning at an enterprise level. School based technology specialists very clearly do not have support, vision or guidance from the IT central office.” – Elementary Teacher

• “Also, the changing of systems we are using without sufficient training, expectations, accountability. We need to find an online program, actually train everyone at every school and use it daily. By the time teachers start to use one online program, the county is switching to another one.” – Elementary Teacher

• “Inadequate opportunities for teachers to provide input on how technology is used. Year and year, significant changes were made to the app approved process with little or no explanation. The message many teachers received was that they were not using the devices in ways that APS saw as best practices. This was especially frustrating as lack of training was an overall issue that teachers were constantly trying to work around. Between 2017 and 2018, sweeping changes were made in regard to what apps could be used and how they could be accessed. The app catalog was restricted to each school, rather than the county. For many teachers this made finding high-quality apps was even more difficult because we weren’t able to see what other schools were using. This year, 1:1 device were completely removed for 2nd grade, seemingly without opportunity to provide teacher feedback (such as this survey) showing a severe lack of teacher input."

• “I am not aware of what the county’s vision is for use of 1:1 devices. They go out of their way in every Personalized Learning PD to say that Personalized Learning is not about the use of iPads and laptops, which I understand & agree with, but I wonder then how they expect / hope for us to be using these devices to support student learning.” – Middle School Teacher

• “…APS hinders our involvement and effectiveness every year substantially: we don’t get asked what programs we need or want…APS, ask your teachers what we need, then listen. We have a lot of experience and good ideas. Use us and our expertise!” – High School Teacher

• “There is no clear vision, minimal support, but great expectations from central office administration as to the potential positive effects.” – High School Teacher
### Hardware Issues

- “Students not bringing their devices to school or broken devices or uncharged devices. There is not back-up device in my class and at lease two students do not have a working device each class period.” – Middle School Teacher
- “There is also the constant problem of students breaking their devices… Teachers struggle to locate alternative devices for them--this also cuts into teacher and class productivity… It would be better if students had access only to laptop computers that were not personalized. If these were kept at school, students would not be able to add improper games and content to them. Also, laptops are more appropriate to middle school instruction… iPad do not have proper keyboards and make writing and grammar instruction unnecessarily difficult.” – Middle School Teacher
- “The devices provided are not adequate to meet the educational needs. iPads do not have the capabilities necessary for the work required of middle school students… Giving the teachers a classroom set of computers would provide adequate technology with equal access for all students.” – Middle School Teacher
- “… broken devices or devices with no charge--not having a device is very challenging when everyone is supposed to be completing a task that is device dependent. While alternate assignments are possible, the experience isn’t the same and engagement wanes.” – Middle School Teacher
- “[Typically the causes of broken devices are] in high school is liquid damage and broken screens, and in middle school it is mostly broken screens.” – Secondary ITC

### Software Issues

- “The filters that filter out “inappropriate” content make research a little more difficult. Ex. I tried to search up Montreal, Canada and it said it was restricted which is weird.” – Middle School Student
- “Also, many bugs and software conflicts with apps such as canvas and accessing the textbooks online.” – Middle School Student
- “At home, I have a lot of trouble with using Global Protect and also have trouble accessing websites that are school related but are locked due to administration such as watching YouTube videos that can help me with math, physics, and English. I also have issues with global protect at school and home which causes much anxiety due to having trouble completing homework and assignments.” – High School Student
- “The only thing that is kind of bad (but I understand how this happened) is that the county got the 1:1 devices and teachers were sort of expected to figure out the best ways to use them. And then we (teachers) did find amazing apps and resources and figured out how to do things, and slowly some things have been removed or unapproved (e.g., Socrative, RAZ Kids, Dictionary.com appli... to have put in the time and work and then have it taken away because some people didn’t do the groundwork on their end.” – Elementary Teacher
- “There are too many hoops to jump through to obtain apps or programs that are helpful to students. Teachers’ personal time is expected to be used to look for appropriate apps/resources and that is not right. Then once found, the process for approval takes too long/never happens, and then the resource is often taken away.” – Elementary Teacher
- “The platforms/programs the devices interface with often crash, do not perform properly, or are unable to access, causing work to be lost or unable to be completed. There is one program (Dreambox) that does not work at all on our child’s iPad… There are multiple platforms by which the student accesses homework assignments and multiple ways the student submits assignments (including paper assignments that do not involve devices.) This has been extremely confusing for our child AND the parents (and having spoken to other parents I know our child is not the only one), and causes difficulty accessing/completing/submitting assignments. Our child often does not know if an assignment has been submitted or not until it appears in StudentVue or ParentVue as missing. – Middle/High School Parent
Internet Access

- “The most difficult aspect of having my own device is when an assignment is not available offline. If the internet is down, we do not have the resources to complete an assignment.” – Middle School Student
- “And sometimes Global Protect thinks that they are protecting me against my own Wi-Fi at home meaning I sometimes am not able to work at home because of Global Protect” – High School Student
- “The software put on the computers to block certain websites make it difficult to connect to new Wi-Fi and even more difficult to connect to non-password protected Wi-Fi so using them in hotels and other public places is very inefficient.” – High School Student
- “Not all students have access to the internet at home, and there are not enough aps-provided hotspots to go around. We can’t as a school system require students to check or complete homework that requires internet if we don’t provide internet to all students. This is an enormously important equity issue that isn’t being sufficiently addressed. New textbooks are increasingly e-textbooks and students without internet at home never have access to these at home.” – Middle School Teacher
- “The greatest barrier is when the internet drops or is overloaded. This makes it difficult to have a back-up plan b/c I have tried to eliminate making copies and if the internet goes out, there is a line out the door to the copy room. We need to have 100% functional Wi-Fi at all times (or at least 99.9%).” – High School Teacher
- “Reliability - my children have sometimes had access for weeks to their device and Global protect has been a constant source of frustration” – High School Parent

Professional Learning Needs

- “Use of technology in my specific content area... a way to highlight how other teachers are using the technology in their classrooms, grouped by similar grade levels.” – Elementary Teacher
- “Training needed on how to use or ideas on how to use new technology devices replaced in classroom. We don’t have SMART boards, now we use Apple TV, but no one knows how to use it in the classroom. All of a sudden our interactive resources (flipcharts) aren’t usable and we don’t know how to make the Apple TV interactive in the classroom, so we have to go back to just drawing on the small amount of white board remaining on the wall (that isn’t blocked by the tv).” – Elementary Teacher
- “…only some teachers have been given the necessary training to properly and effectively implement personalized learning. I believe the iPads have so much potential, but teachers need a lot more support and instruction to effectively use the iPads with confidence, in the way they were properly intended.” – Middle School Teacher
- “…only some teachers have been given the necessary training to properly and effectively implement personalized learning. I believe the iPads have so much potential, but teachers need a lot more support and instruction to effectively use the iPads with confidence, in the way they were properly intended.” – Middle School Teacher
- “I do not believe many people understand how the devices should be used beyond assessment. Sure, applications like Quizizz is great for getting students to review material in a fun way, but this is review not new learning… Additionally, we as teachers are not doing a sufficient job creating a personalized learning environment. The small number of people at our district level are doing a great job helping… but limited resources hinders the massive progress we still need to make.” – Middle School Teacher
- “It will be helpful to learn how to obtain student data from Synergy more efficiently, and to transfer grades from Canvass to Synergy.” – High School Teacher
- “There has been little to no training on how to use the software on MacBook Airs in the educational setting. We’ve really missed a great opportunity to leverage Apple’s built-in software to create great lessons and projects.” – High School Teacher