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Teacher Perceptions of One-to-One Laptop Implementation: Suggestions for the Role of School Librarians

Daniella LaShaun Smith, PhD, Hazel Harvey Peace Endowment Professor, Department of Information Science, College of Information, University of North Texas, Denton, Texas

Stacie M. Milburn, PhD Candidate, Department of Information Science, College of Information, University of North Texas, Denton, Texas

Yildiz Esener, PhD Candidate, Department of Information Science, College of Information, University of North Texas, Denton, Texas

Diana Colby, PhD Candidate, Department of Information Science, College of Information, University of North Texas, Denton, Texas

Abstract

The purpose of this study was to examine variables related to teachers' perceptions of the impact of a one-to-one laptop program on learning. The participants were fifty-three high school teachers who taught at a school with a one-to-one laptop program. A mixed-methods design was implemented using a survey designed to determine the teachers' self-reported level of technology adoption, demographic variables, professional development needs, and perception of the impact of one-to-one laptop availability on student academic performance. Findings indicate that most teachers identified themselves as Early Majority Adopters. A significant relationship was not found between the demographic variables and the participants' perception of their level of technology adoption. An increase in the participants' self-perceived level of technology adoption was positively related to their belief that students' academic performance improved with the use of laptops. In addition, there was a significant positive relationship between the participants' belief that they had adequate professional development for incorporating the laptops in instruction and learning, and the belief that laptops assisted students with improving the quality of their work. While the findings are not generalizable, results suggest that school librarians must support one-to-one device implementation through student training, teacher professional development, and ongoing technical support.

Introduction

The digital divide is the gap between those who have access to technology and those who do not (North Carolina Department of Information Technology, 2022). These technologies include smartphones, desktop computers, the Internet, and laptops, which are the focus of this study. The concept of the digital divide adapts as technology evolves (Hohlfeld et al., 2018). For instance, iterations have included access to smartphones and the Internet. For those who have access, divisions may occur regarding how much access they have and their ability to use the technology competently. Gaps also exist between rural and urban areas, the literate and the illiterate, and socioeconomic groups.

Moreover, the digital divide can exist in populations with access to technology yet maintain differences in computer performance or information access on the Internet. For example, Perrin (2019) stated that rural Americans have adopted technology in the past decade but are less likely to have access to broadband and smartphones. Adults in rural communities are less likely to own tablet computers or have more than one device or service for online use.

Because the digital divide persists, the U.S. government strives to counteract it. Notably, the National Education Technology Plan of 1996 was the first to mention the digital divide in K–12 education. In the U.S., the national Digital Empowerment Act and its Universal Service Program for Schools and Libraries increased technological gadgets and Internet access in schools during the 1990s (Dolan, 2016). Nevertheless, in the early twenty-first century, education stakeholders noticed the digital divide persisted among learners in U.S. schools.

For example, the homework gap is defined as the inability to complete schoolwork because of a lack of Internet access in the home. A study by the Pew Research Center indicated that parents with lower income levels were more likely than those with higher income levels to indicate that they had problems helping their children with the technology needed for online learning (McClain et al., 2021). Differences among the types of communities were also identified. Only 23% of parents in suburban areas noted difficulty with helping children with technology, while parents in urban (33%) and rural (39%) areas had more problems (McClain et al., 2021). A similar study found that 59% of the children in lower-income families were reported to face technology obstacles such as having to use a smartphone for homework because the family did not have a computer and reliable Internet in the home (Vogels, 2020). Hence, inequitable technology access and technological literacy deficits reduce social capital and have contributed to an unequal quality of life in the U.S.

Given the relationship between the digital divide and education, the overall purpose of this study was to examine the variables related to teachers' perceptions of the impact of a one-to-one laptop program on student learning. Questions of professional development needs, perceptions of laptop use on the impact of student learning and work quality, and how likely the teachers were to use technology were incorporated. These questions were used to understand who the teachers were

as technology adopters, their beliefs on one-to-one laptop programs, and the programs' effects on the quality of student assignments.

This paper discusses COVID-19 in the context of education, although the study presented was conducted a year before the pandemic began. COVID-19 is discussed because the pandemic highlighted the need to share our findings. The educational disruption caused by the pandemic necessitated more emphasis on distance learning and one-to-one digital devices. Research (Johnston, 2012) has noted that school librarians had successfully implemented educational technology well before the COVID-19 pandemic. As such, we felt that sharing how teachers perceived a one-to-one laptop program administered by a school librarian could provide insight for school librarians who are made responsible for managing these types of programs.

LITERATURE REVIEW

The literature review in this paper provides the foundation for the study. The literature review provides an overview of topics relevant to understanding how one-to-one laptop programs relate to the roles of school librarians. One-to-one laptop programs are discussed because concerns about the digital divide are often the catalyst for creating one-to-one device programs in K–12 schools in the United States. A review of the professional development role of school librarians follows to illustrate how school librarians facilitate technology utilization. The literature review concludes with the study's theoretical framework, Rogers' Diffusion of Innovation Theory, to indicate how the theory relates to educational technology initiatives.

One-to-One Technology in Education

Although researchers (McClain et al., 2021; Vogels, 2020, 2021) continue to report significant issues with Internet access, the use of one-to-one technology (one computer or another smart device for each student) has continued to grow in education. At a high level, one-to-one technology involves students accessing the Internet, digital course materials, and digital textbooks via computers in educational settings. According to Damian Bebell and Rachel Kay (2010) (as cited in Vu et al., 2019), a one-to-one technology program's main objective is to ensure students are provided with a computing device that facilitates the delivery of learning experiences aligned with learners' needs. The use of one-to-one technology in educational institutions is advantageous in multiple ways. First, it allows instructors to present personalized content to students because it provides a mechanism by which teachers can design curriculum for students' individual needs. In addition, various software applications and tools are available to support individualized learning. Furthermore, by using one-to-one technology learners may improve their digital literacy—namely, their technology skills—and potentially be encouraged to produce complicated and creative work (Vu et al., 2019).

Vu, Fredrickson, and Gaskill (2019) explored one-to-one initiatives in rural public K–12 schools in the U.S. They highlighted several important features and challenges in the context of one-to-one initiatives. Results suggested that committees with limited membership usually decided how

to implement these initiatives. When choosing devices, the decision-makers typically focused on the technology's cost. The other factors considered were device management, durability, and ease of use. The study's findings indicated that two primary challenges impeded the fulfillment of one-to-one initiatives. First, teachers and administrators were not sufficiently trained in the use of the devices before the one-to-one initiatives were implemented. Second, after implementing one-to-one initiatives, educational establishments frequently overlooked the importance of evaluating instructional effectiveness.

Curry et al. (2019) conducted a longitudinal study by examining the introduction and administration of a digital environment in a high school and evaluated a program over a four-year period during which a one-to-one iPad program was implemented. The findings revealed that the students felt the iPads facilitated assignment completion. Students noted that some teachers used the iPads too much while others barely incorporated them. In classes with teachers who embraced the iPad, the students viewed the iPads as positively changing the learning environment.

Blau, Peled, and Nusan (2016) examined how teachers used technology in one-to-one classrooms and assessed how such technology facilitates teachers' professional growth in technological, pedagogical, and content knowledge (TPACK). These researchers reported increasing awareness among teachers in integrating technology both in the teaching and learning environments. The study also provided evidence to support the idea that technology use in the classroom transforms teachers from lecturers to moderators. Furthermore, the teachers' digital content was available to both students and colleagues, thereby making evident the relationship between teachers' technological and content knowledge. On the other hand, despite laptops and digital content availability, the researchers found that many teachers still preferred to use traditional resources such as printed textbooks.

Downes and Bishop (2015) studied one-to-one programs in middle schools. They concluded that access to educational technology played an essential role in engaging students and inspiring teachers. Downes and Bishop also reported the fundamental role technology played in building educator team activities. In other words, one-to-one technology contributed to cultivating a responsive team culture in middle schools. In the study, teachers and students also defined the technology-rich curriculum as valid and useful because it was challenging, individualized, and creative for both students and teachers. However, the study participants shared how they lacked sufficient preparation time to plan optimal technology-based pedagogy.

In contrast to the previously described literature findings, Swallow's (2015) findings emphasized the difficulties and struggles of one-to-one technology programs by focusing on teachers' and students' negative experiences during the second year of a program. Swallow reported that communication represented a serious difficulty in classrooms, and technology played a decisive role in shaping students' negative experiences. Even though the literature in general supported the idea that teacher creativity and innovation were improved with the help of one-to-one technology, Swallow's study presented ideas contradictory to those reported by other researchers.

For example, according to Swallow's findings, the students articulated a lack of teaching innovation. In other words, participants claimed they were continually doing the same things in the classroom. The researcher surmised that teachers neglected engagement in learning in the one-to-one program, building a new teacher-centered learning environment rather than advancing student-centered collaborative learning.

Conversely, the majority of the teachers who participated in a study performed by Li (2010) believed that technology positively impacts students. However, participants stressed that technology might engender some changes and that teacher and student empowerment plays a decisive role in implementing those changes. Li also reported that social trust, access to expertise, and social pressure contributed to the sustainable performance and the advancement of innovation in schools. By taking some risks, novice teachers successfully exploited trends and new ideas to deliver teaching interventions that were more distinctive than traditional methods and views.

Lastly, Kuzo (2015) highlighted the school librarian's considerable role in implementing one-to-one technology within educational settings. According to Kuzo, many teachers complained about a lack of support in employing one-to-one technology. However, this perceived lack of support represented a missed opportunity. School librarians were ready to help students and teachers shape their plans and shift toward a blended environment.

School Librarian's Role in Offering Professional Development

Kuzo's (2015) discussion of the school librarians and one-to-one technology is relevant to school librarians' role in offering professional development to other educators. Professional development (PD) is a crucial resource that is evident on the most successful campuses (Marzano et al. 2005). It is the principal's primary responsibility to identify continuing education needs. However, librarians can play a fundamental role in ensuring these needs are met. School librarians can ultimately foster student academic achievement by developing close relationships with personnel and delivering PD opportunities to administrators and fellow educators (Lance & Kachel, 2018).

Johnston (2012) asserted that supportive principals are key enablers of successful leadership in technology integration and, as such, play a crucial role in providing opportunities for PD. However, the responsibility for delivering PD extends beyond the principal alone. Johnston also described how district library personnel and collaborations with classroom teachers could be enablers for technology leadership. According to Baker (2016), school librarians also assist teachers by providing pedagogical strategies for integrating technology into their content areas.

As school librarians build trust with their principal and colleagues, they are better positioned to offer PD on their respective campuses (Baker, 2016). Lance and Kachel (2018) have agreed that school librarians are well placed to deliver PD interventions. According to Lance and Kachel, principals want librarians to be a PD resource for classroom teachers. Librarians serving as

coaches are beneficial for teachers who are more comfortable taking risks with peers instead of with authority figures. Librarians can assist teachers in applying new teaching methods and incorporating resources into their classes. More specifically, resources that can be offered through librarian-led PD are typically inquiry-based and foster acceptance of new technology (Lance & Kachel, 2018).

As collaborative partners and educators who interact with the entire school, school librarians are uniquely positioned to provide PD to support the curriculum and nurture technology integration (AASL, 2018c, 2019). Conversely, offering PD that directly supports the curriculum enables librarians to encourage a shared school vision aligned with the library's mission. In developing a school library mission, librarians lead by supporting all learners' curiosity, including providing PD for other educators (Martin & Roberts, 2019). Librarians whose practices follow the principles shared in the ALA/AASL/CAEP School Librarian Preparation Standards (AASL, 2019) and the National School Library Standards for Learners, School Librarians, and School Libraries (AASL, 2018b) can prepare themselves to offer their expertise for curriculum support and technology integration by attending PD opportunities.

Rogers' Diffusion of Innovation Theory and Its Application

Offering PD to explain new technologies (innovations) is one way to assist with the acceptance of these tools. Differentiating PD according to the audience's needs and acceptance levels makes PD more authentic for learners. Everett M. Rogers's Diffusion of Innovation Theory (1995) is compatible with examining technology practices in relation to needs and acceptance levels in schools.

Rogers's theory is frequently used to explain how a population accepts new ideas (that is, innovations) over time. As ideas or products emerge, individuals perceive them to be useful or ineffective as people adapt to each innovation's changes. Rogers (1995) noted that individuals must accept or reject an innovation after perceiving its usefulness. Decision-makers in organizations are an influential part of this process because they must assess and adopt each innovation before promoting it to stakeholders. Within schools, stakeholders will exhibit varying degrees of resistance to change. Therefore, Rogers's theory may be applied to understand how school environments employ technology.

Many people struggle with change, while others embrace it. Rogers described individuals' willingness to adapt to change by categorizing them into five adopter categories (LaMorte, 2019). These categories are Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (see Table 1).

Table 1
Adopter Categories in Rogers's Diffusion of Innovation Theory

Category	Category Characteristics	Percentage of the Population
Innovators	This group is the most open to change because they are interested in new ideas. They are the first to try an idea, are adventurous, and do not need convincing to try an innovation.	2.5%
Early Adopters	This group willingly works with innovators, and innovators need to recruit them when introducing new ideas. They understand the need for change and are comfortable with embracing it.	13.5%
Early Majority	These individuals are not likely to be leaders. However, they quickly adapt to new ideas. They request evidence that supports new concepts, such as success stories.	34%
Late Majority	This group is more resistant to change because they need to verify that a change benefits their needs. They look for examples of how several other people accepted an idea and succeeded.	34%
Laggards	They are the last group to embrace change. They are conservative traditionalists who are skeptical of new ideas. For this reason, it is hard to get them to accept a new idea. People in other adopter categories may have to pressure this group to agree to a change. These individuals often need personal demonstrations.	16%

It is crucial to start integrating innovations in any environment by providing knowledge. Sahin (2006) has asserted that sharing knowledge begins with "how-tos" to understand the function of something new. Therefore, change agents who can work with other members of an organization are vital. While a change agent may not convince everyone to accept an idea, Rogers noted rejection might lead to reinvention. If an idea is tested and rejected, innovators may adapt the idea to meet the target audience's needs (1995).

In schools, innovators and early adopters must explore, innovate, and apply technology to many situations. Wilson and Conyers (2015) have advised that two of the primary considerations for a new approach should be the "advantages of a new idea or approach in comparison to the status quo" and whether the innovation is "compatible with existing professional values and past experiences." The responses of the participants suggests that teachers can be frustrated by new tools because they view the tools as impractical. Wilson and Conyers suggest that one of the best ways to convince teachers to accept change is for other educators to prove an initiative's value. They further note, one of the most beneficial steps in adopting new concepts is allowing teachers to experiment with technology. Teachers can serve as testers who then provide much-needed

evidence to gain other educators' approval. Based on Wilson and Conyers advice, one can conclude that innovators and early adopters are excellent testers.

Using Rogers's Diffusion of Innovation Theory is beneficial in schools, and understanding it is essential for understanding how educators may react to innovations. Assessing educators' needs and collecting feedback reveals whether they resist change because of their needs or a desire to continue with activities that they view as already effective. Hence, introducing technology without considering the school climate can be counterproductive.

Research Design

RESEARCH QUESTIONS

The literature review has established that one-to-one device programs are a critical aspect of education. One-to-one devices supplied by schools are essential because they can lessen the impact of the digital divide. However, the distribution of devices to support educational activities should be well planned and include adequate stakeholder preparation. Furthermore, when considering new technology initiatives leaders need to understand where other stakeholders, such as teachers, are distributed in Rogers's five adopter categories.

According to Johnston (2012), school librarians are well suited to be innovators in adopting technology. School librarians can find connections between technology and the curriculum while providing or facilitating demonstrations of new tools. Johnston further noted that depending on their environment, school librarians might administer technology programs by serving as resources for technical support and providing training. In some school districts, school librarians serve as resources to the technical personnel. Johnston's assertions are echoed by the National School Library Standards for Learners, School Librarians, and School Libraries (AASL, 2018b) and research on current practices (SLJ Staff, 2020a, 2020b).

These research questions were used to implement the study:

1. What type of adopters were the teachers?

2. To what extent did the teachers' adopter category relate to demographic variables: age, years of experience, degrees, and gender?

3. Did the teachers believe they had adequate professional development opportunities?

4. To what extent did the teachers' belief that they had adequate professional development opportunities (in the context of the one-to-one program) relate to their belief that laptops assist students with improving the quality of their work (i.e., producing better assignment results)?

5. What type of training do teachers believe they need to integrate technology into the curriculum?

METHODOLOGY

Interest in this mixed-methods study began when a high school librarian was tasked with administering a one-to-one laptop program. The librarian was responsible for inventorying, storing, and distributing the laptops and offering professional development for their use. One defining characteristic of the school was that it was in a low-income neighborhood. The administrators wanted to create opportunities for the students to experience learning outside of the school day. As a result, the one-to-one laptop program was implemented to give students access to computers and digital resources to facilitate their education. The librarian felt the need to assess the teachers' needs to determine how to administer the program.

Participants

This study's participants consisted of a purposive sample of fifty-three teachers who taught at the high school. Purposive sampling is a form of nonprobability sampling appropriate for researchers to study a representative sample of a population. In purposive sampling, members of a population are selected based on their characteristics (Battaglia, 2008).

When asked about their gender, most (75.5%) of the participants identified as female, and the rest as males (24.5%). A majority (37.7%) of the participants were 40–49 years old. The remaining teachers reported being 30–39 years old (30.2%), 50–59 years old (15.1%), 20–29 years old (11.3%), and 60 years old and over (5.7%). The participants responded to a question about their highest degree level. Most (56.6%) reported having a Master's degree. The others stated that they had a Bachelor's degree (30.2%) or Advanced Master's degree (13.2%). In response to a question about their years of teaching experience, participants replied that they had 16 years or more (43.4%), 5–10 years (26.4%), 1–4 years (17.0%), and 11–15 years (13.2%) of experience (see Table 2).

Table 2
Demographic Profile Distribution

Demographic	Value	Percentage
Gender	Female	75.5%
	Male	24.5%
Age	20–29 years old	11.3%
	30–39 years old	30.2%
	40–49 years old	37.7%
	50–59 years old	15.1%
	60 years and older	5.7%

Education	Bachelor's degree	30.2%
	Master's degree	56.6%
	Advanced Master's degree	13.2%
Experience	1–4 years	17.0%
	5–10 years	26.4%
	11–15 years	13.2%
	16 years or more	43.4%

Data Collection

Clark and Ivankova (2016) explained that mixed-methods research is used when one method will not sufficiently answer a research question. For instance, simply asking survey questions that required quantitative responses would not have been sufficient for the purposes of this study. We sought to know more about the participants' needs. The open-ended questions assisted us with making inferences about how school librarians can effectively implement one-to-one laptop programs.

The study participants were provided with an online survey using the Qualtrics online survey tool. The survey was self-administered. After obtaining permission from our university's human subjects board and the school district, the school librarian at the high school sent emails to invite teachers to participate in the study. The survey consisted of 31 questions. A subset of the data is used for this report.

The questions relevant to this study's topic included demographic characteristics, the teachers' category of technology adoption, their beliefs about laptops' impact on their students' quality of work, and the belief that they had adequate PD. The question about the teachers' technology adoption category asked the teachers to select a category based on Rogers's definitions of adopter categories (1995) associated with his Diffusion of Innovation Theory. The survey also included an open-ended question about the type of professional development needed to implement technology (see Table 3).

Table 3
Survey Questions Relating to This Study

Survey Question	Relevant Research Questions
How many years of teaching experience do you have? o Less than 1 year o 1–4 years o 5–10 years o 11–15 years o 16 years or more	Research Question 2
Select your age range below. o 20–29 years old o 30–39 years old o 40–49 years old o 50–59 years old o 60 years or more	Research Question 2
What is your highest level degree? o Bachelor's o Master's o Advanced Master's (i.e., Specialist Degree) o Doctorate	Research Question 2
What is your gender? o Male o Female o Non-Binary	Research Question 2

Survey Question	Relevant Research Questions
Which statement best describes your implementation of technology at school for instructional purposes? o I use new technology before anyone else is aware of it. o I am among the first to use new technology when it becomes available. o Less than half of the teachers are using new technology when I start using it. o More than half of the teachers are using new technology when I start using it. o I am among the last people to use new technology.	Research Question 1 Research Question 2
I have had adequate professional development opportunities to assist with implementing your school's one-to-one laptop program. o Strongly agree o Agree o Neutral o Disagree o Strongly disagree	Research Question 3 Research Question 4
The laptops assist my students with the quality of their work. o Strongly agree o Agree o Neutral o Disagree o Strongly disagree	Research Question 4
What specific training do you need to integrate technology into the curriculum?	Research Question 5

Data Analysis

SPSS Statistics software was used to analyze the quantitative data. Responses relevant to Research Questions 1, 3, and 4 were analyzed using descriptive statistics. For Research Question 2, Spearman's correlation was used to analyze the relationship between the teachers' adopter categories and their age, years of experience, and degrees. Spearman's correlation is a nonparametric method of measuring association that can be used instead of Pearson's r when variables are not normally distributed (Onwuegbuzie et al., 2007). The Mann-Whitney U, a nonparametric alternative to the independent t-test, was used to examine the participants' gender and adopter categories. The Mann-Whitney U does not require data to be normally distributed (Sawilowsky, 2007). Data for Research Questions 3 and 5 were analyzed using Spearman's correlation to determine the relationship between the variables.

For Research Question 5, the qualitative data from the open-ended question were grouped into themes using a grounded theory approach (Benaquisto, 2008) and then collaboratively reviewed until intercoder reliability (van den Hoonaard, 2008) was achieved. These themes were reviewed and decided upon by consensus.

Results and Discussion

RESEARCH QUESTION 1: WHAT TYPE OF ADOPTERS WERE THE TEACHERS?

The teachers were given definitions for each adopter category and asked to identify their category based on their technology integration activities. Results showed that 17% identified as Innovators; 24.5% were Early Adopters; 35.8% were Early Majority Adopters; 18.9% were Late Majority; and 3.8% self-identified as Laggards. As such, most participants fit into a category that will quickly accept new ideas after providing evidence of success stories (see table 4).

Table 4
Participant Adopter Categories

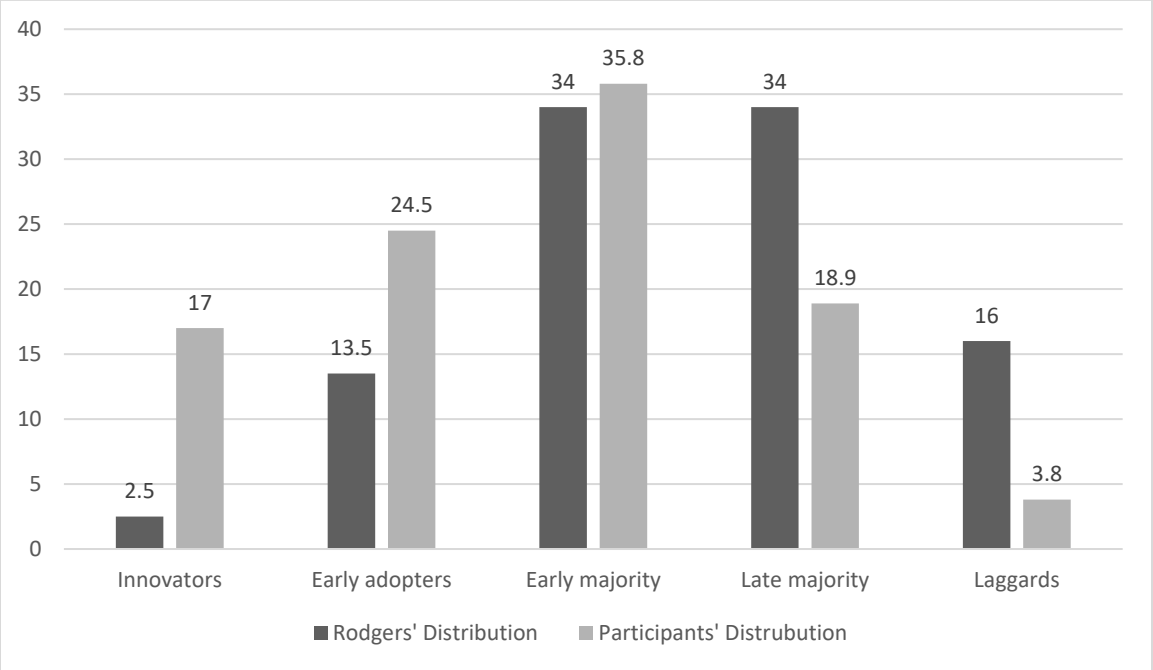
Category	Percentage
Innovators	17.0%
Early Adopters	24.5%
Early Majority	35.8%
Late Majority	18.9%
Laggards	3.8%

These results indicate there were participants in each of the adopter categories, with most of the participants in the majority groups. Evidence of participants in each adopter category is consistent with Rogers's (1995) theory. However, Rogers posited a different distribution of adopter levels than the results found in this study. In this study, more teachers were in the Innovators, and Early Majority categories than Rogers posited for the general population. Conversely, fewer participants were in the Early Adopters, Late Majority, and Laggards groups than Rogers found. (See Figure 1 for a comparison of percentages in each category.)

One explanation for the lower percentage in the Late Majority and Laggards categories and the greater percentage in the other groups might be that the participants are educators who have their performance judged by standardized testing (Close et al., 2018). When used correctly, technology can be a catalyst for academic achievement, and teachers frequently use technology to enhance learning and modify instructional strategies (Shank, 2019; Swallow, 2015). Another explanation for the percentages in the Innovators, Early Adopters, and Early Majority groups being higher than those found by Rogers could be that teachers are becoming more aware of how to integrate technology into their lessons (Blau et al., 2016). Blau et al. made several observations of teachers in one-to-one classrooms that suggest teachers in these environments are learning while adapting their classes. For example, the teachers in Blau et al.'s study allowed students to assist them with technical problems. In turn, allowing the students to assist them resulted in the students taking more responsibility for learning. As the teachers stayed in the one-to-one classroom longer, they became more adept at managing their classrooms because students cooperated more. Hence the teachers became better facilitators of student learning.

Figure 1

Rogers's Adopter Category Percentages Compared to the Study Participants



Downs and Bishop's (2015) study specified that teachers need adequate time to adapt lessons to technology. Swallow (2015) further remarked that teachers could lack innovative instructional approaches when technology becomes the focus of one-to-one programs rather than learning outcomes. After reviewing the results of this study, the researchers recommend that, school librarians consider collaborating with the Early Adopter group to share specific examples of how technology can be implemented in classrooms. Another option would be to have no-pressure "playground" demonstrations in the library for teachers to explore new technologies. Moreover, extended professional development options that last more than a day and incorporate videos to review later, availability of tools such as VoiceThread to encourage asynchronous conversations, tasks to complete and share, and technology class tours would help teachers. Additionally, creating boards to share success stories with tools such as Padlet and Wakelet can be beneficial for increasing technology acceptance. When new technology is implemented in a school district, it could be worthwhile for school librarians to partner with school librarians and classroom teachers from other schools to share examples and engage all educators with success stories.

Research Question 2: To What Extent Did the Teachers' Adopter Category Relate to Demographic Variables?

The Spearman correlation analysis indicated no significant relationships between the participants' adopter categories and their age ($r_s(51) = -.155$, $p = .268$), years of experience ($r_s(51) = -.227$, $p = .105$), and highest degree earned ($r_s(51) = .153$, $p = .275$). A Mann-Whitney U test was run to determine if differences in adopter categories existed between males and females. Distributions of the engagement scores for males and females were similar, as assessed by visual inspection. Median engagement scores for males (3.00) and females (3.00) were not statistically significantly different, $U = 281$, $z = -281$, $p = .652$ (see table 5).

Table 5
Values for Adopter Categories and Demographic Relationships

Demographic Variable	**P Value**
Gender	.652
Age	.268
Education	.275
Experience	.105

The analysis for Research Question 2 shows that demographics did not relate to the adopter categories. Again, the results are consistent with Diffusion of Innovation Theory literature (LaMorte, 2019; Rogers, 1995) because the diffusion of ideas is more about whether an idea is compatible with needs than demographic characteristics. Leaders must encourage change agents to assist with transitioning organizational cultures (Sahin, 2006) instead of making assumptions

based on demographic variables. For instance, a leader cannot assume that a younger community member, as a digital native, will accept new technology or find it easier to use than their older colleagues. School librarians serving as leaders can help community members adjust to innovations by answering questions and explaining new concepts.

Research Question 3: Did the Teachers Believe They Had Adequate Professional Development Opportunities?

When asked if they had adequate professional development for using the laptops, most participants agreed (50.9%) or were neutral (18.9%). The rest of the participants disagreed (15.1%), strongly agreed (9.4%), or strongly disagreed (5.7%) (see table 6).

Table 6
Teachers' Belief That They Had Adequate Professional Development Opportunities

Level of Agreement	**Percentage**
Strongly Agree	9.4%
Agree	50.9%
Neutral	18.9%
Disagree	15.1%
Strongly Disagree	5.7%

This question was asked because offering adequate professional development is necessary when implementing one-to-one device programs (Swallow, 2015; Vu et al., 2019). While it is evident that devices will add greater flexibility for instruction in schools during the day, teachers need to understand the tools that can be easily implemented to connect students with resources in the evening. In addition to identifying tools, librarians can be instrumental in identifying resources such as public libraries and free hotspots than can be used to connect devices. Moreover, if teachers are compelled to use a specific instructional program, they should have adequate technical assistance and professional development to understand the tool. Otherwise, teachers in the Late Majority or Laggard categories are likely to be agitated and unconvinced of a device's value because they have not seen evidence of positive student outcomes using the device.

School librarians can assist teachers in the Late Majority and Laggard categories in adopting new technologies. Similar to Kuzo's (2015) finding, the librarian in the school where this study was conducted had an excellent opportunity to enhance their leadership role. Many (39.7%) of the teachers in the school were not satisfied with their PD opportunities. AASL's Definition of an Effective School Library notes that school librarians should be instructional leaders who provide ongoing professional development. School librarians are responsible for creating instructional

opportunities that facilitate the development of digital and information literacy skills for all learners in the school community (2018b). Based on the study results relating to Research Question 3, we can surmise that school librarians can facilitate the acceptance of new technology initiatives by offering PD before implementation and consistently afterward to assure that teachers know how to use the technology. Such professional development offerings may be developed and delivered by collaborating with school district technology staff (Johnston, 2012).

Research Question 4: To What Extent Did the Teachers' Belief That They Had Adequate Professional Development Opportunities Relate to Their Belief That Laptops Assist Students with Improving the Quality of Their Work?

When asked if they believed laptops assisted students with improving their work quality, most of the participants agreed (52.8%) or strongly agreed (22.6%). The remaining participants chose neutral (17%), disagree (5.7%), or strongly disagree (1.9%). (See table 7).

Table 7
Teachers' belief that laptops assist students with improving the quality of their work

Level of Agreement	**Percentage**
Strongly Agree	22.6%
Agree	52.8%
Neutral	17%
Disagree	5.7%
Strongly Disagree	1.9%

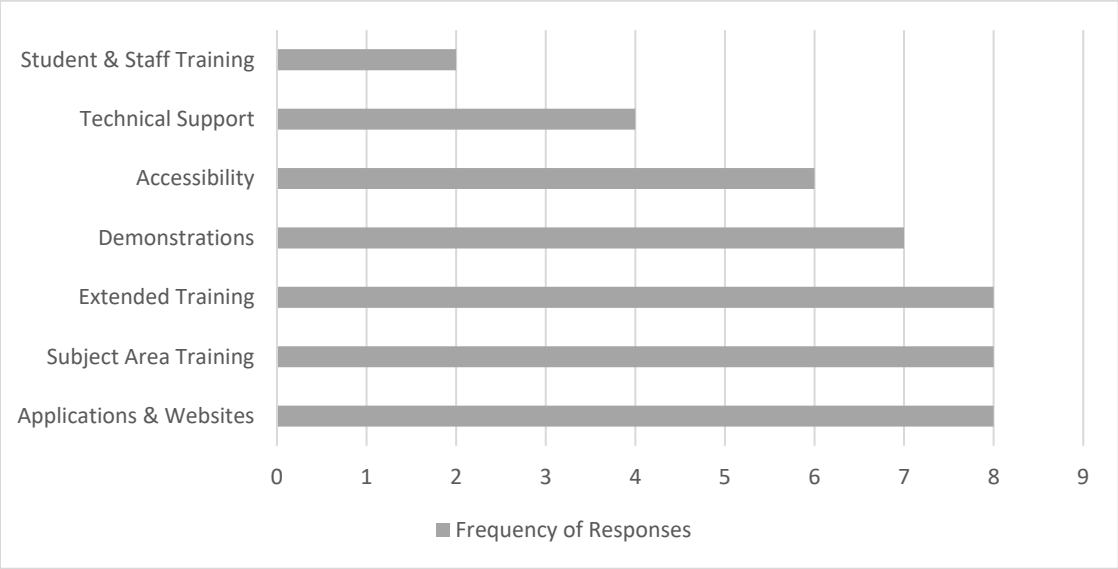
A Spearman's correlation was run to determine the relationship between the participants' belief that they had adequate professional development opportunities and their belief that laptops assist students with improving their work. A statistically significant weak positive correlation was found between the participants' adopter category and their belief that laptops improved their students' academic performance, rs (51) = .287, p=.037. The teachers' belief that laptops assist students with improving the quality of their work increased with participants' belief that they had adequate professional development opportunities.

These results are consistent with Vu et al.'s (2019) finding that laptops help students produce better quality work. However, technology training is essential for realizing successful one-to-one laptop programs. Vu et al. further note that it should be a goal that all teachers feel that they have enough professional development opportunities. As such, Research Question 5 provides qualitative responses relative to the professional development that teachers need.

Research Question 5: What Type of Training Do Teachers Believe They Need to Integrate Technology into the Curriculum?

An open-ended question was included to inquire about the training needed to help teachers integrate technology into teaching and learning. Twenty-four of the participants offered responses. See figure 2 for a summary of the responses.

Figure 2
Professional Development Needs Identified by Participants



Many responses indicated that the teachers needed training specifically designed for their subject area (eight participants). Representative examples of their comments follow.

> Training about how to use Google Classroom is fine. But how can I make it work for my students with my curriculum in the time frame I need?
>
> I want to learn how to use student laptops for math students. It is difficult to produce math writing on laptops.

In addition, participants frequently identified the need for training in specific applications and websites that can be used for instruction (eight participants). For example:

> How can I utilize the Google Black menu more efficiently?
>
> Just mentioning cool apps is not enough to get me to integrate them. We need guided time to use them. I would LOVE to use [KAMI] and Pear Deck. But, I haven't the time or initiative to teach myself.

Teachers were also interested in extended training opportunities (eight participants). Suggestions for comprehensive training included adding more in-service days and incorporating more time to practice new technology before deployment. For example:

> Every time I go to a training, I learn to do something new, but I don't have time to practice it before introducing it to kids. If it works fine the first time, great. If I have trouble, I don't have enough available resources to fix it. No one can help me at the moment. I'd like to be able to have kids turn in more things electronically, but I need more practice getting that done.

> I need time to practice and not more "donated" time where I learn it on my own. Professional development should be taught in a setting that has a good [Internet] connection with clearly outlined goals.

Seven responses further suggested that demonstrations are vital for understanding new technology. For example:

> Some of us who are not so adept at implementing new technology need lots of models to experience the best ways to incorporate tech for effective teaching.

> The biggest thing I can say is that I do NOT want to sit at professional development and have people show me tech stuff. I would like to visit a classroom that successfully uses technology and see how the teacher uses it. I want to know what the kids like and dislike. I don't need to hear about something. I need to see how it is used and what the potential pitfalls are.

Six participants noted that a lack of accessibility hindered their technology professional development goals. Accessibility is related to training offered at times when it is difficult to attend. For example:

> While our school has staff to provide professional development on technology, teachers are unable to take advantage due to time constraints. The district should provide mandatory training for teachers so that they attend and see the value in using technology.

> Training needs to be accessible for different grade levels.

Teachers also voiced the need for ongoing, readily available technical support (four times). For example:

> Provide someone in class to help me as glitches appear.

> We need easy access to help when things don't work or when we have questions during a lesson.

Instead of focusing on their own needs, two participants suggested that students and non-instructional staff needed training, too. Their comments:

> All staff need opportunities, support staff included.

> Students need training, too, on typing.

In all, these answers reveal that providing students with laptops is not enough to make a one-to-one program successful. The replies from the teachers point to evidence of the digital divide with the student population. In the case of this school, the divide was present in the students' need to access devices, which led to the creation of the one-to-one program. Furthermore, the divide was evident in the overall need for training for both teachers and students. The request for training indicates that providing the laptops was only a preliminary step toward easing the digital divide. These results are consistent with Swallow's (2015) finding that technology initiatives need to go beyond providing devices to emphasizing instructional strategies and learning outcomes that utilize the devices effectively.

Teaching technology skills is within the school librarian's scope of practice (AASL, 2018a, 2018b, 2018c, 2019). It can be concluded from the comments that even when a teacher is fine with implementing an innovation such as one-to-one laptops, a barrier that must be accounted for is the students' ability to use the technology. Teachers may not have the time to teach the appropriate skills, and students may benefit less from the technology if a training program for students is not developed.

Lewis (2020) offered more insight into the school librarian's instructional role in assisting students and teachers with acquiring technical skills. Lewis cited her experience as a school librarian and her research in asserting that principals are limited in offering professional development. Librarians can benefit from a principal's lack of time and resources by stepping in as instructional experts. Lewis's principal selected her to design and implement curriculum units that were delivered to the teachers and students in her school. Completing this task led to student academic achievement and a positive relationship between this school librarian and her school community and administrator. In addition to benefiting learners, her instructional activities served as an advocacy tool.

FURTHER RESEARCH

Understanding the Effect of COVID-19 on Professional Development

As stated in the introduction of this paper, the research did not take place during the COVID-19 pandemic. However, the pandemic encouraged the education community to evaluate the best practices for implementing technology for online learning. For instance, during the pandemic School Library Journal (SLJ) has been instrumental in documenting how school librarians supported their schools. Much of the support services documented were technology related.

School librarians have reported offering technical assistance and virtual classes; regularly communicating with teachers, parents, and students through video conferencing; and delivering training to support distance learning (SLJ Staff, 2020b).

SLJ and AASL have responded to elevated demands on school librarians by providing professional literature. For example, SLJ has many online articles published by school librarians sharing their insights on offering effective services during the pandemic. At the time of this writing, the SLJ website's homepage has a COVID-19 link in the header. SLJ also planned and delivered COVID-19-centric professional development in 2021.

AASL's response to the pandemic has included providing free resources on its Learning Community website to help school librarians cope with the pandemic. AASL also asked Knowledge Quest bloggers to write posts that provided suggestions for best practices during the pandemic. These blog posts were featured on a webpage of free pandemic materials curated by AASL (2021b). In March 2020, AASL began offering a series of town halls related to the pandemic and best practices (2021a). The purpose of these meetings was for the school librarian community to seek ideas and share successful strategies for coping with the pandemic. The town halls continued into 2022.

The curated literature, new articles, and webinars have enabled rapid responses to a changing educational environment. However, it can take a year to plan a conference. The professional conferences offered in late 2021 and early 2022 were among the first planned and executed during the pandemic. Organizations such as AASL and the International Association of School Librarianship held conferences in late 2021 with several sessions designed to report how librarians problem-solved and adapted to the pandemic. Analysis of the documents supporting these sessions will yield rich data.

Future advantageous research would explore the type of technology-related professional development offered to school librarians in response to COVID-19. This research could examine the types of sessions offered, how these sessions related to collaborative technical support, and the types of professional development that school librarians feel are most beneficial to their needs. Such research could help school districts, professional organizations, and school library education programs to adapt training to meet the new challenges that educators must overcome.

Teachers' Perceptions of School Librarians

The school librarian at the school in which this study was conducted was responsible for facilitating the one-to-one laptop program. This study examined how the teachers perceived the impact of the laptops on student academic achievement, professional development needs, and their willingness to adopt the technology. The teachers were not asked their perception of the librarian as an instructional expert, technology leader, and collaborative partner. In the future, a study that expands upon this research could be designed for multiple schools where school librarians are the primary individuals responsible for implementing a one-to-one device program.

This type of study could provide a better understanding of effective ways to train school librarians on how to employ one-to-one programs and the types of factors that could facilitate or impede their progress.

Parents' and Students' Perceptions of School Librarians

Two aspects of the one-to-one program that were not examined in the research reported here were the experiences of parents and students. Parents' perceptions about using laptops for learning can impact how students can use school-issued laptops at home. The information literacy skills of parents could affect how well they assist students with completing assignments.

Moreover, students may feel that they need training on using laptops in informal learning settings. Swallow (2015) also noted that students might view technology negatively based on teachers' instructional strategies. Exploring perceptions of teaching strategies and skill deficiencies identified by parents and students would help school librarians implement training sessions to improve academic achievement.

Examining Factors that Impact One-to-One Laptop Programs

This study does not address all the factors that can influence the adoption of one-to-one laptop programs. Situations in schools and school districts vary according to several factors. For example, one-to-one device applications in middle and elementary schools could be different because of the students' age, school schedules, and how subjects are taught. Other factors that might impact how laptops are implemented include the demographics, broadband access and how it impacts the device utilization, and locations of the neighborhoods where one-to-one laptop programs are implemented. More research is needed to examine such factors to enhance the services that school librarians offer their school communities.

Limitations

The study has limitations because the subjects taught by the teachers were not collected and analyzed in relation to the teachers' perceptions of the impact of the one-to-one laptop initiative. Furthermore, the study relies upon self-reporting and assumes that the responses are truthful. The sample population was small. Although the one-to-one laptop program was managed by the school librarian, this study also relies on the teachers' responses about the program's implementation to share suggestions for the roles of school librarians. As such, the results are not generalizable.

In addition, one of the findings of this study was that students needed training for using laptops. This finding was shared because one can deduce that the students' need for training was impeding the teachers' ability to use the laptops effectively for teaching and learning. Unfortunately, questions were not included about students, and the responses about student training were not anticipated.

Moreover, another significant finding is that the teachers' belief that they had adequate professional development opportunities had a positive relationship with their belief that laptops helped students to improve the quality of their assignments. However, no open-ended question was included to define how the students' assignments improved. Therefore, it is acknowledged that the survey should have contained more questions about students to understand the teachers' needs thoroughly.

Finally, much has changed in educational technology and its application since the COVID-19 pandemic began. While COVID-19 is mentioned, this study does not account for its impact on technology use because data were collected before the pandemic. In the future, another study should be conducted to understand how COVID-19 has impacted one-to-one laptop programs and how they are implemented. Researchers should also explore how school librarians adapted their outreach efforts, program management, and teaching models to support one-to-one laptop programs during the pandemic.

Conclusion

In conclusion, the one-to-one laptop program discussed in this study was facilitated by a school librarian. This study aimed to examine variables related to teachers' perceptions of the program's influence on assignment results. Additionally, this paper examines how school librarians can assist with one-to-one laptop programs based on the participants' perceptions. Hence, the participant responses summarized in this paper may be used to provide insight into how school librarians can facilitate similar programs.

The findings indicate a positive association between the participants' self-perceived levels of technology adoption and their belief that their students' academic performance improved with the use of laptops. In addition, results suggest an increase in the participants' belief that they received adequate professional development is related to an increase in their belief that laptops assisted their students with the quality of their work. Based on these findings, one may assume that school librarians must support one-to-one device plans through student training, teacher professional development, building collaborative relationships, and offering ongoing technical support.

Finally, school librarians are uniquely positioned to understand the multifaceted viewpoints and needs represented within school communities. Their connection to stakeholders means assuming the role of an Innovator as defined by Rogers (1995), a circumstance that offers school librarians a leadership opportunity. The Innovator role places school librarians on a path for frequent interaction with the school administration. As Innovators, school librarians can establish themselves as invaluable resources who can bridge the gap between school administrators' expectations and how teachers utilize technology in their classroom. In this way, librarians can be leaders who positively impact the technology behaviors of teachers, students' understanding of technology, and the adoption of innovations.

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