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When Left to Their Own Devices: Exploring Teacher Preference for Digital Learning Tools

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Abstract

Every day, technological proficiency is becoming an increasingly essential skill in almost every career field. Those of us who have been called, as teachers and educational researchers, to guide the scholarship of the next generation, understand the importance of helping students succeed in today's world. It would be difficult to find an educator who does not want their students to excel in their educational endeavors and future professional lives. However, many teachers are just not equipped to translate this increased integration of technology into their everyday classroom practices, which is necessary for the success of this new generation of students. These 21st century students enjoy and engage with well-designed technology-based learning experiences, practices which also improve teacher effectiveness. However, teacher training and classroom practices have not kept pace with the rapid changes in technology. This paper shares the results of our original research on the specific technology tools used by teachers in remote instruction forced by the COVID-19 pandemic. Additionally, we analyzed teacher questionnaire data from the 2018 International Computer and Information Literacy Study (ICILS). Our purpose in both studies was to determine factors which may influence the use and perceptions of technology as a teaching tool. Our conclusions argue that new teacher training should, by default, standardize the use of educational technology in schools, and emphasize the need for meeting students in the digital learning space where they exist.

Keywords: educational technology, teacher training, 21st century, quantitative, survey

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Introduction

As teachers and educational researchers, we yearn for a world where students are prepared to achieve their dreams. We want students to rise to today's challenges of the increasing technological aptitude required in every career field. Integrating technology into the pedagogy of practicing teachers is therefore essential to the success of this new generation of students. Students enjoy and engage with well-done technology-based learning experiences and this, in turn, suggests that teaching effectiveness is improved when technology is used to teach (Ghavifekr & Rosdy, 2015). We believe teachers are innovators. Nothing has made this more apparent than 2020's crisis in education, in which teachers, students, and learning across the country shifted almost overnight to a remote modality due to the COVID-19 pandemic. Many teachers navigated new roles as online educators and “Zooming” became the verb of the times. However, it was quickly evident that educational practices and teacher training have historically failed to keep pace with the rapid

changes in technology (Brooks & Kopp, 1989), and that this is detrimental to student success in remote teaching and learning.

It is important to understand the role that teacher training currently plays in supporting educators with technology use. Preservice teachers across the United States are expected to meet certain technology expectations set forth by the International Society for Technology in Education (ISTE). For the most part, these expectations have been included as a set of standards including the use of technology to support lesson design and to facilitate assessment, and more generally, using technology to enhance teachers' practice.

For teacher preparation programs, the attempt to assist teachers with their technology skills is generally one course in their training program. Teachers are expected to demonstrate understanding of basic computer skills, like using a word processor or creating a slideshow (Blanchard et al., 2016). This itself shows a challenge teachers face, since such basic computer skills alone are likely not sufficient to create a learning environment which successfully and fully integrates technology. However, whether training has a significant impact on pedagogy at all is called into question by research such as Hill (2009), whose results find that less than 25% of teachers feel that professional development has an impact on their instruction.

Before pinning the blame entirely on low or minimal technology training for teachers, examining the state of technology in modern pedagogy requires mention of the digital divide. This is a massive barrier to preparing students for a digital future. Despite nearly twenty years of history into this concept of inequity of computer availability (coined by former President Clinton in the late 1990s), more research is needed to understand the modern issues related to inequitable internet access. Exploring teacher perception of internet access issues is one of the focal points of our study.

Morgan (2020) discussed best practices in online education as a response to the COVID-19 pandemic, including student-centered learning. The most compelling modern research into student skills examines students as creators and asks what can be done to help teachers meet students in this "third space" for learning, the digital world of communication and creation to which students belong and from which their educators are often excluded. The "third space" concept is mentioned in Lim and Toh's (2020) research on students' skills in producing YouTube media content and how these unique skills can be more effectively harnessed in the classroom. It was earlier conceptualized as an "affinity space" in Gee's (2017) work on skillbuilding in communities with shared hobbies and interests, including online spaces. These concepts help define what classroom technology integration could look like, and how teachers can shape classrooms to meet students' technology needs.

In this paper, our aim is to share what we have determined to be factors which may influence the use and perceptions of technology as a teaching tool. To do so, we combine results of original research on specific technology tools used by teachers during COVID-19's school closures, with quantitative analysis of teacher questionnaire data from the 2018 International Computer and Information Literacy Study (ICILS).

Study 1: ELL Teachers' Use of Educational Technology During COVID-19 Remote Teaching

As quantitative research students with backgrounds in both language and online education, we were initially interested in investigating how K-12 teachers of English Language Learners (ELLs) were operating in the new teaching environment created by the COVID-19 pandemic in March 2020, namely through the necessary incorporation of educational technology tools. We prepared and disseminated an anonymous survey through various social media outlets, which was completed by over 200 teachers in the United States. The survey queried ELL teachers about the websites, software, and applications that they found valuable when teaching online, as well as which communication methods they used with their students. However, for our analysis, we focused on unearthing which barriers, or challenges, teachers perceived were most significant with respect to learning in the remote environment.

The digital divide was a notable talking point during the initial stages of COVID-19's school closures. However, despite decades of research into the issue of digital equity, research does not definitively state whether the technology access gap is closing or widening. Studies such as Ritzhaupt et al. (2013) report that a clear digital divide is still existent and related to a student's socioeconomic status, race, and gender. Yet just seven years after the concept of the digital divide was introduced, Kalyanpur and Kirmani (2005) posited that the digital divide gap could in fact be closing, sharing data that showed most schools had computer access for students, with resources such as shared computer labs. Thus, our questions to teachers about their greatest perceived barrier to online education helped us further a conclusion regarding this. Was it an inadequacy of technical ability, an inability to communicate effectively, or a lack of access to technology?

We analyzed two sets of data using chi-square tests. First, we looked at the intersection of the type of barrier (e.g., access, technical knowledge, communication) with school type (e.g., public schools, private or charter schools). Our aim here was to evaluate whether the resources allotted to each type of school were disparate enough to be statistically significant. Our results showed no significance between barrier type and school type: $X^2(2, N = 170) = .354, p > .05$.

Secondly, we looked at the intersection of the type of barrier (e.g., access, technical knowledge, communication) with grade band (e.g., lower band (K-5), upper band (6-12)). Here, we were interested in seeing whether the barriers to remote learning varied depending on the age of students. We found a statistically significant relationship ($X^2(2, N = 171) = .012, p < .05$) between barrier and grade band. Specifically, while elementary grade band teachers reported a lack of technical knowledge (53.3%) as the biggest barrier to students' academic growth, middle and high school (upper grade) teachers reported a lack of communication as the biggest barrier.

Our conclusions suggested that teachers face different challenges depending on the grade levels of their students. We also learned that the type of school does not impact which barriers are perceived as most significant. Lastly, we found these results surprising considering the ongoing conversation of the digital divide discussed above. Lack of access, which is the most popular barrier to education in published research, was only identified as the primary barrier by 16.2% of respondents, or 28 of 173 teachers.

Study 2: Teachers' Use and Perceptions of Classroom Information and Communication Technology (ICT)

As we prepare for a post-pandemic learning environment, more and more conversations are taking place around teacher readiness to teach using technology (e.g., Morgan, 2020; Tiba & Condy, 2021). The data we collected in the study above on ELL teachers' use of technology consisted of a relatively small sample size. To cast a wider net and help develop a deeper understanding of how teachers use technology, we continued our research by exploring teacher questionnaire data from the 2018 International Computer and Information Literacy Study (ICILS). This large-scale survey from ICILS asked teachers about what specific software programs they used to teach students, ranging from spreadsheets to digital learning games. Analyzing the United States ICILS data on over 3,000 teachers, we sought to determine whether teacher age could be a significant predictor of their readiness to teach with technology.

We examined the answers to two questions in the teacher survey from the 3,218 ICILS study participants who were based in the United States. The first question asked teachers whether they agreed or disagreed, on a 4-point Likert scale, with numerous statements regarding the use of technology in the classrooms. The second asked teachers how often they used specific types of tools (broken into 17 categories) in their classroom pedagogy. Teacher age in the original survey was divided into six age groups: 1) less than 25; 2) 25-29; 3) 30-39; 4) 40-49; 5) 50-59; and 6) 60 or over, with the mean age of teachers being 42.41.

Using regression analyses and chi-square tests, we found significant relationships between age and both perceptions and use of technology. Results of analyzing responses to the first question showed that younger teachers typically disagreed with statements that set a negative view of ICT (e.g., "Using ICT limits the amount of personal communication among students"). Pearson's correlation results showed that age makes a good predictor of a teacher's agreement towards the statements about ICT in schools ($r = .185$), indicated by the significant regression coefficients. The F value in the ANOVA ($F=13.008$), and $R^2 .034$ confirm this predictive relationship. A subsequent chi-square test found significant results for nine of the 13 statements on perception of ICT usefulness.

In the second question where teachers were asked how often they used different types of tools, we decided to focus on tools that were like those which teachers had identified as useful in our first study. Pearson's correlations showed that age was again a significant predictor of teachers' usage of: 1) practice programs or apps; 2) digital learning games; and 3) collaborative software. After the regression analysis, we performed a Pearson's chi-square test for independence. The test confirms that there is an inverse relationship between age and usage of the three specific types of educational technology tools evaluated: practice programs or apps ($X^2 = 46.899$, $p < .001$); digital learning games ($X^2 = 15.479$, $p < .001$); collaborative software ($X^2 = 43.098$, $p < .001$). For each tool, age decreased as usage increased.

Conclusions

Fishman and Dede (2016) outlined three levels of technology classroom integration: minimal, intermediate, and extensive. Most teachers have at least a minimal level of technology integration in their classes today: perhaps they maintain an electronic gradebook or communicate with parents via a web-based messaging application. In a slightly more integrated scenario, students have access

to technology devices to deepen their understanding and network access is minimally restricted. However, when we seek to understand the readiness of teachers who are “prepared to teach with technology” in our research, we mean specifically those teachers who can successfully use technology tools extensively to increase student learning in a way that goes beyond a supplement.

Since COVID-19, in-person instruction is no longer the predominant modality for educators. We argue that hybrid learning is, in fact, the new standard delivery method for instruction; technology should not be an afterthought, but instead an integral and central part of instruction. Therefore, teacher professional development should better support teacher technology preferences and innovation. Unfortunately, however, training is typically focused on learning how to use a specific new tool, usually one that is pre-purchased by a district or school, without input from the educators themselves (Green & Allen, 2015). Understanding how certain demographics affect teacher technology usage, and how teachers perceive technology in their classroom, opens a dialogue about resources and training. Teachers deserve resources that are proven to be useful to them, with their input at the helm of the decision-making.

The assortment of technology resources available for teachers is immense. Our study is an introduction into exploring teachers’ innovation within the growing educational technology space. Peering deeper into how educational technology decisions are made in schools can help us understand how we can improve upon the skills which teachers already possess. We also must understand teachers: what they are capable of, what they perceive as useful, and how their demographics can affect comfort level with technology.

Our conclusions argue that new teacher training should, by default, standardize the use of educational technology in schools, and emphasize the need for meeting students in the 21st century digital learning space where they exist (Gao et al., 2011). All teachers can be made ready to foster meaningful digital learning, and while the default learning experience for educators and learners has always been “brick and mortar,” the expectations of educational technology integration in a post COVID-19 world may reveal a new standard.

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