



# **STUDENT REMOTE LEARNING**

## **Effects of Modern Technology In Public Administration**

### **Educational Organizations**

#### **Grades K-12**

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December 23, 2022

**Introduction:**

In recent times, modern technology has played a key role in electronic learning for students from around the world. Understanding the benefits and barriers, especially as it relates to a younger generation of learners in grades k-12, is crucial to successfully integrating technology into education. Information obtained through evidence-based research, can help public administrators in education to introduce and support an extensive use of technology for remote and for in-classroom instruction. The effective use of modern technology in educational organizations may be critical in delivering a public service to the community, it can result in improved communications between teachers and students, as well as between public administrators, staff and educators. A more equitable education (Huck, 2021) in a digital learning era, can also help to close the current academic achievement gaps between in-person and remote learning. It may also create a balance in the socio-economic status of same grade peers in the future regardless of geography, race, gender, educational and income levels, disability status, among other identifiers.

**Purpose:**

This Literature review focuses on the question of whether the integration of modern technology in educational organizations, academically benefit students in grades k-12 or if academic performance is negatively impacted, as a result of solely communicating remotely with teachers and peers. Since the start of the public health emergency related to the world-wide Coronavirus pandemic in March 2020, public officials and school administrators in each state were suddenly forced to order the cancelation of in-person teachings, in order to mitigate the spread of the virus among school attendees. This decision was also geared toward protecting vulnerable populations, such as grandparents or persons with disabilities that students and teachers come in contact with outside of the school, especially in the absence of vaccines or other remedies that help prevent

## Student Remote Learning and Modern Technology

more serious symptoms that require hospitalizations or lead to death. School districts are charged with the responsibility of educating every child and fulfilling curriculum requirements during the school year, and as a result of the closings, school administrators urgently transitioned teachers and students into a full-time remote learning model from the traditional in-classroom instruction. Educators and learners, alike, relied solely on digital communication platforms to participate, find and share classroom information. This pandemic has proven to be the longest and most challenging crisis in educational history, thereby highlighting the need for a more effective means of communication in education through the use of modern technology. Since schools first closed nearly 3 years ago, analysts have reported qualitative and quantitative results based on academic scores, interviews and surveys of stakeholders in education, in order to assess student achievement gaps related to remote learning and other challenges. Compared to pre-pandemic data of same grade peers receiving traditional in-person learning, academic scores since the pandemic, have substantially plummeted. Researchers have also collected data analyzing achievement gaps among students residing in poorer school districts or in communities of color, compared to students living in more affluent school districts. Studies show the benefits and challenges associated with the use of technology in remote education, relative to grade level and test scores. Additional research has revealed how geography, demographics, education and income levels, among other variables, impact remote learning in economically disadvantaged communities. Though relatively new, analysis of qualitative tests and quantitative data, help guide elected officials, public managers and other stakeholders, on the future use of modern technology in education during a temporary state of emergency or as a more permanent presence.

**LITERATURE REVIEW:**

Today's world demands a more efficient learning model using modern technology (Criollo et al. 2021), that facilitates access to education and allows for continuity in instruction, as well as expand its reach to increase student capability beyond a physical structure, and provide more opportunities of engagement between educators and students. Technology and mobile devices are already present in many people's daily lives, especially among the younger population. They are growing up with internet access, mobile devices and are more able to transition and adapt to a digital learning platform. Through the use of mobile learning technology in educational organizations, analysts find that this newly informal and self-directed form of learning still provides teacher support, convenience, accessibility, availability, portability, flexibility and affordability, as well as an improved student behavior in terms of engagement, performance and retention. It allows for the use of multiple physical, conceptual and social learning spaces. Benefits also include constructivist learning which translates into higher student participation, challenge in education and new learning opportunities. It sparks collaborative learning, which tends to improve communication between teacher-to-student and between student-to-student, as it opens the door to virtual face-to-face communication and project-based sharing in real-time. Digital resource technology promotes motivational learning, generates interest, achievement and enjoyment. For teachers, using modern technology as a new resource also allows for immediate delivery of feedback, more innovative ways to teach, interface capabilities, adaptability to learning needs, and more (Criollo et al. 2021). Overall, researchers believe that the appropriate use of technology and an educational approach in the design of learning models, can generate improvement in the learning results of the students. For example, an advanced and interactive form of technology providing real-time access to educators, may change a student's outlook on remote learning.

## Student Remote Learning and Modern Technology

Students feel a sense of belonging or connectedness (Hehir et al., 2021). Building relationships is a component of the full student-life experience, and as distant learners, pupils have reported feeling connected when a teacher's presence was on video giving them real-time access to the educator through a virtual digital resource (Hehir et al., 2021). Many prefer to interact with the teacher and to have live discussions that align with assignments, rather than having a form of passive learning (Jamison & Bollinger, 2020), where students simply receive instructions and receive no feedback from the instructor (Mandernach et al., 2018). Teacher's voices in personalized audio lessons also increase connectivity and student engagement, in the absence of a face-to-face interaction (Hehir et al., 2021). Additionally, the immediate feedback to emails (Starke & Warne, 1999), as opposed to a phone call or even a face-to-face with teachers, was also found to be most effective in feeling connected to the educator because it was a more detailed response (Van Tryon, 2007). Analysts identified synchronicities as another relevant component to feeling connected while using a digital resource in remote learning situations (Lambrinidis, 2014). Synchronicities happens when things coincidentally occur in real-time, while simultaneously, communication between teachers and students about the same issue or topic is already underway. On-line lectures and discussion boards have also proven to have strong potential in developing a sense of community (Jameson and Bollinger, 2022) and to increasing student connectedness, participation, engagement and retention (Ortega & Falconer, 2015). Literature Review has revealed that while modern technology has been beneficial, it has also presented challenges for all stakeholders in education. The mandatory and urgent need for distant learning presented the first test for public managers in education, who were forced to address issues of inequity caused by a digital divide in technology. The lack of software, laptops and universal internet access, created barriers for educational organizations to equally deliver a public service to all of the population. Consensus among scholars, indicate that the digital

## Student Remote Learning and Modern Technology

divide stressed the fact that as schools closed at the start of the pandemic, the more affluent communities were able to quickly provide computers and internet access to students in order to close any potential learning gaps. Students with little to no access to technology even if temporarily, suffered an educational gap that will have long-lasting consequences (Frances & Weller 2022), according to researchers. The most negatively impacted during the pandemic were groups that were economically disadvantaged including communities of color such as blacks and Hispanics, first language speakers, single family and low-income households, as well as families with disabled status or with non-college degrees (Francis & Weller, 2022). To alleviate inequities in education, it is important to have data on how many citizens and non-citizens live in the school districts. This would help government and public managers provide the tools necessary to comply with all of the population's educational needs, especially during the recent remote learning plan. The US Census data is key to help bridge the digital divide in communities, as they are mandated by the US Constitution to conduct a national survey every 10 years to count the population. The data collected is to inform policy decisions, enforce laws and regulations, as well as to protect against discrimination based on age, race, ethnicity, sex and housing (US Census Bureau, 2020), for the most part. The federal, state, and local officials use this data to allocate funding in areas like education, hospitals, infrastructure, as well as to determine congressional apportionment and state legislative redistricting (US Census Bureau, 2020). If the problem is not corrected, it will negatively affect the future socio-economic status of individuals who are impacted by the digital divide (Francis & Weller, 2022). Legislators have advocated for programs that would provide access to technology and to broadband connectivity. For the first time, the Federal Communications Commission (FCC), launched a \$3.2 billion dollar Emergency Broadband benefit for qualifying households that are under 200% poverty level per federal guidelines, or for

## Student Remote Learning and Modern Technology

those with a sudden loss of income due to the pandemic or furlough with a monthly discount benefit of \$50 or \$75 in tribal lands (FCC, 2022). The commission also offered a one-time \$100 discount benefit to purchase laptops, computers or tablets, should the individual contribute \$10 and less than \$50 toward the purchase (FCC, 2022). The FCC also appropriated \$7.17 billion dollars to the Emergency Connectivity Fund for libraries to purchase laptops, modems, routers, Wi-Fi, and hotspots to provide other options for students impacted with what was also dubbed as the “homework gap and digital divide” (FCC, 2022). Moreover, states like New Jersey, passed legislations appropriating federal funds to the Department of Education awarding grants to school districts for the purchase of technology for students’ remote use, whether it was for broadband access, software or hardware (NJ Legislature 2020). As the strategic educational plan was rolled out, it became increasingly evident that schools were simply not prepared or equipped to teach online. Educators lacked training on the use of technology and unlike their young students, many of the older generation teachers were unaccustomed to posting assignments or providing instruction in a digital format, which led to a disconnect between some educators and students (Criollo et al., 2021). Many teachers had difficulty understanding and using the technology, rejected culture change and resented the additional workload, and the need for updating knowledge in their teaching methods. Another unfortunate downfall to remote learning, reported by teachers, was that in high-poverty schools students lacked a workspace and were less likely to have an adult present to help with technology or assignments. In some cases, older students who otherwise could have served as a resource, may have been forced to become caretakers and to get a job, due to the unprecedented pandemic. Some software applications were also poor in content or lacked innovative designs, as they provided no real learning experience and were found to be a deterrent for enlisting student participation. Technological concerns were also raised, as security and

## Student Remote Learning and Modern Technology

privacy became an issue. Limited, slow or no internet access, as well as outdated systems and costly equipment, were flagged. Students learning remotely were confronted with using applications assigned by teachers that were archaic and boring, or they were surrounded by distractions in their new learning environment or they were subject to restrictive conditions. Students complained about cost and device accessibility or that they lacked institutional support. Numerous factors were impeding the delivery of educational lessons or materials, including problems within the learning institutions with regard to the implementation and deployment of technology, digital security, and investment cost in technological infrastructure (Criollo et al., 2021). Through interviews, researchers also found that people need a sense of belonging and to feel physically connected to others, which increases student's health and well-being (Arslan 2021) academic success (Wilson 2018) and improves graduation rates (Bridgton 2019). In the absence of feeling connected to teachers and peers, students felt isolated and lonely (Hehir, 2021). As a result, students have reported an increase in mental health problems and a decline in academic performance. When virtual platforms with an interactive approach to education was initially introduced, it was immediately embraced by all stakeholders. Students and teachers reported feeling more connected to each other through face-to-face digital communication. Instructors are able to display slide presentations to create dialogue or to better explain the assignments. Students are able to raise their hands, via a virtual chat, to ask questions or answer teacher inquiries. Virtual platforms, such as zoom, also provide a form of interface communication through a video conference between public administrators, teachers and staff. It is a more efficient tool that creates an immediate exchange of information, instruction and training. Though, video conferencing would be considered more effective than other media such as emails and phone calls, compared to face-to-face in-person communication, it is not as positively impacting. As a result of qualitative

## Student Remote Learning and Modern Technology

analysis, literature now includes the topic of “zoom fatigue” referring to tiredness or anxiety regarding the use of virtual platforms (Hehir, 2021). Quantitative investigation, tested objective characteristics, determining that virtual meeting size, duration and the presence of a supervisor, also play a role in “zoom fatigue.” Analysts concluded that a better managed virtual meeting by administrators, could improve user outlook (Hehir, 2021). Additional assessments include the Annenberg Brown University, which found that the Coronavirus pandemic has created an on-going disruption to student learning in grades k-12. According to their study, test scores in math and reading achievement from 5.4 million students in the United States in grades 3-8 in the first 2 years of the pandemic, showed a substantially lower deviation compared to peers in 2019. In Math test scores, standard deviations represented 0.20-0.27, whereas reading presented a 0.09-0.18 in standard deviation achievement gaps. Even greater drops in test scores were reported in students in low-income communities and high poverty schools. Math showed a 20% decline and reading a 15% shortfall. Percentages were also higher than during closings affiliated to natural disasters (Kuhfeld, M., Soland, J., Lewis, K., & Morton, E. 2022). Moreover, the Center for Education Policy Research at Harvard University used testing data, from 2.1 million students in 10,000 schools in 49 states (including Washington DC), to investigate remote and hybrid learning (Goldhaber et al. 2022). Experts confirmed that widened gaps in achievement by race and power was driven by remote instructions and that individual future income will be majorly impacted by this (Goldhaber et al. 2022) The American Institutes of Research (AIR) also launched a national survey on educators’ response to the coronavirus between 2020 and 2021 (Garet et al. 2020). The data came from 2,500 school districts and organizations to assess teacher’s lack of familiarity with learning tools, district ability to offer socio-emotional support to students, and frequency of teacher-student and teacher-family interactions (Garet et al. 2020). Researchers at the RAND

## Student Remote Learning and Modern Technology

Corporation also found that nearly 90% of administrators indicated that students lacked internet access and 40% reported that technology and/or internet access was also a barrier for their teachers. A third of principals (35%), also said that online tools, such as Zoom, presented limitations (Hamilton et al. 2020). Additionally, (EdWeek, 2020), reported that 74% of teachers said their students' current level of engagement was "much lower" than in-person instruction (Hamilton et al. 2020). These alarming numbers are devastating for public officials and stakeholder in educational organizations. As further studies and analysis are conducted by scholars to help guide decision-makers and improve processes, it would be interesting to learn if and how school district administrators are using assessments and the pandemic experience to improve instruction for grades k-12, or are they reverting back to the traditional education model without the implementation of modern technology (EdWeek, 2020). Public Administrators may want to consider using technology more effectively, during both in-classroom and remote learning, as a catalyst to enhance education. A mixed-method approach is recommended by many teachers (Yungo, et al., 2021), to achieve recovery and to accelerate learning. Before the pandemic, access to digital education was uneven, but government officials have diligently worked toward removing as many barriers. However, learning gaps in education still exist. Since 2014, the US Census has released a set of questions as a requirement of the Broadband Data Improvement Act of 2008. This would help to assess if any household members have access to a mobile device, if there is access to the internet, and how is broadband service delivered (US Census Bureau, 2020). In light of the recent pandemic, analysts may want to consider preparing a survey for government officials and public administrators to investigate how they will use the new 2020 census data. They should include key questions like, "what further steps can be taken to continue addressing the inequities in technological infrastructure that would help to improve education? The US Census may also

## Student Remote Learning and Modern Technology

want to consider adding questions for respondents, like “what is their profession or roles at work?” and “what is the level of education? This would help to determine socio-economic status and accessibility to modern technology. Nowadays, innovative learning has become a part of this ever-evolving world of technology. Educational organizations’ implementation of a permanent use of electronic devices for distant learners, may allow for a more engaging, visual and interactive learning experience while completing homework assignments, compared to a full virtual school day. For in-person instruction, embracing technology to support learning lessons are also beneficial. Computer technology in classrooms can serve as a tutor (Gully, 2003). Through the click of a button, instructions or lessons can be repeated, aiding in student comprehension and teachers’ time management. Some argue that computers in classrooms may limit human connectedness and students may be less likely to seek teacher assistance, while others say that the implications of having technology for in-person instruction, is that they can teach what teachers cannot and that it improves test scores in math and reading (Gully, 2003).

### **Methodology:**

A systematic and structured methodology was used to identify, review and analyze scholarly literature, student analysis of academic test scores and surveys, to assess the remote learning and teaching experience of students and teachers using modern technology as the sole tool for education, during the Coronavirus pandemic. The extensive search for relevant articles, led to numerous revisions of either the research question, purpose, expectations and/or implications, in order to narrow down the specific area of study, to find key answers, data, methodology, recommendations and references. Some key words searched in Google were “remote learning, technology in education, digital divide, federal funds for remote education, mixed method in education” or other similar phrases (Yungo, et al., 2021). Upon screening 25 scholarly articles, 15

## Student Remote Learning and Modern Technology

of them were aligned with the research question and were also noted in the reference section. The 10 unused scholarly articles focused on international or global education, higher education, Canada (Houlden, S., & Veletsianos, G., 2022), or impacts on students' mental health. The relevant studies selected were carefully and thoroughly reviewed, analyzed, compared and combined to include qualitative evidence by scholars. Public administrators used the trusted and innovative MAP assessment test to (NWEA 2022) determine students' achievement and growth in grades k-12, by measuring skills in math, reading, language, and science. The selected participants for surveys and interviews were educators. The questions focused on teacher's lack of familiarity with learning tools, district ability to offer socio-emotional support to students, and frequency of teacher-student and teacher-family interactions. Evidence-based research identified the benefits and challenges associated with remote learning and technology. A variety of solutions to areas of concern were implemented by public officials and/or school administrators, who are charged with providing quality and accessible education to the public. The framework study produced quantitative data and qualitative assessments, resulting in policy recommendations to aide in closing achievement gaps between in-classroom instruction and distant learning, enhancing education, and preparing the student body for future challenges.

### **Implications/Expectations/Conclusion:**

As public administrators in education fully relied on the sole use of technology to teach students remotely during the public health emergency related to the Coronavirus pandemic as of March 2020, it brought about many implications. Questions were raised, related to the effectiveness of educational technology in bridging students of ages k-12 to subject learning, in the absence of in-classroom instruction. There were concerns of whether the communication between teachers and students was being impacted, especially in the early stages of the pandemic, when digital resources in the form of virtual learning were not made available as a learning tool. Researchers examined

## Student Remote Learning and Modern Technology

e-mmediacy strategies and they found that the use of virtual digital resources providing face-to-face interaction with teachers and peers or teacher audio recorded lessons among other forms, was most effective in developing connectedness (Lambrinidis, 2014). Now, as students return to in-person instruction, researchers have studied if the integration of modern technology in education benefitted students and teachers and how effective was it. Analysts also sought to find if technology created new challenges for stakeholders and why. Investigations also included if distant learning instructions caused considerable long-term effects in students and, if so, which population may have been more adversely impacted. Additionally, studies focused on whether digital learning platforms created gaps in subject test scores, compared to pre-pandemic results for same age peers. It is as equally important to learn if any or all of the implications were addressed by government and public managers. Elected and school officials are tasked with the responsibility of serving the public by identifying challenges and implementing solutions. Qualitative tests and quantitative data analysis in education help answer research questions and to determine future decisions and actions by public leaders. As emergency measures were put in place, government and educational organizations expected to set in motion a remote learning plan geared toward causing very minimal to zero disruption in academic instruction. Unfortunately, the sudden transition from in-classroom learning to remote, highlighted the need to bridge the educational gap in populations with limited or no access to technology. Evidence-based research, shows that students in disadvantaged communities were more negatively impacted by remote learning. The learning gap grew wider, between the time that the digital divide was identified and addressed, by government and public managers. Gaps in education have been coined by many as “learning loss.” and researchers predict that impacted distant learners will suffer long-term consequences in their socio-economic future, as they would likely acquire lower paying jobs and may not achieve post-

## Student Remote Learning and Modern Technology

secondary education. Some public administrators believe that if you never learned it, you didn't lose it, but many parents believe that the term "learning loss" because it captures the urgency, they now feel to make up for what their kids lost during remote learning (Turner, 2022). In the early stages of the pandemic and in an effort to minimize the impact, public officials urgently passed legislations and approved emergency federal funding for school districts, in order to ensure equal accessibility and affordability to technology. All were steps in the right direction in the attempt to address the issue of the digital divide, which was causing much uproar and disruption in learning. Remote learners' tests scores in math and reading, were substantially lower in students with financial constraints and with limitations in technological infrastructure, compared to pre-pandemic results and to same grade peers residing in more affluent school districts. During the height of the pandemic, distant learners were initially deprived of innovative technology with real-time access to educators. Electronic devices also failed to psychologically connect students to teachers and peers, especially during a time when digital communication was the only tool used for sharing instructions and assignments. Later, digital resources were introduced to facilitate a more interactive educational platform providing virtual access to teachers and peers, promoting student participation and engagement, increasing academic performance and helping students feel connected in hopes to alleviate issues of loneliness and isolation that were causing mental health problems. Literature now explains that educational organizations have experienced "zoom fatigue," a feeling of exhaustion caused by video conferencing (Hehir, 2021). Overall, users benefit from a more interactive approach in digital learning, but compared to in-person communication, the positive impact is minimal as stakeholders expressed a feeling of loss for "the old times." In part, results also reflect that providing continuity in education through modern technology yields favorable benefits. Continued interactions, between teachers and students, are

## Student Remote Learning and Modern Technology

critical in establishing a collaborative working relationship. Equal access to technological infrastructure among all students, educators trained on mobile devices, and effective use of electronic technology, are all key components to ensuring quality education. Closing the digital divide, ensuring virtual real-time access to teachers and improving software applications, can help tip the scales for a more equitable education (Huck, 2021), increased participation and engagement, as well as creating a sense of community and connectedness between teachers and students in remote learning situations. Post pandemic, educational organizations should learn from scholars, the benefits and challenges of using digital technology in learning. Literature explains that there should be a link between the world and the classroom and that unless education reflects the world in which it exists, it has no significance to the students. Public administrators in education should consider permanently incorporating, both the traditional in-classroom instruction and innovative technology learning models into the curriculum, to close learning gaps and to enhance education. Mobile devices are part of the 21<sup>st</sup> century and can be used to transform education in a mixed method approach of in-person learning, as well as remote. Public officials and administrators' responsibility is to provide equal access to quality education through transformative educational strategies and to better equip students for any future challenges. Literature review recommends that public administrators analyze research results to implement a mix-method approach to learning that includes both technology in and outside of classrooms to enhance education and to consider questioning if post-pandemic, they are reverting back to pre-pandemic learning strategies (EdWeek, 2020). "Public managers have considerable authority over the structure of their organizations and make many decisions in relation to technology and tasks, so current thinking on these topics is important to effective public management" (Rainey 2021).

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## Student Remote Learning and Modern Technology

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