

MEMORANDUM

TO: United States Department of Education

FROM: Andrew Wang

DATE: December 11, 2021

SUBJECT: Re-evaluation of and Restructuring Facilitation of Technological Devices for the Purposes of Augmenting Education

Introduction

This memorandum is directed to the United States Department of Education with the intent to prompt decisive action on the presently stalling quality of education in the United States. As technology advances and innovators create new tools, traditional teaching practices are being left behind and are dragging students and teachers alike down as well. Not all learners are equipped to engage in the rapidly modernizing and evolving employment market, and are held to the relatively unchanging standards of education regardless.

As such, it is important to identify possible solutions to improve the content provided by our educational institutions. Though technology's influence on education for students currently has limited positive results and holds many potential pitfalls without sustained and proper introduction, it is more likely that this is a greater reflection of poor planning and implementation rather than a limit on technology's true capability to enhance learning processes. By increasing familiarity and proper facilitation throughout the preK-12 levels and beyond, students' psychological and learning needs can be better met.

The usage of technological tools such as online platforms and wireless devices in daily routine is rapidly becoming a fact of life in many areas of the United States, but is only burgeoning in an educational setting. Studies show, however, that even limited introduction has promising results relative to the fundamental components of higher quality education. In order to achieve this goal, increased funding and more modern policies for technological introduction, distribution, and support should be prioritized by the United States Department of Education. By doing so, students will have improved interest in a learning process that is more conducive to their progress, and become better prepared for the future regardless of the field they choose. This will expand into many of the other challenges we face, such as unemployment, economic security, and social turmoil.

Background

Before discussing the specific potential areas where technology can be applied to educational practices, we must consider how it has already been used in classroom settings and what results it yielded. Studies found that technology by itself does not have a significant amount of impact on developing skills involving critical thinking, problem solving, etc (Thieman, 2016). There was variance depending on the grade level, as lower levels do not usually use computers as aids for education, and higher levels only increase slightly in facilitated usage. In spite of that, there is a growing requirement of technological understanding pushed onto students in order to keep up with learning practices, which requires early introduction and emphasis on learning to truly succeed. By fostering interest and connecting existing as well as new passions to usage of technologies, administrators can increase educational motivation and fulfill psychological needs simultaneously. School and staff often sideline computer and wireless technology, however, because they do not possess the means to ensure additional use will have desirable feedback.

One major facet of student learning that must be addressed is engagement, as it is closely correlated with retention of information. There are three main types of student engagement: behavioral, emotional, and cognitive, which all must be met to ensure the student's needs are fulfilled (Schindler, 2017). Some activities are already proven to have significant influence on these types of engagement, such as digital games, web conferencing, and social media platforms. By leaning more into usage of these platforms for educational purposes, teachers can ensure their students have no shortage of motivation in class.

We must also highlight the position teachers and other education staff are in, as they can help students acquire skills in technology necessary for careers, but not before they are also trained as well. Without proper frameworks, numerous issues can arise, including tool availability, excessive screen time, questionable digital content efficacy, and tech equity. It is thus important to scrutinize what resources are needed, instead of a blanket grant to everyone that is based on a loose standard for success and likely will not solve the problem. Additionally, individual attitudes and beliefs that can manifest as hesitancy from the teacher should be considered and addressed if conflicting with any sort of technological presence in order to minimize disturbing the students' educational processes. As a preventative measure, teachers need to be given learning resources to practice how to effectively use tech as well as raise overall digital literacy. According to one report, the "most commonly cited reason for lack of technology implementation in the classroom is inadequate professional development and training" (Johnson, 2016). Therefore, both students and teachers can benefit from this as tech can enable greater connectivity, more personalized learning, stronger curiosity for subjects, and increased efficiency/productivity.

The most recent showcase of the importance of tech is likely the ongoing COVID-19 crisis, as online methods of communication are pertinent to maintaining learning efforts. Since there is such a high degree of introduction of newer technologies into learning spaces, such as online class calls through Zoom, we have to consider how all new practices are adopted into how society functions. Normalization Process Theory (NPT) discusses this concept, and forms a

framework to better predict the phenomenon's behavior (Goh, 2020). Specifically for the COVID-19 pandemic, such high demand was created for new solutions to these extenuating circumstances that we are unlikely to return to previous educational methods as there is clear evidence of shortcomings. Notable ones include lack of sufficient educators as well as quality of content; thus, in order to compensate for these issues, we are likely to adopt greater usage of technology to supplement learning curriculums as opposed to reverting to purely traditional face-to-face teaching methods.

Procedures & Technology

By implementing the proper usage of technology for students and teachers, we can reasonably expect the quality of education to improve as well. It follows that we must discuss the aspects of learning that increased usage would affect, and their functional concepts. One of the primary topics is the efficacy of personalized learning (PL) activities in addressing specific concerns in the classroom, namely psychological needs, and learning motivation over online platforms. PL activities must be based on a learner profile with strengths/weaknesses, preferences, and goals, as well as a learning path to help guide progress (Alamri, 2020). They should also include metrics to determine ability to master certain subjects as opposed to flat time spent, which traditional standards usually employ. These traits utilize the concept of constructivism, where individuals construct new meaning and knowledge based on past knowledge and experience, which may hold more ground with student learning compared to behaviorism. Behaviorism is commonly applied in current learning spaces, but often does not yield results due to being arbitrary and not factoring crucial student traits. Thus, through PL students can become more aware of their own needs and traits relative to others in a non-competitive manner, and gain greater motivation while mitigating burnout. This feeling of autonomy, or self-determination, is especially important as it is something all students intrinsically want to have in their educational setting. Providing information and communication technology (ICT) can increase this effect, and can be accomplished by allowing students to either school-owned devices or use their own to grant them unhindered access to learning tools. In order to fully utilize ICTs, teachers must be effectively trained to use digital tools so that students can capitalize fully on them.

This round-the-clock access to devices is also what is known as 1-to-1 computing, whose goal is to improve technological literacy as well as increase the complexity of student's work. By providing these services, institutions will also have a better grasp on what students know and can better manage communication between staff, students, and parents. Accomplishing these goals helps contribute to the larger concept of blended learning, which combines traditional teaching methods such as lecturing, mediated learning, assigned supervised work, etc. with instruction involving the use of technology. It is important to mention, however, that using technology seems to have positive effects on engagement and self-directed learning but has no concrete benefit to academic performance as of yet (Herold, 2016). At the very least, current data indicates we can expect an improvement in technological literacy if we follow the same path, and

the only real caveat is that there is no research to really imply the current blended learning dynamic works as there are too many variations and options.

To curb this lack of progress, the Federal Communications Commission (FCC) drew up a list of long term goals and regulatory changes in 2014, such as raising the internet connection to 1 Gbps per 1000 students and measures to provide rural and remote schools with fiber optic cables as well as fairer rates (Herold, 2016). These changes reflect a sentiment that should be carried forward, as technical resources are a component many regions in the United States lack and are a prerequisite for a modern educational wireless network. With sufficient hardware, schools can access and provide access for items classified as open educational resources (OER), a major contributor to recent gains in education as it is online and ready for use. It is unsurprising that it would gain traction as more people believe that it is more worthwhile for the student as opposed to static textbooks that take too long to update. In comparison, online materials incentivize collaboration between experts, sport greater ease of access, and accelerate the update process to maintain quality of content.

A significant contributor to the success of online materials are the platforms providing them as well as maintaining them, and thus should be reviewed to best improve their usage. AI algorithms are a common topic within educational communities and certainly have uses to help improve learning processes, but their best qualities are speed, accuracy and consistency as they are relatively reliable once refined and developed correctly. Their weaknesses share many parallels with current education models: creativity, innovation, critical thinking, leadership, and empathy. Before employing these algorithms over educational platforms, data on student learning should be analyzed by human experts to determine a standard to follow and build off of.

Open online courses, such as Khan Academy, Coursera, and even Youtube tutorials, already provide decent to high quality content, and share the added benefit of being easily accessible. The side effect, however, is that its growing presence puts pressure on institutions to lean more into online learning, and could motivate collaboration to revamp existing courses in institutions. It would thus be prudent to simply invest into online learning practices, and develop a professional standard that can be relied upon by everyone. Structured online educational experiences have already existed for a while, namely learning management systems (LMS), such as Blackboard, Canvas, and Brightspace (Rosenbusch, 2020). They are commonplace in many educational institutions and are noted to be the most important learning tool for students; however, they are often just a remixed way of displaying pre-existing information to the students and certainly have the potential to provide many more resources for learning. Rather than simply transposing the methodology of an in-person class to an online platform, we should aim to provide as many opportunities and learning tools through portals like LMSs as possible.

Issues & Impact

There are a myriad of difficulties with implementing a conducive online learning system, especially when traditional approaches are fraught with many already, but they can be mitigated with a hybrid approach. A common issue with creating an infrastructure with technology is that it

cannot adapt to the staff, who possess their own traditions and habits and are further handicapped by outdated educational standards and requirements. Currently, a number of schools have found that they may have some degree of access to resources and invest substantial amounts of time into using new programs and apps, but poor implementation and results indicates improper planning in the first place. Many institutions still have a severe lack of true transition to digital content, with 70% of preK-12 instructional material remaining in print (Herold, 2016). Assuming devices can be distributed to staff and students, determining the appropriate level of usage and managing said usage is far more difficult, and also happens to be the aspect that impacts quality of education the most. Furthermore, without a proper framework to handle the data available from the devices and a proper approach to making decisions based on that data, education quality will not improve. Thus, it is imperative to determine useful standards to build these frameworks for management in the interest of learning goals, and ensure equity of technical hardware.

Regarding usage of AI and other algorithmic methods, we must be careful to not continue teaching our students the way we train AI. Oftentimes, teaching practices involve throwing information at students in a vague attempt to instill knowledge, otherwise known as infodumping, without real facilitation or guidance. This is the equivalent of brute force training an AI on a database, which can lead to unaccounted biases and other critical errors. Educators that “adopt too much too fast” can fall prey to this, and a more reliable and trusted infrastructure that is commonly agreed upon by experts and institutions would be more effective (Rosenbusch, 2020).

Policy Recommendation

The quality of education in the United States has been lackluster since before the advent of digital technology, signifying that change is more important now than ever. There is a need to increase support to integrate new technologies for educational purposes. Such technology can be expected to have the intrinsic potential to collect the data necessary for predictive learning, which is information that is lost in traditional practices. Policies should change to enable institutions to work with staff to increase usage of technological resources, and ensure the transition is as smooth as possible. In addition, standards for teacher training must be brought up to increase the skill level with technology necessary to qualify. Some attributes of student-teacher learning to consider updating include audio/video content, web-based content, and open/distance learning.

In 2014, the FCC approved a program cap raise from \$2.4b to \$3.9b; within roughly a year, schools and other educational facilities could expect to receive a portion of the increase for wireless network equipment (Herold, 2016). To maintain this momentum, the United States Department of Education and/or the FCC should redirect funds from the federal budget to invest in more research and staffing for a universally agreed open framework for educators and their organizations, then increase the aforementioned cap to back the distribution of resources and the construction of proper infrastructure for sustained long-term support.

Conclusion

Without adjustment to our education system's practices, the gap between our standards and higher quality education will only widen. Encouraging the use of technology and facilitating its proper implementation should improve student learning experiences, and lay the groundwork for further progress. We must consider the risks of this transition, most notably the lack of reliable research to design programs and frameworks off of. Without proper information, we cannot begin to train teaching staff and expect learner success either. Additionally, the management of resources online is still in its infant stages; there are no means to guarantee control over information, which poses a large risk for learners and staff alike. By developing actual modern policies and updating old ones, the U.S. Department of Education can spur a new age where technology is accepted rather than neglected, and education can evolve rather than stagnate the way it has for so long.

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