

## **To what extent were schools and stem education affected and rebuilt after the covid-19 pandemic?**

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### **Abstract**

The COVID-19 pandemic had a major impact on STEM education, affecting students, teachers, and the entire education system. The switch to online learning brought about many challenges, which have not been fully analyzed in current research. Reading and summarizing articles on this particular topic formed the primary methodology of this research paper. Upon examining sources on the topic, we found some of these challenges facing the transition to online learning include students' lack of motivation, the demoralization of teachers, and the change of priorities in STEM education. Moreover, STEM teachers' attitudes and views toward online teaching were negatively affected, leading to an increase in mental stress and a higher number of teachers quitting their jobs. On the other side, STEM professors who prioritized open communication and leniency in policies were more successful in creating a positive and inviting learning environment for their students. Based on this information, we can presume that the education system needs to be more adaptable and flexible to ensure that students and teachers receive the assistance they need in times of crisis. It is through their resilience and determination that STEM education will be able to continue to thrive in the post-Covid era.

Keywords: STEM, Covid, Resilience



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## **Introduction**

According to Daniel Kelly (2021), assistant professor of STEM Education in the Department of Curriculum and Instruction at the College of Education at Texas Tech University, the single most important event in recent history that had such a tremendous influence on education was Covid-19. The Covid-19 epidemic began in late 2019 but did not have a true impact until March 2020, when on-site schools were completely closed following spring break. The transition to online learning persisted for the remainder of that academic year. The majority of schools made the decision to continue offering lessons online that following August using tools like Zoom, Schoology, Canvas, and Google Classroom. Again, throughout the duration of that academic year, strict protocol stayed in place. Even after the Covid vaccination was discovered and distributed, there were still stringent regulations in place to protect students. Many schools around the country mandated the usage of masks for the school year 2021–2022, and they set up hand-free hand sanitizing stations for students to utilize. This was the year that schools and students' lives began to be rebuilt and reimplemented in terms of education, particularly STEM education. In this period of reconstruction, there are many diverse viewpoints to take into account, ranging from students, teachers, school boards, and the federal Department of Education. Overall, an evaluation of the situation shows that STEM teachers were discouraged from teaching, priorities for STEM education were changed, school boards implemented multiple techniques to help cushion the blow from Covid, and increasing students' on-campus, peer, and familial support helps reintegrate them into STEM education.

## **Effects of the Pandemic on Teaching Staff**

While the pandemic had a major negative effect on students, some of this effect could be attributed to students' lack of motivation to participate in school. This lack of motivation to do work, however, could not explain the negative effect Covid had on teachers. According to Daniel Kelly (2021), "teachers are working longer hours, yet instruction is suffering due to virtual/hybrid teaching, social distancing, and sanitation concerns." Kelly illustrates how even though teachers were putting in more effort than a normal school year, they were still showing worse results, which means that teachers did not have a lack of a work ethic during Covid, but a surplus of it, and it still wasn't enough to overcome the difficulties of online teaching.

Even though instructors put forth more effort, their working circumstances and altered lesson plans led to their demoralization (Kelly, 2021). The goals of general STEM education have allegedly shifted, according to Jessica Sain and Bradley Bowen (2022), who are affiliated with Oklahoma State University and Virginia Tech, respectively. The student's lack of engagement and the shift in priorities made it difficult for instructors to perform their tasks, which increased mental strain and led to an increase in the number of teachers quitting their jobs in an effort to alleviate that mental stress.

Another negative outcome that resulted from the pandemic was the teacher's outlook on online learning becoming very negative. According to Ishe DeCoito and Mohammed Estiathiye (2022), Ishe being part of the Faculty of Education at Western University, "despite few successes, teachers faced a wide array of challenges that negatively affected their attitudes and views toward online teaching." Given the evidence, which was specialized to STEM teachers, we can assume that STEM teachers did not find online school beneficial, and

instead found in harmful to the general learning environment. While the overall self-efficacy and technological competency slightly increased their view of online learning (DeCoito & Estiathiye, 2022), the effect was not enough to completely alter the previously mentioned negative effects of online school.

The final point to touch on is the adaptability of STEM teachers to the abrupt conditions presented due to Covid-19. According to Mina Sedaghatjou et al (2021), a graduate of the College of Liberal Arts and Science at Alfred University, “the effective domain of teaching is identified as the missing dimension of an e-learning framework.” Based on the given information, we can infer that the domain of online school, which is the platform used to teach online, is the missing portion to have a properly functioning online educational facility. However, this domain has a very minimal impact on STEM, and is the “area of least concern for teaching STEM online.” (Sedaghatjou et al, 2021).

In conclusion, due to students' and teachers' lack of motivation, extra hours worked, STEM education's changing priorities, the number of challenges to online school, and the domain used for online school, STEM teachers were discouraged from teaching in general, and the STEM curriculum took a hit because of the inability for it to be taught.

### **College Stem Adjustments Post-Covid**

STEM education does not only mean grade school, it also applies to any college or university STEM classes, majors, or pathways. Covid also didn't only affect grade school, its effects were felt through all facets of education, including higher education like colleges and universities. Effects like the switch to online education and the personal relationship disconnection between teacher-students occurred throughout universities.

However, some STEM professors attempted to rebuild that personal connection with their students and have a positive learning environment. According to Sherry Pagoto et al (2021), a member of the Department of Allied Health Sciences at the University of Connecticut, the most common behaviors professors did to make their students comfortable and cared for was leniency on the professors' policies and an open, quick line of communication. Meanwhile, the most common behavior that made STEM undergraduates feel uncared for was a very closed and poor line of communication (Sherry Pagoto et al, 2021). In other words, employing practices that normally would be common in non-Covid times, like an open line of communication through things like office hours and tutoring, allows for a more positive school experience for STEM undergraduates. Not only professors, but the university itself can implement ideas to make students feel more accepted and content with their academic situation. The most beneficial implementation would be to make inflexible policies and rules a lot more lenient (Sherry Pagoto et al, 2021). This implementation, along with the professor's individual contributions would give undergrad STEM students a more comfortable, and therefore more productive work environment.

Another factor that would allow college students to have a more comfortable and accepting environment would be family and peer support. According to Sivan George-Levi et al (2022), who is part of the School of Behavioral Sciences in Peres Academic Center, “hope and support from peers mediated the relations between perceived family support and perceived on-campus support”. Basically, peer support is necessary in order to not be overwhelmed with

either family or on-campus support. Without family support, peer support has nothing to mediate, and without on-campus support, Stem students would lose out on possible academic opportunities and academic successes. Since these three need to be constantly working together, each is a vital part of rebuilding the familiar and beneficial college ecosystem post-Covid.

Overall, Stem college students need support and leniency from multiple different groups, including but not limited to professors, universities, families, and peers. With the combined support from each of these groups, along with the support mediating and keeping each other in balance, a Stem undergraduate student would be able to re-enter the intimate and constructive ideal college environment after the Covid era.

### **School Boards Reactions and Adaptations**

School boards across the country have had to quickly adapt and make difficult decisions in response to the COVID-19 pandemic. One major challenge has been maintaining and restoring access to STEM education, which is essential for the development of a strong workforce and for preparing students for future careers in science, technology, engineering, and math.

In order to keep students engaged in STEM education during the pandemic, many school boards have turned to online and distance learning platforms. This has allowed students to continue learning and participating in STEM classes, even when in-person instruction is not possible. Additionally, many school boards have also made an effort to provide students with access to technology and resources they need to participate in online learning, such as laptops and internet access.

Another way that school boards have adapted to the pandemic is by working closely with STEM educators to develop new and innovative teaching methods. These methods often incorporate technology and online tools to make learning more interactive and engaging for students. School boards have also been working to increase the number of STEM programs and resources available to students, such as coding classes, robotics clubs, and online STEM competitions.

Despite the challenges posed by the pandemic, school boards have been working hard to ensure that students continue to have access to high-quality STEM education. By utilizing online learning platforms, providing students with the necessary technology and resources, and working closely with STEM educators, school boards are helping to keep students engaged and motivated in STEM subjects, and preparing them for future success in these fields.

### **Conclusions**

The Covid-19 pandemic had a major impact on STEM education, affecting students, teachers, and the entire education system as a whole. The switch to online learning brought about many challenges, including students' lack of motivation, the demoralization of teachers, and the change of priorities in STEM education. STEM teachers were burdened with extra work hours, but their efforts did not translate into better results due to the difficulties of completely

virtual and hybrid teaching, social distancing, and sanitation concerns. Moreover, STEM teachers' attitudes and views toward online teaching were negatively affected, leading to an increase in mental stress and a higher number of teachers quitting their jobs. The domain used for online teaching was identified as the missing dimension of an e-learning framework for effective teaching, but this area of least concern for teaching STEM online.

In post-Covid era, STEM education at the college level faced the similar challenges as primary and secondary school. These challenges include the switch to online education and the disconnection between teachers and students, however, STEM professors who prioritized open communication and leniency in policies were more successful in creating a positive and inviting learning environment for their students. The use of online resources such as office hours and tutoring services also aided to bridge the gap between students and teachers.

The pandemic wasn't the tragedy to education that it could have been. It has shown that the education system needs to be more adaptable and flexible to ensure that students and teachers receive the assistance they need in times of crisis. STEM education, in particular, needs to be reevaluated to address the challenges and changes brought about by the pandemic and to provide a more effective learning experience for students. The efforts of teachers and educators to adapt and overcome these challenges is a start, and it is through their resilience and determination that STEM education will continue to thrive in the post-Covid era.

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