Effects of Blended Learning on Student Achievement and Motivation in a Mathematics Classroom

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Abstract

Education is continually evolving to satisfy the advances made within society to better adhere to students' needs on a day-to-day basis. The aftermath of a pandemic year in education unlike any other resulted in a dire need for technology and the use of online platforms to provide content and instruction to students of all ages. As education has faced a remote, digital environment as well as face-to-face instruction, the blended learning model provides an opportunity for aspects of both platforms to be incorporated into students' education. The components of this article discuss the effectiveness of the blended learning model, specifically in students' academic achievement, motivation, and independent learning, to ultimately set students up for success.

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A true passion as an educator is watching students succeed and reach their full potential as learners. As a first-year educator, I have seen a significant decline in the interest of students in mathematics. Throughout a year of unknowns due to a pandemic, both teachers and students have had to significantly adjust their teaching and learning styles to adhere to the uncontrollable situations presented. The increase in the use of technology has begun to create a negative connotation in my district because, like all educators, the students are tired of the lack of normalcy within their education. Given these unpredicted factors, teachers, including myself, were at a loss for the next steps on how to accomplish that true passion. As I was faced with both digital and face-to-face instruction, it became clear that students need a balance of both to reach their academic potential in mathematics, while also attaining the social development skills that a classroom setting provides.

Digital learning required students to participate exclusively through an online platform, while face-to-face instruction included teacher instruction and assignments in an in-person environment. To combine the most effective components of both learning models, blended learning is the integration of technology in a classroom setting. The implementation requires an extensive understanding of students' individual needs, which ultimately sets them up for success. The flexibility of technology can adapt and personalize content and instructional strategies by personalizing them to support individual students' needs (Bryant & Fazal, 2019). The incorporation of flexibility within

this model could potentially eliminate the amount of burnout many of the students are experiencing.

A common trend in today's society is the amount of technology and technological advancements that students experience and demonstrate familiarity with on a day-to-day basis. To promote student success, it is important to highlight students' technological skills as assets and incorporate them into the classroom. As education continually evolves, the assumption is that technology will continue to evolve and be an everlasting component of students' careers to follow as they advance in their education and life itself. The blended learning model is highlighted for its technological advances to not only assist students in their learning but also prepare students for the continuous advancements in technology as the generation progresses (Iyer & Pitts, 2017). The sole purpose of investigating the effectiveness of the blended learning model is to ultimately decide if it provides an academically challenging environment, while also preparing students to succeed in all their future endeavors. The claims of this model adhere to the passion of educators to provide a great educational experience for each student.

A common misconception regarding blended learning is that it is difficult to find a balance in the implementation of face-to-face and digital instruction, specifically in mathematics. As I experienced this year, this can lead to student exhaustion, which decreases levels of student achievement and motivation altogether. To avoid students' disengagement from technology in the classroom, the blended learning model is established to be used in a positive, reinforcing way to challenge and enhance students' mathematical skills and levels of understanding through practice and demonstration. Through the underlying concern of online platforms replacing the role of educators,

Fazal et al. (2020) incorporate data that discusses the use of technology and online platforms cannot replace a teacher, as well as face-to-face instruction. Rather than completely dismissing the role of a teacher, the blended learning model has demonstrated that effective technology implementation takes students' learning process to the next level (Iyer & Pitts, 2017). For a teacher that is incredibly outnumbered by students, the implementation of technology appears to be an effective strategy to provide necessary skills and feedback to individual students.

Technology is often deemed negative in a school setting, and while I do agree that it can be an overbearing issue at times, it is consistently our job as educators to adapt and adjust to provide what our students need. Our students need us. That is inevitably true, but they also need to be challenged and always supported. The blended learning model presents an opportunity to highlight our role as educators, while also promoting technology that the students are familiar with and will continue to use as they continue their life and education. If we want the best for our students' education, blended learning is a learning model that needs to be explored.

Review of Research

Blended learning is categorized as an effective learning model that highlights the implementation of technology in the quintessential classroom. This model can be interpreted in a variety of ways that complement both teachers and students. An effective way to incorporate this model into the classroom is to use it for differentiation purposes. The teacher could deliver content and instructions in a face-to-face setting. After the content is delivered, students could practice their skills with technology to provide them the skill level that is needed. Vice versa, an educator could introduce

content through an online platform such as Nearpod. After this, the students could collaborate in an in-person activity or task. Both are very beneficial depending on the task and instruction that is being provided. Flexibility is an essential factor in any type of learning model because all students have different learning styles. This also puts effectiveness into question for a singular learning model, such as blended learning, to be successful for all students. The goal of blended learning is to strengthen the necessary skills for students to be classified as successful.

Academic Achievement

The implementation of a blended learning model directly affects the outcomes of academic achievement through quantitative and qualitative data measures. Students in blended learning classrooms demonstrated more growth percentage on the Measures of Academic Progress (MAP) assessment, while students in a face-to-face classroom excelled more on the State of Texas Assessments of Academic Readiness (STAAR) (Bryant & Fazal, 2019). The two tests represent different skill sets as the STAAR test measures grade-level content, while MAP scores reflect on skills incorporated in grades K-12. Through over a 2-year study, MAP scores increased in the blended learning mathematics classroom, but it was the implementation of blended learning that directly correlated with the score increase (Fazal et. al., 2020). The effectiveness of the blended model demonstrates increases in mending student gaps and deficits to excel through MAP growth scores.

The quantitative data presented discusses how blended learning affected academic achievement in mathematics students. Quantitative data is essential in mathematics because of the state-wide testing of this course, so the academic

achievement is deemed necessary, specifically with this attentive subject. The quantitative data is inconsistent with its results and lacks research about this topic. These results are fully dependable on results that do not include any other factors besides test scores. While quantitative data is extremely important, it cannot be the only data that is considered. Qualitative data is the “behind the scenes” data that lead up to the result of quantitative data. This type of data represents the quality of work being done within the classrooms that are easily attainable. It highlights observations, strategies, and room for improvement to lead to desired results from blended learning models (Fazal et. al., 2020). Qualitative data is easily accessible through the implementation of technology in a blended learning setting. Teachers can retrieve data on individual students almost instantly so that the next steps to support each student can be made. With that data, direct feedback from students’ workpieces can be delivered immediately to the student, which allows for interventions and differentiation to be put into action. These strategies would positively impact academic achievement because students’ deficits and gaps are being addressed immediately, which will increase students’ skills and abilities throughout the school year.

Student Motivation

The intense effort among schools to increase academic success is futile without the presence of student self-motivation. An increase in student feedback promotes a positive impact on students learning; thus, it increases student motivation within the classroom. Through the incorporation of a blended learning model, feedback is more accessible and relatively quicker than a traditional setting due to the implementation of online platforms. In a traditional setting, it is nearly impossible to be consistent with

helpful feedback due to the teacher-to-student ratio. With online platforms, students' scores are available immediately following completion, where the teacher can provide direct, efficient feedback either through an online messaging forum or student conferences. With instant and accurate feedback, students' individual needs can immediately be addressed to progress towards a deeper understanding of content (Fazal et. al., 2020). This provides students with the confidence and motivation to progress forward in their learning.

In a 1:30 ratio of teacher to student, the difficulty of providing effective and influential individual feedback is limited due to time restraints and an excessive workload for educators. Mistakes marked on a paper with limited to no feedback result in the inability to create a high challenge and cognitive demand environment within the mathematics classroom (Anderson et al., 2018). A blended learning model provides an opportunity for teachers and students to "use data to differentiate instruction, track and motivate student progress or growth, and create opportunities for student-directed learning and agency" (Fazal et al., p. 75, 2020). As students receive more positive and effective feedback, an increase in motivation is present.

Independent Learning

The ratio of teacher to students is often a disadvantage for individual learning strategies to be put into action. Personalized learning is available through the blended learning model as teachers can provide needs-based learning activities and forms of instruction to adhere to individual students' needs. When students become active in their learning, they can see what learning styles and pacing strategies work best for them to be successful (Chapman & Mitchell, 2020). While the implementation of

personalized learning strategies requires structure, students often have control over their own pace of learning, which helps them adapt to their strengths. To ensure the effectiveness of this learning strategy within the blended learning model, multiple supports need to be provided to the student, class, and personal communities (Borup et al., 2020). Although the software and online programs vary upon the district, students can work at their own pace to deepen their understanding of a mathematical concept through online applications (Iyer & Pitts, 2017). These platforms vary across districts, but with any platform, educators must become familiar with the online platforms available to them.

In my experience, success in math requires the incorporation of student collaboration. Students can learn best when they are thought-provoking conversations about the content. The balance of face-to-face instruction and online learning in the blended learning model directly affects the amount of student collaboration. A balance is required to incorporate effective mathematical collaborations, including those with and without the use of technology. As mathematics is widely known as a subject that causes anger and frustration, this often leads to a lack of motivation in a mathematics classroom. In Anderson et al (2018), an anonymous 5th-grade teacher spoke on their experience with student collaboration:

> I've gone from direct instruction (DII) with little exploration of tasks to a complete shift of teacher role and I've become a facilitator. I anticipate their answers to math tasks, but they share their thinking and ask each other questions. They clear up their misunderstandings most of the time with little direction from me. My students are thoroughly enjoying math. (p. 33)

Through a blended approach, students are given more opportunities to take ownership of their learning, while collaborating or working independently, because they are responsible for certain components of the material.

In a long-term blended learning model classroom, a digital, collaborative activity demonstrated that the two emotions that were studied to cause the biggest decrease in student motivation are fear and anger. Likewise, emotions such as excitement and happiness directly increase student motivation (Arguedas et al., 2016). Diminishing these emotions to promote student motivation requires positive implementation of learning strategies and student collaboration, specifically in a blended learning model classroom. Through a simulation of educators in Virtue (2021), a model that highlights, team, task, and time, was used to demonstrate a blended learning model that values student collaboration, task incorporation, and time spent on each section. Through blended learning, time is an important factor to ensure that rich discoveries are being made during face-to-face as well as online instruction (Virtue, 2021).

Independent learning strategies are essential in increasing student growth percentages in a mathematics classroom. Blended learning intends to adhere to all learning needs and learning styles to maximize student understanding (Bryant & Fazal, 2019). As students' individual learning needs are targeted, students are open to more opportunities to demonstrate a deeper connection within the content. Students who connect their mathematical understanding to personally relevant concepts outside of mathematics achievement in the application category (Bowman et al., 2020). Students gain the ability to take concepts of mathematics and connect them to real-world problems and examples. The skills acquired through students' real-world connections

are that they “equip them to thrive in a changing world and prepare them for whatever the future holds” (Chapman & Mitchell, p. 34, 2020). The purpose of individual learning is ultimately to provide those real-world connections and understanding of mathematics to promote a positive relationship with the subject in the future.

Discussion

While the effectiveness of a blended learning model depends on the implementation process, it is evident that technology is making significant advances specifically in education. Through data and research, the positive impacts of blended learning must be taken into consideration to ensure students are prepared for a lifetime of technological advancements. In my district specifically, students are required to test using an online platform. Eliminating the use of technology in the classroom would completely put the students at a disadvantage for that sole reason. As students progress through their education, the emphasis placed on technology continually increases. Students are required to demonstrate academic achievement, motivation, and independence to be successful. The perspectives of students are a significant consideration when observing the effectiveness of a specific learning model. Promoting the incorporation of a blended learning model, Malczyk (2018) mentions the importance of technology in today’s society, where students have grown up with access to digital learning and online platforms. As society progresses, this is what to expect as educators for future students to come.

The research presents itself as positively impacting a students’ educational experience. As educators, the implementation process is what separates blended learning from being effective to ineffective. To successfully understand the blended

learning approach, educators must experience professional development in the form of a blended learning model. This allows a “learning by doing” experience, where educators can experience firsthand what strategies are most effective. While content can be delivered partially online, the in-person experience provides a perfect opportunity to incorporate collaboration with peers. In the blended learning-inspired professional development course in Anderson et al., (2018), seven in-person meetings involved discussing online learning, while also creating action plans on how to implement learning into the participants’ classrooms. Just as educators gain from this experience, students can also be participants in this effective strategy to further understand mathematical concepts. Values have a strong influence on technology practices in the classroom, so teachers must receive professional development exposure (Bowman et al., 2020). The lack of exposure ultimately leads to a lack of confidence with implementation, which provides a negative persona against the blended learning model.

The following next steps extending from this research require guidance and understanding from an educator’s perspective. The incorporation of strategies and activities that are ineffective can potentially cause negative results. While that factor is possible, educators must understand the positive data that can occur if the implementation is executed effectively. Effective strategies include using technology incorporation as a differentiation strategy to provide rigor or support for individual students. This could include but is not subjective to instructional strategies or practice with supports or extension problems. To utilize blended learning, teachers could provide recordings of the content for the students to watch digitally at home before the lessons.

The students could take notes and answer practice questions. This strategy could eliminate the notetaking process in the classroom to provide opportunities for student-centered learning, higher-order thinking tasks, and various activities. Ineffective strategies would be implementing online practice or instruction for convenience rather than including instruction that is purposeful to the content that is required for the students. This can be executed with attentive detail towards research, as well as being mindful of incorporating instructional strategies that promote academic achievement, student motivation, and independence while highlighting the individual needs of students. Teachers' internal perceptions of technology directly affect the implementation of technology (Bowman et al., 2020). As an educator, I will further approach technology as a positive influence and tool within the classroom, which will ultimately increase the effectiveness of the technology-related skills; however, if an educator demonstrates negative feelings toward the implementation of technology, the technological skills within the classroom will suffer.

Positive implications for educators, regarding the research presented, promote effective teaching strategies to create a positive environment for a blended learning classroom. Blended learning educators can invite parents and/or guardians to be a part of their child's learning to provide multiple sources of support (Borup et al., 2020) Educators, including myself, can also use this understanding to implement technology to target concepts within the cognitive domain (Bowman et al., 2020). Although individual classrooms can succeed, it is a bonus to see the same academic success in mathematics district-wide. With directions on the next steps, schools' academic achievement would benefit from incorporating structured blended learning practices into

their mathematics classrooms (Bryant & Fazal, 2019). An effective approach to the model would be intentional incorporations through the teachers by building relationships and understanding what each student needs, while also applying students' interests related to the content. The main reason for students' burn-out towards classroom-related technology is the lack of teacher presence within the classroom. This ultimately leads to frustration among the students due to a lack of understanding. Blended learning provides technology implementation when adhering to students' needs, while also providing the teacher presence that students need to excel.

Further research to strengthen the study of the effectiveness of blended learning needs to incorporate studies with structure and organization. These studies need to continually be consistent with more frequent observations to ensure honesty, random selection, a larger selection of students (Bryant & Fazal, 2019). An intentional data gathering process would provide significant results in the determination of the effectiveness of blended learning specifically in academic achievement. The quantitative data provided was inconsistent, but other factors such as qualitative data, student motivation, and independence directly produced positive results.

Conclusion

Mindful implementation of blended learning produces positive results in the determination of effectiveness. The quantitative data presented an increase in growth percentages for the MAP assessment presented in Bryant & Fazal (2019), measuring mathematical skills presented in grades K-12, while the qualitative data discussed significant improvements in differentiation and needs-based learning. As presented in this article, more studies need to be implemented to conclude blended learning as

positively affecting academic achievement on a broader scale. The increased opportunity to provide student feedback, incorporating personalized learning and independent learning strategies, directly provides opportunities to increase student motivation. The classroom environment is affected by the amount of effort from both teachers and students to provide collaborative learning opportunities while participating in a blended learning model. An increase in motivation through blended learning maximizes the amount of independence a teacher can expect from the students. Opportunities for both independent and collaborative learning enhance and deepen the levels of understanding in mathematics. An ongoing increase in technology will prepare the students for a lifetime of technological advancements; therefore, the blended approach will teach the students life skills of flourishing in an academically challenging environment and independence. As the information presents itself, the blended learning model provides the opportunity to use the best strategies in both digital and face-to-face instruction to enhance student growth performance and motivation.

References

Anderson, R., Boaler, J., & Dieckmann, J. (2018a). Achieving elusive teacher change through challenging myths about learning: A blended approach. *Education Sciences*, *8*(3), 98. https://doi.org/

Arguedas, M., Daradoumis, T., & Xhafa, F. (2016). Analyzing how emotion awareness influences students' motivation, engagement, self-regulation and learning outcome. *Educational Technology & Society*, *19*(2), 87–103.

Borup, J., Graham, C. R., West, R. E., Archambault, L., & Spring, K. J. (2020). Academic communities of engagement: An expansive lens for examining support structures in blended and online learning. *Educational Technology Research and Development*, *68*(2), 807–832. https://doi.org/10.1007/s11423-020-09744-x

Bowman, M. A., Vongkulluksn, V. W., Jiang, Z., & Xie, K. (2020). Teachers' exposure to professional development and the quality of their instructional technology use: The mediating role of teachers' value and ability beliefs. *Journal of Research on Technology in Education*, 1–17. https://doi.org/10.1080/15391523.2020.1830895

Chapman, S., & Mitchell, M. (2020). Momentum in math. *The Learning Professional | www*. *41*(3).

Fazal, M., & Bryant, M. (2019). Blended learning in middle school math: The question of effectiveness. *Journal of Online Learning Research*, *5*(1), 49–64.

Fazal, M., Panzano, B., & Luk, K. (2019). Evaluating the impact of blended learning: A mixed-methods study with difference-in-difference analysis. *TechTrends*, *64*(1), 70–78. https://doi.org/10.1007/s11528-019-00429-8

Iyer, R., & Pitts, J. (2017). Teaching math to my scholars: Inner-City Middle School students. *Journal of Education and Learning*, *6*(3), 243. https://doi.org/10.5539/jel.v6n3p243

Malczyk, B. R. (2018). Multimodal instruction, the new hybrid: A student-centered approach to blended learning. *Journal of Nonprofit Education and Leadership*, *8*(1), 16–31. https://doi.org/10.18666/jnel-2018-v8-i1-8347

Virtue, D. C. (2021). Simulating collaboration in a blended course for preservice middle grades teachers: Attending to team, task, and time. *Current Issues in Middle-Level Education*, *25*(2). https://doi.org/10.20429/cimle.2021.250205