

How Implementing Technology and a Growth Mindset Has Increased Student Performance in the Mathematics Classroom



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Introduction

21st Century students now have more access to knowledge than at any other time because of technology. 21st century skills include creativity, innovation, critical thinking, communication, collaboration, character, and global citizenship. These components are interconnected and necessary to help meet the individual needs of our students. This study focused on the most effective technology, growth mindset lessons, and Common Core State Standard aligned math curriculum, for the purpose of gaining insight into how to increase quantifiable student growth in mathematics.

Implementing a growth mindset and technology in the mathematics classroom yielded the following results: increased student motivation, greater creativity shown in math, and increased student performance. This study investigates the question: *How does implementing technology and a growth mindset increase student performance in the math classroom?*

Background and Need

International, state, and local data prove that there is a need to develop strategies to increase student math scores. In 2018, fourth grade students scored lower in the area of Mathematics than in English Language Arts/Literacy on the California Assessment of Student Performance and Progress (CAASPP). In Mathematics, 18.46% scored "Standard Exceeded," 24.45% scored "Standard Met," 30.81% scored "Standard Nearly Met," and 26.27% scored "Standard Not Met." (CAASPP Results, 2018).

A Northern California school district trains and encourages teachers to focus on implementing 21st Century Skills in the classroom. This district places an emphasis on creativity, innovation, critical thinking, problem solving, communication, collaboration, character, global citizenship, inquiry and open-mindedness. (NVUSD, 2016). The belief that intelligence or other skills can be continually improved with practice causes students to develop perseverance (Robinson, 2017). This mindset ties into what this school district desires teachers to implement in their classrooms.

Literature Cited

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 Napa Valley Unified School District. (2016). *Philosophy, Goals, Objectives and Comprehensive Plans. Revised: September 15, 2016*. Retrieved from <http://gamutonline.net/district/napavalley/DisplayPolicy/162525/0>
 Robinson, C. (2017). Growth mindset in the classroom. *Science Scope*, 41(2), 18–21. Retrieved from <https://doi.org/10.2505/4/ss17pass:10410218>

Results

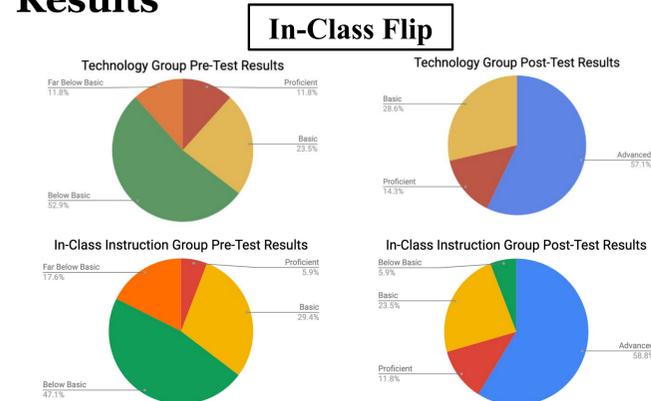


Figure 1. In-Class Flipped Model Test Results

All students took the same pre-test and post-test based on Fourth Grade Common Core State Standard 4.NBT.6. One half of the class, the In-Class Instruction Group, received lessons through direct instruction from me, the teacher. The other half of the class, the Technology Group, completed assignments with the support of teacher-created videos and CCSS-aligned videos assigned in Google Classroom. Post-test results showed that both groups led to an equal increase in student performance. Both groups had 71% of students score Proficient or Advanced. This was a 65% growth from the pre-test for students from the In-Class Instruction Group, and a 59% growth from the students who were in the Technology Group. This proves that an In-Class Flipped Model of teaching is effective.

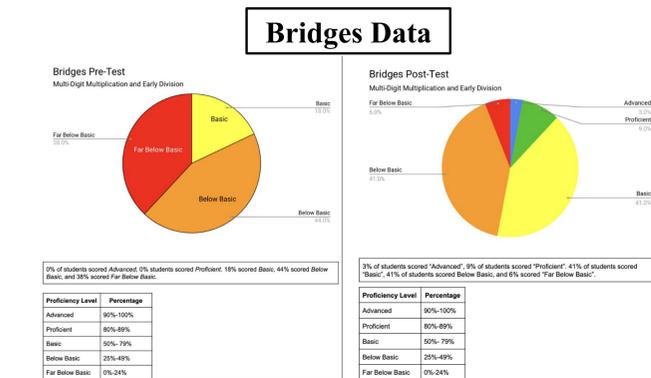


Figure 2. CCSS Aligned Curriculum *Bridges in Mathematics* Test Results

Growth Mindset



Figure 3. Growth Mindset Bracelet Student Descriptions

The graphic above displays words that fourth grade students used to describe how wearing Growth Mindset Bracelets helped them apply a Growth Mindset throughout the day.

Math Inventory

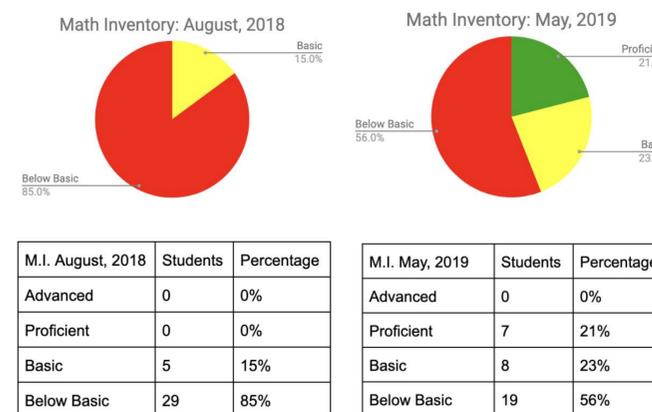


Figure 4. Math Inventory Results for a 4th Grade classroom

Materials and Methods

Students received Common Core aligned math curriculum from *Bridges in Mathematics* while receiving technology support and growth mindset lessons. Several rounds of research based on CCSS Standards, technology feedback forms, inquiry, and growth mindset surveys were conducted.

Students learned about using a growth mindset through read-alouds, collaborative activities, reflection, and videos. Figure 3 shows the words students used to describe their Growth Mindset Bracelets. These bracelets allowed them to focus on one positive phrase throughout the day, and then reflect on how that phrase helped guide their day academically and socially. The teacher transitioned from teaching a growth mindset in general, to focusing on teaching a growth mindset in mathematics. Students learned about Digital Citizenship through Google's *Be Internet Awesome*. They interacted with programs like Prodigy, Khan Academy, and Sumdog to support student learning. Google Classroom was utilized to assign videos and quizzes via Google Forms in order to get immediate student feedback and provide one-on-one support. This technology provided the opportunity to adjust student learning experiences based on student feedback, and to individualize instruction. Teacher-created video content was put into Google Classroom for students to use during an In-Class Flipped Model of teaching.

Conclusions and Next Steps

Figure 1 displays the In-Class Flipped Model post-test results for both the In-Class Instruction Group, and the Technology Group. Both groups had 71% of students score Proficient or Advanced. This was a 65% growth from the pre-test for students from the In-Class Instruction Group, and a 59% growth from the students who were in the Technology Group. This proves that an In-Class Flipped Model of teaching is effective. Continuing to create video content to place onto Google Classroom for students to access will benefit teachers each year.

Figure 4 shows Math Inventory results. These results show increased scores from August, 2018 to May, 2019. In August, 0% of students scored Advanced or Proficient. In May, 21% of students scored Advanced or Proficient. Figure 2 displays the data from a *Bridges in Mathematics* test. This data shows increased student performance. 38% of students scored Far Below Basic in the pre-test, and only 6% of students scored Far Below Basic in the post-test. 32% of students moved out of the Far Below Basic level. Students surveys provided feedback through Google Forms throughout this process. This allowed the teacher to continually monitor and re-adjust curriculum to fit individual student needs. The combination of a growth mindset, strong technology support, and rigorous common-core aligned curriculum, increased student performance and motivation in the mathematics classroom. This research study will continue to be built upon, expanded, and shared with colleagues.

Acknowledgments



I am incredibly thankful to NapaLearns for providing me with the opportunity to enroll in Touro University's Master's in Innovative Learning Program. Through of the support of NapaLearns, I have been able to enhance my teaching and apply innovative technology tools.

Further Information

Please visit <http://www.learninginnovationlab.com/perkins-home.html> to learn more about how implementing a growth mindset, technology, and Common Core State Standard aligned curriculum in the mathematics classroom has increased student performance. This site is filled with additional information and resources. You can contact me at Jennifer.Perkins@tu.edu.