Effects of Technology in Elementary Classrooms

A Mixed-Methods Action Research Study by Alice Schatz
In pursuit of a M.Ed in Teacher Leadership

Introduction

Technology plays such a significant role in our lives on a daily basis. According to the Pew Research Center (2021b), about 97% of adults owned a cell phone, 85% owned a smartphone, 77% owned a desktop or laptop computer, and 53% owned a tablet computer. Because of this increased dependency on technology and technological devices to efficiently and effectively complete tasks, students are expected to be taught these digital skills to prepare them as productive citizens starting in classrooms. In 2013, President Obama announced the ConnectEd initiative with the five-year goal of giving 99% of students access to high-speed broadband internet and teachers the tools, resources, training, and support to effectively implement technology in the classroom (U.S. Department of Education, n.d.). Since this initiative, schools have implemented technological learning programs and curriculums to develop and improve these skills. With the rise of technology use in today's society, schools put more of an emphasis on computer literacy, digital skills, and online learning tools and resources to supplement and support student learning. During my own time in the classroom, I have observed and implemented technology use in the classroom for instructional purposes with the hope to help improve student learning and understanding of curriculum. For my research study, I hope to investigate the effects of technology use by students and teachers in elementary classrooms on student learning, especially regarding student academic achievement.

Research Questions and Purpose of Study

To approach this topic, I narrowed down the focus by asking the following three research questions:

1. Are students effectively and productively learning and engaging more with technology as an educational and instructional tool? If so, how are they utilizing technology?

2. In what ways are students learning more because of this technology use?

3. What are students losing/missing by using technology?

- The purpose of the study will be to determine in what ways does technology affect student learning and engagement, which can help educators utilize and instruct students on how to utilize technology more effectively and productively in the classroom to promote student learning and achievement.
- It will highlight the perceived benefits and the drawbacks of technology use in elementary classrooms, allowing educators to make a more informed decision on the implementation of technology in their classrooms, weighing the pros and cons of technology's effects on students' overall wellbeing.

Setting

The study conducted will take place at School A Elementary School, a local elementary school in Los Angeles County. As stated previously, there are 22 teachers employed at the school, teaching one transitional kindergarten class, three kindergarten classes, three first grade classes, three second grade classes, four third grade classes, three fourth grade classes, and four fifth grade classes. Only one out of the 22 teachers are male; the rest are female.

At this local elementary school, 22 teachers are employed to teach transitional kindergarten to 5th grade. In a first grade and fourth grade class, a co-teaching model occurs, so these two classes each have two teachers instructing. According to the School Accountability Report Card for this school (California Department of Education, 2021), 529 students were enrolled at this school during the 2019-2020 school year. The charts to the right break down the number of students in each grade level (California Department of Education, 2021).

Student Enrollment by Grade Level (School Year 2019-2020)

Grade Level	Number of Students
Kindergarten	82
Grade 1	69
Grade 2	89
Grade 3	100
Grade 4	90
Grade 5	99
Total Enrollment	529

Student Enrollment by Student Group (School Year 2019-2020)

Student Group	Percent of Total Enrollment
Black or African American	2.5
American Indian or Alaska Native	0.2
Asian	5.5
Filipino	0.8
Hispanic or Latino	9.1
White	68.6
Two or More Races	12.1
Socioeconomically Disadvantaged	7.8
English Learners	11.2
Students with Disabilities	8.3
Foster Youth	0.2
Homeless	0.2

Sample

For this study, the participants will include K-5 teachers at a local elementary school in Los Angeles County, as well as a sample of third graders from my own classroom. As this study will be conducted as action research, the teachers and students all work at and attend the school that I teach at. Only 7 out of the 22 teachers consented to participating in the study. The class sample used in this study consists of 15 students in the 2021-2022 school year. Seven students are females, while the other eight are males. The students are 8-9 years of age.

Breakdown of Student Demographics by Ethnicity in Class Sample	
Ethnicities	Number of Students
White	8
Asian	0
Latinx	2
African American	0
Two Races or More	5
Other	0

Methodology

For this action research project, I conducted a mixed-methods approach, utilizing qualitative data from interviews and quantitative data from test scores to explore some typical uses and the perceived effects of technology from classroom teachers and my own students. The qualitative data in the form of teacher and student interviews identified and detailed perceptions about technology use in our classrooms from both educator and student perspectives, where I analyzed emerging themes as to its perceived effectiveness. The quantitative data extracted from a pre-test and a post-test that assessed the same content and/or concepts that the students completed before and after utilizing a technological support program. With both qualitative and quantitative data, the research results can help highlight whether or not students are learning more productively and effectively with technology use, as well as the positive and negative effects of technology use in my own school setting.

Qualitative Data

The interview process will be free response, so the participants feel comfortable and free to answer as honestly as possible. The questions asked will go as follows:

1. What kind of technology do you see being used in the classroom?

2. Do these technologies help improve lessons and/or learning? (Yes or No) If so, where do you notice these improvements?

3. What do you like about using technology in the classroom?

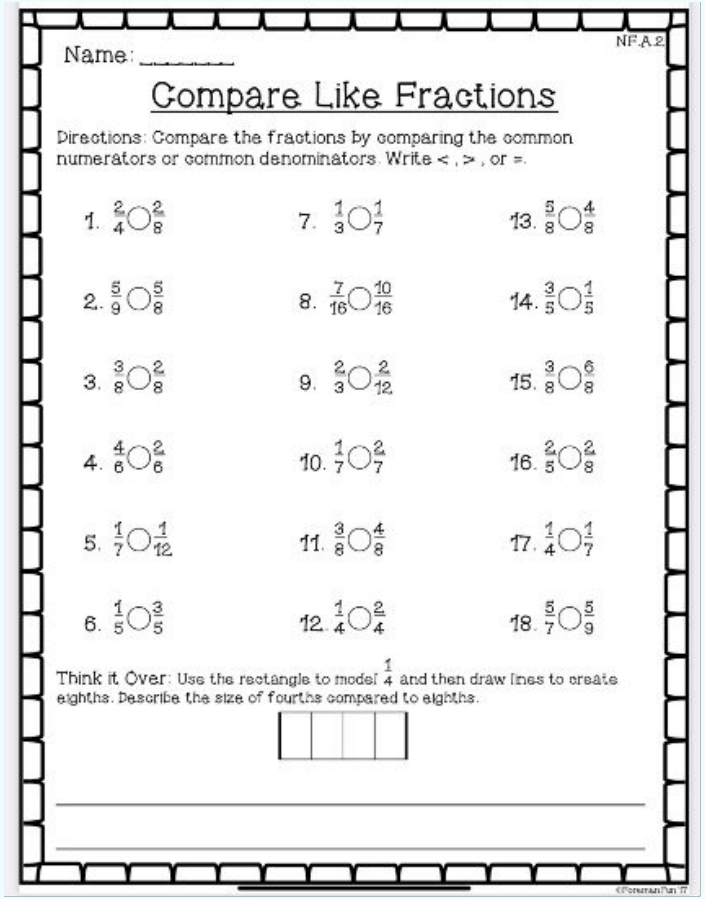
4. What do you not like about using technology in the classroom?

For these interviews, I will conduct them in-person, asking the participants to answer them truthfully and earnestly as I record their answers using voice recording. These responses will serve as qualitative data, revealing patterns or themes that may emerge from teacher and student perceptions about technology use.

Quantitative Data

A pre-test and a post-test was given to my class sample to reveal any correlation between technology use and student achievement, therefore answering the first research question on the productivity and effectiveness of technology in relation to student learning. I used the Compare Like Fractions worksheet as a pre-test to assess student understanding of the concept of comparing fractions. This Compare Like Fractions worksheet was given at the halfway point of the math chapter, assessing student understanding of the first several lessons that have already been taught (Figure 4). I taught the lessons prior to the worksheet without any reinforcement from technology to further support student learning. After the pre-test scores are recorded, I then assigned the students to practice the same skills of comparing fractions using three correlating IXL skill practices that target comparing fractions with like numerators and like denominators using and graphing them on a number line. After students have practiced these skills using the IXL skills practices, I will give the pre-test again as a post-test (Figure 4).

Figure 4. Ch. 9: Comparing Fractions Worksheet Serving as a Pre-test and Post-Test



Name: _____

NF.A.2

Compare Like Fractions

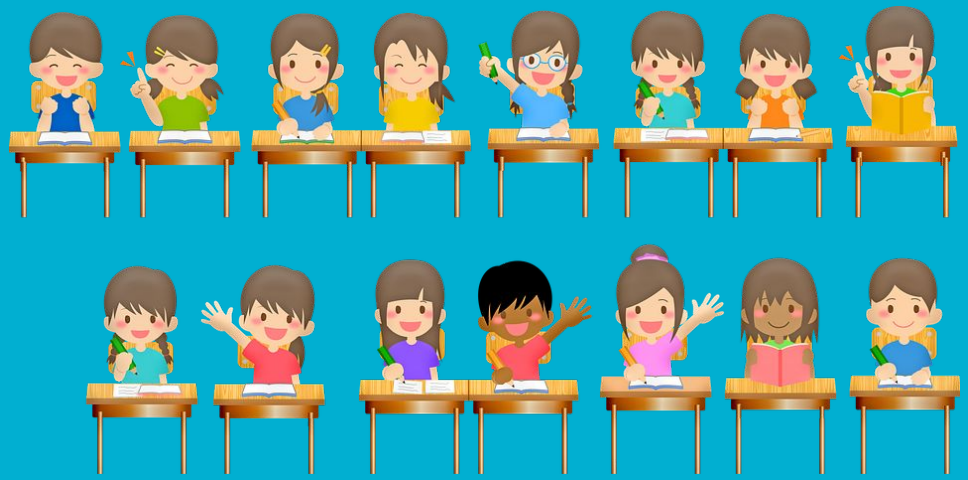
Directions: Compare the fractions by comparing the common numerators or common denominators. Write <, >, or =.

1. $\frac{2}{4} \bigcirc \frac{2}{8}$
2. $\frac{5}{9} \bigcirc \frac{5}{8}$
3. $\frac{3}{8} \bigcirc \frac{2}{8}$
4. $\frac{4}{6} \bigcirc \frac{2}{6}$
5. $\frac{1}{7} \bigcirc \frac{1}{12}$
6. $\frac{1}{5} \bigcirc \frac{3}{5}$
7. $\frac{1}{3} \bigcirc \frac{1}{7}$
8. $\frac{7}{16} \bigcirc \frac{10}{16}$
9. $\frac{2}{3} \bigcirc \frac{2}{12}$
10. $\frac{1}{7} \bigcirc \frac{2}{7}$
11. $\frac{3}{8} \bigcirc \frac{4}{8}$
12. $\frac{1}{4} \bigcirc \frac{2}{4}$
13. $\frac{5}{8} \bigcirc \frac{4}{8}$
14. $\frac{3}{5} \bigcirc \frac{1}{5}$
15. $\frac{3}{8} \bigcirc \frac{6}{8}$
16. $\frac{2}{5} \bigcirc \frac{2}{8}$
17. $\frac{1}{4} \bigcirc \frac{1}{7}$
18. $\frac{5}{7} \bigcirc \frac{5}{9}$

Think it Over: Use the rectangle to model $\frac{1}{4}$ and then draw lines to create eighths. Describe the size of fourths compared to eighths.

Results

Currently, I am still reviewing and analyzing the qualitative data from my interviews with teachers and students. From the interviews that I have transcribed and reviewed, I have documented and outlined some common themes and similarities among their responses, which can be found on the next slide. The quantitative data has been collected and analyzed in the following slides.



Results -Qualitative Data

Teachers Perceptions

- Common Technology Uses
  - Devices: Acer laptops, iPads
  - Assessment tool: RenStar, Reading Counts, Kahoot, Blooket, Freckle
  - Student engagement/ Skills Practice/ Reinforcement Tool: Lexia, Prodigy, videos, IXL, Kahoot, Blooket, Symphony Math, Khan Academy, typingweb)
  - Access/ Retrieval / Sharing of Information: Google, Google Docs/Slides, Studies Weekly online, Storyworks online)
  - Communication: International pen pals, Google Classsroom)
- Improvements? Resounding yes from all teachers
  - Increase in student motivation and engagement in learning
  - Reinforcement of skills in student learning, especially in reading and math, with repetitive practice
- Benefits
  - Useful life skills
  - Accessible assessment data
  - Allows variety and differentiation for deeper learning
  - Independence
  - Reinforcement of skills
  - Greater engagement
- Drawbacks
  - Troubleshooting technology issues (functions stop working, wifi goes out, old computers, updates)
  - Distraction/ Too much screen time
  - Access to too much/ inappropriate information

Students Perceptions

- Common Technology Uses
  - Devices: Acers
  - Student engagement/ Skills Practice/ Reinforcement Tool: Lexia, IXL, Blooket, Kahoot, Google Classroom, Prodigy, Clever Portal, Khan Academy, typing.com
- Improvements?
  - 2 students voted no, that technology use did not improve their learning and/or lessons
  - 3 students voted that it depends
    - It can help with studying/ reviewing, but not always
  - 6 students voted that technology use did improve their learning and/or lessons
    - Helped reinforce and give extra practice, especially in math
- Benefits
  - Less paper and pencil work
  - Independence
  - More engaging/ fun
- Drawbacks
  - Troubleshooting technology issues (functions stop working, wifi goes out, old computers, updates)
  - Distractions/ Students abusing it

Results- Quantitative Data

- **5 out of the 15 students' scores improved from the pre-test to the post-test (33.33%).**
  - 3 out of these 5 did score an average of 90% or higher on all three IXL practices.
  - 1 student scored an average of 46.33% on their IXL practices, while the other one student did not practice at all on IXL.
- **5 out of the 15 students' scores did not change from the pre-test to the post-test (33.33%).**
  - All 5 students scored a 90% or higher on the pre-test and scored the same score on the post-test.
  - 3 students scored an average of 80% or higher on their IXL practice,
  - One student scored an average of 78% on their IXL practice.
  - One student scored a 19% on their IXL practice, only completing one IXL instead of 3, but still scoring a 100% on the pre and post-tests.
- **3 out of the 15 students' scores decreased from the pre-test to the post-test (20%).**
  - One student scored an average of 100% on their IXL practices, but decreased by 1 point from their pre-test to the their post-test score.
  - Two students scored an average of 56% on their IXL practices, going down several points from their pre-test to their post-test scores.
- **2 out of the 15 students' scores were not used as they did not take either the pre-test or the post-test (13.33%).**

Key
Improvement in Post-Test Score
No Change in Post-Test Score
Decrease in Post-Test Score
Invalid Data

Student	Pre-Test Score	Post-Test Score	X.3	X.4	X.5	IXL avg.
1	19/21	19/21	100	x	x	100.00%
3	21/21	21/21	100	61	x	80.50%
4	10/21	19/21	x	x	x	n/a
5	20/21	20/21	100	85	83	89.33%
8	19/21	21/21	100	87	x	93.50%
10	20/21	21/21	100	81	x	90.50%
11	n/a	15/21	x	x	x	n/a
13	21/21	20/21	100	100	x	100%
14	21/21	21/21	19	x	x	19%
15	n/a	21/21	91	x	x	91%
17	11/21	21/21	100	x	x	100%
18	15/21	12/21	100	0	x	50%
19	20/21	20/21	100	56	x	78%
20	20/21	18/21	100	24	x	62%
21	17/21	21/21	100	0	39	46.33%

Discussion

Emerging Themes:

1. Most teachers positively perceived that technology generally serves as a useful tool to improve student learning and lessons, while students have a more divided perception.
2. Teachers and students agree that with technology use in the classroom, there is an increase in student motivation, engagement, and independence with their learning compared to paper-pencil tasks.
3. Teachers and students also agreed, however, that with technology use in the classroom comes with the drawbacks of technology troubleshooting issues and distractions which can pause the momentum in the learning process.

Analysis from the Quantitative Data

1. Generally, students, who repeatedly practiced on IXL and scored an average of 80% or higher on them, did show more improvement or knowledge of the concept of comparing fractions by scoring either higher than they previously did or scoring an 80% or higher on the post-test than students who did not practice or scored lower on their IXLs.
2. This data may suggest that students can productively and effectively learn using technology as a tool, as there is a greater percentage of students who improved or kept their high scores using these IXLs as an additional support.

References

California Department of Education. (2021). School Accountability Report Card. https://sarconline.org/public/findASarc

Pew Research Center. (2021b). Mobile fact sheet [Infographic]. Pewresearch.org. https://www.pewresearch.org/internet/fact-sheet/mobile/

U.S. Department of Education. (n.d). ConnectED: Learning powered by technology. ed.gov. https://www.ed.gov/connected

Acknowledgements

I would like to thank the California Lutheran Graduate School of Education and my dedicated professors for this opportunity to research this topic and the support given to me to complete this project.

I would also like to thank my school site and school community for allowing me to interview my amazing colleagues and fellow teachers and my hardworking class of students, who inspired this whole project.