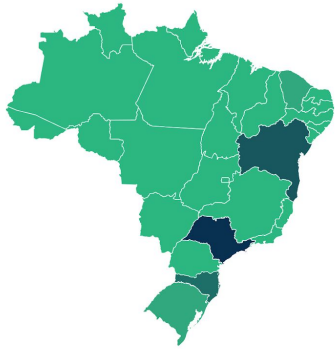# Tech 4 Teaching

Project id: SF-BS-280

Problem

With the rise of YouTube, video-based instruction has rapidly increased. Khan Academy is one of the most notable such examples. In 2019, 240,000 teachers in over 50 countries used Khan Academy. The impact of virtual learning is huge and is transforming education across the globe. So now we ask the question: Is video instruction effective?

Khan, Sal. *Khan Academy Annual Report*, khanacademyannualreport.org/parts/step-05_content.html.

Approach

Lemann Foundation Survey with Khan Academy

The Lemann Foundation teamed up with Khan Academy in 2014 to promote the use of Khan Academy and determine if students that had access to KA performed better than students who did not. His results showed that **fifth graders in math classes that used KA videos performed better**.

To determine if video learning is effective, **I tested three different learning methods** by comparing student performance with each:

1. **Reading/Writing Instruction**: The student reads a text/article, and learn from it independently.
2. **Visual instruction**: The student watches a video, without a human instructor.
3. **Auditory/Direct Instruction**: The student is taught by a virtual/in person teacher.

Khan Academy, Lemann Foundation. "Five Years of Khan Academy in Brazil, Impact and Lessons Learned." Lemann Foundation, Apr. 2018. Vidwonders.com: Why Animated Videos are Useful for Education

Hypothesis

I believe that the auditory method, or direct instruction, is the most effective method of learning.

Teachers are able to actively engage students in the material. This life interaction gives teachers the ability to tailor the instruction based on the reactions and questions of students in real time. The combination of visual and audio aids teachers often use will further improve their communication ability and student understanding of material.

Figure 6: Percentage of Kindergarten Students At or Above 40th %ile, Math SAT, Fall and Spring, by Year
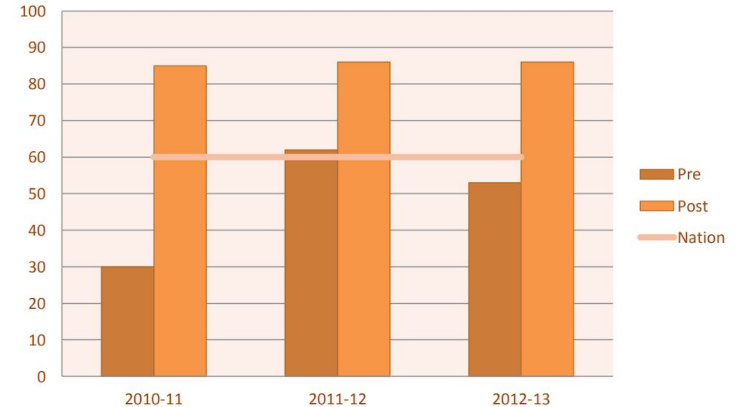
In a study done in Portland, Oregon from 2010 to 2013, Kindergarten Standardized Test scores **significantly increased** after one quarter of implementing the direct instruction learning method.

Renard, Lucie. "Direct Instruction - A Practical Guide to Effective Teaching." *BookWidgets Blog*, 28 Mar. 2019, www.bookwidgets.com/blog/2019/03/direct-instruction-a-practical-guide-to-effective-teaching.
 Stockard, Jean. "A Brief Summary of Research on Direct Instruction." National Institute for Direct Instruction, 18 Jan. 2015.

Procedure & Materials

Materials

- Scratch programming language account
- Sound & Video recording application, Youtube account (or an account to any video sharing database)
- Lesson from an Article or Section of a Textbook
- Computer, Calculator, Journal

Scratch is a free programming language created by MIT in 2007. I chose to use Scratch in my project because it is made for beginning coders like myself. I initially tried Alice, a similar language to Scratch, but I wasn't able to create effective animations.

https://stemeducationclub.com/

Procedure Part 1: Create a Lesson Plan

1. Determine a concept you would like to teach
2. Develop lessons that follow the three teaching methods
3. Video: Find a video online that teaches your concept or develop your own video
4. Textbook: Use an excerpt from an existing textbook, find an article, or develop your own
5. Classroom: Use an online teaching plan (such as from cpalms.org) or develop your own
   Lesson Plan link: https://tinyurl.com/lessonplanosf02021
6. Prepare an entrance ticket (pre-test) and exit ticket (post-test) that will be used to benchmark concept understanding.

Scratch Staff. "About." *Scratch*, scratch.mit.edu/about.

Procedure & Variables

Procedure Part 2: In the Classroom

1. Give the students the prepared entrance ticket
2. Randomly assign the students into 3 different categories: Video, Textbook, or Classroom
3. Give each group their appropriate learning materials or teach the "Classroom" group
4. Then give the students the post-test
5. Compare the post-test percentage accuracy and pre-test percentage accuracy to determine which method was the most effective

Procedure Part 3: Develop the Video

1. Create a Scratch programming account
2. Create an animation using Scratch programming
3. Add sound to it using a sound software
4. Load the animation video to the YouTube website.

Experiment Variables

Control Variable:
➢ Pre-test result: The original knowledge that the students have.

Independent Variable:
➢ Each Teaching Method: Visual, Read/Write, Auditory/Face-to-face interaction

Dependent Variable:
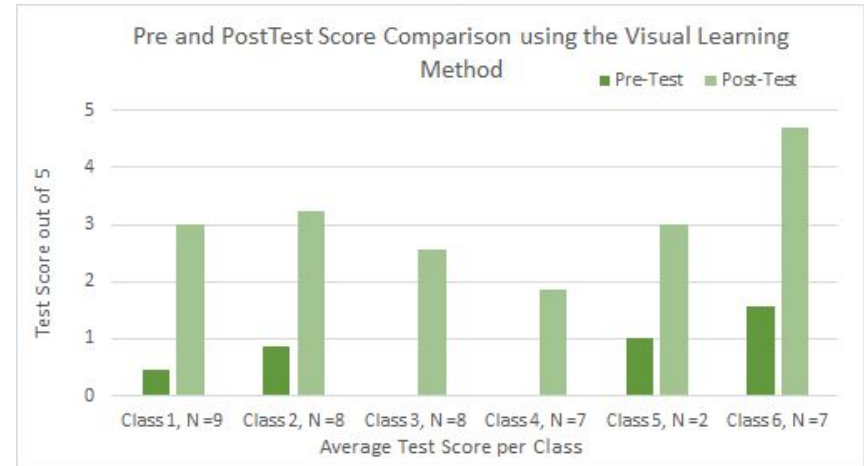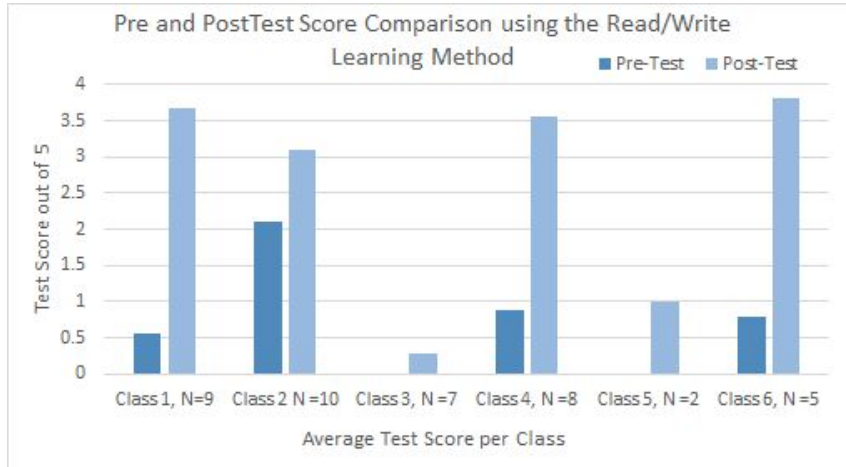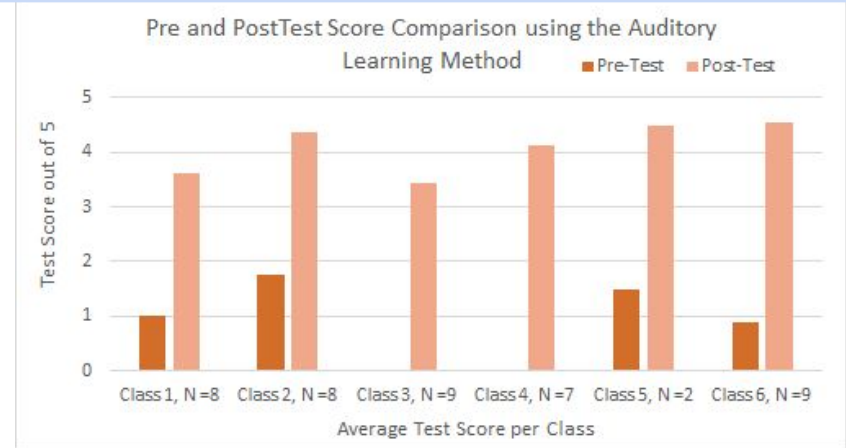➢ The Post-test results between each group: the difference between the scores

My Scratch Video:
https://tinyurl.com/tech4teach2021

Data

- N = 129 students from 6 Algebra classrooms across 3 different schools
- 258 total test = 129 pre + 129 post test

These 3 bar graphs show **the pretest and posttest scores I recorded** for each learning method across the 6 classrooms.

Pre and PostTest Score Comparison using the Auditory Learning Method

Pre and PostTest Score Comparison using the Read/Write Learning Method

Pre and PostTest Score Comparison using the Visual Learning Method

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Data Analysis

Class	Type	Student	Pre Test Score	Post Test Score	% Test Score Increase
Class 2	Read/Write	26	2	2	0%
Class 2	Read/Write	28	1	4	60%
Class 2	Read/Write	30	1	2	20%
Class 2	Read/Write	35	1	1	0%
Class 2	Read/Write	37	5	4	-20%
Class 2	Read/Write	38	1	4	60%
Class 2	Read/Write	42	0	5	100%
Class 2	Read/Write	44	4	3	-20%
Class 2	Read/Write	46	1	2	20%
Class 2	Read/Write	50	5	4	-20%
Class 2	Auditory	29	1	5	80%
Class 2	Auditory	32	0	5	100%
Class 2	Auditory	34	1	4	60%
Class 2	Auditory	39	1	5	80%
Class 2	Auditory	41	5	5	0%
Class 2	Auditory	43	1	4	60%
Class 2	Auditory	47	1	3	40%
Class 2	Auditory	49	4	4	0%
Class 2	Visual	27	1	3	40%
Class 2	Visual	31	0	2	40%
Class 2	Visual	33	0	4	80%
Class 2	Visual	36	1	4	60%
Class 2	Visual	40	2	5	60%
Class 2	Visual	48	1	2	20%
Class 2	Visual	52	0	4	80%
Class 2	Visual	20	2	2	0%

- This is an example of one of my data tables for each learning method. Shown here, are the readings from Classroom 2.

- To calculate the percentage score increase, I subtracted the percentage of the pretest from the posttest

  Posttest score - Pretest score = Score increase

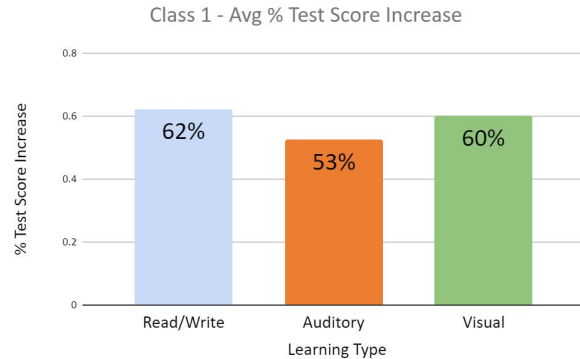- For example, student #34 received a 1 out of 5 on their pretest and a 4 out of 5 on their post test.

  $\frac{1}{5}$ x 100 = 20%
  $\frac{4}{5}$ x 100 = 80%
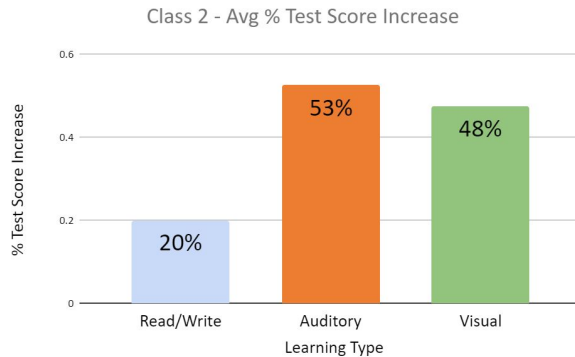
  80% - 20% = 60% increase

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Results

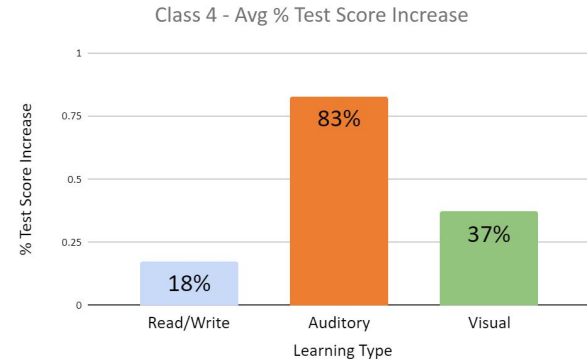I organized the data by classroom and learning group to determine which learning method was most effective.

Class 1 - Avg % Test Score Increase

Read/Write: 62%
Auditory: 53%
Visual: 60%

Learning Type

Observations taken at Warren Jr. High, Jan 2020

Class 2 - Avg % Test Score Increase

Read/Write: 20%
Auditory: 53%
Visual: 48%

Learning Type

Observations taken at Warren Jr. High, Jan 2020

Class 3 - Avg % Test Score Increase

Read/Write: 6%
Auditory: 69%
Visual: 51%

Learning Type
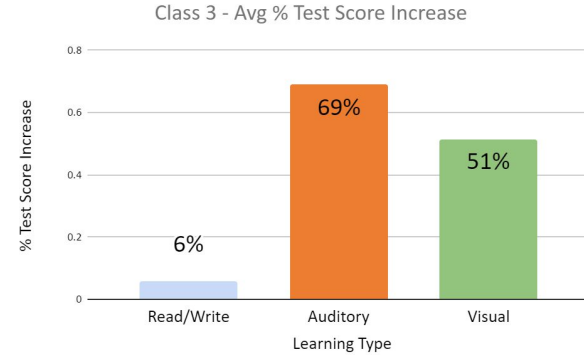
Observations taken at South High School, Jan 2020

Class 4 - Avg % Test Score Increase

Read/Write: 18%
Auditory: 83%
Visual: 37%

Learning Type

Observations taken at Grimmway Academy, Jan 2020

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Results

Possible errors:

- No understanding of the project
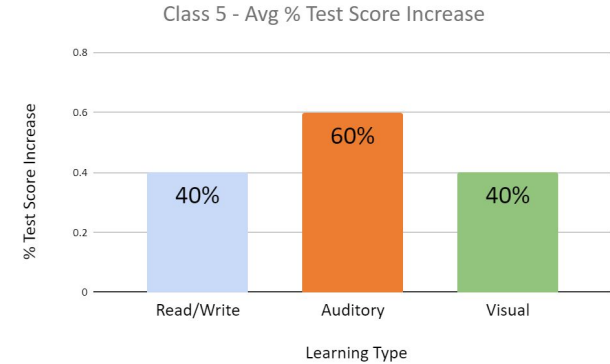- Bad internet or WiFi

Problems faced:

- Find the best way to create the video
- Finding a teacher or adult supervisor on school payroll and class willing to participate
- Engaging the class while conducting the experiment
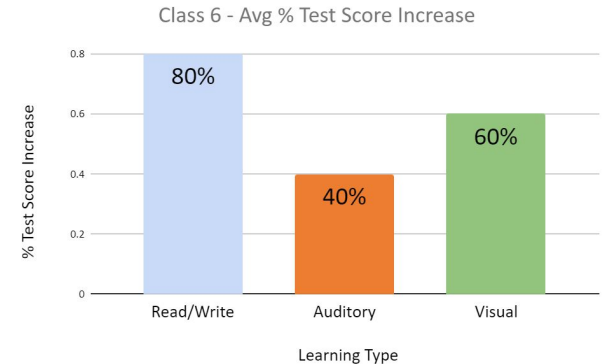- Transportation to conduct the project

How were results affected by uncontrolled events?

- Student performance could have been affected by personal factors or distractions such as exhaustion or stress
- How well I am able to engage the students

Observations taken at Warren Jr. High Jan 2020

Class 5 - Avg % Test Score Increase

Learning Type	% Test Score Increase
Read/Write	40%
Auditory	60%
Visual	40%

Observations taken at Warren Jr. High Jan 2020

Class 6 - Avg % Test Score Increase

Learning Type	% Test Score Increase
Read/Write	80%
Auditory	40%
Visual	60%

Conclusion

My Hypothesis was correct. The Auditory method, was the most effective method of learning. This is due to the score increase between the posttest and pretest.

Throughout the data, the Read/Write learning type had the lowest percentage increase and Visual was consistently in the middle. I believe this occurred because Visual learning is used more often than Read/Write with this age group (12-16). Watching videos instead of reading a text is easier for students to comprehend because of the technology that surrounded them.

Avg % Test Score Increase
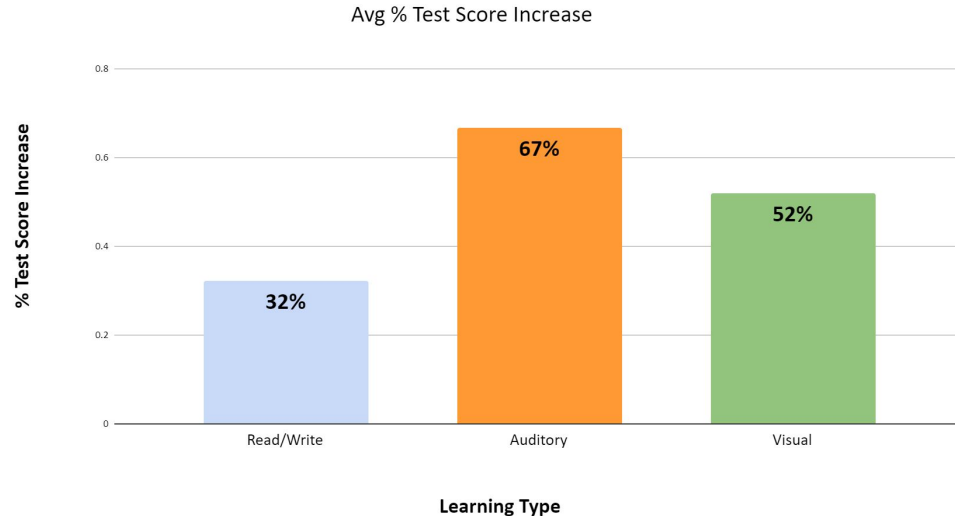
Based on my observations, it appeared that the students enjoyed the Auditory learning method the best. I tried to make the lesson engaging and interesting.

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Further Study

Zoom session, Stockdale High in Dec 2020

Covid19 -Distance Learning - Avg % Test Score Increase
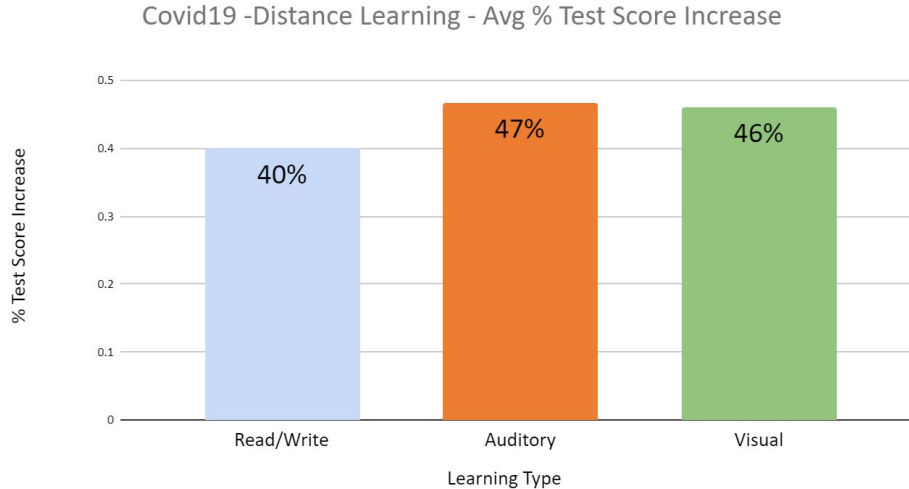
The observations above, are not included in the results and have no impact on the conclusion. It is simply a further study of my project.

Last year, I conducted this experiment in hopes of finding the best learning method, in a classroom. Unfortunately, the pandemic hit and school began to occur online. Many of the teachers in my classes began to assign us videos to complete instead of teaching us online. I was curious if the videos (visual) were more efficient than learning with an instructor (auditory). So, I tested this in a virtual classroom. As you can see, the Visual method's average score increases and is it extremely close to the Auditory learning method's. From this I can assume that the Visual learning method may be just as effective as the Auditory learning method in a virtual classroom. I'm also learning Python to elevate my knowledge so that I can create better animations in the future.

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