OZARIA

Computer Science that Captivates

Ozaria Efficacy Report Summary

McIntosh Middle School

Computer Science, and especially programming should be accessible to all students. The projected job growth from 2018-2028 in all computer science fields is exponentially faster than any other industry. (Committee on STEM Education, 2018) These skills can provide access to employment in growing fields such as software and application development (21% growth), information security (32% growth), and computer research and science (16% growth) (US Bureau of Labor Statistics, 2020). In addition, the skills that students acquire while studying computer science are deemed essential for any future career, such as computational and logical thinking, problem-solving, and digital literacy, among others.

Many students find programming courses intimidating, boring, and/or beyond their ability. Ozaria aims to give all students an authentic, engaging, and challenging experience. It is designed to accommodate students' of all backgrounds, ability levels, and interests, ensuring a positive experience that leads to further studies in computer science related fields.

What is the impact on Outcomes?

Our study looked at the impact Ozaria had on its intended learning outcomes such as:

- Students' level of engagement and enjoyment with the content
- Students' level of understanding of foundational concepts
- Students' ability to apply and extend critical thinking and problem solving skills
- Students appreciation of the real world application of programming skills and concepts and how they relate to future studies and careers

In addition to the student outcomes, we also looked at teachers' perceptions of Ozaria as related to:

- Degree to which teachers found the program easy to implement
- The amount of prep time required to deliver Ozaria lessons

To explore the relationship between the use of Ozaria and its intended outcomes, we conducted a study with:

- McIntosh Middle School, Sarasota, FL
- 3 Cohorts- 64 students total
- Mixed grade classes with students in grades 6-8
- During the 2021 Fall Semester from August to December

How Ozaria Was Used

Course Description

Three cohorts of students were studied. Each cohort had the same instructor, who is a novice teacher with advanced level coding experience. All three cohorts met 5 times a week for 50 minutes. The course was called Coding Fundamentals, and was an elective course for students with no prior coding experience.

- Cohort 1 included 17 students
- Cohort 2 included 24 students
- Cohort 3 included 23 students

The Course Construct

- Before any instruction occurred, students took a pre-assessment/diagnostic to gather baseline data on students' prior knowledge of basic computer science concepts.

- The instructor followed the provided pacing guide, using only the student-facing lesson slides to introduce new concepts.

- Students were instructed to engage with all aspects of the online content independently. They were administered short low-stakes quizzes after each lesson to assess their comprehension of both the Ozaria storyline as well as the new concept.

- Following each Ozaria module, the teacher led a full class period Exploration project where students worked collaboratively to develop a tangible object, report, or other related to CS topics, including Cybersecurity, Networking, Impacts of Computing, Data and Analysis, and Computing Systems.

- The online Capstone projects were used as summative assessments after each Chapter in Ozaria (4 total). The teacher used the provided grading rubrics to assess their students. Students were also asked to do a self-assessment of their capstone projects.

- A criterion-referenced mid-term exam was administered after Chapter 2, and a final exam at the end of the semester-long course, using 70% as the criteria.

How We Conducted the Study

- To analyze student achievement, we used a combination of quantitative data taken from student scores on pre-, mid-, and post criterion-referenced tests; qualitative data based on intake surveys, mid-point and post-surveys, frequent anecdotal evidence from the teacher, and student self-reported gains.

- To determine the impact of student engagement on performance, we used anecdotal evidence from teacher interviews and surveys of both teacher and students; and quantitative data indicating the correlation between student engagement with cinematics and achievement.

- To determine the degree of student comprehension, we used statistical models to connect student usage of Ozaria and their performance on both formative and summative assessments; and the overall progress made from the beginning of the course to the end based on assessment score data.

- To determine the level of transferable skills acquired through Ozaria, we used qualitative data taken from student and teacher surveys at the beginning, middle, and end of the course.

- To assess students' level of interest in pursuing computer science courses, we used anecdotal evidence gathered from student and teacher surveys and interviews.

- To determine the degree to which teachers found Ozaria easy to implement and the amount of time needed to prepare each lesson, we used anecdotal evidence using surveys and interviews with the teacher.

What We Learned

- Ozaria was reported by the majority of students to be a fun and engaging curriculum. Students especially noted how effective it was in teaching text-based coding, and how the tutorials, hints, and error messages provided the appropriate amount of support.

- Both teacher and students found the platform easy to implement and use.
- Almost all students surveyed said they really enjoyed being able to create their own game at the end of each Chapter.

- After using Ozaria, a majority of students reported a high confidence level in their ability to code, as well as their overall understanding of CS concepts

- After completing Ozaria a majority of students expressed an interest in continuing their studies in CS courses and/or pursuing a career in the field of Computer Science

- The teacher found Ozaria to be a superior curriculum for teaching complex coding concepts as well as essential 21st century skills, such as problem solving and reasoning, critical and computational thinking skills.

- The teacher reported that, through Ozaria, his students were able to appreciate the real world application of programming skills and concepts and how they relate to their future careers

McIntosh MS Student Reported Confidence Level

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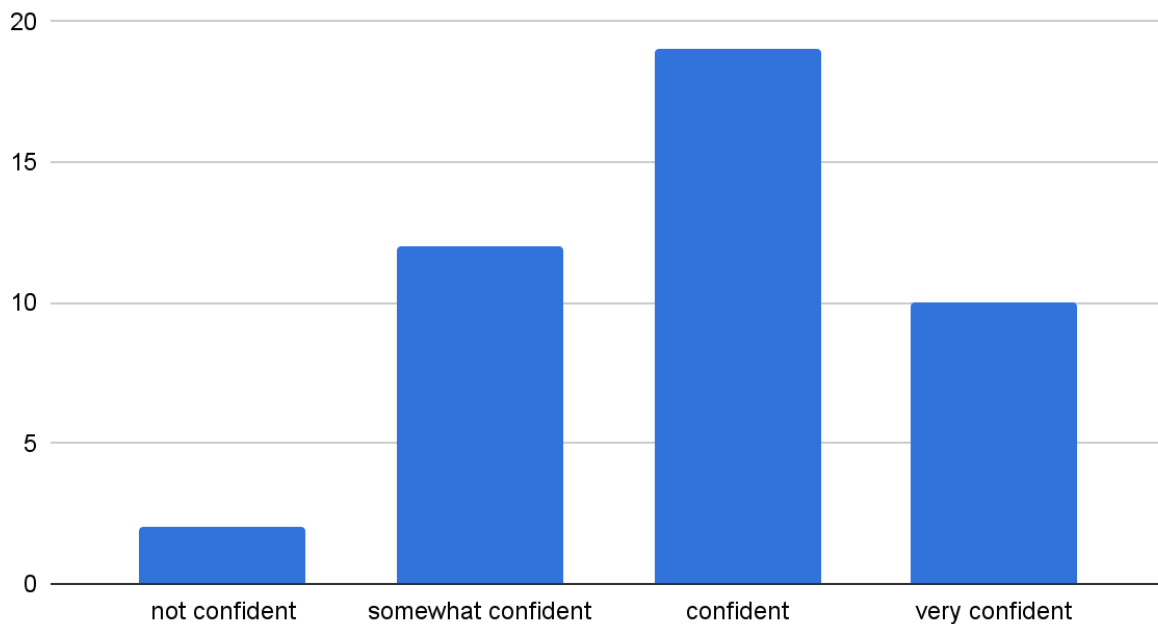
> The curriculum had students thoroughly engaged. They enjoyed the story and the characters. More importantly, they gained confidence in their ability to solve complex problems with concepts they'd learned in Ozaria.
>
> Ronnie Cox
> McIntosh Teacher

> I now know how to use lines of code for different things and can now identify conditionals, variables, and lots of other lines of code.
>
> McIntosh Student

> I would like to personally thank the team who designed and continues to improve the user interface. It was very intuitive. I was able to get going with no formal training. I was never unable to accomplish my daily lessons. And, I really benefited from the PD materials as well.
>
> McIntosh Teacher

> I like that you can make a mistake and the game corrects it or tells you that there's an error. A lot of beginners make a lot of mistakes when coding and sometimes don't know how to code so they can't correct their mistakes because they don't know what's wrong. Ozaria is the perfect coding game/app for beginners and mistakes.
>
> McIntosh Student

"

Descriptive Efficacy Statements

- More than 70% of students rated their coding confidence level as Confident or Extremely Confident after using Ozaria

- 98% of students rated their level of enthusiasm for Ozaria as high or extremely high

- Between the pre-assessment and the final assessment, students made an average gain score of 47%

- 100% of students scored above 70% on both the mid-term and final assessments

- 84% of students rated their enthusiasm level for the field of computer science as high or extremely high after taking this course
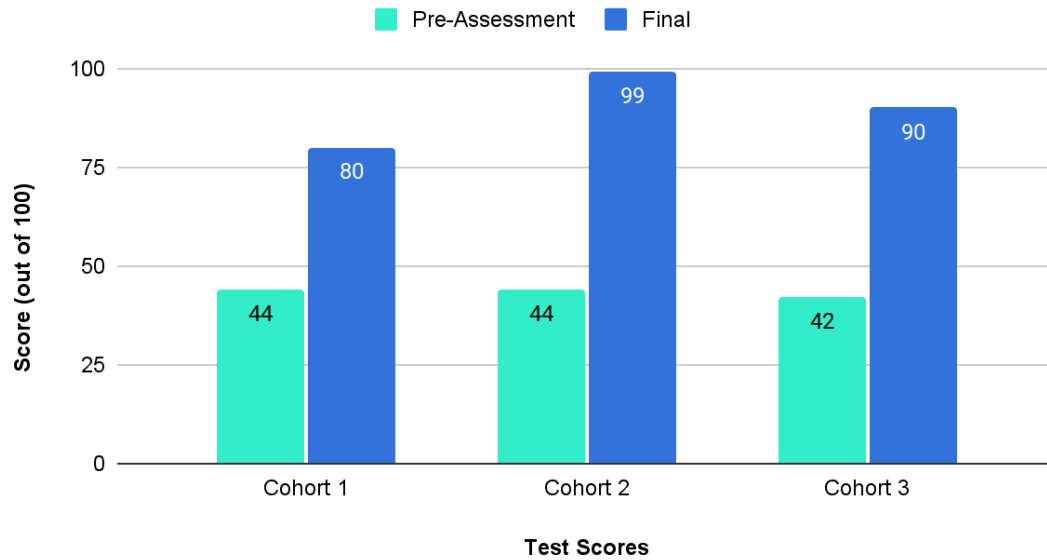
> " I cannot say enough here [re: students level of understanding]. Many of my students went from no knowledge of coding to being familiar with advanced concepts and applications within a semester. My only regret is that they didn't have this when I was learning to code! "
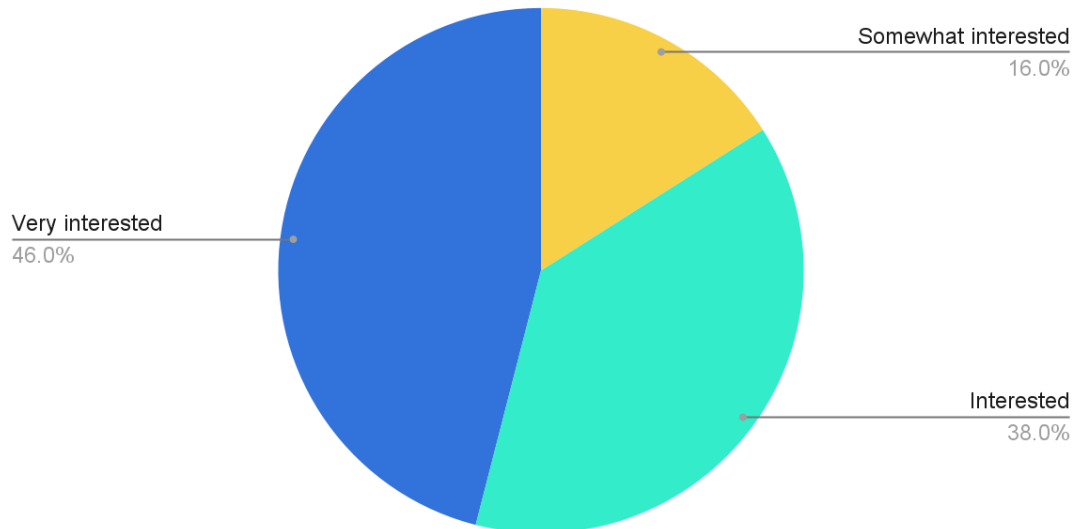
McIntosh Teacher

McIntosh MS Pre-Assessment and Final

Pre-Assessment **Final**

Score (out of 100)

	Pre-Assessment	Final
Cohort 1	44	80
Cohort 2	44	99
Cohort 3	42	90

Test Scores

McIntosh MS- Level of Interest in the Field of Computer Science After Using Ozaria

Somewhat interested
16.0%

Very interested
46.0%

Interested
38.0%

Correlational Efficacy Statements

In comparing the averages across all students from 3 different schools and 7 classes, a positive correlation (r=1) was found between performance on formative cinematic quizzes and summative exams.

What this means: the cinematic dialogues provided effective instruction and context as related to the concepts applied and assessed

Avg score on cinematic quiz vs. Avg score on summative assessment
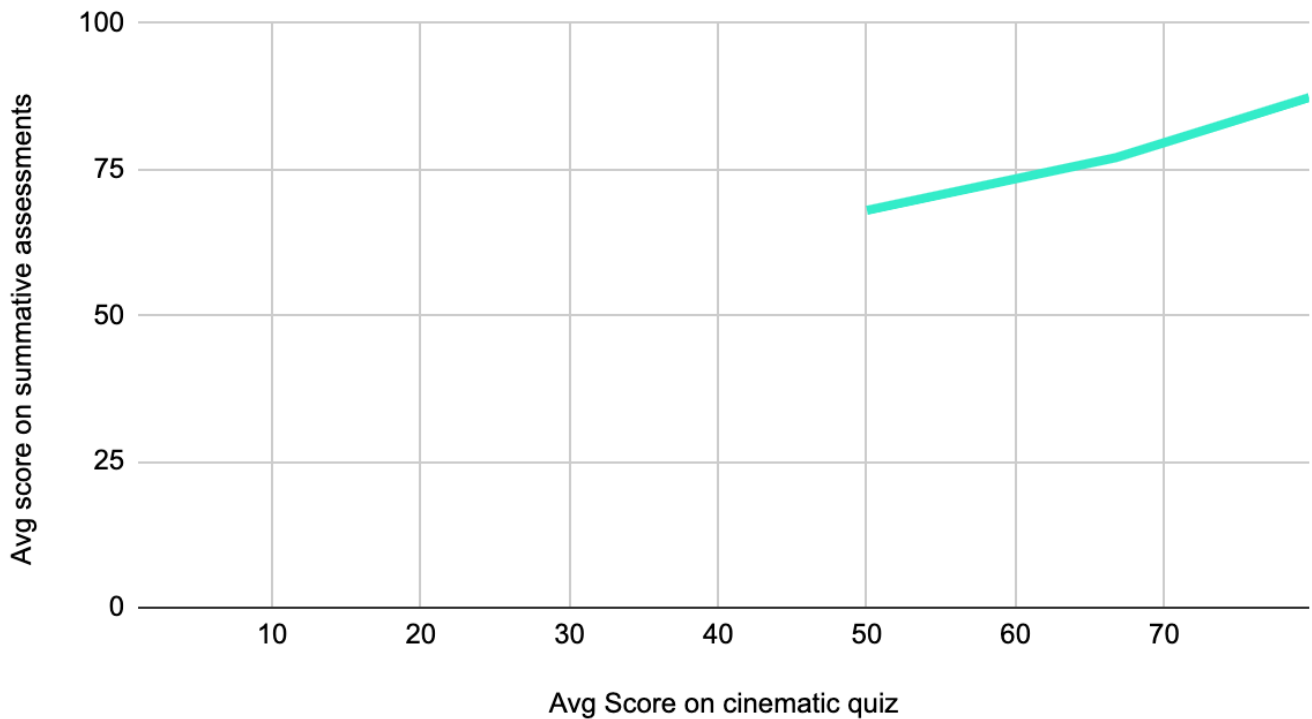
This chart illustrates a positive correlation (r) of .99 between performance on formative cinematic quizzes and summative assessments using results from 3 schools (n=3)

Final Conclusions

Ozaria has proven to have a positive impact on the student learning outcomes that matter most to both students and educators. Using defined populations and statistically sound research methods, our studies indicated the following:

1. Both students and teachers find Ozaria to be a fun and engaging platform

2. Students' score gains on assessments are statistically significant after completing Ozaria

3. Students' level of confidence in coding and computer science concepts increases greatly after completing Ozaria

4. Students and teachers find Ozaria to be a highly effective curriculum when implemented as intended

5. After taking a course with Ozaria, most students plan to continue studies in Computer Science

CodeCombat's Commitment to Efficacy

We are committed to ensuring our products have a positive and measurable impact on learning outcomes. We create meaningful learning experiences, with the learning outcomes that matter most to students, at the center of everything we do and use evidence-based best practices to design content that will realize those outcomes.