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Classtime Math

Research Foundation & Logic Model

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RESEARCH-BASED DESIGN

LXD Research Recognition for Classtime

Classtime

This product has been rigorously evaluated and is hereby acknowledged for meeting the educational impact criteria of the Every Student Succeeds Act (ESSA), warranting a Level IV for **"Demonstrates a Rationale."** This recognition is based on its proven effectiveness in enhancing grade-level learning outcomes.

REVIEWED BY THE LXD RESEARCH EXPERT REVIEW PANEL

Rachel Schechter, Ph.D.
Founder of LXD Research

September 2024

DATE

Understanding ESSA Evidence

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Educators search for high-quality research and evidence-based interventions to strengthen grant applications, to support comprehensive and targeted schools, or to implement new programming in their schools. Evidence requirements under the Every Student Succeeds Act (ESSA) are designed to ensure that states, districts, and schools can identify programs, practices, products, and policies that work across various populations.

Educational programs document their evidence of design, effectiveness, and impact in order to be eligible for federal funding. While there is no singular authority that determines a program's tier, the Department of Education's Office of Educational Technology provides standards to assess the varying levels of strength of research for education products.

The categories for ESSA Evidence are: strong (Tier 1), moderate (Tier 2), and promising (Tier 3) evidence of effectiveness, or demonstrates a rationale to be effective (Tier 4).

This product meets the requirements for Tier 4:

- Documentation of how the product's design relates to intended outcomes, with corresponding academic, published research
- Describes the product's features and outcomes in a logic model
- A study is planned and/or currently underway
- A third-party research organization has reviewed the documentation for ESSA validation

When product designers leverage learning sciences to design their programs, educators can better target instruction, and students' skills soar. Through interviews with the product designers, an evaluation of their research-informed activities, and a planning of an efficacy study, this product meets the criteria for LXD Research's ESSA Tier 4 Evidence.

– Rachel Schechter, Ph.D., Founder of LXD Research

What is Classtime?

Classtime offers an innovative platform that goes beyond traditional learning methods by integrating Strategic Thinking in Math with key features such as real-time actionable data, Strategic Thinking in Math assessments, and technology mirroring high-stakes testing environments. These elements are specifically tailored to enhance student engagement and proficiency in strategic thinking in math by helping teachers quickly understand if students are struggling with the basic concept, math-specific item types and formats, or explaining their thinking.

Strategic Thinking in Math

REAL-TIME ASSESSMENT
Saves teachers time by giving immediate insight into their students' progress

ENGAGING LESSONS
50,000 free, curriculum-aligned questions that teachers can leverage and share

DIGITAL CLASSROOM ACTIVITIES
Engage all students with Collaborative Challenges and puzzles

Personalized Data Analysis

- Efficiently track all student responses in a beautiful overview
- Leverage automated scoring and AI tools to save time
- Analyze class performance and drill down into individual student answers
- Immediately understand why and in what ways students are struggling with specific CAASPP math questions

Classtime Foundational Research Summary

In recent years, US education has faced a significant challenge: declining proficiency in mathematics among students across K-12, particularly in elementary and middle school, as evidenced by trends in National Assessment of Educational Progress (NAEP) test scores. For example, only 41% of fourth-grade students were proficient in mathematics in 2019. By 2022, partly due to COVID-related learning gaps, that number dropped to 36% (NCES, 2022). At the same time, achievement gaps between low-poverty and high-poverty students, as well as disparities by race/ethnicity, only grew wider (Kuhfield et al., 2022; Moscoviz & Evans, 2022). Furthermore, the National Research Council (NRC) has consistently highlighted the urgent need for innovative approaches to math education, emphasizing the importance of strategic thinking and problem-solving skills for students' academic and future career success (NASEM, 2022).

> "This is the best thing that has happened to me during my teaching career. You can't imagine how much easier my teacher life has become. Thank you!"
>
> ***Oksana Voloshyna, Teacher***

Classtime is uniquely designed to address these challenges by integrating embedded assessment into the learning process. Classtime's innovative platform goes beyond traditional learning methods by explicitly teaching Strategic Thinking in Math while practicing targeted grade-level standards. The platform assessments mirror the state-testing experience in a low-stakes environment to counteract the main cause of math anxiety---fear of failure (Szczygieł & Pieronkiewicz, 2022). Student performance then feeds Real-time Actionable Data dashboards to let teachers understand classwide trends and learn where every student succeeded or needed support with just a few additional clicks, helping teachers target their feedback to support student learning (Fyfe et al., 2023). The instructional routines within Classtime help teachers quickly understand students' skill levels with the basic concept, math-specific item types, and formats to identify students' needs and strengths, which is key to effective formative assessment (Martin et al., 2022). The detailed information provided by Classtime allows teachers to check students' understanding and address misconceptions so they can plan intentional and targeted teaching that is critical for learning (Fisher & Fray, 2014).

Research also shows that teachers' math teaching anxiety negatively impacts student achievement (Schaefer et al., 2021). Alternatively, when teachers are confident they have the skills and materials to teach students successfully, their job satisfaction improves, as does student achievement (Harrison et al., 2023).

The platform resources, structured routines, and consistent terminology within Classtime can boost teachers' confidence and competence in teaching math within the class and across the grade levels, improving teacher satisfaction and the school-wide math climate. Research has shown that dimensions of the class climate substantially impact individual students' mathematical self-efficacy and meaningfully explain differences in math achievement (Zedan & Bitar, 2014), and is particularly important for multi-lingual learners (Dislen Daggöl, 2019). Classtime leverages engagement features that center on cooperative challenges to promote a positive class climate around math achievement. Compared to individualistic leaderboards, group-centered gamification promotes a social learning experience that encourages knowledge-sharing and is more enjoyable (Morschheuser et al., 2017).

"Classtime's variety of tech-enhanced question types are great to verify whether my students have understood a new concept or achieved mastery. They can even use it outside of class - for homework or test preparation!"

Stefan Bernhard, Secondary Teacher

By using Classtime in their classrooms, teachers can expect to see enhanced capabilities in identifying and addressing diverse learning needs and notable time efficiency gains in their instructional planning. The platform's real-time data analysis feature allows teachers to swiftly adapt their teaching strategies and focus on specific strategic thinking gaps, thereby saving valuable instructional time. Student performance on standardized math assessments is also expected to increase, reflecting a substantial improvement in students' mathematical skills (Kay & Knaack, 2008). Educators can also expect a positive shift in students' attitudes toward math, instilling confidence and a proactive approach to problem-solving (Beasley et al., 2019; Rackoczy et al., 2020). Long-term impacts include a sustained enhancement in students' learning attitudes, a heightened interest in STEM fields, and the development of a consistent, effective teaching approach across grade levels. Teachers are expected to gain newfound proficiency and a positive outlook toward state testing and math instruction.

In conclusion, Classtime addresses a critical need in K-12 education by providing a unique, technology-driven solution to improve mathematical understanding and strategic thinking. Its outputs and outcomes are geared not only towards immediate academic performance but also towards shaping a generation of students equipped with the strategic thinking skills necessary for future academic and professional endeavors in an increasingly STEM-oriented world.

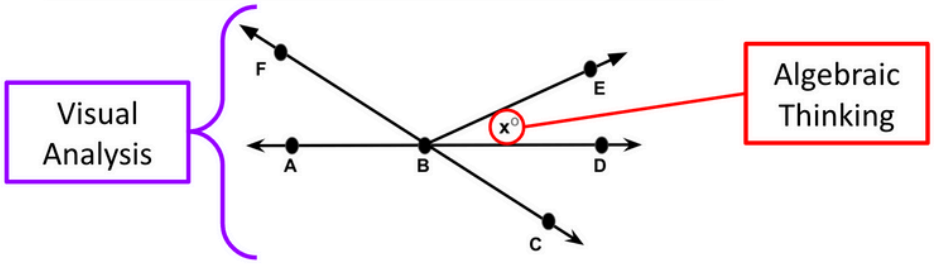
Classtime identified sixteen Strategic Thinking Types aligned with California's Standards for Mathematical Practice to help students navigate high-stakes assessment questions. Many students struggle with state assessments because they lack the skills required to comprehend what a question is asking and to explain their reasoning. Classtime's practice tests incorporate Strategic Thinking Types to familiarize students with various question formats and build their proficiency as well as their confidence.

1. Be able to recognize the Strategic Thinking Skills within any assessment question or strategy and clearly articulate it to their students.

Find the measure of $\angle EBD$ using the clues below.

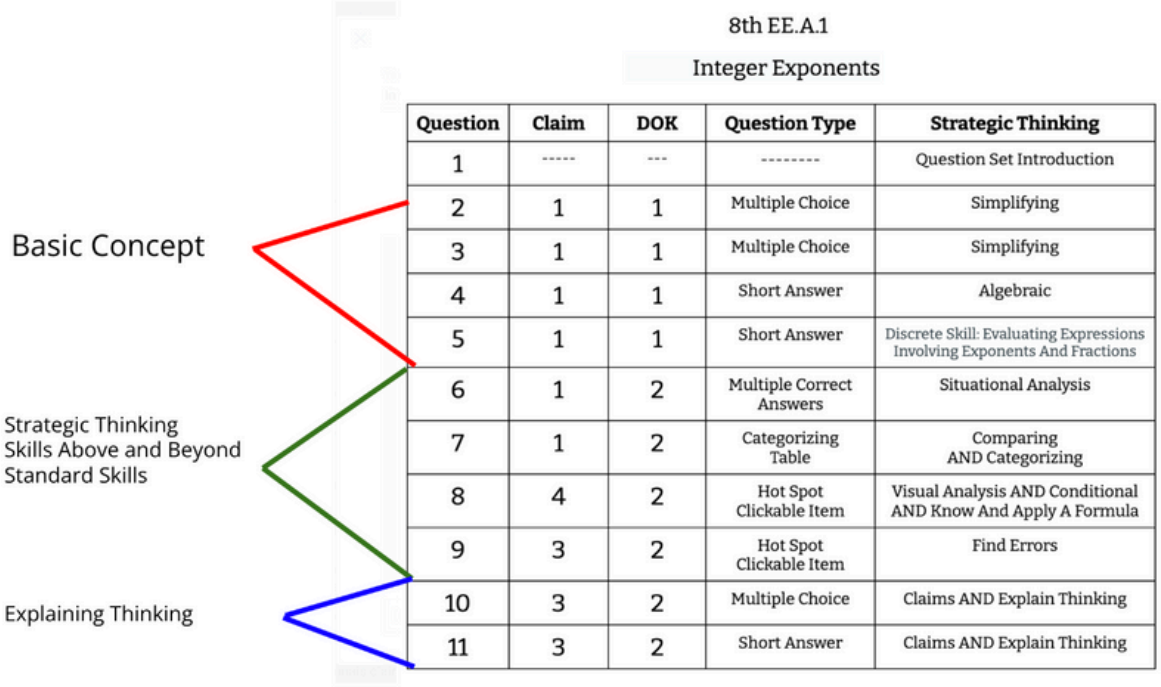
1. The measure of $\angle CBD$ is 15 degrees more than the measurement of $\angle EBD$.
2. The measure of $\angle FBE$ is 30 degrees less than the measurement of $\angle ABC$.
3. The measure of $\angle CBA$ is 3 times larger than the measurement of $\angle CBD$.

Conditional Thinking



Beyond specific math standards, mathematical reasoning and sense-making are essential for students' mathematical understanding and success (NCTM, 2009). The Classtime lessons include eleven items that intentionally build in and layer math skills, technology skills, and strategic thinking skills.

- The "basic concept" items match skills that align with what students typically see in their core curriculum, using simpler multiple-choice and short-answer questions.
- The next set of items layers in different types of strategic thinking and tech types found on state assessments, such as multiple correct answers, categorizing tables, and hot spot clickable items.
- The final items require students to analyze claims and explain their thinking. As students advance in their conceptual skills, their comfort and flexibility with strategic thinking build over time. A layered assessment routine, such as the one leveraged in Classtime, supports students' understanding of mathematical concepts and retainment of learned skills (Graham et. al., 2010).



8th EE.A.1

Integer Exponents

Question	Claim	DOK	Question Type	Strategic Thinking
1	-----	---	--------	Question Set Introduction
2	1	1	Multiple Choice	Simplifying
3	1	1	Multiple Choice	Simplifying
4	1	1	Short Answer	Algebraic
5	1	1	Short Answer	Discrete Skill: Evaluating Expressions Involving Exponents And Fractions
6	1	2	Multiple Correct Answers	Situational Analysis
7	1	2	Categorizing Table	Comparing AND Categorizing
8	4	2	Hot Spot Clickable Item	Visual Analysis AND Conditional AND Know And Apply A Formula
9	3	2	Hot Spot Clickable Item	Find Errors
10	3	2	Multiple Choice	Claims AND Explain Thinking
11	3	2	Short Answer	Claims AND Explain Thinking

Initial research on Classtime shows that integrating practice on the platform, even just a few times a month, improves students' outcomes on state tests.

> *When the kids came to me from 3rd grade, they were at 16% and then we utilized Classtime all year long, my students scored 58% in Math, an increase of 42%. That was only my first year using the Classtime platform and the math strategic thinking in my lessons.*
>
> -Teacher, Monte Vista Elementary

Classtime

Classtime Logic Model

PROBLEM STATEMENT

In recent years, mathematics proficiency has been declining among K-12 students, particularly in elementary and middle school. Classtime addresses a critical need in K-12 education by providing a unique, technology-driven solution to improve mathematical understanding and strategic thinking. The platform resources, structured routines, and consistent terminology within Classtime can boost teachers' confidence and competence in teaching math within the class and across the grade levels, improving teacher satisfaction and the school-wide math climate.

RESOURCES

What resources are or could be available?

- **The Classtime Assessment Platform:**
  - Strategic Thinking in Math Assessments
  - Real-time Actionable Data ("Teacher Dashboard")
  - Technology similar to High-stakes Testing ("Student Interface")
- **Professional Development & Training**

STRATEGIES AND ACTIVITIES

What will the activities, events, and such be?

Regular interactions with Strategic Thinking in Math assessments

- **Teachers** assign specific 10-question formative math assessments to students, either as in-class activities or homework assignments.
- **Students** interact with technology similar to High-Stakes Tests when they complete assignments by analyzing math questions, identifying, discussing, and applying relevant Strategic Thinking Types.
- **Teachers** review **Real-time Actionable Data** and plan intentional and targeted follow-up teaching and remediation strategies.
- **Teachers** attend and engage during the **Professional Development & Training**

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OUTPUTS

What are the initial products of these activities?

- **Teachers** and **students** regularly practice recognizing and articulating which Strategic Thinking skills are required in any math problem.
- **Teachers** modify existing resources to incorporate Strategic Thinking Types that were not previously emphasized.
- **Teachers** focus instruction on class-wide and individual gaps in Strategic Thinking.
- **Teachers** more regularly engage with students to analyze math problems through conversations using math content skills and Strategic Thinking terminology.
- **Teachers** use consistent terminology across all grade levels related to Strategic Thinking Types.
- **Students** actively participate in their learning process, analysis, and discussion of Strategic Thinking Types.
- **Students** engage with sense-making and reasoning across math skills, building knowledge across years.

SHORT-TERM AND INTERMEDIATE OUTCOMES

- **Teachers** better understand which math skills and Strategic Thinking Types students have mastered or need support.
- **Teachers** spend less time on data analysis and identifying targeted resources during instructional planning.
- Increase in **teacher** confidence and ability to adapt their instruction based on assessment reports.
- Improved **student** performance and decreased anxiety on math assessments within Classtime and in the core curriculum.
- Improved **student** attitudes about learning math and applying Strategic Thinking across assessment settings.
- **Students and teachers** feel a stronger sense of belonging by being better supported and connected to their math learning within their class and school.

LONG-TERM OUTCOMES AND IMPACTS

- Decrease in **teachers**' math teaching anxiety and positive change in teacher attitudes towards math instruction, resulting in increased confidence and self-efficacy.
- Decreased **teacher** time spent on remediation and increased quality of remediation instruction with students.
- More positive **teacher** and student perspectives towards state testing.
- Improved **student** academic performance on high-stakes standardized math assessments.
- Positively shift **students**' attitudes toward math, promoting a more confident approach to critical thinking and problem-solving.
- Increased **student** interest in pursuing careers in STEM fields.

ASSUMPTIONS

- Computers or tablets with internet connectivity
- School administration implements the program across the grades (for the school-wide outcomes)

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TEACHER PERCEPTION SURVEY

SPRING 2024

KEY FINDINGS

- Most teachers reported low math anxiety while using Classtime. Teachers felt comfortable answering student questions and being observed during a math lesson.
- Teachers generally feel that Classtime provides adequate access to materials and support.
- Teachers have observed higher student engagement with Classtime and feel that students are more prepared for assessments.

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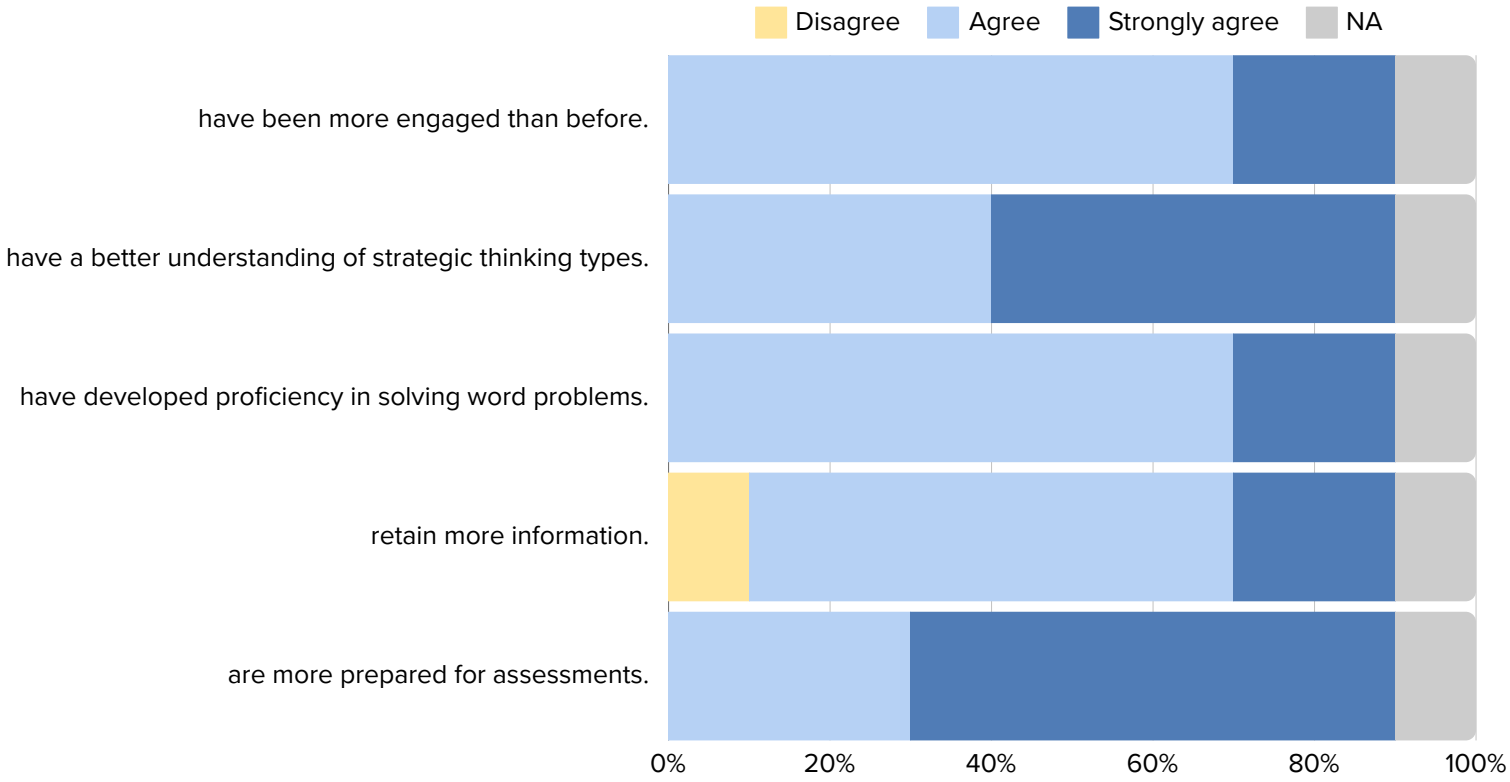
Summary

A lookback efficacy study was conducted in the Ontario-Montclair District in San Bernardino County, California during the 2022-2023 academic year. Monte Vista Elementary School began using Classtime in August 2022. Their iReady and SBAC data will be compared to two control schools to analyze the impact of Classtime. Educators at the treatment school completed a survey in late April/early May 2024.

This survey consisted of 12 questions and was taken by 10 participants in the treatment school (grades K-6). Question types were varied between multiple-choice and open-ended response, affording educators an opportunity to provide deeper feedback on particular items. Queries in the survey included respondent demographics, implementation of Classtime resources, and feedback on students' experiences.

Student Experience

Since using Classtime...



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Educator Testimonials

The following quotes were gathered during a district-internal meeting (Jan 2024) of principals and district leadership in the Ontario-Montclair District. The meeting was presented by a principal, instructional coach, and teacher who have been using Classtime with Strategic Thinking In Math since August 2022.

> When the kids came to me from 3rd grade, they were at 16% and then we utilized Classtime all year long, my students scored 58% in Math, an increase of 42%. That was only my first year using the Classtime platform and the math strategic thinking in my lessons.
>
> *Teacher, Monte Vista Elementary*

> As a teacher, I feel like it's very impactful. I feel like it's worth it. I know there are a lot of programs out there and it's hard finding the time. Sometimes you have to pick and choose what programs you are going to use. I really feel that Classtime is worthwhile.
>
> *Teacher, Monte Vista Elementary*

> It was amazing to see little third-grade students looking at a problem from Eureka Math and being able to identify the four strategic thinking types that are in that one problem and how they're gonna go about solving it. It's really amazing that that's what the kids are able to do early on.
>
> *Principal, Monte Vista Elementary*

> Our third through sixth-grade teachers had a half day each with Scott and that was like peeking behind the curtain in The Wizard of Oz. We realized this is what we're missing. After that we said A) we need more of this and B) the usage was incredible.
>
> *Instructional Coach, Monte Vista Elementary*

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