Classtime Logic Model

Co-developed with *Classtime,* with support from the Jacobs Foundation

WestEd

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Overview

From September 2023 through the end of April 2024, WestEd staff engaged in a collaborative and productive coaching process with staff from *Classtime*, resulting in a logic model describing *Classtime*'s mathematics assessment platform. The logic model is accompanied by an evidence-based and sourced preamble, which provides an overall vision for the *Classtime* platform, along with a detailed description of the platform and its features.

Classtime Vision Statement

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).

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 class-wide trends and learn where every student succeeded or needed support with just a few additional clicks. 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 & Frey, 2014).

Beyond specific math standards, mathematical reasoning and sense-making are essential for students' mathematical understanding and success (NCTM, 2009). The *Classtime* assessments include various items that intentionally build and layer math skills, technology skills, and strategic thinking skills (see "strategic competence" in NAGB, 2021). 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).

Research also shows that teachers' math teaching anxiety negatively impacts student achievement (Schaefer et al., 2021). Strategic thinking in math has been recognized as a method for reducing math anxiety and improving math scores (Passolunghi, De Vita, & Pellizzoni, 2020). Additionally, 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); this is particularly important for multi-lingual learners (Dislen Daggöl, 2019). *Classtime* leverages engagement features focused 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).

By using *Classtime* in their classrooms, teachers can expect to see enhanced capabilities in identifying and addressing diverse learning needs, as well as 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 (Boström & Palm, 2023). Educators can also expect to see 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 potential 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 with all levels of mathematics training 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 Logic Model

Inputs	→	Activities	→	Outputs	→	Short-term Outcomes	Long-term Outcomes and Impacts
Users: **Teachers** and their **students** in grades 1-8 in US school districts aiming to improve math assessment scores. Stakeholders: • Instructional coaches • Math coaches • Curriculum coordinators • Assessment coordinators • School principals • District leadership Location: School classrooms during instruction. Required Technology: Computers or tablets with internet connectivity. **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**		**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, and 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.**		**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 student 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.		Increased ability for **teachers** to understand and determine which math skills and *Strategic Thinking Types* students demonstrate mastery in, and where they 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.	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. Positive shift in **students'** attitudes toward math, promoting a more positive and confident approach to critical thinking and problem-solving. Increased **student** interest in pursuing careers in STEM fields.

Detailed *Classtime* Product Description

The *Classtime* Assessment Platform

- **Strategic Thinking in Math Assessments:** *Classtime* formative assessments are aligned with the eight Standards of Mathematical Practices and cover every CCSS math standard for grades 1-8. These assessments are designed to evaluate students' understanding and strategic thinking capabilities in math.
    - Teachers assign assessments for students to complete in class or as homework 15-30 minutes per week.
    - Teachers can also project math questions to the class and discuss various types of *Strategic Thinking*, engaging in whole-class discussions around specific assessments.
    - Students access visual mnemonics to reinforce *Strategic Thinking Types* and references during math practice.
- **Real-time Actionable Data ("Teacher Dashboard"):** The assessment platform immediately reports data on students who are struggling with content, math-specific item types and formats, or strategic thinking. This feature allows teachers to make timely interventions and adjustments to their instructional strategies. Assessments are pre-built and include AI-supported auto-grading and concise reports.
    - **Teachers** first identify specific question sets similar to the unique question types seen on relevant high-stakes tests. They can assign these sets as assessments to their class, ensuring that **students** are familiar with the exam format.
    - **Once students start interacting with assignments, teachers analyze results** and spend 10-20 minutes weekly selecting and assigning appropriate question sets for reviewing topics or teaching new content.
- **Technology similar to High-stakes Testing ("Student Interface"):** The *Classtime* assessment platform mirrors the unique item types and formats students encounter on high-stakes math assessments, helping educators prepare students for the exam format and requirements.
    - **Students** engage with *Classtime* assessments for 15-30 minutes weekly, providing regular, short-duration, and consistent exposure to strategic thinking in math without overwhelming students.
    - **Students** participate in class-wide cooperative challenges that boost engagement and motivate students to maintain and boost their skills to support their peers.
    - **Teachers** adapt their instruction to more explicitly include instruction and practice of assessing *Strategic Thinking Types*, such as revisiting basic math concept practices within their curriculum or projecting a specific strategic thinking question to practice explaining student thinking.

Professional Development & Training

Sessions are delivered in person or online, with an introduction to *Strategic Thinking in Math* as early as possible in the school year (3-6 hours), followed by grade-specific sessions in the fall and again in the spring (1-2 hours). *Classtime* professional development sessions are designed to inform educators on:

- Using the *Classtime* platform and its specific features.

- A thorough understanding of the 16 *Strategic Thinking Types* and their importance in learning math.
- How to analyze questions to determine appropriate *Strategic Thinking Types*.
- Modeling activities that promote various *Strategic Thinking Types*.
- Best practices for recognizing and instructing on the *Strategic Thinking Types* to improve test scores.

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