Measuring Math Motivation:

Kiddom's Motivation, Engagement and Persistence Metric Methodology

Overview

Kiddom's Measuring Math Motivation (M3) work was a multi-organizational effort put forward in response to a practical challenge in education research:

- We know that student motivation, engagement and persistence (MEP) has a direct connection to student math achievement
- Though validated measures exist, administering them through standalone surveys is a burden that can take time precious time away from classroom instruction
- Because it is so difficult to measure, most edtech companies don't build their tools with MEP in mind

Kiddom believes there is a better way to study these constructs and their impact on learning, one that uses a curriculum platform itself as a source of behavioral evidence while still grounding that evidence in validated research measures.

In partnership with WestEd and a large, southeastern district, supported by philanthropic funding from the Gates Foundation,[1] Kiddom developed a methodology for translating platform activity into measurable, actionable indicators of MEP.

This document describes the process Kiddom took to build its methodology, including the alignment artifacts, as well as development work required to support MEP measurement in a real implementation context. It is intended to be used by edtech operators, as well as other researchers and district partners as a practical reference point as they consider how platform-based metrics might support their own work. The specific mappings and implementation choices described here should be taken under advisement rather than treated as universal; they reflect the constraints, curriculum, and research goals of the M3 project.

Kiddom views this as active and ongoing work and welcomes engagement with researchers interested in advancing MEP-informed feature design, measurement, and evaluation.

Questions can be directed to impact@kiddom.co.

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Data is accessible for qualified researchers from Kiddom Research Studies https://www.kiddom.co/impact by completing the application for data access.

Approach

Kiddom's approach to developing an MEP metric took place in parallel across four interconnected domains:

1. **Research design and data management**
    - Of the validated MEP measures that already exist, which are right for our project?
    - Given seasonality and classroom constraints, how often can we realistically ask teachers to run these surveys?
    - How and where do Kiddom's existing platform-based metrics align with selected survey constructs?
2. **Coverage and Data infrastructure**
    - Do we have access to platform-based metrics that correlate with all required survey constructs?
    - What additional data infrastructure and product capabilities are needed to support rigorous analysis?
3. **Curriculum work**
    - What must be true of the curriculum itself to ensure frequent, consistent usage required for ongoing collection?
4. **Product development**
    - What features or specific functionality is actively driving MEP in the right direction?
    - How must the process and protocols of product design at Kiddom change based on what we know about MEP?

The result is a replicable process: a way to map platform behaviors to validated constructs, test those mappings with research partners, and refine the data model as new districts and instructional contexts are added.

Outputs

1. Research design and data alignment

Our first workstream, focused on research design and data alignment, produced the following artifacts:

Platform Activity to Student MEP Alignment: To understand what additional measurement infrastructure had to be developed, Kiddom began by mapping existing available student activity data (e.g., time spent, number of attempts at problems) to MEP survey constructs. Ultimately, by testing these proxy correlations and refining the weighting, we hope they will be able to serve as proxies for the constructs the survey is designed to measure. That means researchers and product developers could measure MEP on an ongoing basis, with fewer interruptions to teaching and learning.

Teacher Survey Activity Alignment: Knowing that teachers' own identity has an impact on their ability to implement their curriculum and attend to student MEP, we also mapped Kiddom in-platform teacher behaviors (e.g., assignment creation, grading patterns, feedback frequency) to parallel survey constructs.

2. Coverage and Data infrastructure

Following this alignment work, the Kiddom team made three infrastructure investments to support the research methodology.

Multiple Response Logs: Based on our conversations with math numeracy coaches, we knew early on that this research would require an understanding how students engage with assignments over time, including resubmission behavior, feedback response, and scoring patterns. Prior to this project, Kiddom's platform only stored the most recent submission. With our philanthropic funding, we extended our data model to capture:

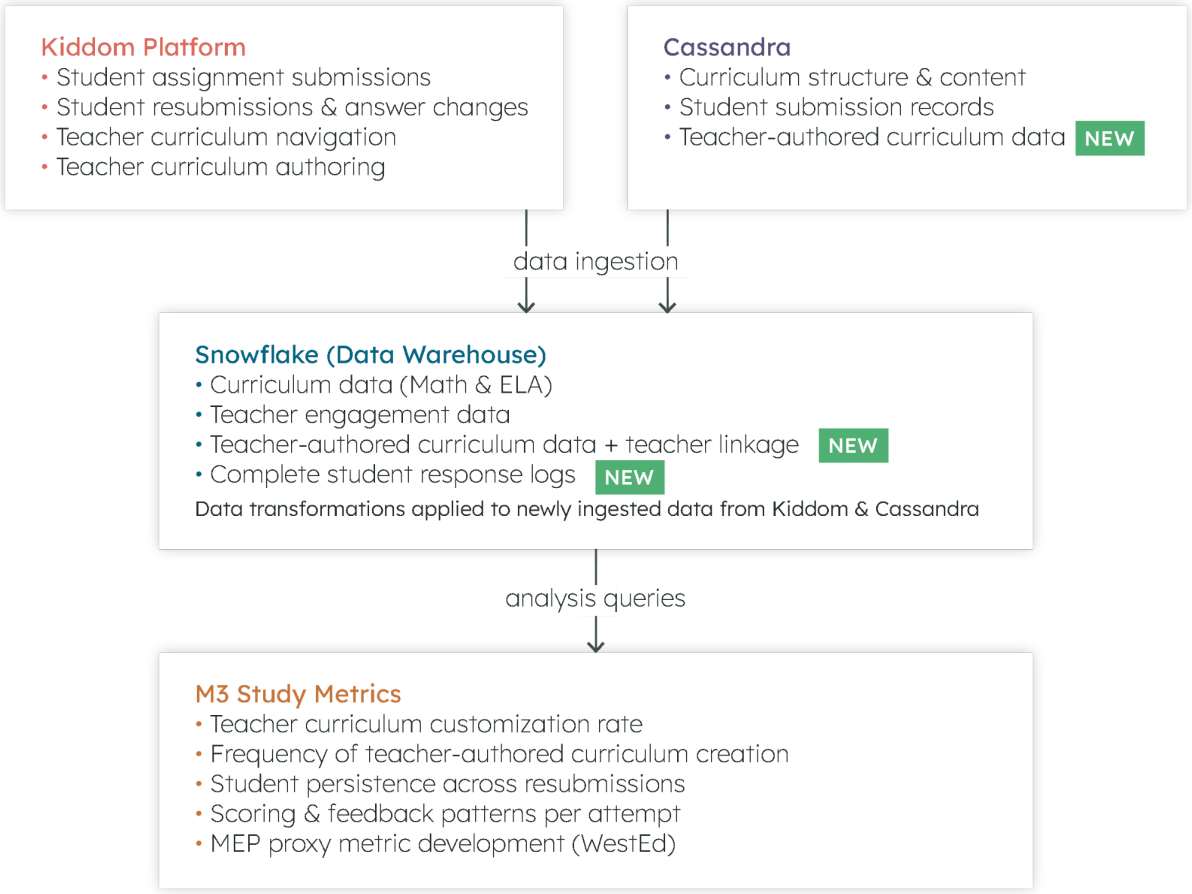
- Timestamp of each submission and resubmission
- The answer provided at each attempt
- Whether each attempt was scored, and whether by autoscoring or teacher
- Whether feedback was provided at each attempt, and whether automated or teacher-created

This change enabled the longitudinal analysis of student learning behaviors that was previously impossible.

Teacher-Created Content Collection: To support identity metrics development, we established a systematic process for collecting teacher-created materials. This dataset enables research into how teacher instructional choices correlate with the teacher identity constructs measured by the surveys.

Custom Curriculum Parsing for AI Features: Knowing our district used not just the state-aligned version of their math curriculum, but custom, derivative content that would require specialized parsing to enable AI feature support, we developed a pipeline to ingest, structure, and validate this content so it could be processed by Kiddom's AI infrastructure (pictured below).

Kiddom's M3 Data Infrastructure Architecture



AI infrastructure can ingest, structure, and validate custom district curriculum content, enabling AI features to work with locally adapted materials

3. Curriculum Work

The features and functionality we hypothesized would drive student MEP depended on structured standards alignment to generate meaningful, content-aware insights for teachers. Because the curriculum used by our research district did not contain complete standards tagging, our team had to fill in the gaps, tagging each formative assessment item to specific state standards, enabling rich assessment reporting tied to specific learning objectives.

We also developed and documented a repeatable process for integrating the district's custom slide decks into the platform: intake, upload, testing, and troubleshooting. This process documentation ensures the work can be replicated for additional content sets without requiring bespoke engineering engagement each time.

4. Product Development

M3 product development focused on enabling the experimental conditions required by the study design.

AI Features: We implemented the full suite of Kiddom AI features for our research district's custom curriculum, including AI recommended scoring and feedback, a curriculum aligned practice problem generator, and a lesson clipper that shortens lessons while maintaining curriculum integrity. For our research partner district, we implemented a custom version of these features to support the district partner's chosen curriculum.

In-App Student Survey: We planned and scoped in-app student survey capabilities, which we knew would be required to collect the student-side MEP constructs within the Kiddom platform faster and more consistently than through external survey administration.

Experimental Condition Setup: We established the process and method for managing control vs. experimental conditions through AI feature availability, specifically which students and teachers have access to which AI features at which points in the study. This gating mechanism is what enabled the study's quasi-experimental design.

Math Notebooks Investigation: We investigated and sized the ability to create in-app math notebooks for capturing student reflections on their learning, performance, and emotional responses to math. This work furthered metric development by creating a source for self-reported qualitative data on student motivation, engagement, and persistence, while also supporting direct student interaction. We selected content prompts to populate the notebook and scoped the implementation and student user research.

Future Work

M3 delivered the foundational data, alignment, curriculum, and product infrastructure needed for researchers to translate Kiddom platform activity into meaningful evidence of teacher practice and student learning.

Through the alignment artifacts, Kiddom established a clear crosswalk between platform behaviors and MEP and teacher identity survey constructs. New data infrastructure now captures student learning behaviors at the level of granularity required for longitudinal analysis, including submissions, resubmissions, scoring, and feedback patterns. The curriculum and product work also demonstrates that Kiddom can support the study's experimental conditions, tailor those conditions to the needs of school districts, and replicate the system mappings to MEP and teacher math identity for future partners.

This work positions Kiddom to successfully roll out future studies on student and even teacher MEP in math and other disciplines. We look forward to continuing to test, validate, and refine this work with our expanding customer base in the years to come.