

Title: Centering Student and Educator Voice and Expertise in Inclusive, Equity-Centered Research and Development

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Abstract

Inclusive R&D is an equity-centered, inclusive process for developing innovative research programs in partnership with students, educators, families, and communities. This symposium will showcase specific results of two R&D projects - CueThinkEF+ and Our Mathematical World - and an analysis of six projects actively engaging students and educators in Inclusive R&D. The CueThinkEF+ team will share the process and outcomes of deeply integrating teacher expertise as they sought to develop and improve a web-based learning system focused on rich mathematics problem solving and discourse. Then, the Our Mathematical World team will share their journey in the development of a mathematics curriculum overlay in which 3rd-5th grade students design stories that center themselves as strong mathematical problem solvers.

Overall Session Summary

EF+Math, an Advanced Education Research and Development Fund (AERDF) program, offers a model of research and development (R&D), Inclusive R&D, that centers communities in the co-construction of bold educational approaches that disrupt systems of oppression. Inclusive R&D is an equity-centered and inclusive process for developing innovative programs which center students and educators who have historically been left out of other design and research methods. Drawing from education research, design, and development fields, Inclusive R&D centers student and educator voices in all parts of the process to create new learning approaches that improve student outcomes.

The field of education research is increasingly incorporating perspectives of educators through research methodologies including research practice partnerships, research alliances, design-based implementation research, and networked improvement communities (Vetter et al., 2022). As Coburn et al. (2021) point out, all types of education research require collaboration with educators, but many new models pair teachers and researchers as collaborative partners. In 2016, Penuel and Coburn called for more research on partnership dynamics and outcomes. Vetter et al. (2022) pushed the field to consider how research partnerships can disrupt barriers to equity. Inclusive R&D also draws from the fields of ed tech development and inclusive design models such as participatory design (DiSalvo et al., 2017), Inclusive Innovation (Angevine et al., 2019), and equityXdesign (Hill et al., 2016). As we learn from existing work and push for

inclusive and equitable R&D, this symposium will showcase how products are better designed and research is more relevant to students and educators when they are actively engaged throughout the entire R&D process.

The EF+Math Program is structured to create space and place to bring students' and educators' perspectives and relevant lived experiences together with perspectives and expertise from researchers and developers to co-create math learning approaches. As a result, the designs and research questions become stronger, insights built from classroom and community contexts strengthen the prototype feasibility, and those intended to benefit from the solution are invested and better served. In this symposium, research and educator partners from two teams funded and supported by EF+Math will discuss the influence of this inclusive approach on the development process of their new math learning approaches. Two members from the CueThinkEF+ team will share the process and outcomes of deeply integrating teacher expertise as they sought to develop and improve a web-based learning system focused on rich mathematics problem solving and discourse. Then, two members from the Our Mathematical World team will share their journey with educators in the development of a mathematics curriculum overlay in which 3rd-5th grade students design stories that center themselves as strong mathematical problem solvers. Last, EF+Math will share the results of a portfolio-wide analysis. Attendees will be active participants, asking questions and sharing ideas and experiences. Small group time will allow for connections and idea generation, and the symposium will conclude with key takeaways to further the goals of student and educator engagement in the R&D process.

CueThinkEF+ Session

Title: The CueThinkEF+ Inclusive R&D Approach: Learners as experts & experts as learners

The CueThinkEF+ team aims to build upon the existing CueThink platform to create a web-based learning system that brings rich problem solving to all students by structuring the process, facilitating collaborative math discourse, scaffolding embedded executive functions, and making student thinking visible. CueThinkEF+ is designed with, and for Black and Latinx students and students experiencing poverty by intentionally drawing on lived experiences, identity, and beliefs.

The overarching research aim of this project is to evaluate the potential benefits of the CueThinkEF+ platform on student metacognition, executive function, and mathematics problem solving abilities. Using a quasi-experimental design, two matched middle schools were identified and recruited for participation in the study – one assigned to

use CueThinkEF+ (intervention group) and one assigned to teach using standard pedagogy (control group). The student participants (N=3550) were in 6th-8th grade and 34% self-identified as Black and/or Latinx. The implementation group (N=225) used CueThinkEF+ once every 1-3 weeks, and the control group (N=125) received math curriculum as usual.

The CueThinkEF+ application is designed with, by, and for students and teachers at all stages of the process, including prototype development, professional learning, and research. The team has established a strong co-design structure and culture, grounded in co-created project goals that are based on teachers' own math goals. Each session follows a clearly defined process that includes: stating the purpose, creating a safe space, honoring each voice, investigating and co-creating, re-voicing key themes and ideas, and ensuring accurate representation and authentic interpretation.

Instead of presenting their team's designs and eliciting feedback, the CueThinkEF+ team has opened the door to creative thinking and authentic investigation by positioning participants as designers, and encouraging them to brainstorm ideas about what's important to them and how the space should look and feel. Follow up discussions about these ideas have ensured that participants understand their voice matters, feel a part of the entire team, and confirm interpretation of the original ideas.

Results of this co-design process have led to more creative and out-of-the-box thinking. Initially, students would say phrases like 'I like that...' but with more intentionality to increase the value of their expertise, the team started to hear ideas from students like 'What if we...' Teachers too began thinking beyond their own classrooms and connecting to future users of the program. They shared examples of features in other programs that they liked or did not like as concrete examples to help the team understand their vision.

Co-design has provided opportunities for CueThinkEF+ to get a better understanding of usability and accessibility of their intervention by carefully listening to how teachers and students are using the platform. The CueThinkEF+ team will present ongoing considerations for codesign, including continuing to center the voices of Black and Latinx students, navigating the roles of experts and learners in co-design sessions, finding ways to elicit ideas without showing a design or influencing their thinking, and providing strategies to deal with time zone and time constraints when partnering with districts across the country.

OMW Session

Title: The Our Mathematical World Inclusive R&D Approach: Math Storytelling and Storybuilding

Our Mathematical World (OMW) aims to improve executive function skills, math identity, and math outcomes for Black and Latine students and students experiencing poverty through a curriculum overlay in which 3rd-5th grade students design stories that center themselves as strong mathematical problem solvers. The OMW team approaches equity-centered, inclusive R&D by aiming to create equitable access to a culturally-responsive math curriculum overlay, by embracing families and communities in a shared mission to educate every student, and by promoting continuous learning throughout the team. The focus of the OMW team has been the co-ideation, construction, implementation, and refinement of a curriculum overlay that incorporates three strands: Math Stories, Executive Function, and Problem Solving.

In response to limited teacher time during the pandemic, researchers worked with district leaders to shift the approach to co-design to ensure educators could play a central role in creating the overlay. The OMW team implemented ways for educators to participate as time allowed, including the use of asynchronous feedback logs, independent readings, and online document editing. Asynchronous teacher recommendations were presented to the team for further ideation. Equity checks, in the form of anonymous, online surveys, ensured each team member felt valued. Reflecting the cyclical nature of inclusive R&D, lessons were revised, piloted, and another round of feedback was sought. This process has resulted in a series of lessons and books that reflect district partner students' interests and identities and alignment with math curriculum and learning goals.

From the beginning of the co-design process, students and educators have significantly impacted the research and development of the OMW project. Within the series of OMW books developed, students requested the formatting be adjusted so they are able to solve the problem before turning to the next page for the solution. Students created drawings that served as the base illustrations for books four and five. Teachers have edited the text and math problems featured in each book. Teachers have strengthened the illustrations in every book by ensuring classroom layouts were true to current educational practice, including characters of differing abilities, and ensuring the math problems were visualized in meaningful ways. Additional teacher impact has occurred in the overall modification of the overlay timeline to better fit within instructional goals, shortening the text and broadening the interactive capabilities of the "Math Doer Bios," and the refinement of executive function lessons.

The full 9-week curriculum overlay pilot study was conducted in Spring 2022 with 8 teachers and 119 students. Five teachers from one district began implementation, and after three weeks, their feedback directly informed the revisions to materials for the second district. Three teachers from a second district then started the program. Teachers from both districts came together monthly with core members of the R&D team to discuss comments from their implementation logs and suggestions for revisions. Overall, the current, revised lessons (to be used by new teachers in the 2022-2023 year) are a result of the co-ideation and co-revision built from centering student and educator voices.

EF+Math Session

Title: Equity-Centered Inclusive R&D: Analysis and Themes

EF+Math funds and supports teams of researchers, educators, and product developers to co-create bold but attainable approaches that promise to dramatically improve math outcomes for students in grades 3–8, with a focus on Black and Latinx students and students experiencing poverty, by strengthening executive functioning skills. Our Inclusive R&D approach utilizes a set of principles and practices to center students, educators, and families throughout the R&D process. Our theory of action is that through Inclusive R&D, equitable *processes* and teams of equity-centered and engaged *people* will develop innovative *prototypes* that create transformative gains in outcomes for Black and Latinx students and students experiencing poverty, and ultimately all students.

To understand the nuances of how Inclusive R&D looks across multiple project teams, EF+Math completed a mixed-methods review of the processes by which six funded teams have implemented Inclusive R&D, including how they have integrated principles of equity, inclusion, and co-design to center students and educators in the development of new math learning approaches. EF+Math will share learnings of this analysis, including understanding the role of equity in partnerships, important structures to guide Inclusive R&D, and strategies for supporting research teams and districts.

The mixed-methods review of six funded teams was completed with quantitative analysis of bi-annual surveys and qualitative analysis of interviews, focus groups, and collaborative learning tools. EF+Math surveyed district representatives and R&D team principal investigators twice per year to gather both formative and summative information on inclusive R&D practices. Semi-structured interviews and focus groups were conducted with researchers, developers, teachers, district administrators, and

EF+Math program staff. A collaborative Miro board collected learnings at multiple touch points with members of the EF+Math community. Through analysis of all forms of data, EF+Math identified common approaches and barriers to implementing Inclusive R&D processes and the ways in which shifting R&D practices to be more equity-centered and inclusive have influenced the design and evaluation of the math learning approaches.

The learnings from this work are expansive and ongoing; however, preliminary analyses have pointed to key learnings about the role of equity in Inclusive R&D, important structures to guide Inclusive R&D, and strategies for supporting teams implementing Inclusive R&D. Equity-centered processes can be supported through both intentional design and by leaving room for growth and iteration. Similar structures for inclusive work have been most successful with a strong framework (e.g. team charters) and room to adapt and grow (e.g. variation based on maturity of the partnership, additions based on new learning). With the goal of helping multiple teams develop partnerships in various contexts, supports such as educator and content-area advisors, collaborative opportunities to discuss key expectations, and community learning have supported the outcomes. EF+Math aims to contribute to the existing literature and provide practical tools and frameworks that can help other multidisciplinary teams work towards more inclusive and equitable research and development practices.

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