EF+Math Program

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Community Learning Event: Rapid-Cycle R&D

Description

This resource is provided as an example of the Inclusive Research Key Action of "Set research priorities with educators, students, and families, and adapt research methods based on their input."

As part of the EF+Math Community Learning Events series at the start of year 2 of the program, this session brought together researchers and developers from across EF+Math to develop a shared definition of Rapid Cycle R&D and explore how this approach could be applied within EF+Math projects. The session focused on helping teams use Rapid Cycle R&D methods to shape and refine their research and development plans in ways that are responsive to educator and student needs.

Participants were introduced to a practical framework and guiding questions to support decision-making, such as examining whether a prototype is meeting a need identified by the community. Teams practiced applying these tools by reviewing a project's Theory of Action, surfacing key assumptions, and identifying priority areas for investigation. Using a structured process, participants worked through examples together and then were set up to apply the approach to generate or refine ideas for their own research and development plans. The slide deck for this session contains worked examples and a blank template for audience members to use in their own contexts.

Acknowledgements:

- This presentation was developed and presented by Dr. Alexandra Resch, Align R&D, in collaboration with Mathematica.

Please view the Rapid Cycle R&D presentation below:

Mathematica
Progress Together

Rapid Cycle R&D

Learning Event for EF+Math Community

Alexandra Resch

September 28, 2021

Objectives for this learning event

- Participants have shared understanding of Rapid Cycle R&D
- Participants have tools for applying Rapid Cycle R&D in the EF+Math program
- Participants from prototype teams have generated ideas (or refined existing ideas) for their research plans

- Share in the chat: What's one thing you're hoping to get out of today's session?

Agenda

/Defining Rapid Cycle R&D

/Applying Rapid Cycle R&D to EF+Math

- Practice in full group
- Apply in breakout groups
- Discussion and Q&A with full group

/Next steps

/Optional: More Q&A!

What is Rapid Cycle R&D?

Rapid Cycle Research & Development

Defined by how quickly you could see changes in relevant outcomes

Systematic investigation

Iterative, building on learning in real time

Creation or production

How do you define Rapid Cycle R&D?

Mathematica
Progress Together

A R&D cycle that addresses an urgent need and needs to be responsive by creating shorter feedback and iteration cycles.

Processes/approach to research that supports evidence-backed decisions efficiently

Using the cheapest available option to collect data on a proposed approach, then using the information gained for new approaches

Iterative , continuous development of a product and research and measurement into the efficacy and usability of a product

Reducing planning time and emphasizing prototype iterations

Continuous improvement

A quicker, shorter, more proximal data collection process.

quick iterations through collaborations with end user: listening, gathering, designing/revising, trying, assessing, redefining

A process of data collection, analysis, and refinement in which implementation is continuously adapted based on current data.

My understanding is that it involves multiple, short, cycles of intervention projects that iteratively build on each other.

Iterative improvements through co-design and rapid pilot testing of prototype

Responsive Stakeholder Engagement

Iterative studies in which each study provides quick and strategic evidence to improve a product.

Fast iterations made to prototype based on short sprints of data collection, continually happening.

Anchoring Rapid Cycle R&D in the EF + Math Program

Our Objective

EF+Math funds and supports **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.

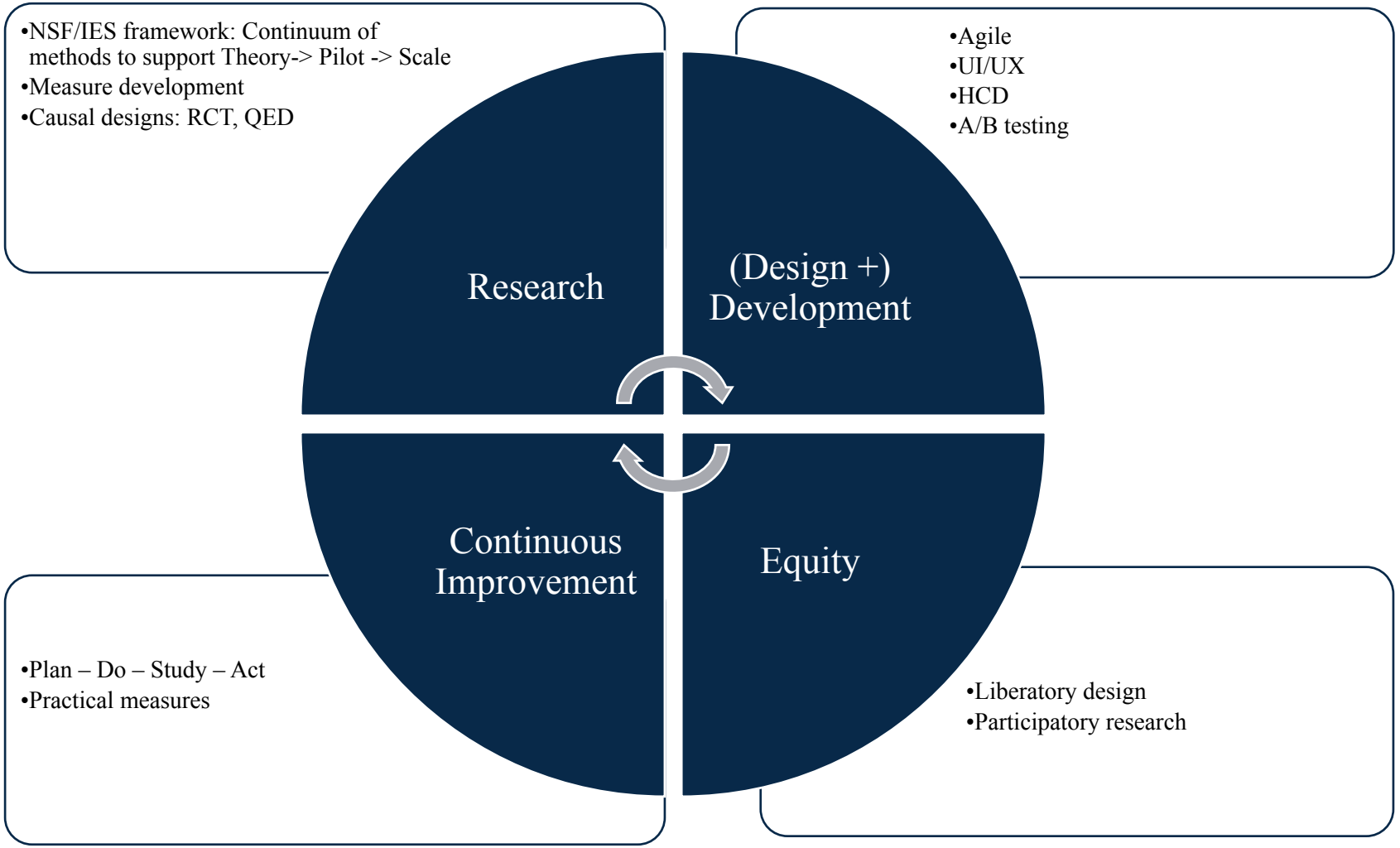
Borrowed from: 2021.09.10 Program Impact and Outcomes [Community Website] - Google Slides

Our Theory of Action

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.

Borrowed from: 2021.09.10 Program Impact and Outcomes [Community Website] - Google Slides

Rapid Cycle R&D pulls from many frameworks



PROTOTYPING TRACK

We track outputs and outcomes aligned with our intended impact

Desired Outputs

Phase 2

Prototypes

- Evidence of improved usability and accessibility for priority student user groups
- Evidence of feasibility for classroom use
- Early indicators of improved student EF and math outcomes

Processes

- Evidence that design decisions are made through a transparent process in which educator and student voices are valued and prioritized
- Clearly defined research questions and progress indicators that are culturally informed and created through a transparent process with input from the entire co-design team
- Demonstrated strong relationships, trust, and open communication across the co-design team, including regular sharing of learnings with key stakeholders (co-design team, students, parents, community members)

People

- Continued development of relationships and collaborations across individuals and teams
- Deepened engagement with critical racial equity knowledge and cultural fluency
- Increased demonstrated knowledge of the intersections between EF, Math, and Equity

* Priority students are Black and Latinx students, and students experiencing poverty

Borrowed from: 2021.09.10 Program Impact and Outcomes [Community Website] - Google Slides

Proposed definition

- **For the purposes of the EF+Math program, Rapid Cycle R&D is a systematic process of iterative testing and refinement that incorporates the perspectives and expertise of students, educators, developers, researchers.**

Applying Rapid Cycle R&D in the EF + Math Program

Basic process for developing R&D plans

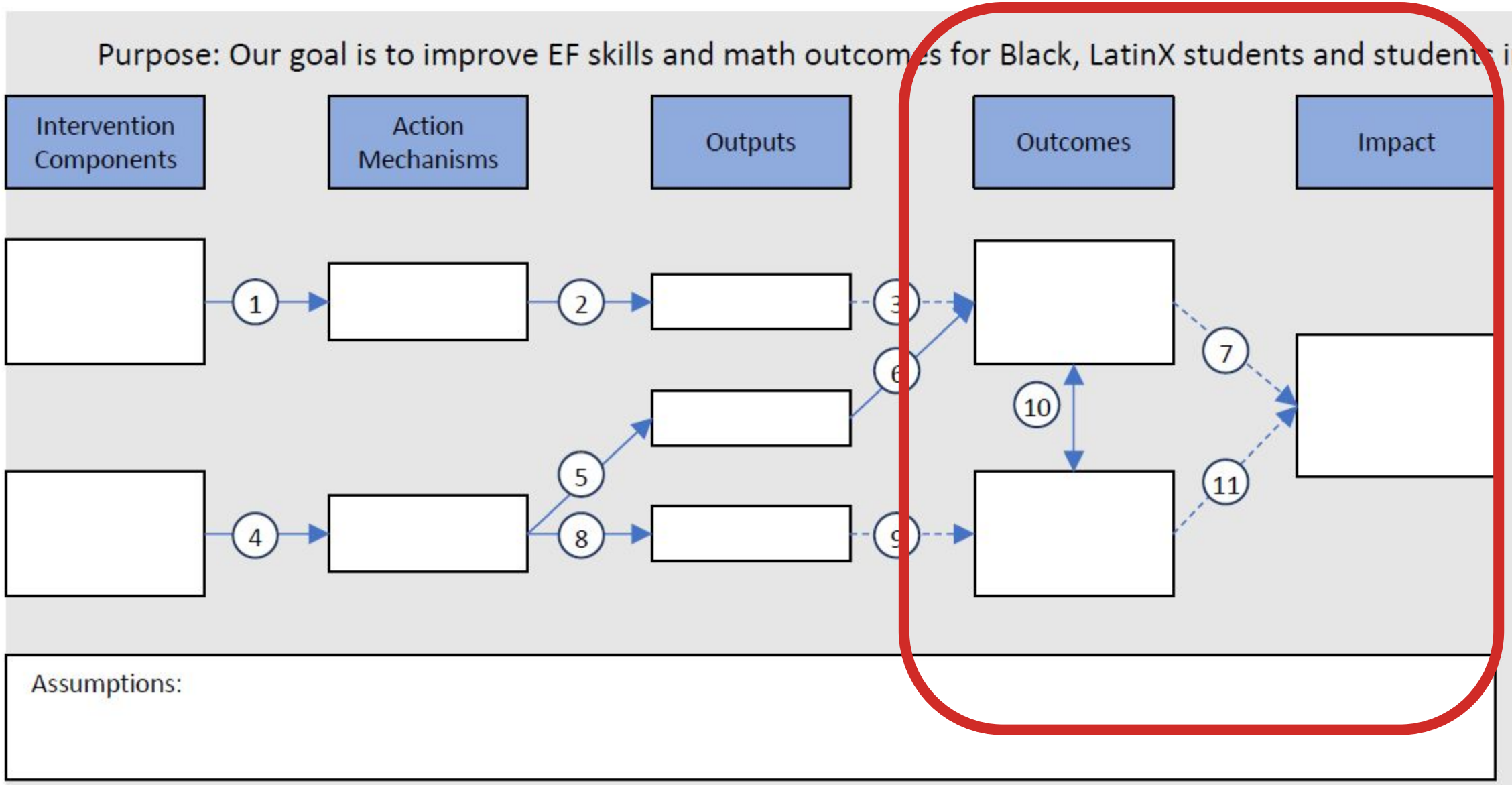
/Identify assumptions or unknowns in your ToA

/Consider ways to test each assumption

/Prioritize!

- Which assumptions are most consequential?
- Which tests will give you information that can be used for refinement and improvement?
- How will this test contribute to your desired Phase 2 outputs?

Your ToA is the starting point for R&D plans



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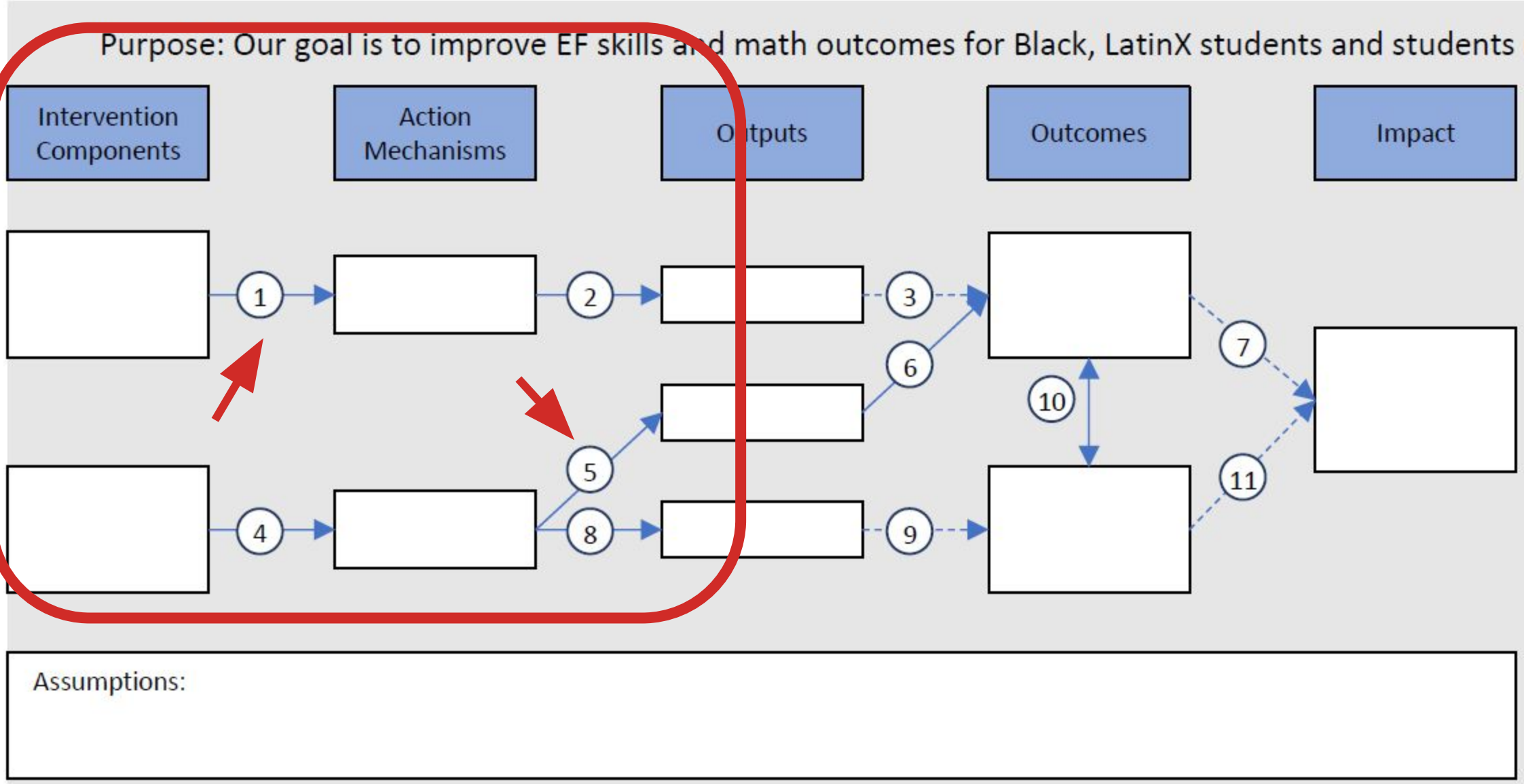
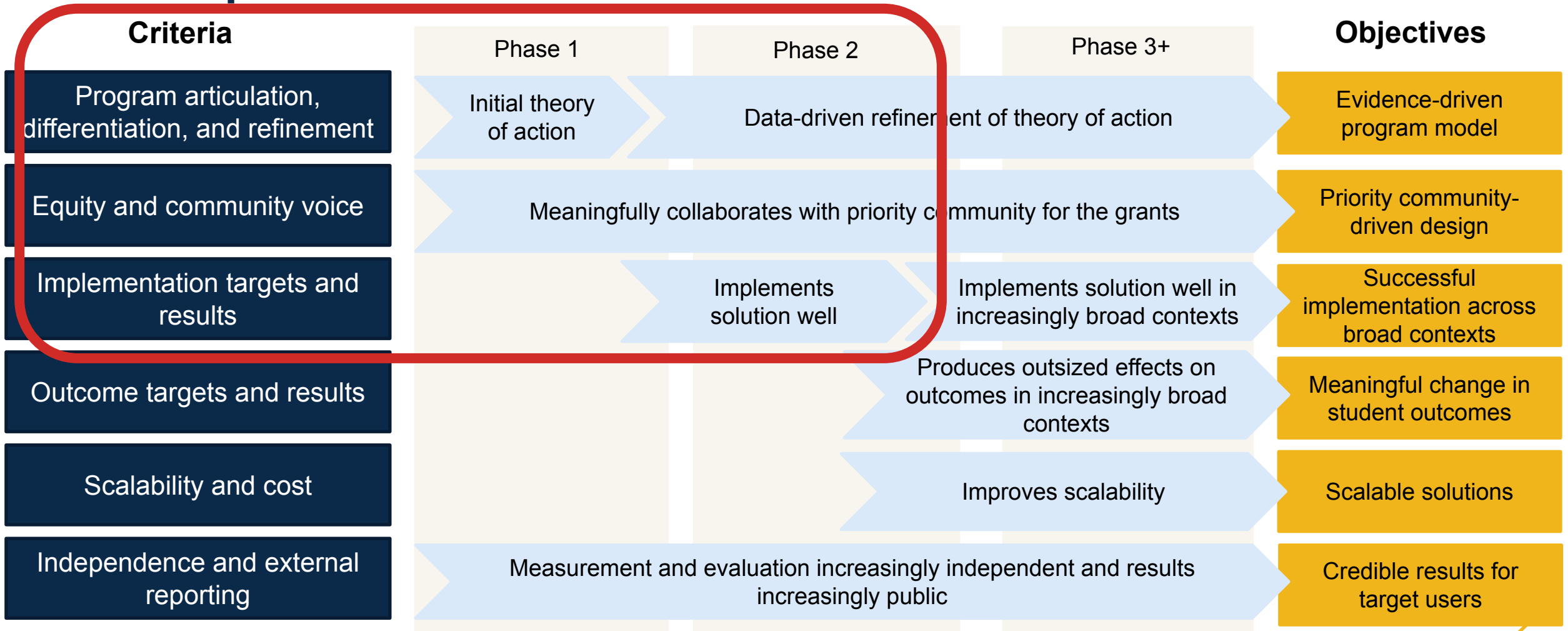


Measurement and Evaluation criteria adapted to EF +Math



Mathematica

Adapted from: Mathematica's M&E Toolkit for Middle Years Math and Secondary Writing Grantees

Getting concrete – questions to consider

Program articulation, differentiation, and refinement

- **Which relationships in the ToA are based on assumptions or conjectures?**
- **Which components are new or untested?**
- **What are early indicators of the targeted outcomes?**

Equity and community voice

- **Who will represent the priority community in designing and carrying out the research plan?**
- **Is this prototype meeting a need for this community?**
- **Is it building on community assets?**

Implementation targets and results

- **Is the prototype accessible and usable?**
- **What instructions and support are required for users?**
- **What adaptations are users making?**
- **What can you learn from those adaptations and why they're happening?**

Applying this framework to EF+Math prototypes

Scenario 1: Fictional Team

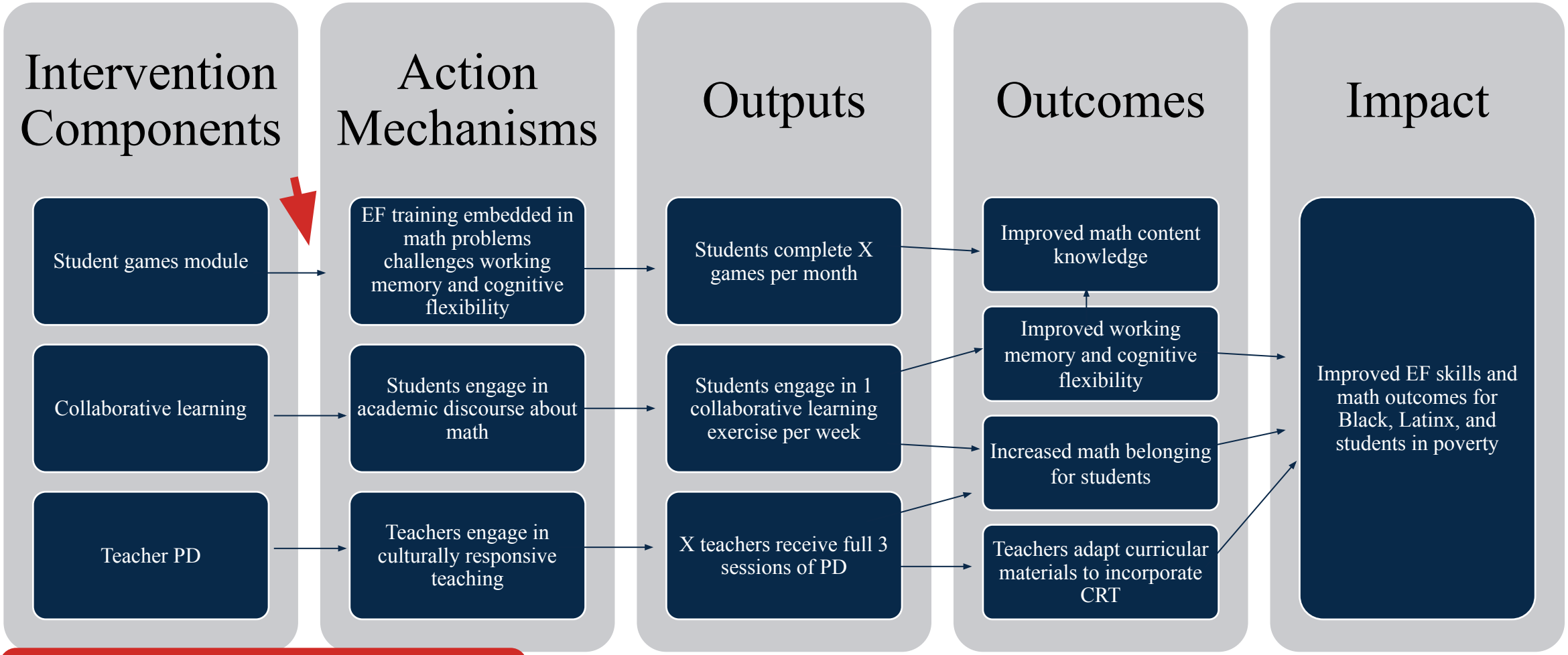
/Prototype has 3 major components:

- Individual student module trains EF through online games
- Collaborative learning component
- Teacher professional development focused on facilitation of collaborative learning and adapting curriculum to incorporate culturally responsive teaching

/Status after Phase 1

- Content for student modules has been tested with 10 students in priority community; online interface developed but not yet implemented
- Collaborative learning exercises co-developed with 5 teachers
- Teacher PD not started

Fictional Team Theory of Action



Assumptions:

- Students can access online games module.
- Teachers participate in PD sessions.

Identifying R&D priorities for Fictional Team

Aspect or component of prototype	Assumption or unknown to investigate	R&D focus	Possible approach	What will we do with this information?
Student module	Students can access and use the module on their own	Usability and accessibility	Survey or feedback form with 5-10 students	Identify and fix access/usability issues

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Student module	Online module successfully replicates paper prototype that was tested in Phase 1	Delivery of content	Cognitive think alouds with 3 students	Confirm that students interpret and interact with content as intended, and refine if needed

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Student module	Prototype games	Early indicators of improved outcomes	Pre-post assessment of targeted EFs with 30 students	Confirm link from mechanism to output, and refine if needed
Collaborative learning	Draft exercises codeveloped in Phase 1 can be incorporated lesson plans once per week	Feasibility	Weekly survey with 5 teachers for 6 weeks	Confirm that component can be integrated into classroom at needed frequency, and refine if needed
Collaborative learning	Teachers not involved in Phase 1 can implement exercises successfully	Usability	Cognitive think alouds with 3 teachers Classroom observation	Identify and fix usability issues; identify training + support needs

Instructions for Breakout Groups

- **Introduce yourselves!**
- **Open your group's template (link in the chat)**
- **Fill in the table of R&D priorities**
  - Start with one conjecture and one hypothesis or unknown and discuss and fill in that row
  - Move onto another hypothesis or unknown if you have time.
- **Identify someone in your group to share with the whole group**
  - Which conjecture you focused on
  - One component and assumption or unknown you discussed
- **We'll bring you back around 10:40 PT/1:40 ET**

Discussion

Each group shares:

- Which conjecture you focused on
- One component and assumption or unknown you discussed

What do you notice as you listen to the other groups?

Which assumptions/tests would you prioritize?

Identifying R&D priorities

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