

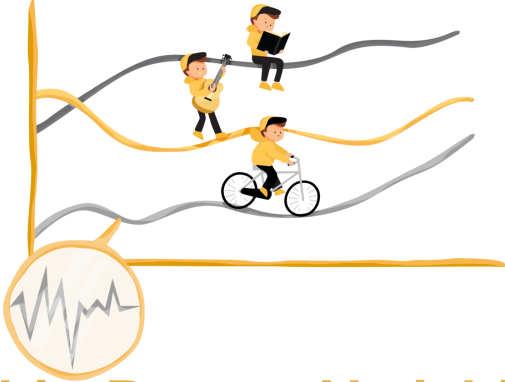


Advancing Research on Learning Variability

Research Agenda

Learning Variability

- Our concept of learning variability captures three types of variation



Within-Person Variability

Each child varies and changes over time.



Within-Group Variability

Learners in groups have diverse needs.



Contextual Variability

Children must operate successfully in a world of ever-changing contexts.

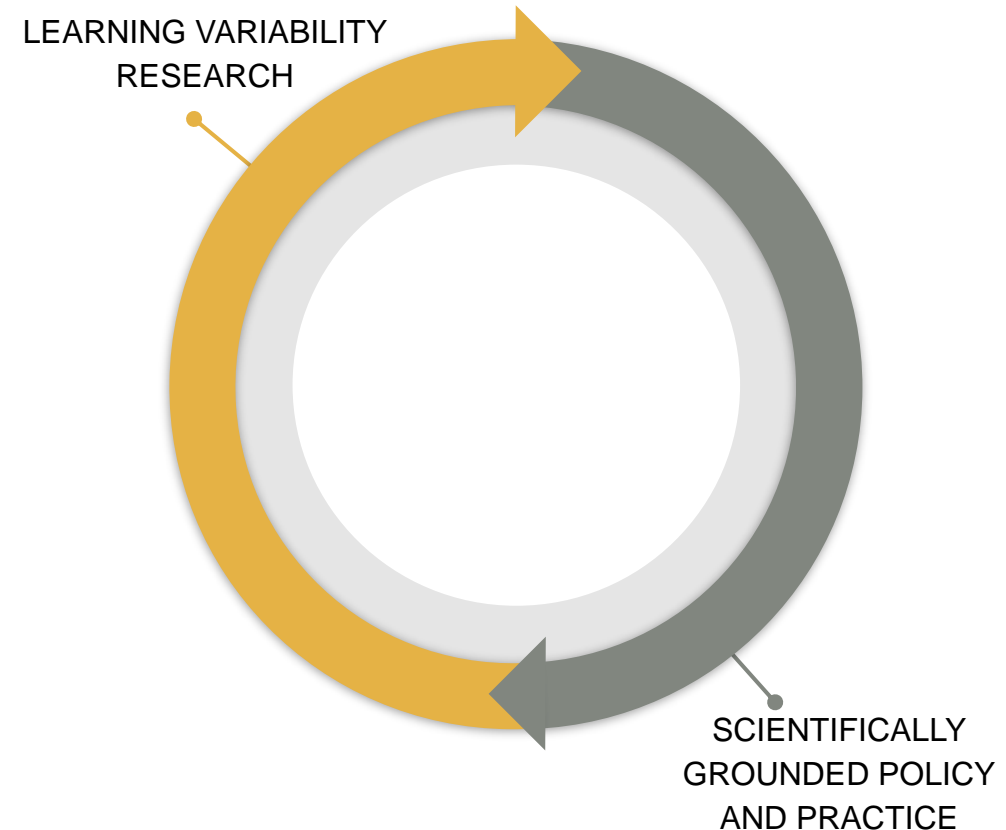
- Yet education systems are not designed to address children's variable states, often offering inflexible instruction that does not fit the needs of most children at a given time.
- In research, dominant methods still favor group averages, short snapshots of time, and single environments. When learning variability is acknowledged, researchers disagree about its origins, how to address it, and when to embrace or reduce it.
- If research fully embraces learning variability, the resulting knowledge could enable policy makers, designers, and educators to make decisions that serve a greater variety of children, more often, in their early and middle years.

The Research Agenda Goals

The current Research Agenda provides a set of guiding questions on learning variability for learning and development researchers to begin to address in the next 8-10 years.

High-level goals

- (1) to **build** the relevant **science of learning variability** and the early innovations upon which variability-based education systems and programming may stand.
- (2) to **build** the **backbone** of a larger **multidisciplinary, multisectoral research community on learning variability** working toward improving children's learning and development globally.



The Research Agenda: Themes and Questions

The agenda is structured around 5 themes:

Variability Themes

1. Within-person variability
Understanding day-to-day variation in children's skills
2. Within-group variability
Learning in diverse groups
3. Contextual variability
Preparing children to learn in different contexts



Supporting Themes

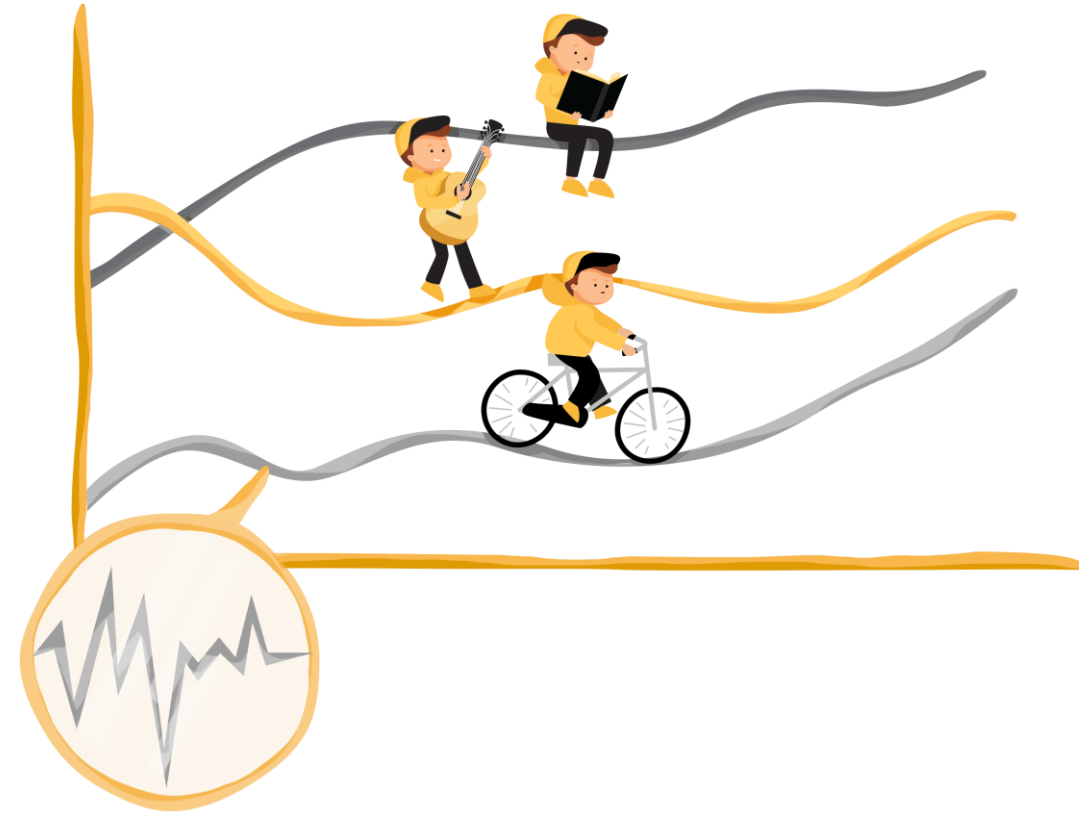
4. Designing for scale
Adapting learning solutions for different implementation settings
5. Data and Methods
Enabling next-generation variability research



Theme 1: Within-person variability

Understanding variation in skills and between skills over time

1. **Why** do children show **inconsistent** behavior, skills, knowledge, and characteristics from one time point to the next? What are the explanations of such variability and what is its developmental purpose?
2. When should learners **perform at the upper end** of their range of abilities and what experiences or factors can bring them there?
3. **How do children vary** in their multiple characteristics, knowledge, and skills over time and at different ages?



Theme 2: Within-group variability

Handling and embracing heterogeneity in group learning settings (e.g., classrooms)

1. **Social learning:** How can instruction in social environments like classrooms both cater to the needs of individual students and take advantage of learning variability for improved learning for all?
2. **Personalized Learning:** How can 1-1 learning experiences more effectively adapt to cater to individual children's academic and nonacademic states and foster their development?
3. What **classroom practices** can accelerate the learning trajectories of lower-performing students while maintaining or accelerating the trajectories of higher-performing students?
4. **Teachers:** How can teachers be better supported to embrace and best address within-group variability in a group learning setting such as a classroom?



Theme 3: Contextual variability

Preparing children to thrive across contexts and time

1. What are those skills, behaviors, knowledge, and characteristics that **prepare children to learn in future contexts** and how do they interact with each other and the context?
2. How might we **teach** such skills, behaviors, knowledge, and characteristics?
3. How do we know children are **learning** such skills, behaviors, knowledge, and characteristics and are able to use them in different contexts?
4. The environment shapes much about how a child interacts and learns within it. How might **environments be described** such that we may predict a child's success therein?



Theme 4: Designing for scale

Making learning solutions effective across multiple contexts

1. In a learning solution, what mental processes or psychological mechanisms (e.g., curiosity, consolidation, connecting to existing mental representations) are engaged to lead to learning? What program components/“active ingredients” instantiate these mental processes?
2. What characteristics of use environments interact with children’s experience of the core learning mechanisms of a learning program and how?
3. How does community-based research/inclusive design impact solution development and the potential for impact within and across communities?
4. To what extent are the social-emotional skills promoted in developed countries “functional” (i.e., conducive to learning) in LMICs? What other skills (not studied in developed countries) are particularly helpful for children to thrive in LMICs?



Theme 5: Data, methods, and theory

Enabling next-generation research, assessment, and design for variability

1. How can **different timescales of study** on learning and development enrich our understanding of within-, between-, and across-context variability?
2. How might **new types of data** (physio, interaction logs, sensors, wearables) at various levels of analysis – especially collected via practical, non-intrusive methods – provide new insights into multidimensional learning/developmental processes and outcomes?
3. How can **classroom assessments** (formative assessments, process assessments, etc.) better enable students and teachers to rapidly see and act upon within-student and between-student variability across multiple dimensions of learning and development?
4. What in-school research methods & assessments are **equally valuable to practitioners and researchers** in meeting their practical goals and knowledge goals?
5. What new **evaluation methods** can provide more rapid feedback on education programs' impacts and mechanisms in different contexts?



Transformative Questions & Priority Approaches

Transformative Questions

- Can we develop a multidisciplinary **ontology of learning contexts**?
- When is learning variability **beneficial vs. detrimental** to learning and development? And thus, when should we focus on reducing vs. leveraging variability in group and individual settings?
- What **methods** might enable individual-level **predictions of future behavior** across contexts?
- How do we educate children for a **rapidly changing future** context?

Priority Approaches: promising ways of thinking or doing in research

- Integrative Research
- Contextualized and Generalizable
- Strengths-based Inquiry

Looking ahead

- If learning experiences considered within-person, within-group, and contextual variability, then a greater diversity of **children** around the world would be supported, more often, to **reach their full potential**.
- Deep research on learning variability will facilitate such experiences. Thus, we offer **guiding research questions** to the field of early and middle childhood education – educators, researchers, and the funders of each.
- The research agenda will be a success if, at the end of 10 years:
 - ✓ a community of researchers has established fruitful lines of **research** on learning variability,
 - ✓ the education funding community **discusses** the three types of variability knowledgeably,
 - ✓ and **innovations** are in development to better address variability **at scale**.

WHAT
SUCCESS
LOOKS
LIKE