**Navigating Disability in Intensive Intervention: Learner Complexity and Small Environments**

**CAREER: FRACTION ACTIVITIES AND ASSESSMENTS FOR CONCEPTUAL TEACHING (FAACT)**

Jessica H. Hunt, Ph.D. (PI)  
Juanita Silva, Ph.D.  
Kristi Martin, M.Ed.  
Blaine Patterson, M.S.  
Andy Khounmeuang

North Carolina State University; The University of Texas at Austin

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**PROJECT GOALS**

**Year 1:** Document ways of reasoning in initial fraction concepts for 50 students with learning differences; theory building.

**Years 2 & 3:** Document learning pathways of three focus students with LDs; theory refinement

**Years 4 & 5:** Develop and test an intervention based on theory and learning pathways of focus students. Produce materials for educators.

**RESEARCH QUESTIONS**

1. What initial and developing key developmental understandings of fractions do students with learning disabilities evidence through employed strategies, language, and representations?
2. How do students with learning disabilities progress in developing and solidifying conceptual understandings of fractions through their mathematical activity?
3. To what extent does an intervention reflective of a research based instructional trajectory facilitate strategic development and increased fraction knowledge in students with learning disabilities?

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**Introduction**

- Historically, researchers define instruction for these students as intervention: the addressing of deficiencies or differences in children’s mathematical knowledge (e.g., Hudson & Miller, 2006).
- Societal norms, the teacher’s knowledge, or some combination thereof becomes the driving force behind mathematical knowledge as a remediation (Vygotsky, 1978).
- Yet, this literature is incomplete and at times misleading for those who do not equate remediation with learning.
  - We frame learning as adaptation (Piaget, 1951/1972/1980)
  - Because disabilities or differences in learning are far more dissimilar than they are similar (Compton et al., 2012), instruction should be based in a complex model of children’s knowing and learning that we call “small environments”.

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**Small Environments**

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**Data Gathering and Analysis**

Through a series of experiments that involve cycles of theorizing, design, implementation, and refinement, this project develops instructional trajectories for individual students in the area of fractions.

**Years 1**

- The observable means by which children with LDs reason does not differ significantly from other children when we hold task types constant.
- Key Developmental Understandings:
  - Part-whole reasoning: Unit Coordination
  - Key Developmental Understandings: All relevant understandings

**Years 2**

- The use of memorized fact combinations or teacher taught strategies eclipsed the development of students’ natural reasoning (Author under review) yet supported the third. The child’s full experience becomes their mathematical reality.
- Symmetric units coordinating; tacit.

**Years 3**

- Teaching moves showing a unique responsiveness.
- Supports for memory processing, reflection, Resists/Reshows.
- Multiplicative reasoning continued barrier to sophisticated fractional reasoning. Focus on breaking down math into two levels of units and the use of a common distinct way of reasoning (additive)