

Using Mathematics Think Alouds: A Field-Identified Teaching Strategy for English Language Learners with Disabilities

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Welcome and Introduction

What Do We Know About ELLs with Disabilities?



- An estimated 357,325 students K-12 in 2001-2002
- 9% of all ELLs have disabilities
- Roughly 80% identified with a learning disability or a speech language impairment
- Spanish language speakers highly represented

One State's Performance Data

Students Proficient on Regular Reading Assessment

2006-2007	Grade 4	Grade 8	Grade 10
ELLs with Disabilities	12% (N=585)	7% (N=402)	2% (N=268)
All students with disabilities	42% (N=8015)	22% (N=7470)	18% (N=7057)
All ELLs	31% (N=5162)	26% (N=3875)	18% (N=3796)
All students	71% (N=57,891)	63% (62,927)	62% (N=65,396)



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Study 1: LEP/IEP Instruction Project (Grant #H324D010023)

- Investigate instructional strategy use for ELLs with disabilities by middle school teachers in one state
- Conduct research on top-weighted strategies in reading and math

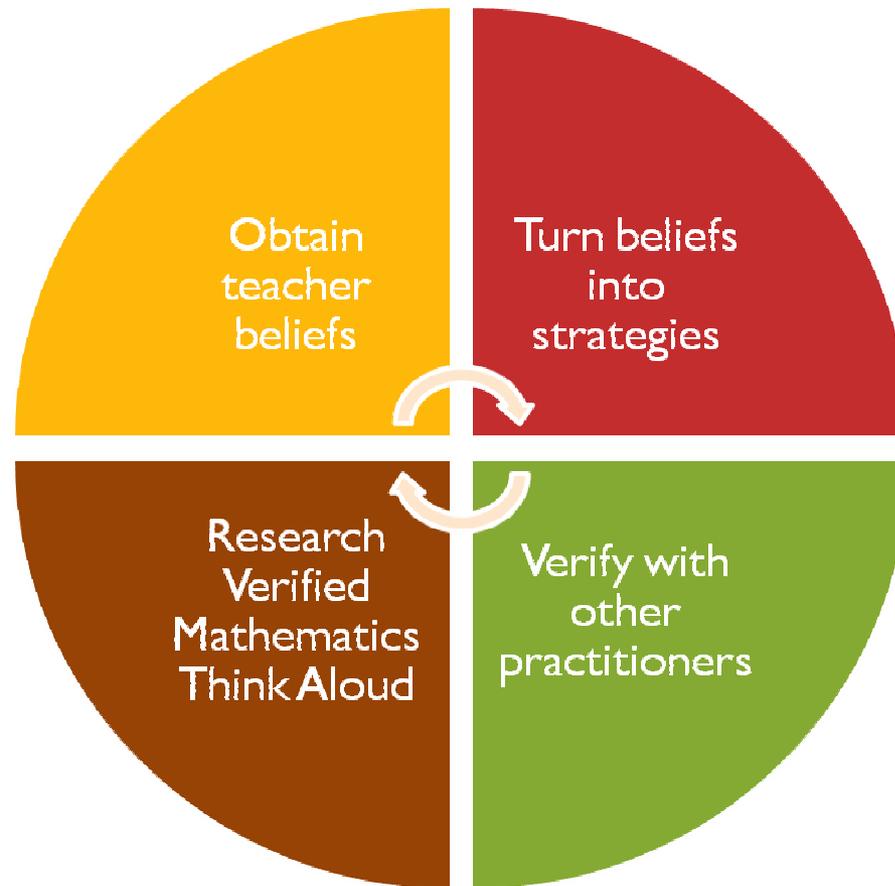


Study 2: LEP/IEP Strategies Project (#H324C040171)

- Follow up on results of LEP/IEP instruction project with successful middle school teachers and principals nationwide

Our projects
funded by the Office of Special Education Programs

Identifying strategies to improve mathematics achievement for ELLs with disabilities

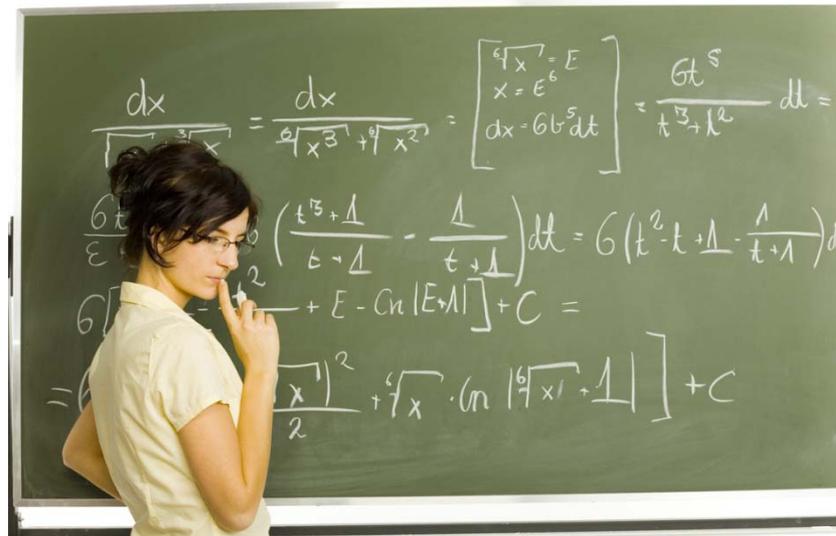


Top weighted strategies according to teachers in one Midwestern state...

Content	Strategy
Math	Tactile, concrete experiences of mathematics
	Daily re-looping of previously learned material
	Problem solving instruction and task analysis strategies
	Teacher “think-alouds”
	Student “think-alouds”
Reading	Teaching pre-, during-, and post-reading strategies
	Fluency building (high frequency words)
	Direct teaching vocabulary through listening, seeing, reading, and writing in short time segments
	Relating reading to student experiences
	Chunking and questioning aloud (reading mastery)

Think-alouds

Explaining and teaching the steps of problem solving through self-reflection and review; that is, demonstrating how to say aloud the steps used in problem solving



Related Research

- Single-subject research with general think aloud procedures for students with disabilities in mathematics (Braten & Throndsen, 1998; Case, Harris, & Graham, 1992; Davis & Hajicek, 1985; Leon & Pepe, 1983;)
- Research on “Self-instructional strategy development” (SI) or “self-regulated learning” (SRL) (Leon and Pepe, 1983; Moore, Reith, & Ebeling, 1993)

Students in Math Think Aloud Study

Student	Grade	Age	Ethnicity/ Language	Oral English Proficiency	Reading Level	Math Level
M	8	15	Hmong	Intermediate	2.5	Low
T1	6	13	Mexican- American/ Spanish	Proficient	4	4
T2	6	13	Mexican- American/ Spanish	Proficient	3	3
T3	6	12	Mexican- American/ Spanish	Beginning	Did not meet standard	Did not meet standard



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Mathematics Think-Aloud Strategy

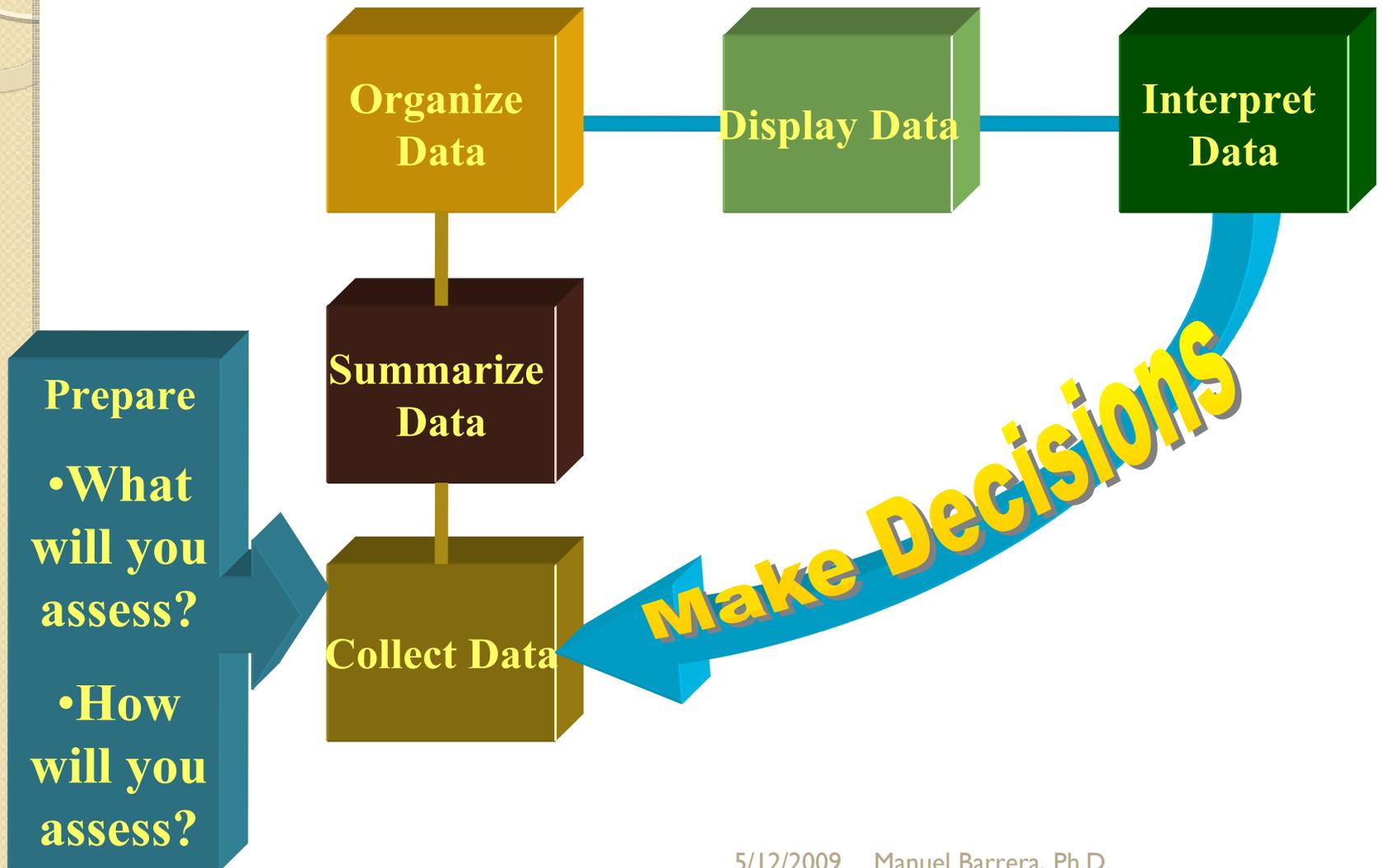
- Teacher determines the standards-based mathematics concept or skill to learn:
 - Example: representing fractions and their equivalents
- Determine Pre-requisite skills
 - Example: student recognizes part-to-whole relationships, understands key vocabulary terms (numerator, denominator, digit, single digit, two-digit) and symbols ($=$, $/$)
 - Conduct Pre-requisite skill assessment (CBM & CBA to verify PrS)
- Teacher modeling of strategy (I do it)
 - Example: “first, I need to [factor the numerator with the denominator to the lowest number, next, I need to [verify that both fractions are equal], finally, I need to [start the next fraction and complete the steps]
- Teacher and Student use the Mathematics Prompt Sheet to teach/learn the strategy (we do it)
- Student Guided and Independent Practice (You do it)

Monitor and Evaluate Strategy Use, Progress, and Student Check-in

- Use of systematic teaching process
 - Explain what will be done and why
 - Determine and verify vocabulary needed
 - Describe strategy steps
 - Modeling and Prompting of steps
 - Provide exemplars & visuals
- Collect strategy and achievement during instruction & practice
- Provide student opportunities to verify comprehension of strategy and process (student check-in)
- See <http://cehd.umn.edu/NCEO/OnlinePubs/ELLsDis16/default.html> for published descriptions

Model for Progress Monitoring

(cf. Salvia & Hughes, 1990)



Applications for ELLs with disabilities in Group and ESL Settings

- Evidence for use of think-alouds with ELLs in ESL settings
 - Use in conjunction with the CALLA (Chamot, Dale, O'Malley, & Spanos, 1992)
 - For review of Chamot, et al., paper go to <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.20.9610>
 - A think-aloud procedure was used as a step in preparing for understanding the problem-solving steps, as a guide during problem solving and as a reflective (“retrospective”) process after solving the problem
 - Students with language and mathematics ability challenges (“low ability”) had more difficulty and could benefit from procedures used in our study (cf. Liu, Barrera, & Thurlow, 2009)

References

- **Thurlow, M., Albus, D., Shyyan, V., Liu, K., & Barrera, M. (2004). Educator perceptions of instructional strategies for standards-based education of English language learners with disabilities (ELLs with Disabilities Report 7)**
<http://cehd.umn.edu/nceo/OnlinePubs/ELLsDisRpt7.pdf>
- **Barrera, M. Liu, K., Thurlow, M., Shyyan, V., Yan, M. , & Chamberlain, S. (2006). Math Strategy Instruction for Students with Disabilities who are Learning English-ELLs with Disabilities Report 16** <http://cehd.umn.edu/NCEO/OnlinePubs/ELLsDis16/default.html>
- **Chamot, A. U., Dale, M., O'Malley, J. M., & Spanos, G. A. (1992). Learning and Problem Solving Strategies of ESL Students,**
http://www.ncbe.gwu.edu/library/./miscpubs/nabe/brj/v16/16_34_chamot.pdf

For additional NCEO research reports on strategies for ELLs with Disabilities, please visit our website: <http://www.nceo.info>

Go to “publications” and look for “ELLs with Disabilities” series