Supporting Mathematical Discourse and Reasoning

BEYOND ACCESS

for Deaf and Hard-of-Hearing Students


Sign Choice & Meaning


Visual Representation


Discourse Routines


Student Reasoning


Power & Participation


Cultural & Linguistic Practices



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Introductions



Dr. Felicia Smith

- CODA
- Taught 7th-8th Grade Mathematics in Mainstream Schools
- 3rd Year Assistant Professor at Minnesota State University Mankato
- Degrees: Math & Statistics (B.A), Secondary Math Education (M.Ed., Ph.D.)



Stefanie Stamatis

- 16 years teaching mathematics to Deaf and Hard of Hearing students
- Previous experience as Math Department Chair & Part-Time Math Coordinator
- NYS Certified in DHH Education and Mathematics (7–12)
- Degrees in Deaf Education, TESOL, and SBL

Session Overview

Explore Snapshots

Examine real-world classroom moments from Deaf mathematics environments.

Analyze Meaning-Making

See how sign choice and visual representation shape mathematical understanding.

Collaborative Discussion

Discuss student communication, reasoning, and active participation patterns.

Instructional Design

Work with colleagues to design a Deaf-centered instructional move.

Six Ways to Notice Mathematical Meaning-Making



Sign Choice & Meaning -How math ideas are expressed through signs, vocabulary, and translanguaging



Visual Representation - Use of signing space, classifiers, diagrams, and tools



Discourse Routines

Patterns of interaction, questioning, re-signing, and peer discussion



Student Reasoning

Explaining, justifying, making connections, and constructing understanding



Power & Participation - Who contributes, who leads, and whose ideas are taken up



Cultural & Linguistic Practices

How Deaf culture and ASL are sustained and valued in instruction

Focus

Brief Study Context:

How do students construct mathematical meaning through discourse in Deaf-centered mathematics classrooms?

These ideas led us to examine how mathematical meaning is constructed in Deaf-centered classrooms.

Key Ideas

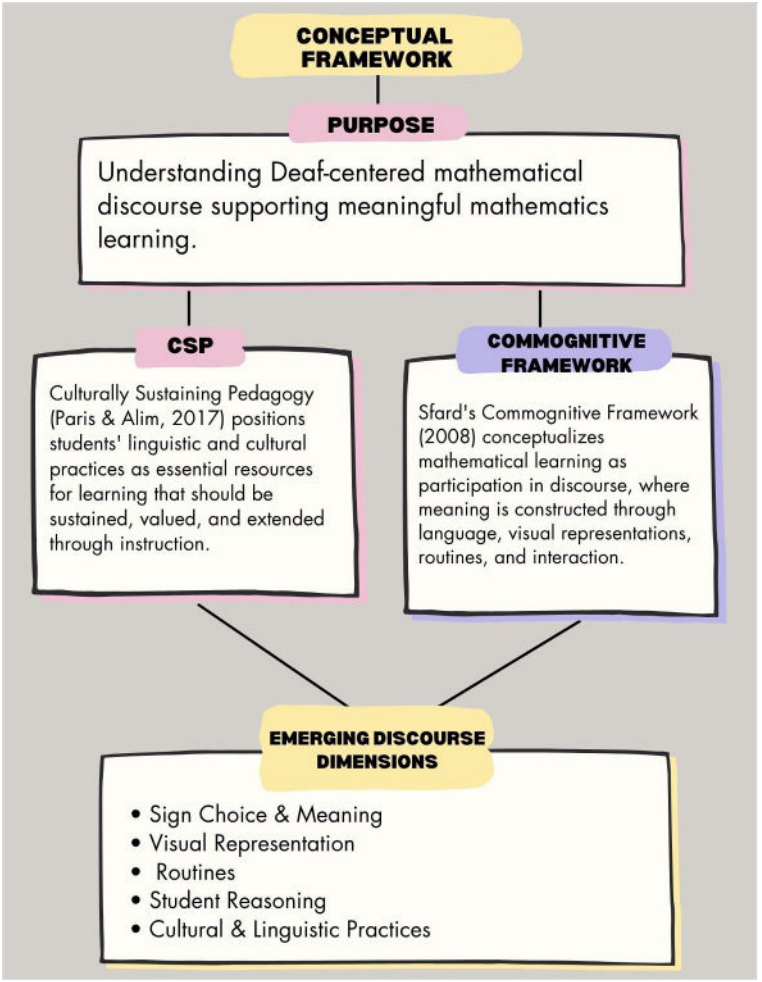
🗣️ **Language & communication**

👋 **Mathematical Meaning**

🧠 **Mathematical Thinking**

Why Deaf Centered Math?





Classroom Snapshots: Slope

Making Meaning Through Context

Challenge

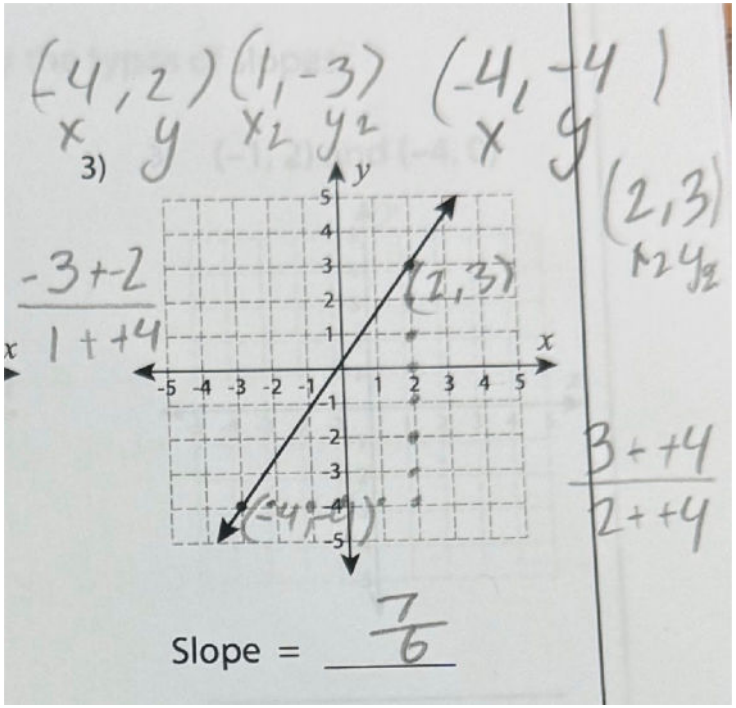
Determining direction and correctly identifying rise and run

Working Through the Mathematics

Graph → Trace movement → Discuss change → Confirm with formula

What Students Revealed

Slope describes the relationship between two changing quantities



👋 **Sign Choice & Meaning Representation**

👁️ **Visual**

💬 **Discourse Routines Reasoning**

🧠 **Student**

Classroom Snapshots: Making Meaning Through Relationships

Making Meaning Through Relationships

Challenge

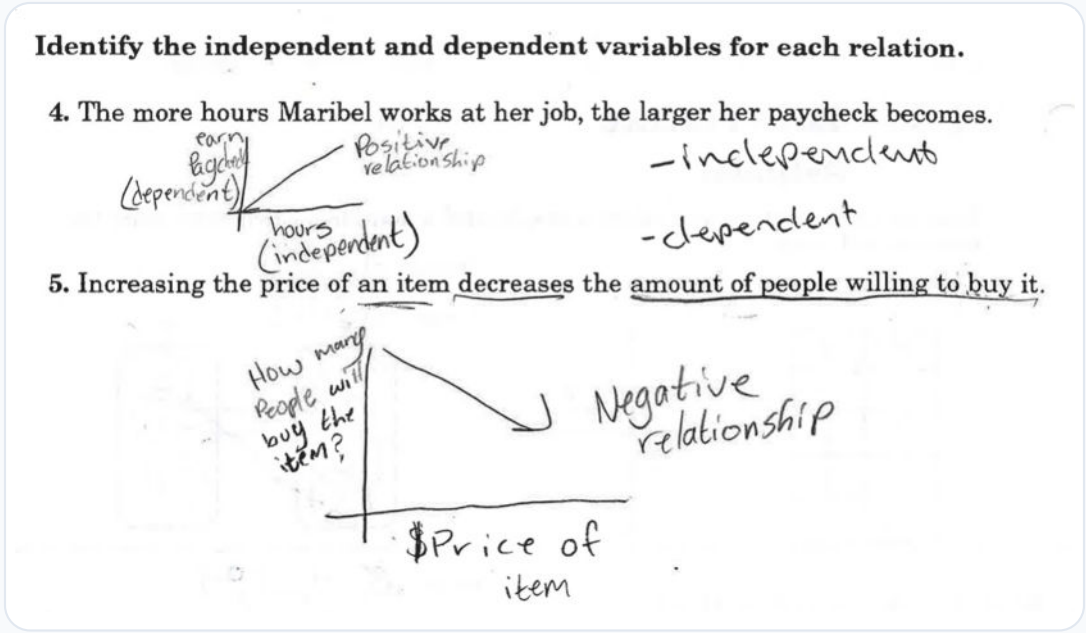
Identifying independent and dependent variables and explaining their relationship

Working Through the Mathematics

Analyze real-world graphs → Represent movement in signing space → Explain relationships between variables

What Students Revealed

Variables can be interpreted through graphical relationships, ASL representations, and mathematical discussion



👋 Sign Choice & Meaning 💬 Discourse Routines
🧠 Student Reasoning 👁️ Visual Representation

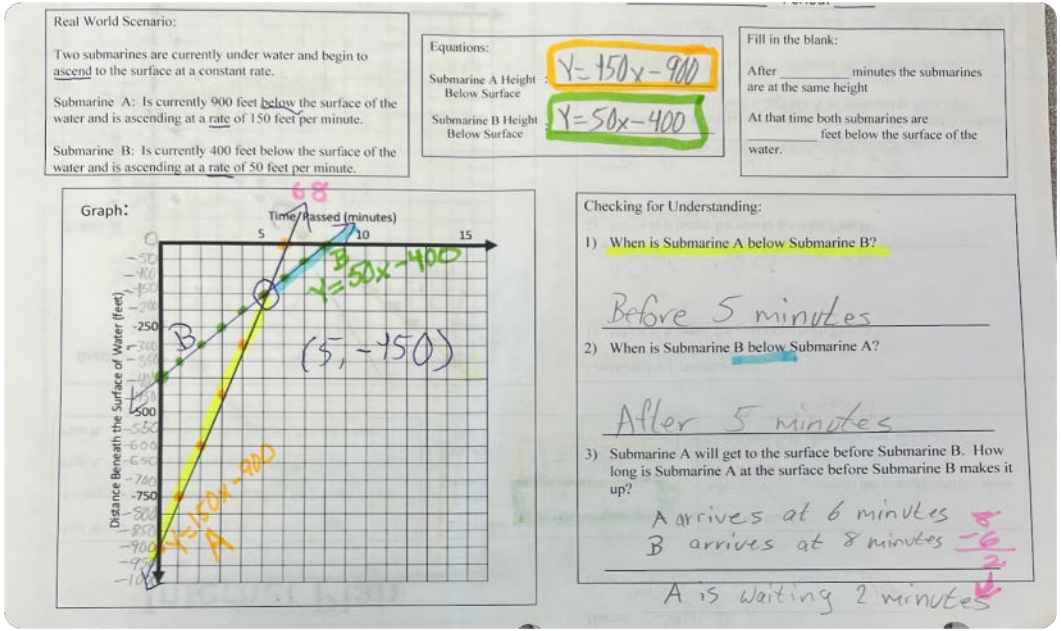
Classroom Snapshots: Positive/Negative Numbers

Making Meaning Through Context

Challenge
Interpreting negative numbers as meaningful quantities rather than symbols

Working Through the Mathematics
Model submarine depths → Represent situations with equations and graphs → Discuss meaning in context

Mathematical Meaning Making
Negative values represent positions below a reference point, and intersections can be interpreted within a real-world context



👋 Sign Choice & Meaning 💬 Discourse Routines 🧠 Student Reasoning

Classroom Snapshots: Fractions

Making Meaning Through Context

Challenge

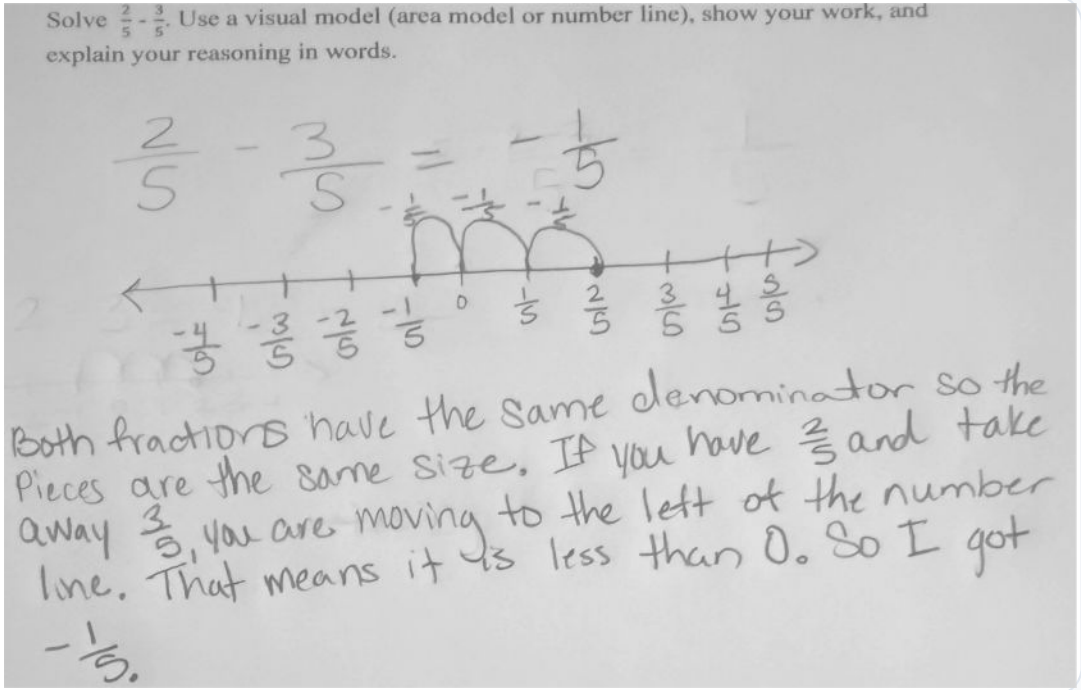
Making sense of fraction subtraction when the result is negative

Working Through the Mathematics

Use visual models → Explain quantities through signing and writing → Connect models to symbolic expressions

What Students Revealed

Negative fractions represent meaningful quantities and can be justified through multiple mathematical representations



👋 Sign Choice & Meaning

👁️ Visual Representation

💬 Discourse Routines

🧠 Student Reasoning

Designing a Meaning-Making Opportunity

Instructions

In Groups of three:

1. Choose a mathematics topic
    a. Slope
    b. Fractions
    c. Integers
2. Design
    a. Sign Choice & Language
    b. Discussion Prompt or Discourse Move
    c. How will students demonstrate mathematical meaning?
3. 10 minutes

Mathematical Meaning-Making in Deaf-Centered Classrooms

Mathematical Meaning-Making

Teacher Creates Opportunities Through...	Students Construct Meaning By...
🖐 Sign Choice & Language	Explaining ideas
👁 Visual-Spatial Representations	Connecting representations
💬 Mathematical Discourse	Justifying reasoning
🤝 Collaborative Participation	Interpreting mathematical contexts

These practices support meaningful mathematics learning while sustaining Deaf students' language and culture.

Mathematical Meaning-Making in Deaf-Centered Classrooms

From Procedure to Meaning

Procedural

"The intersection is (5,-150)"

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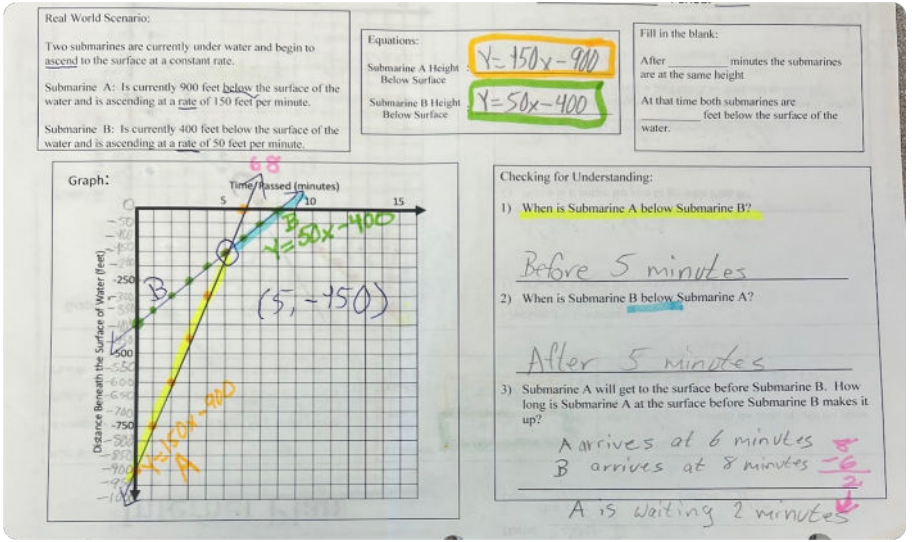
Conceptual

"The intersection means both submarines are at the same depth after five minutes."

What Changed?

- Language
- Visual-spatial representation
- Mathematical discourse
- Context

Mathematical meaning emerged when students explained what the mathematics represented, not simply what the answer was.



Final Takeaway

Reflection

Where do you see opportunities to deepen mathematical meaning-making in your own classroom?

- How are students expressing mathematical ideas?
- How are they using visual-spatial representations?
- How are classroom conversations supporting conceptual understanding?

Session Handout

Our handout is linked here.