A Longitudinal Look at Middle School Mathematics Teacher-Researchers’ Purposeful Work on Their Mathematics Classroom Discourse

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Acknowledgments

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Overview of presentation

• Part 1: Intro to MDISC project
• Part 2: Core discourse-related tools and constructs from SFL & positioning in MDISC
• Part 3: Context for and tracing one long-term collaboration
• Part 4: Enduring issues and dilemmas
Part 1: Intro to MDISC Project

Mathematics Discourse in Secondary Classrooms (MDISC)
### Work before MDISC

<table>
<thead>
<tr>
<th>Dissertation Work</th>
<th>CAREER grant, 2004-2009</th>
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<tbody>
<tr>
<td>• Compared pervasive discourse practices in two CMP classrooms</td>
<td>• How might middle grades mathematics teachers use action research to consciously work to align their discourse practices with their professed beliefs?</td>
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<td>• Both experienced teachers were surprised they had recurring discourse practices &amp; articulated inconsistencies between professed and enacted beliefs.</td>
<td>▫ What ideas about discourse are interesting enough to math teachers for them to use them to change their practice?</td>
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A few recurring items we took forward

- Coalesced around a core set of discourse practices the teachers read about and found useful
  - Revoicing, Probing, Waiting, Inviting
  - Last year of the work: found the “talk moves” (Chapin, O’Connor & Anderson, 2003) book
- Wanted to know how to decide whether what they were doing was ‘good’ or not
- Learned a lot and had a lot of data
  - Had proposed writing case studies, but teacher-researchers wrote book chapters for a book
  - Alternative: developed PD materials
Mathematics Discourse in Secondary Classrooms (MDISC)

- Used artifacts of practice from previous grant to design practice-based professional development materials for secondary mathematics teachers, focused on mathematics classroom discourse.
- Overarching goal is for teachers to be *purposeful* about their classroom discourse practices so that they are *productive* and *powerful* for students’ opportunities to learn.
  - **Productive**: focus on the ways in which the classroom discourse practices can support students’ “access to mathematical content and discourse practices.”
  - **Powerful**: focus on the ways in which the classroom discourse practices can support students’ “(positional) identities as knowers and doers of mathematics.”

(Esmonde, 2009, p. 250)
Structure of materials

- **Introduction**
- **Constellation 1**: Explanations, Evidence, & Tacit Expectations *(focus on students)*
- **Constellation 2**: Interaction Patterns & Teacher Discourse Moves *(focus on teachers)*
- **Constellation 3**: Planning for Rich Discourse
- **Constellation 4**: Setting Up & Gathering Evidence of Student Work *(small group communication context)*
- **Constellation 5**: Concluding & Contemplating Evidence *(whole class communication context)*
- Capstone to design first action research cycle
- 2 years of action research
Each Constellation includes...

- A high-level mathematical task
- A written or video case of a secondary mathematics teacher teaching that task
- Other artifacts related to the task (e.g., textbook pages, student written work)
- Short readings or summaries of readings
  - “Touchstone” documents
- One or more Connecting to Practice activities
Part 2: Core discourse-related tools and constructs in MDISC

Stop and notice: Teacher Discourse Moves
Interpretive discourse lenses:
  SFL: Language Spectrum (& Math Register)
  Positioning
Teacher Discourse Moves (TDMs) (based on modified “talk moves” proposed by Chapin, O’Connor & Anderson, 2003)

- **Inviting** student participation
- **Waiting**
- **Revoicing**
- **Asking** students to revoice
- **Probing** a student’s thinking
- **Creating** opportunities to engage with another’s reasoning
Opportunities to learn: access to...

(Gresalfi & Cobb, 2006)
Consider how language changes as...

• a small group of students work at their desks to try to solve a mathematical task;
• one student from that group is asked to report out their solution to other students after the groups worked on the task;
• a student might write up a formal explanation; and
• textbook explanation
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<td>Most specific, explicit, and precise; dense phrases; no human actors; nominalizations; logical connectors; many symbols; many relational verbs</td>
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• Focuses attention on “communication context” (how language changes based on various contexts)
• Highlights the importance of using language in multiple ways to develop meaning
• Builds on a non-deficit view of language development
• Describes movement from context-dependent language to more abstract and discipline-based use of language—consider when thinking about how to scaffold students’ discourse practices
Opportunities to learn: access to...

- Mathematical content & discourse practices
- (positional) identities as knowers & doers of mathematics

Positioning

(Gresalfi & Cobb, 2006)
Positioning (based on van Langenhove & Harré (1990))

...the ways in which people use action and speech to arrange social structures... recognizes that there can be multiple kinds of conversation happening in any mathematics classroom, each of which assigns fluid roles to the participants. (Wagner & Herbel-Eisenmann, 2009)

- People can position themselves &/or others
- Not necessarily intentional
- Happens all the time
- Supports (and has consequences for) the development of disposition (Gresalfi, 2009) and identity (Anderson, 2009)
Positioning

• Between/among people
  ▫ *Who is considered knowledgeable in my classroom? About what (e.g., procedures? concepts? reasoning?)? Whose voice is being heard? In what ways? Who is considered a ‘struggling’ learner?*
  ▫ **Student-student** (status, competence)
  ▫ **Teacher-student** (authority, agency)

• What it means to know and do mathematics
  ▫ *Is mathematics about procedures, concepts and/or something else? What kind of mathematical practices (e.g., argumentation, explanation, just answers) do we engage in? What is emphasized, thinking processes or doing processes? Do we generate mathematics collaboratively or is it something done individually?*
Using ideas from the **Language Spectrum**, what do you see happening around the TDM?

Stop & notice/identify instances of TDMS in the cases...

In what ways, then, might the discourse be **PRODUCTIVE** for student learning? What might be done differently?

Using ideas about **Positioning**, what do you see happening around the TDM?

**Teacher Discourse Moves**

**Waiting, Inviting** student participation; **Revoicing**; **Asking** students to revoice; **Probing** a student’s thinking; **Creating** opportunities to engage with another’s

In what ways, then, might the discourse be **POWERFUL** for student learning? What might be done differently?
Part 3: Context and Briefly Tracing One Long-term Collaboration
Overview of the work

• 2011-2012: First pilot, mostly HS math teachers

• 2012-2013: ELMS, Full MDISC study group
  ▫ Two 7th grade teachers: Dean Hanton (25 yrs) & Evelynne Pyne (2nd yr)
  ▫ Two 8th grade teachers: Laurie Busby (30 yrs) & Jeff Burgess (8 yrs)

• 2013-2014: ELMS, ‘group’ action research
  ▫ Dean, Evelynne & Laurie
  ▫ + Leah Jones (8 yrs) [no MDISC background except Touchstones]

• 2014-2015: ELMS, individual action research (and Connecting to Practices)
  ▫ Dean, Evelynne, Laurie
  ▫ Leah [partial MDISC study group]; Jodi Wheeler (8 yrs; 2 yrs admin; inclusion)
  ▫ + Three 6th grade teachers: Cyndi Goff, Kyle Haskell, Cindy Loeffert [partial MDISC study group, Intro through Constellation 3]

• 2015-2016: ELMS, individual action research
  ▫ Cyndi, Cindy, & Kyle
  ▫ Dean & Evelynne
  ▫ Laurie & Leah
  ▫ Jodi
What have we been doing?

• Meeting about 2x a month
  ▫ After school: check in & troubleshoot
  ▫ Half day: data analysis & sharing

• Data collection: Video recordings, Exit cards, Surveys, Weekly journals, Student written work

• Analysis: ‘Coding’ data by characterizing what happens around the video instances of their focal TDMs, Data sheets characterizing student contributions, etc.
What have we focused on? ‘Group’ action research

• Positioning of mathematics & students gaining facility with explaining & justifying
• Learned more about students’ perspectives
  ▫ Conceptions of Math inventory; exit tickets
• Worked to make explicit their criteria for a ‘quality explanation and justification’
  ▫ Looked at student work, read some articles, considered what students said when they were probed
• Considered how to support students to develop facility with such explanations & justifications
  ▫ What might 7th graders be able to do? What might 8th graders be able to do? What kinds of tasks might best support students to produce the kinds of explanations/justifications we would want?
• Examined practice
  ▫ How the new activities seemed to influence students’ conceptions and engagement
  ▫ How the new discourse practices seemed to open up students’ opportunities to engage with one another’s reasoning and to make connections
2014-2015 Individual AR Projects

- How does connecting multiple representations (i.e., pictures, symbols, words) through the tasks I use and more purposeful use of the Creating and Asking students to revoice moves seem to affect students’ understanding of mathematics?
- How do the Creating and Probing moves seem to support students to express their understandings of the math learning goal(s)?
- How does being more purposeful in my use of Inviting, Asking students to revoice & Creating moves seem to affect how productive and powerful student-to-student interactions are in whole group discussions?
- When I am purposeful about using the moves Waiting, Probing, Asking students to revoice how does it seem to affect students productive and powerful participation in whole group discussions?
Part 4: Enduring Challenges & Issues
Some of my challenges

• Moving parts & variation in common ground
  ▫ New and shifting faculty
  ▫ Additional faculty who are interested

• Shifting conceptions of what counts as research
  ▫ Teachers have been led to believe that only quantitative data matters (e.g., test scores)

• Learning to facilitate action research
  ▫ Supporting teachers to articulate their focus
  ▫ Various kinds of evidence
  ▫ Kinds of claims one might make

• Researching the action research

• “Beth always gets us to do things we don’t want to do...”
Some of the TRs challenges/issues

• Letting go of control is HUGE!
• Student (& some parent) resistance to ‘new’ ways of doing math
  ▫ New norms/expectations
  ▫ More challenging in terms of being an active learner
  ▫ Help with homework
• Finding & creating resources that best support their work
  ▫ Piloted & have adopted CMP (intensifies work!)
  ▫ Math backgrounds aren’t all they need—learn a lot from literacy/English folks too!
• Moving parts
  ▫ Almost all new administration
• Time
  ▫ To talk to each other, to analyze data, to reflect...
• Process
  ▫ New to collect and analyze data
  ▫ Making claims based on evidence
Thank you! Questions? Comments? Reflections?

For more information go to www.mdisc.org