InterMath-GPS: The Design of a Learner-Centered Professional Development Course

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What is InterMath?

- Funded by the NSF
- Partnership between LPSL & Mathematics Education at UGA and CEISMC at Georgia Tech
- Aimed at supporting middle school math teachers in Georgia
- Three-pronged approach:
  - Deepening teacher's math content knowledge
  - Equipping teachers with technology skills
  - Teaching mathematics through problems

Traditional InterMath Courses

- Focused on teaching mathematics content
  - Algebra, Data Analysis, Geometry, Number Sense
- Participants use technology to explore mathematical investigations
  - Spreadsheets, Geometer's SketchPad, Graphing Calculator Software
  - Technology as a tool for problem solving rather than drill and practice

Traditional InterMath Courses

- Participants write-up their solutions
  - Explain their process of completing the investigation
- Participants write two lesson plans
  - Adapting InterMath investigations to create appropriate middle grades lessons

New Curriculum in Georgia

- Georgia Performance Standards (GPS)
  - Focused on developing student mathematical understanding rather than acting as a checklist of competencies
  - Pushing more mathematics into middle grades by eliminating redundancy
  - Focused on incorporating mathematical processes (such as problem solving, communication, and using technology) into the classroom

New Curriculum in Georgia

- Georgia Performance Standards (GPS)
  - Content standards
    - M6M2. Students will use appropriate units of measure for finding length, perimeter, area and volume and will express each quantity using the appropriate unit.
      - a. Measure length to the nearest half, fourth, eighth and sixteenth of an inch.
      - b. Select and use units of appropriate size and type to measure length, perimeter, area and volume.
      - c. Compare and contrast units of measure for perimeter, area, and volume.

New Curriculum in Georgia

- Georgia Performance Standards (GPS)
  - Process Skills
    - M6P1. Students will solve problems (using appropriate technology).
      - a. Build new mathematical knowledge through problem solving.
      - b. Solve problems that arise in mathematics and in other contexts.
      - c. Apply and adapt a variety of appropriate strategies to solve problems.
      - d. Monitor and reflect on the process of mathematical problem solving.

Designing InterMath-GPS

- Fourth focal point added to InterMath
  - Prepare educators to use InterMath investigations to teach the middle grades mathematics GPS
    - Providing explicit support for instructors
    - Unpacking or "mining" the mathematics
    - Modifying the lesson plan requireement

Designing InterMath-GPS

- Providing explicit support for instructors
  - Create materials to support instructors in understanding tie between InterMath and the GPS
  - Train-the-trainer focuses on how to teach and how to connect to GPS

Designing InterMath-GPS

- Providing explicit support for instructors
  - Sample instructor materials.

GPS Alignment- Instructor Page Printable PDF

Theater Seating

The Mathematics Theater has twenty-five seats in the first row, twenty-seven seats in the second row, twenty-nine seats in the third row, and so on. How many seats are in the theater if there are fifteen rows in all?

GPS	As seen in Problem Exploration
M6A2: Students will consider relations between varying quantities. a. Analyze and describe patterns arising from function rules, tables, and graphs.	A spreadsheet or table can be used to consider the relationship between the number of seats in each row and the row number.

Designing InterMath-GPS

- Class activities
  - Unpacking or "mining" the mathematics
    - Traditional InterMath
      - Participants complete write-ups that highlight their mathematics learning.
    - Modifications:
      - Explicitly tie write-ups to the GPS by specifying which GPS standards are being addressed in the investigation

Designing InterMath-GPS

- Class activities
  - Modifying requirements for lesson plan activities
    - Traditional InterMath
      - Participants select a topic and design a lesson
    - Modification
      - Participants select one or a few standards (content and process skills) and design a lesson
      - Backward Design framework

Findings from InterMath-GPS

- How are we doing at meeting the needs of the teachers in Georgia?

Findings from InterMath-GPS

- Participation
  - School districts have been receptive
    - Investigations align well to new GPS
    - Specifically addresses educators' needs of content, pedagogy and technology
  - Georgia Dept. of Education has collaborated with us on further initiatives
    - Professional development for RESAs
    - Standards-based videos of mathematics teaching

Findings from InterMath-GPS

- Survey Results- Class Means
  - "What is your ability to…"

Question	N	Pre-course	Post-course
Use technology tools to model and demonstrate standards-referenced mathematics content and pedagogy for the middle school.	40	2.68	3.75
Use math-specific technologies to engage in mathematics explorations, to form mathematics ideas, and to solve mathematics problems.	41	2.80	3.76
Use technology tools to construct new and personally meaningful ideas of mathematics.	40	2.83	3.68

* All questions show significant increase ($p<0.05$)

Findings from InterMath-GPS

- Survey Results- Class Means
  - "What is your ability to…"

Question	N	Pre-course	Post-course
Use general tools such as word processing, paint programs, spreadsheets to facilitate mathematics investigations and communication.	41	3.10	3.93
Develop effective mathematics demonstrations using appropriate technology tools.	41	2.68	3.78
Engage in independent investigations of mathematics topics from the middle school curriculum or from mathematics appropriate for that level.	40	2.65	3.95
Communicate mathematics ideas arising from technology enhanced investigations.	40	2.68	3.68

* All questions show significant increase ($p<0.05$)

Findings from InterMath-GPS

- Survey Results- Class Means
  - "What is your ability to…"

Question	N	Pre-course	Post-course
Develop and adapt materials and goals from standards-based curriculum through the use of technology.	40	2.65	3.80
Model and explore collaborative instructional strategies.	39	2.77	3.74
Identify patterns, form conjectures, and develop proofs through the use of technology.	39	2.10	3.62

* All questions show significant increase ($p<0.05$)

Findings from InterMath-GPS

- Survey Results: What did you learn?
  - "I learned more about how the new GPS's are set up and how to develop plans with them."
  - "This class refreshed a lot of concepts for me that I had not visited for several years…I have a better understanding of the new GPS and how to implement them into my classroom."

Implications for InterMath

- Continued struggle for identity
  - What are teachers taking away from InterMath?
    - Mathematics content course
    - Technology course
    - Mathematics education (pedagogy) course

Contact Information

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