Preparation of Algebra Teachers

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Overview of Session

1. Introduce the *Preparing to Teach Algebra* Project
2. Results from a national survey
3. Discuss your experiences:
   a) What algebra knowledge has been useful to you?
   b) What would be useful for teacher preparation?
4. Present findings from our case studies of secondary mathematics teacher preparation programs
5. Questions from you and directions in which you would like to see us turn
Preparing to Teach Algebra Project

• Collaborative work between MSU & Purdue
• Exploration of secondary math teacher prep
• Description of opportunities to learn:
  – Algebra
  – Algebra teaching
  – Issues in achieving equity in algebra learning
  – Algebra, functions, and modeling standards and mathematical practices as described in Common Core State Standards for Mathematics (CCSSM)
2013-14 PTA Research Team

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PTA Design

• National survey of institutions with programs preparing secondary mathematics teachers

• Case studies of programs at 5 institutions
  – Three Midwestern Universities
    • selected before beginning the study
  – Two additional institutions from Southeast and West
    • selected based on survey results
## Sampling and Response Rates

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Sampled $N$</th>
<th>Responded $N$</th>
<th>Response Rate</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors</td>
<td>176</td>
<td>52</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>Masters</td>
<td>160</td>
<td>48</td>
<td>30%</td>
<td>37%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>64</td>
<td>31</td>
<td>48%</td>
<td>24%</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>131</td>
<td>33%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Characteristics of Largest Secondary Math Teacher Prep Program at Institution

• Length and Degree
  - 81% B.A. or B.S. (4- or 5-year)
  - 19% post-BA or MAT

• Certification
  - 3% Middle Grades
  - 74% Combined
  - 22% High School

• Size (ave. last 3 yrs)
  - 0
  - 2.33
  - 5
  - 11.92
  - 52
## Required Courses and Credits

<table>
<thead>
<tr>
<th>Type of Course</th>
<th>Mean Number of Courses</th>
<th>Mean Number of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Advanced) Mathematics</td>
<td>11.3</td>
<td>35</td>
</tr>
<tr>
<td>Mathematics primarily for Teachers</td>
<td>1.2</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics Education (e.g., methods courses)</td>
<td>2.3</td>
<td>7</td>
</tr>
<tr>
<td>Other Education</td>
<td>9.5</td>
<td>27</td>
</tr>
</tbody>
</table>
Required Mathematics Courses

% of Responses Answering “Course is Required”
Opportunities to Learn

Algebra teaching

Equity

CCSSM

Missing

Don't know

No extent

Little extent

Some extent

Great extent
Changes based on CCSSM

- Discussions not begun: 13%
- Discussions begun, but not changes: 13%
- Minor changes: 6%
- Major changes: 29%
- Not familiar with CCSSM: 39%
Summary of Key Findings

• Significant variation in preparation programs
• Extensive coursework for OTL algebra in advanced mathematics courses
• OTL equity issues in algebra are generally not provided
• OTL about (or to teach) the algebra, functions & modeling strands in CCSSM are less likely
• Many programs have made changes to address some aspects of CCSSM
Discussion: Algebra Preparation

• What algebra knowledge has been useful to you? And when did you develop this knowledge? (i.e., course work, field experiences, or in practice)

• What do you think would be useful for teacher preparation?

• Talk to others around you, and discuss each category:
  – Algebra
  – Algebra teaching
  – Issues in achieving equity in algebra learning
  – Algebra, functions, and modeling standards and mathematical practices as described in \textit{CCSSM}
## Extent of OTLs in Case Studies

<table>
<thead>
<tr>
<th>Institution</th>
<th>Algebra</th>
<th>Algebra teaching</th>
<th>Issues in equity and algebra</th>
<th>Algebra and CCSSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>Great</td>
<td>Great</td>
<td>Unknown</td>
<td>Some</td>
</tr>
<tr>
<td>Gamma</td>
<td>Great</td>
<td>Great</td>
<td>Little</td>
<td>Great</td>
</tr>
<tr>
<td>Kappa</td>
<td>Some</td>
<td>Some</td>
<td>Unknown</td>
<td>Some</td>
</tr>
<tr>
<td>Sigma</td>
<td>Great</td>
<td>Some</td>
<td>Some</td>
<td>Some</td>
</tr>
</tbody>
</table>
Equity and Algebra

Across the four universities, some OTL Equity aspects of Algebra were identified:

1. Readings and discussions that help creating awareness about the diversity of learners, use of language and vocabulary in algebra, marginalized students, etc.

2. In some cases, instructors reported to address deeper elements, such as conceptual understanding as an equity issue, culturally relevant context, motivation as a tool, etc.
Readings and discussions: Some instructors used articles to generate awareness and promote discussions about equity.

Secondary Mathematics Methods: Each one of the 4 universities incorporated at some extent equity aspects in (at least one of) their Methods courses.

Conceptual and cognitive aspects: Instructors addressed issues such as conceptual understanding and how to make it more accessible to students and high cognitive demand tasks (not necessarily high difficulty) as a means of providing diverse options to solve problems.
**CCSSM and Algebra**

At each of the four universities, two different types of opportunities to learn related to the *CCSSM* and Algebra were described:

1. Many instructors discussed opportunities to learn algebraic content such as: functions, modeling, and reasoning and proof as recommended by *CCSSM*.

2. Some instructors provided experiences for their students to explicitly engage with elements of *CCSSM*.
CCSSM and Algebra

Content and Practice standards: Understanding how these two pieces of CCSSM interact

Using/Dissecting CCSSM: Working to unpack the standards in order to understand and implement

Connecting CCSSM and Teaching: Personalizing the standards document as applicable to practice
Discussion: Equity and CCSSM

1. Have you experienced OTLs similar to what we found?

2. What are other OTLs you have experienced or seen?

3. What are experiences with Equity and CCSSM that you hope are part of teacher preparation?
Discussion: What do you want to hear?

We are working to analyze and communicate our findings. What descriptions or analyses would be useful for you?
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