Using the DIO Framework to Improve Professional Development for Science and Mathematics Educators, K-16
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PRISM Goals

Raise expectations and achievement in Science and Mathematics in K-12 schools, while closing achievement gaps among demographic groups by

- Requiring all students to complete challenging courses/curricula in SM
- Increasing and sustaining the number, quality and diversity of K-12 teachers who teach SM
- Increasing the responsiveness of higher education to the needs of K-12 schools
Population Served

Regional
- 170,000 K-12 students
- 10,000 K-12 teachers
- In 275+ urban & rural public schools
- 44% of teachers prepared in University System of Georgia

State
- 1.4 million K-12 students
- 100,000+ K-12 teachers
- 100% USG teacher preparation programs in science and mathematics
Regional and State Partnerships

University System of Georgia

Northeast Region
- University of Georgia
- Clarke, Jackson, and Oconee School Districts
- Georgia Perimeter College

Metro Atlanta Region
- Georgia State University
- Atlanta Public Schools
- CEISMC—Georgia Institute of Technology

East Central Region
- Georgia Southern University
- Bulloch, Candler, Effingham, Evans, Screven, Toombs, and Vidalia City School Districts

Southeast Region
- Armstrong Atlantic State University
- Bryan, Camden, Chatham, and Glynn School Districts
- Coastal Georgia Community College

Georgia Department of Education
PRISM Design

- #1 Professional Learning
- #2 SM Specialists Elementary
- #3 Learning Communities
- #4 Institute Teaching & Learning-SM
- #5 Teacher Preparation GPS
- #6 Teacher Working Conditions
- #7 Teacher Recruitment
- #8 New K-12 Curriculum GPS
- #9 Public Awareness Campaign
- #10 HE Reward System

K-12 Teachers

Education Faculty

SM Faculty
Focus Today

#3 Learning Communities
DIO Framework

What changes need to be made?

Outcomes

What are the results?

Design

How are we going to intervene?

Implementation
How We Went About It

- Learning Community Retreat for the PRISM Leadership Team
- P-16 Learning Community Definition Document
- P-16 Learning Community Rubric
- Professional Learning for Lead Teachers
- Regions held Learning Community Workshops/Conferences
What is a P-16 Learning Community?

P-16 Learning Communities provide opportunities for P-16 educators to share what they know, consult with peers about problems of teaching and learning, observe others at work, and explore and test new ideas, methods and materials.
P-16 Learning
Communities Promote:

- Shared vision
- Collaboration between P-12 and college faculty
- Shared leadership – faculty led
- Trying, testing, and replicating effective teaching practices
- Publicizing the work
- Work that leads to improved student achievement
- Participation in collaborative inquiry
Foci of PRISM Learning Communities in 2005-06

- Preparation to implement the new Georgia Performance Standards in mathematics and science
- Content and pedagogy in mathematics and science
- Using data for school improvement
- Action research
- Inquiry-based teaching and learning strategies
Variation in PRISM Learning Communities

- Can be grade, school, district or region level
- Focus varies based on needs identified by participants through a formal or informal needs assessments (customized professional development)
- Some learning communities have and do not have IHE involvement
- IHE faculty members have varied roles in PRISM LCs:
  - Participating member
  - Facilitator
  - Resource
### PRISM Learning Communities by Region: 2005-06

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of PRISM LCs</th>
<th>Number of LCs with IHE participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>East Central</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>Northeast</td>
<td>28</td>
<td>5</td>
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<tr>
<td>Southeast</td>
<td>121</td>
<td>36</td>
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</tbody>
</table>
Evidence-Based Design and Outcomes

DIO Framework

- Design: How are we going to intervene?
- Outcomes: What are the results?
- Implementation: What changes need to be made?
## PRISM Evaluation Design

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Data Collection Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who participated in LCs? To what extent?</td>
<td>Participant Information</td>
</tr>
<tr>
<td></td>
<td>Attendance rosters</td>
</tr>
<tr>
<td></td>
<td>Higher Education faculty participation</td>
</tr>
<tr>
<td>What was the nature of the LC?</td>
<td>Document collection: agendas, syllabi, reading logs, etc.</td>
</tr>
<tr>
<td></td>
<td>Observations of the LCs</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td>Surveys</td>
</tr>
<tr>
<td>Did the participants acquire the intended knowledge and skills?</td>
<td>Inventory of Teaching and Learning Practices (ITAL)</td>
</tr>
<tr>
<td></td>
<td>Open-ended survey</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
<tr>
<td>Did the participant use the acquired knowledge and skills in the classroom?</td>
<td>Classroom observation (Reformed Teacher Observation Protocol)</td>
</tr>
<tr>
<td></td>
<td>Inventory of Teaching and Learning Practices (ITAL)</td>
</tr>
<tr>
<td></td>
<td>Open-ended survey</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
<tr>
<td>Did student achievement improve?</td>
<td>State tests (Georgia Criterion-Referenced Competency Tests, End-of-Course Tests, Georgia High School Graduation Tests)</td>
</tr>
</tbody>
</table>
## PRISM Evaluation of LCs: Quasi-Experimental Methods

<table>
<thead>
<tr>
<th>Year</th>
<th>Schools</th>
<th>Spring 03</th>
<th>Spring 04</th>
<th>Spring 05</th>
<th>Spring 06</th>
<th>Spring 07</th>
<th>Spring 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>Schools</td>
<td>Control</td>
<td>PRISM</td>
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<td>PRISM</td>
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<tr>
<td>Year 2</td>
<td>Schools</td>
<td>Control</td>
<td>Control</td>
<td>PRISM</td>
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<td>PRISM</td>
<td>PRISM</td>
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<tr>
<td>Year 3</td>
<td>Schools</td>
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<td>Control</td>
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<td>PRISM</td>
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<tr>
<td>Year 4</td>
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<td>Control</td>
<td>PRISM</td>
<td>PRISM</td>
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<tr>
<td>Year 5</td>
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<td>Control</td>
<td>Control</td>
<td>Control</td>
<td>PRISM</td>
</tr>
</tbody>
</table>
Qualitative Design-Triangulation

Data Sources
- PRISM Leaders (State and Regional)
- Administrators (K-12 & IHE)
- Faculty (K-12 and IHE)
- External Professional Learning Facilitators

Sites
- Four regions
- State Leadership Team Meetings
Qualitative Findings: Common Positive Outcomes

- Collaboration
  - Within K-12
  - Within IHE
  - Across K-12 and IHE
- Formal sharing of cultures
- Data-driven decision making
- Multiple communication strategies
- Customized professional learning
Qualitative Findings: Difficulties Encountered

- Initial lack of clarity
  - Structure and organization of LCs
  - PRISM
- Time
  - Conflicting responsibilities
  - IHE – no rewards
- Scheduling
  - Conflicts within K-12
  - IHE conflicts with K-12 school-based meetings
Quantitative Instrument

*Inventory of Teaching and Learning (ITAL)*

- Designed to measure K-16 teachers use of inquiry and standards based teaching and learning practices.
- Inquiry items written to parallel indicators in the RTOP.
- Principle components analysis revealed three dimensions.
  - I. Inquiry-based teaching and learning practices (30 items)
  - II. Standards-based teaching and learning practices (10 items)
  - III. Traditional teaching and learning practices (12 items)
Quantitative Procedures:
ITAL

- ITAL administered to all K-12 teachers who teach science and mathematics via email.
- Additional questions about LC participation and IHE involvement included.
- Response rates varied from 24% (problems with email addresses) to 93% for districts. Median response rate = 72%.
Mean Scores on ITAL for K-12 Mathematics and Science Teachers Who Did and Did Not Participate in a PRISM Learning Community

<table>
<thead>
<tr>
<th>Inquiry</th>
<th>Standards</th>
<th>Traditional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>Science</td>
<td>Math*</td>
</tr>
<tr>
<td>Science</td>
<td>Math*</td>
<td>Science*</td>
</tr>
</tbody>
</table>

PRISM LC  
not in LC

*p<.01
Mean Scores on ITAL for K-12 Mathematics and Science Teachers With or Without a IHE Faculty Member in the PRISM LC

- Inquiry
- Standards
- Traditional

*p<.01
**p<.05
Key Findings -- ITAL

- Teachers who participated in PRISM LCs reported greater emphasis on standards-based teaching and learning practices than those who did not.
- Teachers who participated in PRISM LCs that had a IHE faculty member involved reported greater emphasis on inquiry-based teaching and learning than participants in a PRISM LC that did not have IHE involvement.
Additional Findings - ITAL

- K-12 teachers reported greater emphasis on standards-based teaching and learning practices than on either inquiry or traditional practices.
- K-12 teachers reported least emphasis on traditional teaching and learning practices.
Feedback from the qualitative evaluation has led to LCs by
- Calling attention to learning communities that are effective and not effective
- Providing feedback within and across regions to regional leaders who are improving learning communities

Feedback from the quantitative evaluation (i.e., the ITAL and RTOP) has led to increased focus on inquiry in LCs
Further Studies Planned

- Linking the focus of the LC with teaching practices
- Linking participation in a LC with standardized achievement test scores
- Investigating the type of IHE involvement in LCs with teaching practices
- Investigating the effect of IHE participation in K-16 LCs on IHE faculty teaching practices
General Conclusions

- Learning communities viewed as successful by participants
- Time and schedule conflicts appear to be a continual challenge
- Regular feedback from regional evaluators has had some influence on the design of PRISM LCs and influenced the implementation of PRISM LCs
- Learning community participation does appear to have a small positive effect on teachers’ emphasis on standards-based teaching and learning in the classroom
- Higher Education faculty involvement appears to have a small positive effect on K-12 teachers’ emphasis on teachers reported emphasis on inquiry in the classroom
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