Science Teachers Learning from Lesson Analysis (STeLLA)

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STeLLA is…

• A research-tested professional development program

• An NSF-funded research study

• For teachers in grades 4 and 5
The STeLLA Conceptual Framework

Strategies to reveal, challenge and support student thinking (Total of 7 strategies)

• Ask questions to elicit student ideas and predictions
• Ask questions to probe student ideas and predictions

Strategies to create a coherent science content storyline (Total of 9 strategies)

• Make explicit links between science ideas and activities
• Select content representations that are matched to the learning goal and engage students in their use

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STeLLA Professional Development Goals/Research Questions

• Deepen teachers’ science content knowledge

• Improve teachers’ ability to analyze science teaching and learning

• Improve science teaching practice

• Improve student science learning
Initial NSF-funded study of the STeLLA Lesson Analysis Program demonstrated positive impact on....
Building on Success
Improved Teachers’ Science Content Learning

Graph showing the comparison between the experimental group (n=32) and the control group (n=16) in pretest, midtest, and posttest scores.
Building on Success

Improved Students’ Science Content Learning

Before teachers participated in program 2006:
- Photosynthesis: 0.3
- Watercycle: 0.6
- Electricity: 1.1
- Foodwebs: 0.4

After teachers participated in program 2007:
- Photosynthesis: 2
- Watercycle: 1.5
- Electricity: 2.8
- Foodwebs: 1.6
Building on Success

Student learning was predicted by...

Teacher science content learning

Changes in science teaching practice

Teacher ability to analyze science teaching

Improved student learning
STeLLA II in Colorado Springs D11 Pilot Study 2010-2011

• STeLLA Summer Institute was well-received by 4th and 5th grade teachers

• Teachers are now applying their learning to their teaching of science

• D11 administrators and teachers value the usefulness of STeLLA strategies in teaching of other subject areas (especially literacy)
Preliminary Findings from Pilot: Teacher Gains in Content Knowledge

Error Bars: +/- 1 SE
Feedback from the STeLLA pilot

• About content deepening:
  – The quality of instruction was very high, and the professors [from DU] modeled teaching techniques that the teachers would like to emulate.

• About lesson analysis:
  – Teachers agreed that the lenses were a helpful organizational tool that “helps me be better prepared to teach, draw all this stuff together, hopefully be more effective when I teach science.”
“The way we became a community” with the help of facilitators was essential to the STeLLA experience because “it became a safe place.” One said, “This is the definition of a PLC.”

“I look forward to meeting eight times… I don’t feel it’s a chore… I like to meet with these people…. We can go through the fall and the spring together knowing that we’ve got a basis for trusting each other…. I feel that I can call and ask anyone here for help… I would give up four hours to do a PLC of this nature.”
One-year professional development program for 4\textsuperscript{th} and 5\textsuperscript{th} grade in-service teachers

Science content deepening using specific science content in Colorado standards

Analysis-of-practice using videocases in facilitated study groups
Building on Success
STeLLA Research Design 2011-2012

• Randomized-controlled, scale-up study – the “Gold Standard”
• N=200 4th and 5th grade teachers
• All teachers receive 88.5 hours of professional development across one year
• Random selection by school into two groups
  – Content deepening program
  – Lesson analysis program
Hypothesized Pathways of Influence for STeLLA II PD

- STeLLA Professional Development
- Teachers’ content deepening
- Teachers’ ability to analyze lessons
- Changes in science teaching practice
- Improved student learning

STeLLA CONTENT DEEPENING PROGRAM
STeLLA LESSON ANALYSIS PROGRAM

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Comparing STeLLA Content Deepening and STeLLA Lesson Analysis Programs

STeLLA LESSON ANALYSIS PROGRAM
Videocase-based analysis-of-practice as a context for content deepening

One-year PD program for 4th and 5th grade in-service teachers
Focused on specific science content in teachers’ curriculum

STeLLA CONTENT DEEPENING PROGRAM
Intensive content deepening work
Professional Development Leaders

• Content Deepening Program: University of Denver Science Faculty

• Lesson Analysis Program: BSCS Professional Development Leaders and University of Denver Science Faculty
Timeline 2011-2012

• Two-week (9-day) Summer Institute (either June 7-17 or July 5-15)

• 30 additional hours of PD during the school year (meeting times to be determined by each study group or content group)
<table>
<thead>
<tr>
<th>4th Grade</th>
<th>5th Grade</th>
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<tbody>
<tr>
<td>*Food webs</td>
<td>*Water cycle</td>
</tr>
<tr>
<td>†Earth’s changing surface</td>
<td>*Sun’s effect on seasons and climate</td>
</tr>
</tbody>
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* = Matched to new State of Colorado Standards
† = Matched to new State of Colorado 5th grade Standards