Examining the Impact of Lesson-Analysis Based Teacher Education and Professional Development across Methods Courses, Student Teaching, and Induction

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Christopher Wilson
Molly Stuhlsatz
Connie Hvidsten
Betty Stennett
ViSTA Plus: Videocases for Science Teaching Analysis Plus

ViSTA Plus is:

A multi-year pre-service teacher education program for elementary teachers that spans the methods course, student teaching, and the first year of teaching.
Video-based Inquiry into Practice: Line of Research

ViSTA Plus is also:

. . . part of a 13+ year line of research on professional development, involving studies:

- At elementary, middle and high school
- Of in-service and preservice teachers
- Of face-to-face and online PD
- Across the NSF cycle of innovation
- Of PD leadership development
- At different scales, up to district wide sustainability
ViSTA Plus: Videocases for Science Teaching Analysis Plus

ViSTA Plus is also:

• A research study examining the impacts of this approach to teacher education and professional development, and comparing to traditional approaches.

• A collaboration with the University of New Mexico and the University of Houston, Victoria.
ViSTA Plus

- A study in three phases

<table>
<thead>
<tr>
<th>Methods Course</th>
<th>Student Teaching</th>
<th>First Year Teaching</th>
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<tbody>
<tr>
<td><strong>ViSTA Plus</strong></td>
<td>Teacher data</td>
<td>Teacher and Student Data</td>
</tr>
<tr>
<td><strong>BaU</strong></td>
<td>Teacher data</td>
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ViSTA Plus Goals:
Turn Teacher Preparation “Upside Down”

The NCATE Challenge:
• Offer a preservice curriculum that intertwines practitioner knowledge with academic knowledge from the outset
• Emphasize knowledge in use – both science knowledge and teacher knowledge – in the context of real problems of classroom practice.

The ViSTA Plus Answer:
• Build a video-based, analysis of practice of practice program that spans
  – A methods course
  – Small group reflection in practice during student teaching
  – Collaborative lesson planning and analysis of peer videos in the first year of teaching
ViSTA Plus Design Principles

1. Conceptual Framework
### Strategies to Reveal, Support, and Challenge Student Thinking

1. Ask questions to elicit student ideas and predictions
2. Ask questions to probe student ideas and predictions
3. Ask questions to challenge student thinking
4. Engage students in analyzing and interpreting data and observations
5. Engage students in constructing explanations and arguments
6. Engage students in using and applying new science ideas in a variety of ways and contexts
7. Engage students in making connections by synthesizing and summarizing key science ideas
8. Engage students in communicating in scientific ways

### Strategies to Create a Coherent Science Content Storyline

A. Identify one main learning goal
B. Set the purpose with a focus question or goal statement
C. Select activities that are matched to the learning goal
D. Select content representations and models matched to the learning goal and engage students in their use
E. Sequence key science ideas and activities appropriately
F. Make explicit links between science ideas and activities
G. Link science ideas to other science ideas
H. Highlight key science ideas and focus question throughout
I. Summarize key science ideas
2. Theory of teacher learning

Situated Cognition and the Culture of Learning

John Seely Brown  Allan Collins  Paul Duguid

The boundary between learning and use, which is captured by the folk categories "know what" and "know how," may well be a product of the structure and practices of our education system. Many methods of didactic education assume a separation between knowing and doing, treating knowledge as an integral, self-sufficient substance, theoretically independent of the situations in which it is learned and used. The primary concern of schools often seems to be the transfer of this substance, which comprises abstract, decontextualized formal concepts. The activity and context in which learning takes place are thus regarded as merely ancillary to learning—pedagogically useful, of course, but fundamentally distinct and even neutral with respect to what is learned.

Recent investigations of learning, however, challenge this separation of what is learned from how it is learned and used. The activity in which knowledge is developed and deployed is, in fact, not separate from the context of its use. Learning and cognition, it is now possible to argue, are fundamentally situated.

In this paper, we try to explain in a deliberately speculative way, why activity and situations are integral to cognition and learning, and how different ideas of what is appropriate learning activity produce very different results. We suggest that, by ignoring the situated nature of cognition, education defies its own goal of providing usable, robust knowledge. And conversely, we argue that approaches such as cognitive apprenticeship (Brown, Collins, & Duguid, in press) that embed learning in activity and make deliberate use of the social and physical context are more in line with the understanding of learning and cognition that is emerging from research.

Situated Knowledge and Learning

Miller and Glaser's (1980) work on vocabulary teaching has shown how the assumption that knowing and doing can be separated leads to a teaching method that ignores the ways situations structure cognition. Their work has described how children are taught words from dictionary definitions and a few exemplary sentences, and they have compared this method with the way vocabulary is normally learned outside school.

People generally learn words in the context of ordinary communication. This process is startlingly fast and successful. Miller and Glaser note that by listening, talking, and reading, the average 12-year-old has learned vocabulary at a rate of 3,000 words per year (50 per day) for over 10 years. By contrast, learning words from abstract definitions and sentences taken out of the context of normal use, the usual vocabulary curriculum is often found to be slow and generally unsuccessful. There is barely enough classroom time to teach more than 100 to 200 words per year. Moreover, much of what is taught turns out to be almost useless in practice. They give the following example of a student's use of vocabulary acquired this way:

Me and my parents went to the zoo, and I couldn't be more excited about falling off the cliff.

Mrs. Mercer specialized in the woz? Given the method, such mistakes seem unavoidable. Teaching from dictionaries assumes that definitions and exemplary sentences are well-connected pieces of knowledge. But words and sentences are not islands, entire unto themselves. Language use would involve an unrelenting confrontation with ambiguity, polysemy, metonymy, metaphor, and so forth. Thus, even students who find themselves without the extra-linguistic help that the context of an utterance provides (Nunberg, 1978).

Prominent among the intricacies of language that depend on extra-linguistic help are internal words—words like I, you, we, next, tomorrow, afterwards. These lexical items are those that are in the center of the so-called "indexical" or more plainly point to a part of the situation in which communication is being conducted. They are not merely context-sensitive; they are completely context-dependent. Words like I or me, we, your, etc.
**ViSTA Plus Design Principles**

3. Program form

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The practice-based methods course</strong></td>
<td><strong>The student teaching experience</strong></td>
<td><strong>Continued support through the 1st year of teaching</strong></td>
</tr>
<tr>
<td><strong>Spring Semester 2014</strong></td>
<td><strong>Academic Year 2014-2015</strong></td>
<td><strong>Academic year 2015-2016</strong></td>
</tr>
<tr>
<td>• Introduces the STeLLA two-lens framework</td>
<td>• Model lessons support student teachers in enacting strategies in classroom placement</td>
<td>• Small group teams develop grade-appropriate, STeLLA-based lessons</td>
</tr>
<tr>
<td>• Introduces students to the process of video analysis</td>
<td>• Student teachers videotape one lesson of the series</td>
<td>• Teachers videotape one lesson of the series</td>
</tr>
<tr>
<td>• Intertwines learning about science content and teaching pedagogy using two content areas related to energy and matter – food webs and water cycle</td>
<td>• In online small groups, participant’s analyze video clips of their own and their peers’ teaching</td>
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ViSTA Plus Design Principles

4. Analysis of Practice

- Video of other teachers using program strategies establish a common vision of the strategies and classroom possibilities

- Video of participants teaching common lessons provide an rich initial experience to analyze each teacher’s enactment of the strategies
ViSTA Plus Research Study

ViSTA Plus
Video-based Analysis of Practice of 3 Years during:
Methods Course
Summer Institutes
Study Group Meetings
88 hours of PD

COMPARISON
Business-as-Usual:
Methods Course
Student Teaching
First Year Teaching

Same science content learning goals
Research Questions

• What gains do teachers in ViSTA Plus and BaU program experience in science content knowledge, pedagogical content knowledge, and science teaching practice?

• What gains do elementary students of teachers in ViSTA Plus and BaU groups experience in knowledge of science content?
An Interesting Time to Do Research

• A significant period of change in their lives.
• From students to professionals.
• From being contained to widely distributed.
• New schools, new principals, new district rules, new curricula, new standards, etc. etc.
• Multiple pathways
• Life events
• Fires
ViSTA Plus Theory of Change

Program: ViSTA Professional Development Program

Teacher Outcomes: Teacher Science Content Knowledge, Teacher Pedagogical Content Knowledge

Teaching Practice

Student Outcomes: Student Science Content Knowledge
Population and Attrition

<table>
<thead>
<tr>
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<tr>
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<td>17</td>
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<tr>
<td>First Year Teaching</td>
<td>19</td>
<td>3</td>
</tr>
</tbody>
</table>
ViSTA Plus Results – Teacher Content Knowledge

Growth in Teacher Content Knowledge by Treatment

- P = 0.003
  - Effect Size = 0.76
- P < 0.001
  - Effect Size = 0.80

Timepoint:
- Pre Methods
- Post Methods
- Post Student Teaching
- Post First Year Teaching
ViSTA Plus Results – Teacher Reasoning

Growth in Teacher Reasoning by Treatment

P<0.001
Effect Size = 0.85

P=0.114
Effect Size = 0.45

Mean Score (Rasch Person Measures)

Timepoint
Pre Methods | Post Methods | Post Student Teaching | Post First Year Teaching

Treatment
Business-as-Usual | ViSTA Plus

BSCS
ViSTA Plus Results – Teacher PCK
ViSTA Plus Results – Teacher PCK

- P<0.001
  - Effect Size = 1.68
- P=0.012
  - Effect Size = 0.74
ViSTA Plus Results –
Teacher Practice (Student Teaching)

P<0.001
Effect Size = 2.05

Mean Score (Rasch Person Measures)

Treatment
- Business-as-Usual
- ViSTA Plus
ViSTA Plus Results – Student Content Knowledge

Growth in Student Science Content Knowledge by Treatment

P = 0.01
Effect Size = 0.38
Qualitative Analysis

• Anonymous responses from participant surveys
• Participant reflections after study group meetings
• World Café
• Story Corps Interviews
Teacher Feedback and Transformation

• What did participation in ViSTA Plus do for you as a teacher?
  – Greater confidence in science content knowledge (less fear of science content)
  – Greater ability to plan coherent lessons with targeted learning goals (not simply fun activities)
  – Greater skill at using questions to help students investigate their own thinking (not simply telling them the right answer or the right vocabulary term)
Obstacles, Barriers, and Challenges

• Low priority given to science instruction at the schools
• Little respect from their colleagues for new ideas
• Pressure to follow pre-determined curriculum
• Emphasis on teaching to the test (covering the material) rather than on deeper student learning
Teacher Reflection on Student Impacts

• Students learned to express their own thinking, not just right answers.

• Engaging in science through reasoning, rather than being told, supported students’ identities and self efficacy for academic work.

• Students were engaged and motivated for science learning.
Next Steps

• Disseminate results
• Develop resources
• Engage the community

bscs.org/vista-workshop-registration
Contact

Christopher Wilson
cwilson@bscs.org

Connie Hvidsten
chvidsten@bscs.org

Molly Stuhlsatz
mstuhlsatz@bscs.org

Betty Stennett
bstennett@bscs.org

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