Lesson Study: Assessing Implementation to Guide Professional Development

Chris Nugent & Dan Willis
April 25, 2006
NCSM
Professional Development For Teachers

Source: Catherine Lewis

Teachers’ Activities to Improve Instruction

Choose curriculum, write curriculum, align curriculum, write local standards

Plan lessons individually

Plan lessons collaboratively

Watch and discuss each other’s classroom lessons

U.S.

JAPAN
Japanese-Style Lesson Study

- School based
- Collaborative
- Sustained over time
- Focus on learning
- Data driven
- Action research
Lesson Study Cycle

- Discuss goals
- Examine curriculum materials
- Plan a research lesson
- Conduct the research lesson
- Discuss the research lesson
- Reteach the lesson
- Reflect on the process

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Loras College
Lesson Study Project

• *K-6 Mathematics*
• *Iowa Title II (MSP) grant*
• *3 years at $150,000 per year*
• *Matching funding from Loras College, school districts, and AEAs*
Loras College Lesson Study Project

• 49 total participating teachers
  – ½ within Dubuque
  – ½ within 80 miles of Dubuque

• 16 lesson study teams

• 3 teachers (usually) on a team
Loras College
Lesson Study Project

• 15 buildings
  – 2 Title I schools
  – 5 parochial schools

• 10 school districts in Eastern Iowa
Loras College
Lesson Study Project

• Project Staff:
  – Co-directors: Chris Nugent & Dan Willis
  – Math faculty, AEA Math consultants
  – Consultants
    • Akihiko Takahashi, Ph.D.
    • Makoto Yoshida, Ph.D.
  – Assessment: Linda Munger, Ph.D.
  – Student Workers
Current Project: Typical Year

• **Summer workshops**
  – Week 1 (June)
    • Mostly Content
      – *Year 1: Number & Operations*
      – *Year 2: Geometry & Measurement*
      – *Year 3: Algebra, Data Analysis, and Probability*

• Some Lesson Study
  – *One or more research lessons*
Current Project: Typical Year

Week 1 (June), continued

- NCTM Content Standards
  - Number & Operations
  - Geometry
  - Measurement
  - Algebra
  - Data Analysis & Probability

- NCTM Process Standards
  - Problem-Solving
  - Communication
  - Reasoning & Proof
  - Representations
  - Connections

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Current Project: Typical Year

- *Summer workshops, continued*
  - Summer Homework
    - Content work
    - Lesson study
    - Lesson planning
  - Week 2 (August)
    - Mostly Lesson Study
      - Finish Planning Research Lesson
      - Conduct Research Lesson
      - Discuss Research Lesson
Current Project: Typical Year

• **School Year Activities**
  – Lesson Study process in school
  – Full group meetings
  – ICNs / speakers
  – Math content class
  – Public research lessons
  – Dissemination
  – Area Leaders
Teacher Expectations

- Attend summer workshops
- Participate in Lesson Study group and other sessions
- Assist with data collection
Teacher Rewards

- **Stipend**: $1500/year
- **Materials or Travel**: $300
- **Opportunity for graduate Education credit** at $125/credit
- **Opportunity for graduate Math Education credit** at $125/credit
Assessment / Accountability:
Iowa Professional Development Model

Program Evaluation (Summative)

Collecting/Analyzing Student Data

Goal Setting & Student Learning

Selecting Content

Designing Process for Professional Development

Ongoing Data Collection (Formative Evaluation)

Collaboration/Implementation

Training/Learning Opportunities

Ongoing Cycle
Assessment / Accountability

- Knowledge, Attitude, Skills, Application and Behavior
- Theory of Change
- Implementation Data
Assessment / Accountability

- Assessing Teachers:
  - Michigan (LMT) test
  - Teacher Implementation Survey
  - Meeting Minutes
  - Lesson Plans
  - Reports
Assessment / Accountability

• Assessing Student Achievement:
  – ITBS
  – Problem Solving Probes
  – Behavior Rating Scales
Assessing Teachers: Michigan (LMT) Test

- LMT = Learning Mathematics for Teaching
- Deborah Loewenberg Ball, Hyman Bass, Heather Hill, et al (at Michigan)
- On the web at
  http://sitemaker.umich.edu/lmt
Michigan (LMT) Test

• Liping Ma:
  – Elementary School Math
  – Compares US and China
  – Teacher Knowledge
  – Professional Development
Michigan (LMT) Test

• Test is designed to measure
  – “Content knowledge for teaching mathematics”
  – “Pedagogical content knowledge”
  – “Profound understanding of fundamental mathematics”

• K-6 Content areas:
  – Number and Operations
  – Geometry
  – Patterns, Functions, and Algebra
Michigan (LMT) Test: A Released Item

• Which of the following story problems could be used to illustrate $1\frac{1}{4}$ divided by $\frac{1}{2}$? (Mark “Yes”, “No”, or “I’m not sure” for each possibility)
  – a) You want to split $1\frac{1}{4}$ pies evenly between two families. How much should each family get?
  – b) You have $1.25 and may soon double your money. How much money would you end up with?
  – c) You are making some homemade taffy and the recipe calls for $1\frac{1}{4}$ cups of butter. How many sticks of butter (each stick = $\frac{1}{2}$ cup) will you need?
Assessing Teachers: Teacher Implementation Survey

• Use of manipulatives
• Use of technology
• Amount of time on solving problems
• Amount of time working in groups
• Writing in math
Assessing Teachers: Meeting Minutes

Amount of time spent:
• Planning a lesson
• Looking at curriculum
• Reflecting on the lesson
• Organizational details
Assessing Teachers: Lesson Plan Form

- Context
- Books and Materials
- Goals of the Lesson
- Research Questions
- How the Lesson Fits into the Unit
- Detailed Lesson Plan
- Data (handouts, student work, etc.)
Detailed Lesson Plan

• Column 1: Learning Activities
• Column 2: Teacher Support
• Column 3: Things to Look For
• Problem-Based Instructional Task:
  – Introduction and Review
  – Launch
  – Explore
  – Discuss (Lifting)
  – Extensions
# Detailed Lesson Plan

<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>Teacher Support</th>
<th>Things to Look For</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Launch</strong></td>
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<tr>
<td><strong>Explore</strong></td>
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<td></td>
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<tr>
<td><strong>Discuss (Lifting)</strong></td>
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<tr>
<td><strong>Extensions</strong></td>
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</tr>
</tbody>
</table>

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Assessing Students: ITBS Data

- Pilot project data (DCSD & DHF)
- Achievement measure: ITBS Math (NGE)
- Comparison: cohort’s NGE growth versus district average NGE growth (over one year)
- Cohort = group of students whose teacher participated in Lesson Study in year one of the pilot project (2002-2003)
- Intervention or treatment = Teacher participation in lesson study
ITBS Data

• DHF results:
  – 3 third grade cohorts
  – 3 fourth grade cohorts
  – 1 fifth grade cohorts

• DCSD results:
  – 4 third grade cohorts
  – 2 fourth grade cohorts
  – 3 fifth grade cohorts
  – 1 sixth grade cohort
ITBS Data

• Research design:
  – Dan Willis & Chris Nugent

• Data analysis:
  – Todd Wessels, DHF
  – Shirley Horstman, DCSD
  – David Tallant, AEA1

• Notes:
  – Data does include one cohort (N = 8) from DCSD with large attrition
  – Data does not include results from two teachers from DCSD who dropped out midyear
# ITBS Data: DHF

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cohort N</th>
<th>District Average Growth (Years)</th>
<th>Cohort Growth (Years)</th>
<th>Building Demographic</th>
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<td>26</td>
<td>1.80</td>
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<tr>
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<td>Downtown</td>
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<td>21</td>
<td>1.50</td>
<td>2.45</td>
<td>Affluent suburban</td>
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## ITBS Data: DCSD

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cohort N</th>
<th>District Average Growth (Years)</th>
<th>Cohort Growth (Years)</th>
<th>Building Demographic</th>
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<tbody>
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<td>1.57</td>
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<tr>
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<tr>
<td>6</td>
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<td>1.85</td>
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</table>
ITBS Data: Research Issues

• Quasi-experimental, not true experimental (lacks random assignment to treatment and controls)
• Campbell & Stanley Type 10 (nonequivalent control group) design
• Control for teacher? For building?
• Fidelity of implementation?
• Small N
ITBS Data: Federal Guidelines

From the “What Works” Clearinghouse (USDOED):


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ITBS Data: Federal Guidelines

• “Statistical significance tells us very little (if anything) about the practical significance or relative impact of the effect size.”

• “Sometimes, how much an education intervention ‘matters’ is easily understood, because the measurement metric is familiar to most people.”
ITBS Data: Federal Guidelines

• “Another example of a relatively easily understood metric is grade level equivalents (GLE) … We can compare the average GLE score for a group of students who received some intervention with the average GLE with a group of students who did not receive the intervention and get a good intuitive sense about whether the difference is small or large.”

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Assessing Students: Problem Solving Probes

The Problem Solver,
Creative Publications, copyright 1987

• Each year down at the bottom of the sea, the codfish hold their annual ball. This year 1/3 of the invited guests are codfish, since they are giving the party; 2/6 of the guests are in the tuna family; 1/6 are flounders, who get in everyone’s way; 1/12 are salmon, who always want to dance up stream; and the last 32 are electric eels who provide the lighting. How many fish are coming to the party, and how many are in each group?
## Assessing Students: Behavior Rating Scale

1. This student is confident of his/her math ability.
   
   4  3  2  1

2. This student perseveres even when experiencing difficulty.

   4  3  2  1

3. This student uses a variety of strategies when solving problems.

   4  3  2  1

4. This student can explain his/her thinking in writing.

   4  3  2  1

5. This student is not confused when a problem has too much or too little information for solving.

   4  3  2  1

6. This student uses estimation to be sure an answer makes sense.

   4  3  2  1

7. This student checks his/her work.

   4  3  2  1

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Project Web Site

http://myweb.loras.edu/lessonstudy

- More Information
- Resources
- Links
- Talks