Japanese mindset of continuous learning in teachers

Akihiko Takahashi, Ph.D.
DePaul University
atakahas@depaul.edu
Twitter: @AkihikoTa
Three Levels of Teaching

Japanese mathematics educators and teachers identify three levels of expertise of mathematics teaching (Sugiyama, 2008):

• Level 1: The teacher can tell students the important basic ideas of mathematics such as facts, concepts, procedures, and practices.

• Level 2: The teacher can explain the meanings and reasons of the important basic ideas and practices of mathematics in order for students to understand them.

• Level 3: The teacher can provide students with opportunities to understand these basic ideas and practices, and support their learning so that the students become independent learners. (Trans. A. Takahashi, 2011a)
Level 1 Teaching vs. Level 2 Teaching

• $23 \times 14$

• $435 \div 3$

Lesson Study Alliance
Helping teachers work together to improve teaching & learning.
http://www.LSAlliance.org
Problem Solving
(Standards and Focal Points, NCTM)

• Problem solving means *engaging in a task for which the solution is not known in advance.*

• Good problems give students the chance to solidify and extend their knowledge and to *stimulate new learning.* Most mathematical concepts can be introduced through problems based on familiar experiences coming from students' lives or from mathematical contexts.

• Students need to develop a range of strategies for solving problems, such as using diagrams, looking for patterns, or trying special values or cases.
For Level 3 teaching

• In order to develop expertise for Level 3 teaching, learning by reading, listening, and seeing may not be sufficient.
Two Major Types of Professional Development

• Phase 1 professional development focuses on developing the knowledge for teaching mathematics,
  – through reading books and resources, listening to lectures, and watching visual resources such as video and demonstration lessons.

• Phase 2 professional development focuses on developing expertise for teaching mathematics
  – teachers should plan the lesson carefully, teach the lesson based on the lesson plan, and reflect upon the teaching and learning based on the careful observation. Japanese teachers and educators usually go through this process using Lesson Study
## A framework for developing programs and resources for mathematics teacher education

<table>
<thead>
<tr>
<th>Phase 1 Professional Development</th>
<th>For becoming Level 1 Teacher</th>
<th>For becoming Level 2 Teacher</th>
<th>For becoming Level 3 Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewing the contents for teaching • Workbooks • Online courses • Developing lesson plans</td>
<td>Undergraduate courses for prospective teachers • Books/resources • Classroom videos • Classroom observation</td>
<td>Undergraduate courses for prospective teachers • Books/resources • Classroom videos • Classroom observation</td>
<td>Lesson Study Design, Teach, Observe, and Reflect Establishing shared knowledge for Level 3 teaching</td>
</tr>
</tbody>
</table>

| Phase 2 Professional Development | Find effective ways of presenting ideas and procedure through Lesson Study | | |
|----------------------------------|------------------------------------------------------------------------| | |

Lesson Study Alliance

*Helping teachers work together to improve teaching & learning.*

http://www.LSAliance.org
Initial teacher education (Mathematics)

a) Support prospective teachers develop knowledge for Level 2 teaching

b) Understanding the basic form of Level 3 teaching (Teaching through Problem Solving)

c) Establishing the foundation for Lesson Study
   – Understanding the student needs (formative assessment, classroom observation)
   – Design a unit and lessons through collaboration
   – Examine the impacts of the lesson through classroom observation
   – Modifying lesson plans based on the post-lesson discussion in order to meet the student needs
An example of student teaching at a national university in Japan

• Junior year (3rd year of 4 year teacher preparation program)
  – Three weeks student teaching in the middle of the year at a national school affiliated with the university

• Senior year (4th year of 4 year teacher preparation program)
  – Three weeks student teaching in the middle of the year at a public school
An example of student teaching in the middle of Junior year

• Several student teachers, typically 4 or 5, are assigned to one cooperating classroom teacher.

• All the student teachers work together to design, teach, and reflect lessons under the guidance of the cooperating teacher in order to establish the foundation of Lesson Study; such as careful observation of student learning, designing lesson through collaboration, and examining the impact of lesson to the student learning.

• Each student teacher teaches only 3 or 4 lessons during the three weeks, however, all of them observe all the lessons during the three weeks and having a post lesson discussion under the guidance of the cooperating teacher.
An example of student teaching in the middle of senior year

- Typically one student is assigned to one cooperating classroom teacher at a public school.
- A student teacher gradually increase the number of lessons to teach in each day.
- At the end of three weeks, the student teacher will have a research lesson in front of all the faculty at the school.
Implementing Japanese lesson study in a US context
Contrasting methods of professional development
(reprinted from Lewis, 2002, p.12)

Traditional
• Begins with answer
• Driven by outside “expert”
• Communication flow: trainer to teachers
• Hierarchical relations between trainer & teachers
• Research informs practice

Lesson Study
• Begins with question
• Driven by participants
• Communication flow: among teachers
• Reciprocal relations among teachers
• Practice is research
Lesson Study Alliance
Helping teachers work together to improve teaching & learning.
http://www.LSAlliance.org

Network CCSS Leadership Teams
2 ISL's per network: (1) Gr P-5, (1) Gr 6- HS
9 Teacher Facilitators per network:
(1) PreK, (2) Gr P-2, (2) Gr 3-5, (2) Gr 6-8,
(1) HS Algebra, (1) HS Geometry

Deliver Teacher Leader Institutes
to Teacher Leaders.

Teacher Leaders
(with support of PRINCIPALS)
Up to 5 Teacher Leaders per school:
(1) Gr P-2, (1) Gr 3-5, (1) Gr 6-8,
(1) HS Algebra, (1) HS Geometry

Deliver School Level PD to ALL Teachers.

All Teachers
that teach or support Mathematics
instruction
Implement with fidelity CCSS instructional
model, strategies, and focus standards.

Post-PD Classroom Look Fors*

Schools have to decide how and conduct it effectively.

Classroom Vision for High-Quality Mathematics Instruction
Every day, in all mathematics classrooms throughout Chicago Public Schools (CPS),
ALL students will:
• Engage in mathematical sense-making leading to deep mathematical understanding.
• Apply mathematics efficiently and flexibly to solve problems.
• Communicate and respond to mathematical thinking in visual, written, and/or verbal
forms.

Reprint from
CPS Network Partnership
Mathematics Common Core PD Summary SY 2014-15
CLR cycle to impact on student learning

Research Theme
A desired outcome for students and an entry point for achieving that outcome

1. Select a topic and a grade for investigation in order to address the theme
2. Live research lesson
3. Post-lesson discussion to solidify ideas for addressing the research theme
4. Summarize learning and identify next steps
5. Support by knowledgeable other to conduct kyouzai kenkyuu and to develop lesson research proposal
6. Develop lesson research proposal with unit plan
7. Kyouzai Kenkyuu groundwork for lesson design
8. Final comments by knowledgeable other to summarize learning and guide future research

Sharing the results
Teaching through Problem Solving

Average Percentage of TIMSS Mathematics Topics Taught in School and the Achievement (Average Scale Score) of the TIMSS 2003

Grade 4

<table>
<thead>
<tr>
<th>Scale Score</th>
<th>Average Percentage Taught</th>
<th>Country</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-60</td>
<td>54% taught, 565</td>
<td>Japan</td>
<td>69% Correct</td>
</tr>
<tr>
<td>60-70</td>
<td>73% taught, 495</td>
<td>Int. Ave.</td>
<td>53% Correct</td>
</tr>
<tr>
<td>70-80</td>
<td>82% taught, 594</td>
<td>Singapore</td>
<td>74% Correct</td>
</tr>
<tr>
<td>80-90</td>
<td>82% taught, 518</td>
<td>United States</td>
<td>58% Correct</td>
</tr>
</tbody>
</table>

Source TIMSS 2003 International Mathematics Report
Grade 8: Exhibit 5.7 (p.192), Exhibit C. 1 (p.400)
Grade 4: Exhibit 5.7 (p.193), Exhibit C. 1 (p.402)
School-wide CLR projects

- **US**
  - Chicago Public Schools (CPS) 6 + schools
  - Oakland Public Schools (OUSD) 5 schools
  - San Francisco Public Schools (SFUSD) 5 schools
  - University City School District in St. Louis
  - 4 elementary, 2 middle, and 1 high schools

- **Qatar**
  - 4 independent Schools (public schools)
    2 primary and 2 lower secondary schools

- **UK**
  - Partner schools of Shell Center at the University of Nottingham