An Introductory Experience with Lesson Study

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Abstract

This paper is a report of a summer lesson study experience with middle school mathematics and science teachers at Cowherd Middle School in East Aurora School District 131. Teachers planned, taught, evaluated, revised, retaught and reflected on a lesson concerning spatial visualization and geometric reasoning. Teachers grew in their understanding that the lesson study process is valuable for their preparation of challenging lessons and that the process supports their professional development as teachers.

An Introductory Experience with Lesson Study

In June 2001 at an Illinois Math Teacher Educator Meeting, Claran Einfeldt, formerly a Division Administrator with the ISBE Division of Mathematics and Science, gave all participants a copy of The Teaching Gap (Stigler & Hiebert, 2000). Ideas of a teacher-led professional development called Lesson Study were fostered in the text. The original ideas came from Japan where teachers routinely participated in lesson study. I am submitting this report to offer assistance to others who may be interested in undertaking lesson study.

Synopsis of Japanese Lesson Study

In Japanese lesson study, teachers come together to decide on a research theme or main goal of the lesson (Lewis, 2002). This is a statement of the broad aim of the lesson study that might be aligned with the school’s mission statement. Next a subject area is chosen and then the teachers choose the topic and the unit/lesson goals. The teachers are now ready to research the topic and plan the lesson. In the planning discussion, teachers focus on student learning. They decide on a list of carefully worded questions and attempt to anticipate what students’ responses will be to the teacher questions and classroom activities. During this planning stage, teachers question their beliefs, reflect on why they teach as they do, learn from their colleagues and build a stronger collegial network. The next step would be for one member of the group to teach the lesson and for the others to observe the students and their reactions to the lesson. Soon after the lesson, the teachers would meet to discuss the lesson and make revisions based on student response. Ideally a different member of the group would teach the revised lesson while the others would observe student response.

“Best Practice”

Lesson study employs “Best Practice” because the teachers are being truly collaborative. They research the topic, discuss and question others’ opinions and suggestions and are involved in an in-depth systematic examination of their practice as their focus shifts away from what is
presented to what is learned. Teachers develop habits of mind of research to investigate teaching and learning, communication of new ideas and approaches and self-efficacy as they realize that they can make a difference in student learning. (Stepanek, J., 2007) “Because lesson study is carried out in classrooms, the problem of applying the [research] findings to classrooms disappears.” (Stigler, p. 165).

The benefits for students are that the lesson study lessons are very engaging. They are inquiry-based, have input from many teachers and target specific learning needs. The classroom is learner centered with students learning from classmates that there are multiple ways to a problem solving solution while explaining their thought process orally and in writing. Teachers tend to question by scaffolding.

The teacher benefits include encouragement for long term professional development as they plan more engaging lessons and gain insights from other teachers. They become more reflective teachers with immediate feedback and gain greater understanding of their colleagues. Also they have an opportunity to discuss whole school issues while planning.

Background

In winter term 2004, a colleague and I engaged my pre-service practicum students in a modified form of lesson study. In fall of 2005, we discussed how we could undertake lesson study with in-service teachers. I approached Joan Glotzbach, principal of Cowherd Middle School in East Aurora School District 131, where I had previously supervised preservice teachers for observation experiences, and asked if she would be interested in starting a lesson study group. Joan discussed it with teachers in her building and three agreed to participate.

The Planning Process

In early April 2006, we scheduled a meeting with Joan and three classroom teachers to introduce our plans and answer their questions. The teachers were interested and offered to recruit more teachers.

We decided to offer the summer professional development institute for three afternoons. We emailed the teachers to further acquaint them with our professional backgrounds and the purpose of lesson study. We also gave them calendar options and a choice of dates. One of the choices happened to be during the last week of summer school. The teachers selected that option and it was decided to hold the sessions on Wednesday and Thursday from 12-5 and Friday from 7:15-3pm that week with lunch provided at all sessions. With this option we would be able to teach the lesson in two summer school classes.

In early May I attended a Lesson Study conference. There several participants talked about a video that they had found very helpful in introducing teachers to lesson study. It is entitled To Open a Cube (Lewis, 2001) and information and clips may be found at http://lessonresearch.net/opencube.html.

We decided that it would be a good basis for the teachers’ initiation into lesson study. I also invited Michelle Pope, one of my former students, who is a seventh year teacher and lesson study participant at Stevenson High School to give a talk to the teachers about her experiences with lesson study. Michelle has co-authored a chapter in Teachers Engaged in Research: Inquiry in Mathematics Classrooms, Grades 9-12 (Teachers Engaged in Research), and many of her remarks were based on her experiences that she had related in the chapter on lesson study.
To prepare for the institute, we made up a notebook for each participant with the agenda, articles and web resources. Two days before the start, we had five enrollees. The day before, we received three more. When we arrived at the school for the first meeting, we were amazed to have ten teachers and a numeracy coach in attendance! Five of the teachers taught math. The other five taught science and math lab. We were ecstatic to have so many.

Summer Institute
Day 1 - Introduction

We began at noon with lunch, a request to complete an information sheet and anonymous beliefs questionnaire, a short introduction about our backgrounds, why we chose that school and why we were so interested in lesson study. I then introduced Michelle Pope. Michelle explained how Stevenson H.S. facilitates lesson study and her involvement. She introduced the steps of The Lesson Study Cycle adapted from (Carter 2006):

- Set goal,
- Conduct research,
- Plan a lesson,
- Teach and observe the lesson,
- Evaluate the lesson, and Reflect,
- Revise and repeat.

Her power point included clips of teacher lesson study planning discussions and actual lessons that had been taught with a lesson study script with teacher/observers in the classroom. Michelle answered many questions about practices used in lesson study and in her classroom. She stressed that the planned lesson was a valuable end product but the process with the teachers interacting and the focus on the learner was even more important.

After a short break, we introduced the activity from To Open a Cube (Lewis, 2001). The teachers answered questions and began work on the activity of how many different nets (flat patterns) could be cut from a paper cube. All worked diligently. The table discussions manifested the depth of their interest, their use of problem solving skills and their different learning styles. All began with scissors to “open a cube”. After cutting open one or two cubes, some tried to analyze the problem and worked on grid paper. When the teachers completed the activity, they viewed the DVD entitled To Open a Cube. The video is of a public research lesson taught by Dr. Akihiko Takahashi to fifth graders in the San Mateo-Foster City School District, CA. The teachers were able to see how Dr. Takahashi fostered students’ thinking, interactions between the teacher and students, the classroom arrangement, and the students’ participation in the activity. After the video, the teachers were given a reflective writing prompt for homework:

Please take a few minutes to express your thoughts and initial reactions to the video on implementation of lesson study. How will Cowherd students’ responses be similar to those of the students in the video? How will they be different? Does a lesson study approach to professional development seem possible for Cowherd teachers? Would a lesson study approach to professional development be effective for improving students’ instructional opportunities? (In what ways?)
Day 2 – Planning the Lesson

The afternoon session again began with lunch and many comments and questions about the previous day’s activities. Some were content related: How many different nets were possible. Was there a formula to determine the number? Others were about the behavior of the teacher and students in the video: Would their students react in a similar manner?

We were now ready to plan the lesson. The teachers divided into two groups: math and science. This was done so that everyone would have a voice in the planning stage. We also thought that the two content areas might approach the lesson differently and they did. After each group brainstormed for a half-hour, the two groups came together and discussed their ideas for the lesson. On the previous day questions had arisen about the lesson plan form. Table 1 at the end of the article is an abbreviated form of one from Karen Jacobson (2006) & Teachers from Northside Elementary School, Montevideo, Minnesota, that we used.

During the planning, the teachers debated and questioned most suggestions. They focused on what they thought the student would think about the lesson. For the introduction, students were to be shown a cube and asked what they knew about it. Precise mathematical vocabulary was to be stressed. The teachers decided to use as the “lesson hook”, the idea of a game imprinted on the inside of a cereal box and how important it was to think about how the box should be cut open to avoid damaging the game. They decided then to introduce the concept of net by giving students the following scenario:

Here is the game Thinking inside the Cube. The object of this game is to discover the mystery net. (One randomly chosen by the teacher and

hid behind a paper on the board.) You will need to cut along the edges so that the faces are attached and intact. The winner or winners who find the mystery net will get 100 grand. You may work alone or with a partner.

Remember there are multiple nets for this cube, but only one net will match the mystery net and will win the 100 grand.

Throughout the planning, the teachers collaborated in an animated discussion. Time was running out but the lesson came together. We asked for volunteers to teach the lesson in two class periods on the following day and immediately two teachers agreed.

Day 3 – Teaching the Lesson

The teachers arrived at 7:15am in preparation for the class starting at 7:30am. It was an 8th grade class on their last day of summer school. How would they react to a different teacher, eleven other adults in the room and an activity to participate in? The lesson was well received. Students participated wholeheartedly. The teacher/observers followed lesson study procedure. They were strictly observers – they did not interact with the students in any way. During the whole group part of the lesson, they stood around the perimeter of the room. During the activity time, they moved around the room and listened to student conversations and observed their activities. They took notes throughout. To the observers’ surprise, they were well received in the classroom and the students worked diligently throughout the lesson.

After the lesson, the teacher of the lesson and the teacher/observers discussed how the lesson was received. The debriefing began by following lesson study protocol Curcio, F. (2002). I thanked the teacher of
the lesson and asked her to comment on the lesson. Then each teacher/observer took a turn by first thanking the teacher of the lesson and making their comments on the lesson. After all participants had a turn to speak, there was discussion on what should be revised. They were pleased overall but decided on a few changes. For the next teaching of the lesson, they decided to have a student cut the cereal box into a net and changed how the winning prize would be distributed. They discussed whether to encourage/discourage students to work in pairs/groups, whether to put all supplies in a central area, and numerous other small changes to the lesson. The second volunteer was then ready to teach the lesson.

The second class was a 7th grade class. They were slower to respond to the lesson but as the lesson progressed, their on-task behavior improved. They also did not appear to be affected by the teacher/observers in the room. Many of the revisions discussed were applied in the lesson. The teacher/observers took notes as they had done in the previous class. One teacher/observer recorded the number of students on task and prepared Table 2 (at the end of the article) comparing changes in on-task behavior as each class session progressed. There was some discussion concerning the differences between the classes. The teachers who were familiar with the students attributed it to the makeup of the classes. Some were surprised at the high level of interest in both classes given that this was the last day of summer school.

The same protocol was used as in the first debriefing. Three main themes came from the comments: How important was it to “stick to the script”, should students be encouraged to work in groups/pairs and how should the supplies be dealt with. The teachers discussed in depth the pros and cons of sticking to the carefully constructed script and examined the pedagogical implications. They seemed to agree that even though much time had been taken to carefully plan that there were times that it was imperative to deviate from the script. No agreement was reached on whether placing the students in pairs/groups would work with their students. The teachers liked the idea of having the students decide which supplies and tools they would need to accomplish the activity even though some students took one of everything available. The discussion was rich and the teachers said that they would like to continue in the fall.

Fall

At the teachers’ suggestion and with the approval of Cowherd’s principal, we continued to meet with the same group of math and science teachers. On the first full day of school we considered overarching goals with a tie-in to the school mission statement and contemplated the ideal student vs. actual student. We discussed how these goals should be reflected in the teachers’ lessons. We also recapped what we had done in the summer. Lesson study meetings were held after faculty and department meetings twice a month from 4:15-7:00pm. Our major difficulty was the interference of after school activities with teachers’ attendance.

The math and science teachers worked on a joint lesson on measurement and taught it in early November. At that point we hoped that the teachers would take ownership and value this form of professional development facilitated by teachers and focused on the learner. There are plans to continue in the summer.
Conclusions

We were very pleased by the teachers’ involvement in their first lesson study cycle. They understand that while they are trying to plan the best lesson possible, they are also engaging in the rich discussion of planning, reflecting and revising of the lesson with the focus on the learner’s perspective. In this process they think more deeply about the content and collaborate professionally to improve students' learning opportunities. For example, in the reflective writing, one teacher commented,

*A lesson study approach for Cowherd will be effective for improving student instruction, because the lesson will be focused. It probably will increase student alertness and awareness as we look at student reaction towards the lesson and tweak it so that students will understand.*

Another teacher remarked on the final evaluation,

*It was wonderful to plan with my co-teachers. I learned a lot about their teaching styles and what they thought was important to a lesson...As we go through the school year, we will be able to apply these methods to our own classroom which will make this even more worthwhile.*

We regard comments such as these as indication of awareness on the part of the teachers of the potential lesson study holds to improve their overall lesson planning skill as well as to improve learning opportunities for students.

References


Karen Jacobson & Teachers from Northside Elementary School. (2006). *Tool for Planning and Describing Research Lessons.* Aspects of this tool were derived from lesson plans provided by Makoto Yoshida of Global Education Resources, L.L.C (myoshida@globaledresources.com), and by the Greenwich Japanese School, CT. In addition, a number of the planning questions suggested in this document were developed by Dr. Fritz Staub and Lucy West, under the auspices of the Learning Research and Development Center, University of Pittsburgh, and Community School District 2, New York City. Barbrina Ertle, Sonal Chokshi, & Clea Fernandez. ©2001, Lesson Study Research Group (lsrg@columbia.edu).


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Table 1

<table>
<thead>
<tr>
<th>Steps of the lesson: learning activities and key questions (and time allocation)</th>
<th>Student activities/expected student reactions or responses</th>
<th>Teacher’s response to student reactions / Things to remember</th>
<th>Goals and Method(s) of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>This column is usually laid out in order by the parts of the lesson (e.g., launch, investigation, congress, extension/applications, etc.), and also includes the allocation of time for each of these parts. This column should also include a description of key questions or activities that are intended to move the lesson from one point to another.</td>
<td>This column describes what students will be doing during the lesson, and their anticipated reactions or responses to questions/problems you will present.</td>
<td>This column describes things that you want to remember to do/not to do within the lesson as well as other reminders to yourself. Also, as you have anticipated student responses and reactions (previous column), this column provides a place where you can think through how you might use these responses and reactions in synthesizing a true learning experience within your classroom.</td>
<td>This column describes the goals that are being focused upon during each part of the lesson, and for each activity/problem. It should also include a concrete description of how you will determine that you have achieved each of these goals.</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Student Participation during Two Minute Intervals Every Five Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart.png" alt="" /></td>
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</tbody>
</table>

*Illinois Mathematics Teacher* – Spring, 2008
Thinking Inside The Box

State Goal
9.7.11: Identify a three-dimensional objects from its nets.
9.7.12: Recognize which attributes (such as shape, perimeter, and area) change or don’t change when plane figures are composed, decomposed, or rearranged.

Lesson Goal
To develop problem solving skills by discovering all possible nets of a cube.

Goal of the Research Lesson
To prove they have a different net through communicating their ideas.

Process of the Research Lesson:

<table>
<thead>
<tr>
<th>Steps of the lesson:</th>
<th>Teacher’s Response</th>
<th>Student activities/expected response</th>
<th>Goal and Method(s) of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro of the cube:</td>
<td>Does anyone know what this object is?</td>
<td>Cube Excellent! Good. Does anyone have another name for this? <em>Box/ Dice</em> Good. Does anyone have another name for this? <em>Square</em> Show a square-Is this the same as what I have in my hand?</td>
<td>To have all students agree the object is a cube.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 faces 12 edges 8 vertices</td>
<td></td>
</tr>
<tr>
<td>Cereal Box Game:</td>
<td>Raise you hand if you have ever seen a cereal box with a game?</td>
<td>Hands raise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Where is the game located?</td>
<td>On the back</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have any of you ever seen them on the inside?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How would you neatly get to the game if it is inside the cereal box?</td>
<td>Cut it open along the edge</td>
<td></td>
</tr>
</tbody>
</table>
## Introduce the game:

Here is the game **Thinking inside the Box**. The object of this game is to discover the mystery design. You will need to cut along the edges so that the faces are attached and intact. The winner or winners who find the mystery design will get 100 grand. If you work alone you will get the 100 grand to yourself. If you work with another person you will have to share the 100 grand.

| If you have 2 people in your group how much of the 100 grand will each person get? | 50 grand |
| If you have 4 people in your group how much of the 100 grand will each person get? | 25 grand |

## Getting Started:

As you come up with designs tape them to the green piece of paper. Make sure your design is not already up there and write your name or names by the design. You have 10 minutes to get as many as you can up there.

What materials will you need to solve this mystery? Cubes Scissors Tiles Grid Paper

Any other supplies that you may need will be on the table.

## After 10 minutes:

If no one has the design: Show the mystery design and how to get to the mystery design.

## To Conclude:

Journal: I saw a lot of good strategies to solve this mystery. I would like you to take the next 5 minutes to write down: How you tried to find the solution? Students begin to write