

Journal of Mathematics Education at Teachers College

Spring – Summer 2010
Inaugural Issue

A CENTURY OF LEADERSHIP IN
MATHEMATICS AND ITS TEACHING

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The *Journal of Mathematics Education at Teachers College* is a publication of the
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This issue's cover and those of future issues will honor past and current contributors to the Teachers College Program in Mathematics and Education. Photographs are drawn from the Teachers College archives and personal collections.

This issue honors NCTM 2010 Lifetime Achievement Medalist, Dr. Henry O. Pollak, who has completed 22 years as a member of the Program in Mathematics and Education at Teachers College. Dr. Pollak has contributed so much to the mathematical preparation of the Program's graduates and to the communities of mathematics and mathematics education professionals in the United States and throughout the world.

David Eugene Smith, also pictured on the front cover, was the founding professor of the Teachers College Program in Mathematics and Education. Like Dr. Pollak, Professor Smith was widely respected by both mathematicians and educators.

Aims and Scope

The *JMETC* is a re-creation of an earlier publication by the Teachers College Columbia University Program in Mathematics and Education. As a peer reviewed, semi-annual journal, it is intended to provide dissemination opportunities for writers of practice-based or research contributions to the general field of Mathematics Education. Each issue of the *JMETC* will focus upon an educational theme. Themes planned for the 2010-2011 issues are: *Teacher Education, International Education, Curriculum, Technology, and Equity*—all centered upon mathematics and its teaching. The *JMETC* will have a distinctive niche in the world of education publishing. Our readers are educators from pre K-12 and college and university levels, and from many different disciplines and job positions—teachers, principals, superintendents, professors of education, and other leaders in education.

Manuscript Submission

We seek conversational manuscripts (2500-3000 words in length) that are insightful and helpful to mathematics educators. Articles should contain fresh information, possibly research-based, that gives practical guidance readers can use to improve practice. Examples from classroom experience are encouraged. Articles must not have been accepted for publication elsewhere. All manuscripts may be submitted electronically at www.tc.edu/jmetc. This system will help keep the submission and review process as efficient as possible.

Abstract and keywords. All manuscripts must include an abstract with keywords. Abstracts describing the essence of the manuscript should not exceed 150 words. All inquiries should be sent to Ms. Krystle Hecker, P.O. Box 210, Teachers College Columbia University, 525 W. 120th St., New York, NY 10027.

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Call for Papers

The “theme” of the fall issue of the *Journal of Mathematics Education at Teachers College* will be *International Mathematics Education*. This “call for papers” is an invitation to mathematics education professionals, especially Teachers College students, alumni and friends, to submit articles of approximately 2500-3000 words describing research, experiments, projects, innovations, or practices related to international or comparative mathematics education. Articles should be submitted to www.tc.edu/jmetc by September 1, 2010. The fall issue’s guest editor, Dr. Juliana Connelly, will send contributed articles to editorial panels for “blind review.” Reviews will be completed by October 1, 2010, and final drafts of selected papers are to be submitted by November 1, 2010. Publication is expected in late November, 2010.

Call for Volunteers

This *Call for Volunteers* is an invitation to mathematics educators with experience in reading/writing professional papers to join the editorial/review panels for the Fall 2010 and subsequent issues of *JMETC*. Reviewers are expected to complete assigned reviews no later than 3 weeks from receipt of the blind manuscripts in order to expedite the publication process. Reviewers are responsible for editorial suggestions, fact and citation checking, and identification of similar works that may be helpful to contributors whose submissions seem appropriate for publication. Neither authors’ nor reviewers’ names and affiliations will be shared; however, editors’/reviewers’ comments may be sent to contributors of manuscripts to guide further submissions without identifying the editor/reviewer.

If you wish to be considered for review assignments, please request a *Reviewer Information Form* from Ms. Hecker. Return the completed form to Ms. Krystle Hecker at JMETS@tc.columbia.edu or Teachers College, Columbia University, 525 W 120th St., Box 210, New York, NY 10027.

Looking Ahead

Anticipated themes for future issues are:

Spring 2011	Curriculum
Fall 2011	Technology
Spring 2012	Equity
Fall 2012	Leadership
Spring 2013	Psychology

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Improving Preservice Field Placements in Secondary Mathematics: A Residency Model for Student Teaching Through Lesson Study

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In response to the recent calls for a residency model for field internships in education, a possible model based on an adaptation of Japanese lesson study is described. Lesson study consists of collaboratively planning, implementing, and discussing lessons after the lesson is taught. Results of a study in which student teachers and cooperating teachers followed a lesson study format for several meetings is briefly shared, including an analysis of the discussion that took place during planning and follow-up meetings. Suggestions and rationale for a more widespread implementation of the model are discussed.

Introduction

In recent months, preservice teacher preparation has been the subject of much press, some of which has been unflattering. In particular, United States Secretary of Education Arne Duncan, speaking to members of the Teachers College community in the inaugural Phyllis L. Kossoff Lecture, called for changes to the way teachers are prepared, including the recommendation for “teacher residency programs” modeled after medical school training. This article proposes that Japanese lesson study, or an adaptation of it, is a possible model for such a residency program in secondary mathematics preservice teacher education. Lesson study, a means of collaborative professional development that originated in Japan, consists of the process of collaboratively planning a lesson, observed live teaching of the planned lesson, and collaboratively debriefing by observers and teacher after the lesson is taught with revisions made to the lesson, and possibly reteaching the revised lesson.

This article proceeds by providing a background of the existing literature on student teaching and lesson study, a brief description of an informal implementation of lesson study within the preservice student teaching internship, and a discussion of challenges to its successful implementation. The conclusion includes recommendations for incorporation of lesson study into student teaching internships, and suggestions for further research.

Background

The student teaching internship has long been the “capstone experience” in teacher education programs (Veal & Rikard, 1998), which teachers look back upon as the most helpful as well as the most powerful part of their preservice teacher education programs (Koerner, 1992; Wilson, Floden, & Ferrini-Mundy, 2001). It is, however,

known that inconsistencies exist among student teaching placements, even within a particular institution, and teaching approaches at student teaching sites are not always consistent with the reform approaches recommended by schools of education and the National Council of Teachers of Mathematics ([NCTM], 1991). Furthermore, although these programs were the most helpful part of teachers’ preservice education, when surveyed, 69% of alumni of teacher education programs said that a better balance between subject matter preparation and field experience was necessary (Levine, 2006). Levine (2006) also found that a common criticism of alumni of teacher education programs “was the desire for more, longer, earlier and better-integrated field work experiences.”

Frykholm (1998) advocates communities of learning for preservice teachers where cooperating teachers and preservice teachers have “the opportunity to grapple together with the deep and perplexing challenges of mathematics teaching” (p. 306). He noted the “impact of reflection upon the teaching process” (p. 307) and concluded that “only when beginning teachers continually find themselves in discussions about learners, pedagogy, mathematics and reform ... will they be able to interrupt the traditional expositional model that has been perpetuated for decades in mathematics classrooms” (p. 320). This sentiment is echoed by Curcio and Artzt (2005), who recommend “careful lesson planning, anticipation of student misconceptions and constructive reflection on a lesson after instruction” (p. 604) for both novice and experienced teachers.

Graham (2006) asserts that cooperating teachers and student teaching sites are “critical to the success of the intern experience” (p. 1118), but also notes that the role of the cooperating teacher is not well understood. Veal and Rikard (1998) described a “functional triad” consisting of “the experienced cooperating teacher at the apex of the hierarchy, the novice student teacher who becomes

teacher, and the pupils” (p. 113). Graham (2006) distinguishes between two types of cooperating teachers: on the one hand, there were those who

viewed the internship as a time to replicate existing procedures and ways of thinking. Their view did not include the notion of helping interns construct meaning from their observations in order to make informed professional decisions when they have classrooms of their own. [They] were content with the status quo; they were not interested in transforming practice. (p. 1126)

On the other hand, there were those whom Graham described as “predisposed to discuss and analyze classroom events and observations with their interns” (p. 1126) who “embodied the notion that teaching is an intellectual endeavor requiring dialogue about practice” (p. 1126). It is evident from Graham’s descriptions that she feels that interns have a superior experience with cooperating teachers who fit the latter description, and thus recommends discussions as the underpinnings of a collaborative approach for the education of preservice teachers.

Lesson study, due to the opportunities for collaboration along with its traditional emphasis on content knowledge and observation of students (Lewis, 2002), could be viewed as a means for structuring productive interactions between cooperating teachers and student teachers as an antidote to some of the problems described above. Stigler and Hiebert (1999) recommended incorporating lesson study into teacher education programs and methods courses in the United States as a result of their analysis of the Third International Mathematics and Science Study (TIMSS).

Mathematics teachers in Japan become initiated into the process of lesson study beginning with student teaching. Peterson (2005) provides a detailed account of his observation of the student teaching experience in Japan. The student teaching assignment took place in a university-affiliated “junior” high school (12-15-year-old students) where two to as many as six student teachers work with one cooperating teacher. Student teachers might teach as few as three lessons during their student teaching placement, and as many as ten. According to Peterson (2005), lesson study is the foundation of the student teaching experience: “The focus of the student teaching experience is planning, teaching, observing and critiquing lessons” (p. 68).

Although the lesson study process that took place during the student teaching assignment was very similar to lesson study in regular school settings, Peterson (2005) reported some notable differences. The student teachers are assigned the topic to teach, rather than having that decision as part of the lesson study process. Also, these assignments were made two weeks prior to the initial planning meeting so that “materials research” (i.e., sources

for ideas for the lesson, existing lesson plans, etc.) could take place and the student teachers could arrive the first day of the student teaching session with a completed lesson plan. The student teachers were expected to give a copy of the lesson plan to the cooperating teacher in advance so that comments could be made before the planning meeting began. They would then try out their lessons in front of the planning group. The other student teachers would “role play or ask clarifying questions” (p. 69). The student teachers would then revise their lessons for a second planning meeting before the actual lesson. For both of these meetings, the cooperating teacher would ask questions to help the other student teachers clarify their thinking and questioning in the lesson, but did not directly tell the student teachers what to do or say. The other student teachers were encouraged to give their input as well.

Peterson (2005) goes on to describe the reflection meeting, which, as is typical in lesson study, involves the teacher who taught the lesson reflecting upon the strengths and weaknesses of the lesson. Student teachers were expected to make comments, and Peterson observed that “learning to observe and offer comments appears to be an important part of the student teaching process” (p. 72). Finally, the cooperating teacher offered his or her thoughts about the lessons and asked questions to clarify the intent of the questioning. In fact, the cooperating teacher seemed to take on the role of the “knowledgeable other” in the lesson study with student teachers. As Peterson describes, “One component of the interactions between the cooperating teacher and the student teacher was a continual emphasis on how the students were making sense of the problems and questions presented” (p. 73).

The Study

The present study sought to examine a model for student teaching in secondary mathematics based upon an adaptation of lesson study by analyzing the discussion that took place during the pre- and post-lesson meeting between student teachers and cooperating teachers. For the purposes of this article, a lesson study “cycle” consists of planning meetings, the teaching of the lesson, follow-up meetings, and possible reteaching of the lesson.

Two cooperating teachers, Ann from Smith Middle School and Ron from Newell High School (a New York City alternative high school), had expressed an interest in working with two student teachers per semester each and conducting informal lesson study with the student teachers during the Spring 2008 semester. They also were willing to have their meetings audiotaped and observed. Three pairs of preservice secondary teachers participated in at least one lesson study cycle (as defined above) with their cooperating teacher, who agreed to plan with their student teachers using this process. The two cooperating teachers

IMPROVING PRESERVICE FIELD PLACEMENTS

had some knowledge of the procedures of what they considered “formal” Japanese lesson study and agreed to participate in the study if they could modify the lesson study process to suit their needs, rendering the meetings “informal” lesson study. The cooperating teachers felt that “formal” lesson study involved time requirements to which they were not able to commit, rendering this an “adaptation” of lesson study. In fact, this informality proved to be advantageous to the study, as it allowed for an examination of how lesson study could work in “real” settings that did not necessarily have resources for extensive planning time and were not district supported or sustained by outside funds or workshops. Furthermore, the characteristics of the adaptation were different in both sites.

The meetings were audiotaped, transcribed, and analyzed using a qualitative coding methodology that sought to determine which “essential features” and “key experiences” as described by Lewis (2002) were present in this adaptation. Some of these experiences and features include the discussion of a mission statement and an overarching goal for students, the discussion of how the mathematics content can best be taught, teacher content knowledge, use of outside references beyond the text, and observations about students. A more detailed description of the coding scheme can be found in Gurl (2009). A summary of steps for the lesson study at each school as compared to “formal” lesson study is provided in Table 1.

The researcher took field notes at both sites and briefly corresponded with the student teachers via email after the lessons. Lesson materials from student teachers and cooperating teachers were collected.

The number of pairs dealt with in this study is small because of recruitment and logistical difficulties. However, each pair supplied a large amount of interaction, and the findings are intended to be suggestive rather than definitive.

Results and Discussion

Although the meetings observed had notable differences from what is usually considered formal lesson study, there were many important similarities. Many of Lewis’s (2002) “essential features” and “key experiences” were observed and categorized. The most prevalent items of discussion during planning meetings involved approaches to teaching the content and procedures in the classroom, such as how many homework problems to discuss. To a lesser degree, students were discussed, including difficulties that individual students might have, as well as the students as a whole. There was, however, little discussion of teacher content knowledge, and no evidence of referencing sources outside the textbook.

During follow-up meetings, observations made regarding students, evaluation of approaches taken regarding teaching the content, and reflection about the lesson were the most frequent items of discussion. Again, discussion regarding content knowledge of the teachers was minimal, and there was no reference of sources outside the text.

Although several features and experiences were absent from this adaptation of lesson study, the presence of many of the important features and experiences might indicate that incorporating lesson study, or an adaptation, would be a positive addition to teacher education programs.

It can be argued that the model used in this study could be considered as a structure for interactions between cooperating teachers and student teachers for secondary mathematics internships, allowing for discussion of many important aspects of teaching, observing students, and collaboratively planning and implementing lessons. This model would also serve to better integrate field experiences for preservice teachers, allowing for a “residency” model for student teaching. The role of the

Table 1. Procedures of Lesson Study Cycles

	Japanese Lesson Study	Site 1- Newell High School (Same for both cycles)	Site 2 - Smith Middle School (Some variation)-4 cycles
Planning	Takes place over several sessions over the course of weeks, usually not on the same day of lesson	One 75 minute meeting the same day as the lesson	Two meetings- one 45 minute meeting the day before the lesson, one 25 minute meeting the day of the lesson
Teaching and reteaching the lesson	The lesson would often be observed by outside observers, in addition to those who planned the lesson.	The only outside observer was the researcher	The only outside observer was the researcher
Follow up	Takes place the same day of the lesson. The format is a bit “formal” with the planners receiving feedback as a “panel.”	The follow up meeting followed immediately after the lesson	Depending on the day, there were one or two follow up meetings that were attended by the CT and ST, and was sometimes followed by a reteaching of the lesson

university supervisor could include facilitation of lesson study with cooperating teachers and student teachers, until cooperating teachers became comfortable with this process of working with student teachers. Benefits could reach beyond the student teaching years, possibly carrying over into their full-time teaching positions after certification. This is suggested by Stigler and Hiebert (1999), who state that “if ... methods courses were restructured to introduce students to collaboratively planning and testing lessons, new teachers would be ready to assume leadership roles more quickly” (p.158), thus initiating change in the culture of teaching.

Although placing pairs of student teachers with one cooperating teacher might result in fewer teaching hours during the internship, it could be argued that the hours would have greater quality. Additionally, the student teachers would have a “built in” opportunity for peer observation. It could also be argued that this model for student teaching internships would provide a superior experience and that the time student teachers spend collaboratively planning and observing other student teachers would be as valuable as time engaged in teaching.

Suggestions for Further Research

There is much about this type of process that is unknown and would benefit from additional research. A comparative study that analyzes the differences in field experiences of student teachers who engage in lesson study and those who do not would provide valuable insight into this process. Additionally, a study analyzing the hindrances to implementing such an internship model would be useful. Such hindrances might include logistical difficulties, state fieldwork requirements, and existing school culture at fieldwork sites that might be resistant to collaboration.

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