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Teacher Collaboration: Implications for New Mathematics Teachers

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Citation

Abstract

One increasingly popular way of supporting new teachers is through the use of mentoring. New teachers are often paired with mentors as one of a number of supports meant to aid new teachers as they begin their career. The various types of mentoring range from school based mentors assigned by the school to specialty mentors, such as math coaches. Examples of other types of supports that are thought of as separate from formal mentoring are lesson studies, professional development schools, professional development workshops supported by local universities, teacher networks and sponsored professional development. Given the popularity of policies promoting support for new teachers, we explore specific supports for new teachers in addition to characteristics of these supports by focusing on two new alternatively certified mathematics

teachers in New York City. Through observations and both formal and informal interviews that

span a year, we gained insight into the various influences on these two teachers' practice in

mathematics and considered how these might inform future practices aimed at supporting new

teachers.

Keywords: : Mathematics Education, Mentoring, Teacher Collaboration, Alternative
Certification

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Teacher Collaboration: Implications for New Mathematics Teachers

Current federal and state policies advocate that new teachers not be left to their own devices in a solitary classroom. The sink or swim model described by Lortie (1975) is being replaced with a "rapid growth in mentoring and induction programs in recent decades" (2006, American Association of State Colleges and universities, p. 1) such that over 80 percent of new teachers now participate in such programs. One increasingly popular way of supporting new teachers is through the use of mentoring. New teachers are often paired with mentors as one of a number of supports meant to aid new teachers as they begin their career. Many states, among them New Jersey, California, Michigan, Virginia and New York, have mandated support programs for new teachers that include mentoring.

Mentoring and other supports are abundant in New York City public schools. The various types of mentoring range from school based mentors assigned by the school to specialty mentors appointed by the Department of Education of New York City (NYCDoE). Examples of other types of supports that are thought of as separate from formal mentoring are lesson studies, professional development schools, professional development workshops supported by local universities, teacher networks and DOE sponsored professional development. Specifically for new teachers in New York City with less than one year of teaching experience, a teacher mentoring program was adopted in 2004. This mentoring program consisted of four components: a) a rigorous

mentor selection process, b) mentors whose full-time job was mentoring, c) intensive mentor professional development, and d) regional rather than school-based assignments. (New Teacher Project@UCSC, 2006)

Given the popularity of policies promoting support for new teachers, we explore specific

supports for new teachers in addition to characteristics of these supports by focusing on two new

alternatively certified mathematics teachers in New York City.   We consider the supports in

place for these two teachers as well as the influence of these upon their mathematics teaching

practices. Some of these supports may include mentoring, collaboration with peers, professional

development, and coursework. These teachers are part of a larger study focused on mathematics

teachers certified through the New York City Teaching Fellows Program, an alternative

certification program that provides over 60% of new mathematics teachers in New York City.

Through observations and both formal and informal interviews that span a year, we gained

insight into the various influences on these two teachers' practice in mathematics.

Theoretical Framework

This paper is framed by the research around learning in social settings as well as on new

teacher induction especially that on both mentoring and teacher collaboration. Historically,

teachers were expected to "sink or swim" (Lortie, 1975). This was often coupled with new

teachers entering the profession as outsiders with a general concept of what to do but little

experience in actually doing it. With this model, many teachers reverted to a teaching method

that was familiar to them and did not deviate from, reflect on, or change this method (Feiman-

Nemser, 2001) drawing on their first opportunity for learning how to teach, one's own practice

as a learner (Bransford, Brown, and Cocking,1999).

In recent years, teachers have had more opportunities to learn from their peers as well as

from the school culture and the benefits of these opportunities have been studied. Darling-

Hammond (1998) notes that, "Teachers learn best by studying, doing and reflecting, by

collaborating with other teachers, by looking closely at students and their work and by sharing

what they see" (p. 1). Teachers who are aware of and involved in a practice where participants can talk, work, generate ideas, build on others' ideas, reason, explore, and discover together can create reflective learning environments that may have the ability to experience what Franke, Carpenter, Fennema, Ansell, and Behrend (1998) call "self-sustaining generative change" in their own learning. This process incorporates not only reflection on the practice of teaching but also continual engagement in a collaborative practice that is supported institutionally. Working in learning communities may not alone lead to change and growth as there needs to be a connection to practice (Rufo-Tepper, 2009). Rather than functioning in isolation, this view of teacher development and learning puts the teachers' social environment at the center of teacher learning.

That teachers learn from the social environments in which they participate has its roots in social learning theories that describe how people learn in practice. The work of both Vygotsky (1978) and Dewey (1997) is seminal in this area and adds to our understanding of how new teachers learn by stressing that what people do in practice influences what they learn.(Vygotsky, 1978; Dewey, 1997). If the practice is designed to further our learning, then it involves "overcoming the inertia that inclines us to accept suggestions at their face value" (Dewey, 1997, p. 13). To be put in a situation of uncertainty or reflective thought leads to further inquiry and change. Vygotsky writes about how social interactions are central to how we learn, reflect, and change. More recently the work of Wenger (1998) takes the idea of learning in social settings even further by claiming that learning is inevitable in social situations and furthermore that learning itself is participation.

Teacher Collaboration (Peer-learning)

Taylor (2004) describes teacher collaboration as an interaction "in which teachers engage voluntarily with the intention of improving their practice" (p. 220). Building on Taylor's

definition and adding to it the perception by teachers of being supported, we take teacher

collaboration to mean the collegial interaction between peers, either voluntary or mandated, in

which the participants feel supported and we use this definition throughout this paper. Schools

where new teachers are not isolated from their peers but instead work collaboratively with them

tend to be most successful in terms of both meeting students' needs and retaining teachers

(Johnson, 2004). As a result, providing opportunities for teachers to work together allows new

teachers to be supported in their professional growth through activities such as lesson planning.

Kardos (2004b) explains that new teachers are more likely to stay in teaching when they "feel

supported and are buoyed by a professional culture that encourages professional interaction"

despite the persistence of the 'sink or swim' paradigm in schools (pp. 139-140). Similarly, many

studies support the use of teacher collaboration in the form of learning communities for the

retention of teachers (Smith and Ingersoll, 2004; National Commission on Teaching and

America's Future [NCTAF], 2005; New Teacher Project@UCSC, 2006).

Teacher collaboration affords teachers the opportunity to focus on practical ways of

improving their teaching that they can use almost immediately. The focus is on their immediate

situation and how best to improve it. Taylor (2004) notes that, "teachers, like students, learn best

when they are solving problems that they have identified and that are in the context of their daily

lives" (p. 221). Working with colleagues allows teachers to focus on classroom issues and make

practical and specific changes in pedagogy that they are unlikely to be able to do with less

frequent, pre-structured, non-school based supports (Branford, et.al., 1999). Outside mentors

who are rarely a daily presence in teachers' lives are often not relied on for ideas and feedback

on immediate issues teachers face daily (Foote, Brantlinger, Haydar, Smith and Gonzalez, 2011).

School based mentors while a more consistent presence in teachers' lives may not be valued by these as highly as peer collaboration. The job of administrators and university mentors includes evaluating teachers, which may place them in a situation of power with respect to these teachers. This is unlike working with peers who may be more equal in power and position to one another. Administrators often conduct observations to determine how well the teacher is fulfilling her/ his duties as an educator. While administrators may provide feedback on how to improve instruction, the evaluative nature of their work impacts the support they may be able to offer in ways that should not be dismissed. University mentors, although they are to provide feedback that improves instruction, are also using observations as evaluations of the teacher's progress in relation to their graduate coursework. For this reason, Kardos (2004b) explains that much more helpful to teachers are observations by peers that end not in evaluation or a letter in one's file but instead in a debriefing session where the teachers learn about each others' practice as well as reflecting on their own.

While it certainly may be the case that power issues exist between colleagues especially between newer and more veteran teachers, for example, such power issues are not as pronounced as when working with a supervisor of some kind. Such issues did not arise in the case of either of the two teachers we focus on. This may be due to the relatively young age of the teachers and the colleagues they chose to work with or perhaps is a result of these teachers seeking out such colleagues themselves. It is reasonable to expect that in choosing someone to work with, these teachers would select individuals who they admire but also with whom they do not feel powerless. In fact, it has been noted that when working with peers, as opposed to supervisors, new teachers may feel that they give to the interaction as well as take from it in the spirit of true collaboration, in part, because issues of power are diminished allowing for a more effective

means to develop teachers professionally (Bransford, et.al., 1999). Formal collaborations that

are supported by the school are beneficial to the teachers' overall feeling of support and

guidance. Johnson (2004) stresses that new teachers who are encouraged to observe and learn

from veteran teachers and whose school structure supports this work, for example, through

accommodations made in scheduling, tend to remain in their schools and be more successful in

their work.

Mentoring

Mentoring has been shown, in many cases, to be a positive practice in the induction of

new teachers. Although many models exist, mentoring is often defined as a strategy for

inducting new teachers into the profession where, "beginning teachers are paired with a more

experienced teacher or, in some cases, with a team of experienced teachers, for guidance and

support" (Northwest Regional Educational Laboratory, 2001, p. 14). In theory, mentors should

be "available to answer questions, observe classes, problem solve, and talk confidentially to new

teachers about problems they may be facing in the classroom" with two main goals which are to

"support the new teacher" and "maximize his or her effectiveness in the classroom" (Northwest

Regional Educational Laboratory, 2001, pp. 14-15). Mentoring, when implemented properly, is

considered a valuable way to enhance the development of new teachers (The New Teacher

Center, 2007).

Some characteristics of successful mentoring include the use of peer mentors, a reliance

on school-specific mentoring models and a structured approach to mentoring. Kardos (2004a)

also touts school-based support structures that orient new teachers to their buildings, school

administration, colleagues, policies, procedures and so forth explaining that,

School based induction begins with the assumption that each school is unique and

intricate and that, in order to succeed, a new teacher must understand her school's

particular mission, values, norms, traditions, curriculum, policies, and practices.

Becoming a good teacher necessarily means becoming a good teacher in the

context of a particular school and its community (p. 195).

Furthermore she describes exemplary programs as those that rely on experienced teachers

to induct new teachers, introduce new teachers to their schools, designate time and space for the

mentoring to occur, and involve reflective teaching, observations and regular feedback for new

teachers (Kardos, 2004a). The use of a multi-year mentoring program and pairing new teachers

and mentors in similar subject areas and grade levels and the ongoing training of mentors, has

also been found to be successful (Smith and Ingersoll, 2004; The New Teacher Center, 2007).

Reasons why mentoring may not be successful in some cases include the relationship of

the mentor and mentee, time committed to mentoring, whether mentoring is content specific and

consistent across multiple mentors and supports/influences. The New Teacher Center (2007)

recommends the rigorous screening and selection of mentors and for pairing with new teachers to

be done in a purposeful manner to avoid issues of a bad fit. A lack of good fit between mentor

and mentee may lead to a lack of success in their work. Further, many programs have mentoring

that occurs infrequently. However, frequent and prolonged interaction between the mentors and

those being mentored seems most successful (Gellert, 2008; Smith and Ingersoll, 2004).

The number of mentors an individual has may cause difficulties. Although being able to

reflect on one's teaching with the guidance of mentors can be a positive step towards improving

one's practice, if there are a large number of individuals offering support, this might make it

difficult to coordinate the feedback and advice being given. As a result, teachers receive

different messages from each of these individuals, some of which may conflict and thus confuse the teacher leaving her/him unable to decide whose advice he/she should follow and becoming more of an obstacle than a support (Foote, et. al., 2011; The New Teacher Center, 2007).

Overall, one thing that comes across from all of these studies is similar to what Ingersoll & Kralik (2004) stated in their research review on mentoring, "collectively the studies do provide empirical support for the claim that assistance for new teachers and, in particular, mentoring programs have a positive impact on teachers and their retention." Therefore, while mentoring clearly has the appearance of enhancing the success of beginning teachers, it exists in a variety of forms with differing degrees of success.

Methodology

We report on a qualitative case study of two NYC teaching fellows with the goals of examining the formal and informal influences on their teaching practices and considering how these might inform future practices aimed at supporting new teachers. We focus on two research questions.

1. What are the influences/supports on the teaching practices of two NYC mathematics teaching fellows?

2. What are the characteristics of the influences and supports that the teachers find most beneficial to their teaching practices?

Data collection included two in-depth, semi-structured interviews of each participant. The participants, whom we will refer to by the pseudonyms Kate and Ellen, were in their first and second year of teaching respectively. As such, Kate's interviews took place prior to and after her first year of teaching while Ellen's took place at the start and end of her second year of teaching. The interviews lasted over an hour each. During the interviews teachers were asked

about their teacher preparation program, the supports in place to help them as they enter the

teaching profession, their beliefs about teaching, mathematics and mathematics teaching as well

as their teaching practices. These interviews varied significantly from post-observation

interviews. Post-observation interviews were more informal and conducted after a researcher

observed the teacher teaching a lesson. The questions focused more on the lesson observed.

They may include questions about why teachers chose a particular pedagogical approach,

impressions of the teacher on the learning of students during the lesson, or clarification for the

researcher about observed practices.

The teachers were observed regularly over the course of two years. After each

observation, the teachers wrote a reflection. These reflections varied in length and scope from

teacher to teacher and reflection to reflection. More than anything, reflections gave teachers the

opportunities to reflect on a particular lesson and make note of the impressions, ideas, feelings

and beliefs that emerge as they considered the lesson. These were unstructured reflections so

teachers could choose to write about whatever they felt was important to them. Field-notes from

the observations, the written reflections of the observed class and the follow-up interviews form

part of the data upon which we rely for this paper.

Analysis was undertaken by coding the data. Codes were created for each category of

supports/influences that the teachers referred to in their interviews and reflections. The

categories that were coded for included mentors, peers, administrators, school structure, and

university coursework. We divided the supports/influences categories into two subcategories,

formal and informal. Formal supports/influences codes included mentors both from the

university partners and the department of education, school-based math specialists, university

coursework, curriculum, scheduling, and school administrators. Informal supports/influences

codes included prior experiences as a learner, prior work experiences and collaborations with peers.

Coded statements were analyzed to connect the influences to teacher's practice based upon how the teachers talked about these supports/influences. Finally, comparisons were drawn between the teachers. We noted the similarities and differences in the ways they were supported and in additional supports/influences they may have sought out. Before moving onto findings, we present a short introduction to each of the teacher participants.

Participants

We were in the classroom of the two teachers participants twice a month for a full academic year with subsequent visits in the following academic year, and as a result quite familiar with these teachers and their practice. As data analysis unfolded in the larger study we noticed that there were patterns of similarity between these two particular teachers with respect to the supports/influences upon their teaching practices. This was particularly interesting to us given the fact that there were many differences between them in relation to the size of school (big school vs. small school), type of curriculum used (standardized curriculum vs. reform curriculum), grade level taught (middle school vs. high school), and the supports in place at their schools (many formal supports vs. few formal supports). As a result, we conducted a focused analysis of the data respective to each of these teachers so as to shed light on the similarities and differences in how supports /influences shape their teaching practices in mathematics.

Ellen.

At the time of the study, Ellen was entering her second year as a NYCTF. Prior to becoming a teaching fellow, Ellen, with a degree in Business Management/Finance was working in finance. She had taken some math courses during her undergraduate studies but was required

to participate in the math immersion program offered at the beginning of the program because

her math background was not deemed strong enough by her university. Ellen stated that she

found the math immersion program to be a reinforcement of essential math topics (1st interview,

September 2006).

Ellen became a teacher at a large New York City public high school with over 3,000

students. This school was similar to many of the large public high schools in that the population

was largely minority students of middle to low socioeconomic status who did not come from the

neighboring communities exclusively. Some students were part of special small academies that

the school set up in recent years. One major difference of this school as compared to other NYC

public schools was that its administration successfully fought to adopt a reform mathematics

curriculum about eight years ago and so did not rely on the mandated New York City

Department of education curriculum entitled Math A and Math B (Prentice Hall Publication).

The reform curriculum is project centered and focuses on problem solving. The chair of the

mathematics department was a strong believer in this curriculum and made sure that all of the

new teachers participated in an intensive two-week professional development on how to teach

the reform curriculum before they began teaching at the school.

At the time of this study, Ellen taught both the first and second year of the reform

curriculum that had students working cooperatively to discover properties of mathematics. In

one observed lesson, a ninth grade class used protractors to measure the interior angles of

triangles and quadrilaterals to figure out the sum of the angles of the given polygons and then the

students worked collaboratively to find the formula for the sum of the angles of any polygon and

determine and/or justify why the formula works (Observation, October 2006). Although, the

school had aligned the reform curriculum with the New York State Math A and Math B

curriculum, Ellen still found that she needed to find and provide additional resources to

supplement the students' learning and readiness for the state exams. These supplements

consisted of traditional texts that were very procedurally focused (1st Interview, September

2006).

Ellen had a university mentor and a Department of Education mentor her first year. In her

second year neither of these supports was available, according to her (2nd interview, August

2007). The internal school support provided by the chair of the mathematics department with

respect to the learning and teaching of the reform curriculum may have made the other mentors

less of a presence in Ellen's practice.

Kate.

At the start of the study, Kate was entering her first year as a New York City Teaching

Fellow. She had studied international relations as an undergraduate student and had worked

several jobs prior to entering the NYCTF program. Kate was placed in the degree program for

high school math teachers (grades 7-12), however, she asked to be placed in the middle school

mathematics program (grades 5-9) because she felt her mathematics background was not strong

enough to warrant her teaching at the high school level. She had taken Calculus I as an

undergraduate and later took Linear Algebra on her own prior to beginning the Teaching Fellows

initial summer program which, for her as with Ellen, included the math immersion program.

Kate enjoyed the math immersion program noting that it was a good review of the mathematics

that she had gone many years without using (1st interview, September 2006).

Kate became a mathematics teacher at a small middle school with only a few hundred

students. At the time of the study she was one of two 7th grade math teachers at the school. The

school was housed on one floor of a much larger building, the other floors of which were used by

a large, comprehensive high school. The student population in Kate's school came from the

surrounding neighborhood and could be described as working to middle class. There were

various ethnicities, religions and primary languages represented. The school differed from others

in that it integrated school fieldtrips with a focus on math and science into the curriculum. Each

subject teacher created a project that addressed a topic in that subject area while incorporating

the trip in some way. To support the teachers, the school administration scheduled common

planning time.

At the start of the study, the school used the NYCDoE standardized curricula, Impact

Mathematics (McGraw-Hill, Glencoe Companies) and Connected Math (Pearson/Prentice Hall).

Impact Mathematics is "a complete mathematics program developed by the Education

Development Center, Inc. It aligns with the Everyday Mathematics elementary program and

supports the integration of conceptual understanding and the teaching of basic skills" (New York

City Department of Education, n.d.). Connected Math is a complete middle school level

mathematics curriculum that "helps students and teachers develop understanding of important

mathematical concepts, skills, procedures, and ways of thinking and reasoning, in number,

geometry, measurement, algebra, probability and statistics" (The Connected Math Project, n.d.).

Kate's first year of teaching can be described as teacher centered, i.e. half the time

devoted to teacher talk, lecture, and little student group work (Goodlad, 1983). However, she

was somewhat open to new ideas, leading her to introduce more group work and exploratory

lessons in her classroom as time went on (Observation, January 2007). Kate had a math coach

based at the school, a university mentor and a department of education mentor. The

administration at her school consisted of the principal and one assistant principal.

Findings

The findings address the specific formal and informal ways the teachers' practices were supported as well as the teachers' perceptions about the supports/influences upon their practice. The formal supports/influences that emerged from the data are the mentors/ coaches/ administration, curriculum, and school structure. The informal supports/influences that emerged from the data were peer collaboration and how the individual teachers were taught mathematics themselves. We now consider these supports/influences.

Mentor/Coaches/Administration

Both Kate and Ellen noted that their experiences with mentors/coaches/administration were at times positive. For example, the school administration at Kate's school insisted that teachers sit students at tables in groups. She explained that although she was initially opposed to the idea, she did follow the school policy.

> The seating thing really bothered me [...] I understand that it's important to have kids sitting in groups, but I don't think that many 12-year-olds can handle facing away from the front of the room and out the window and be able to turn and focus when they need to. And I don't think that the need to sit in groups is more important than the need to help them focus. So I wanted to have the tables in kind of a U, in rows shaped like a U so that they could still turn and work in fours really easily but everyone was facing the front, and I was told I wasn't allowed to do that" (2nd Interview, summer 2007).

The prescribed seating structure facilitated conversations between students about the material. With time, Kate began to see the value of these math-focused interactions. Another example of the influence of Kate's administration was observed midway through her first year of

teaching. A student was up at the board explaining some problems, taking the role of the

teacher. Others called him by his last name and Kate consistently deferred to him when

questions arose. Kate noted, "That was the first time I sent a student to the board. I was

observed a few weeks before and [the assistant principal] suggested I do that so that I can get to

the back of the room while I'm teaching" (Post-Observation Interview, December 2006).

At Ellen's school the administration also believed in group-work and to support this

approach to learning the school had tables for students to work at as opposed to individual desks

(Observation, September 2006). Furthermore, the administration stressed the need for project-

centered student work to be displayed in the classroom (Post-Observation Interview, February

2007).

The math specialist at each school offered suggestions and advice on how to teach a topic

or some other specific practice. Ellen and Kate followed this advice at times while continuing to

make adjustments and seeking further support. Kate expressed frustration at the role of the math

coach in her school saying,

> I mean she'd say things like, 'You really need to work on your questioning' or
>
> 'You need to plan out your assessments in the beginning of the unit.' I mean
>
> what are you supposed to do with those kinds of suggestions? Smile and nod, 'Oh,
>
> thank you. I wouldn't have thought of that' (2nd Interview, summer 2007).

Despite this, the math coach did suggest strategies that Kate could use to involve students

in the lesson to a greater degree. One was to have students explain their answers at the board.

Kate noted that she was trying to use this strategy more often. "I've started having kids share

their answers in different ways. The math coach suggested it" (Post-Observation Interview,

March 2007). This approach was dramatically different from her earlier lessons and highlights the influence of the coach on her practice.

Despite recalling positive experiences with their administration/mentors/coaches, neither teacher felt as if they were receiving all that they could from these individuals. For example, Kate had a university mentor with whom she met very infrequently. She described, "I don't remember how many times we were required to meet [this year], I think it may have been like four or five or something." She highlighted the inefficient nature of her work with this mentor as follows.

> So every couple of weeks she would come in at a really inconvenient time and we
> would sit down and she would ask me if I needed any help or advice and I would
> explain to her how well everything was going and how I didn't really need any
> help at all in any way. And I was always really trying to be really nice and tell her
> how fantastic everything was and then she would leave (2nd Interview, summer
> 2007).

In general, Kate's concern with such individuals was the infrequent nature of their meetings. On the other hand, Ellen found the help offered by the math specialist (the chair) at her school helpful but fleeting. After a lesson involving probability, Ellen stated that she received some pointers from her math specialist stating:

> When I spoke to [her], I mentioned that we did not get into detail in the training
> session, and I was not sure how I taught the lessons last year. She showed me the
> point strategy using a tree diagram, but it was rushed because it was just a few
> minutes before 2nd period was starting (Post-observation Interview, January
> 2007).

Ellen expressed concern about this passing support throughout her first year as well. Though, other mentors where non-existent in Ellen's 2nd year of teaching, she occasionally referred back to them. For example, in discussing an activity she used in class, she stated, "My liaison from [the university] introduced a similar concept to me last year" (Post-Observation Interview, March 2007).

School Structure: Curriculum

Working in a school with strong involvement from the head of the mathematics department in relation to the required reform curriculum, Ellen was exposed immediately to this reform curriculum and a specific way of teaching mathematics. Before beginning in September, the chair of the mathematics department of Ellen's school required all new teachers to participate in a two-week intensive professional development on how to use the reform curriculum. Furthermore, the teachers were supplied additional materials on how best to incorporate the curriculum into the Math A and Math B requirements of the state of New York. Throughout her second year of teaching, Ellen regularly referred to her notes/lesson plans from the professional development as well as her notes/lesson plans from her first year of teaching. She found the professional development for the reform curriculum to be helpful but still felt that she needed to spend time figuring out ways to supplement the curriculum to align it with the New York State Requirements. Ellen stated after a unit on sequences that she "wished the curriculum helped me understand this topic better, they didn't do enough preparation last year" (Post-observation Interview, October 2006).

Some issues that arose while Ellen worked with the reform curriculum were a need for more non-traditional approaches to teaching, a need for supplementation, and a need for more professional development. As a result, Ellen was teaching her class in a non-traditional manner

with lots of group work and open-ended questioning. The idea that mathematics is problem

based and integrated made it necessary for students to solve mathematics problems by pulling

from a variety of different subtopics in mathematics. However, Ellen taught in a New York City

Public High School where students were required to take the Math A and Math B Regents

exams. Therefore, Ellen spent time in her class on Regents review, which followed a very

traditional format using test preparation texts. Ellen found the curriculum to be influential in her

thinking and teaching about mathematics.

> I think the thing that affected me the most was the curriculum and what was
>
> expected in the curriculum. I know that [the reform curriculum] is demanding, not
>
> so demanding on the teachers, but demanding on the students so that is what
>
> helped me the most in teaching mathematics last year (1st interview, September
>
> 2006).

She stated this in the pre-interview before her second year of teaching. In her second

year, she began to adjust her lesson plans according to changes in the scheduling of her math

classes. In her first year, Ellen taught in a double period class but in her second year, she needed

to teach the same material in a single period. Because of the time constraints, many of her

reflections referred to adjusting the curriculum, having the students become familiar with the

curriculum, and not spending too much time on certain activities,

> The time constraints make it difficult to complete one entire assignment in the time
>
> allotted, but once the students are more familiar with the language of [the reform
>
> curriculum] they will be able to finish and present [in the] same period (Reflection,
>
> September, 2006).

Unlike Ellen's school, Kate's school used the prescribed city curriculum for middle schools, Impact Mathematics. The math coach at the school provided teachers with the mathematical topics to be covered and a sequence for doing so. "The math coach tells us what to do in what order and I assume she has an idea of how much we have to cover by when to get through everything in time for the test in march" (Post-Observation Interview, September, 2006). How the topics were taught was left up to the individual teachers who created their own lessons.

Where Ellen's school had no common planning time during the school year, Kate's school supported collaboration among teachers by allotting time for it in teacher's schedules. This structure allowed Kate to work with the other 7th grade teacher regularly. More specifically, this time was helpful for the teachers in using both the standardized curriculum and incorporating the philosophy of the school into their teaching.

As part of the school's curriculum and focus on exploratory learning, students participated in numerous field trips. Teachers were expected to create lessons, projects and activities that linked the trips with their subject area and the topics the students were studying at the time. Kate noted that connecting the trips to mathematics can be more challenging than connecting them to other subjects and expressed a great deal of frustration in her second year regarding this aspect of her teaching. "They put a strain on teachers and are time consuming but also push them to use exploratory and discovery activities and to be a bit more creative with the material." She adds that while she "had more prep periods than a lot of teachers do [I] always felt like I had so much to do every day because I was doing so much planning for offsite and regular stuff" (2nd Interview, summer 2007).

These above school structures that were driven by the curriculums of the schools encouraged the participants to seek out their colleagues for support. Specifically, this support

helped to alleviate the perceived gaps in the curriculum. Ellen regularly met with other

mathematics teachers in her school to plan for the coming week, to supplement the curriculum

with additional material, and to "lighten the load so that we are not both creating worksheets for

the same lesson," (Post – Observation Interview, September 2006). Kate felt a need for

additional support and discussion due to the disconnect between content and pedagogy. She

found this support in collaboration with a more experienced colleague at the school who taught

the same grade. Kate explains, "I think, mostly because of working with [the other 7th grade

math teacher] I felt like very supported and like I was part of a team" (Post-Observation

interview, June 2007).

In both cases presented, the teachers benefited from meeting with other more senior

teachers whether during common planning time or through professional development

opportunities offered to them in order to best address teaching of the curriculum. Thus

collaborations between veteran teachers and newer teachers fostered by the school administration

resulted in a support structure that enhanced new teachers' pedagogy.

Peer Collaboration

In both Kate and Ellen's schools, the administration incorporated common planning time

into teachers' schedules, although Kate's was several times a week during the school year while

Ellen's was prior to the start of the school year. This feature of the teachers' schedules

facilitated Kate and Ellen's work with their peers. At Kate's school common planning time was

scheduled so that teachers who taught the same subject and grade levels could meet to work with

one another. This structure allowed Kate to work with her colleague, the other 7th grade teacher

at the school, who we will refer to by the pseudonym Kelly. The two were about equal in age

although Kelly, also a NYCTF, had taught for several years prior. The two were not only

supportive colleagues but also became friends.

Kate valued the common time built into her schedule though she and Kelly found that

they needed more than just the two designated periods a week to collaborate noting "[we] would

use our preps and stuff to do it, so pretty much every day we would work on planning" and

additionally that "if [planning together] didn't happen during the week then we would get

together on the weekend and plan lessons" (2nd Interview, Summer 2007). Together, Kate and

Kelly supported one another by planning lessons together, sharing curriculum materials with one

another and developing exams, quizzes and projects together. Despite all of the formal

influences, Kate quickly points to Kelly a source of invaluable support as well as the primary

influence upon her teaching.

> [Who most affected my development] as an urban math teacher? Okay. [Kelly]. I
>
> mean I just, I worked with her all the time and more than any other person, like
>
> relied on her to give me advice and just help in every way. I mean there wasn't –
>
> I didn't really rely on anybody else at my school in the same way, and certainly I
>
> wouldn't expect the Fellows program to help me deal with problems that I
>
> encounter on a day-to-day basis (2nd Interview, Summer 2007).

That Kelly was such a strong influence upon Kate in her initial two years of teaching

partly due to the fact that Kelly was a consistent presence in Kate's work life, unlike many of the

formal supports. Additionally, Kate valued that Kelly understood the material and what it means

to be a math teacher at this school; that is, they had a shared practice upon which to draw. Kate

also valued the non-evaluative nature of their work together and felt that they were each

contributing to the interaction. "Last year I was the beneficiary of like an unprecedented level of

support from a colleague, Kelly. But I think I also like gave her a ton of help too, and she would

certainly admit that, especially by the end of the year," (Kate, 2nd Interview, summer 2007).

In Ellen's case, the highly top-down school structure made it necessary for some of the

teachers to meet regularly. Ellen refers to the top-down structure of the school in several

instances noting that the school's administration only cared about improving attendance, the

special academies, and "the few older teachers" (Post-observation Interview, January 2007).

With the school being attentive to the areas just mentioned, the administration did not put an

emphasis on the day to day planning for teaching and learning. The collaboration that Ellen and

her fellow teachers conducted was not a result of common time set up by the school as in Kate's

case. Instead, the teachers involved found time in the mornings to meet.

> Last year we – those kind of, in the morning we would have many talks for living,
>
> if you want to call it that, just to see where everybody was and how we should
>
> teach this, although you know, you may have planned it yourself, you may want
>
> to give it to … or I always wanted to show somebody else to see if that how they
>
> would do it and if not, what would they do differently. (1st Interview, September
>
> 2006).

During her second year, Ellen and two of her fellow teachers set aside time on Sundays to

plan for the week. That is, to "plan in the sense of pacing or how the topics will be presented in

class" (Post-observation Interview, May 2007). This planning enabled the teachers to share

resources, ask mathematical and pedagogical questions of each other and develop a common

theme in teaching and evaluation, "the sheet is based on an exam that I put together with like

three other teachers. So I think the sheet is gonna be good for them for tomorrow." (Post-

observation Interview, March 2007)

Further information provided by the case studies continues to maintain the importance of collaboration with peers to the teacher's practice in mathematics. With all of the formal supports provided to Ellen, she jumped at the chance to change schools in her third year of teaching. This new school had the draw of structured collaboration with peers. Kate, too, continued to express value in peer collaboration. Prior to entering her second year she learned that Kelly would be moved to another grade level. When asked, "What's the biggest challenge you think you'll face in your second year?" she quickly replied, "Not working with [Kelly]" (2nd Interview, August 2007).

Although both Kate and Ellen have different school situations (middle or high, large or small), supports/influences, texts, and experiences; they both highlight in their reflections and interviews that they see working with their peers as most influential upon their teaching practices. This is consistent with prior research on teacher collaboration and mentorship.

One of the most well known ideas expressed for decades about new teachers was that they would either "sink or swim." The teachers who are able to swim, to continue teaching have undoubtedly used many means possible to do this. With respect to our case studies, both have found ways to swim by relying on partnerships built with their peers and facilitated by their school structures. These partnerships, we argue, are evidence of these teachers' belief in continuous learning. That is, they actively seek out ways to learn more about their subject, their curriculum, and their teaching.

Ellen, along with the curriculum, the math specialist and collaboration with her colleagues, was continuously learning about teaching mathematics. When some topic was not clear to her in the curriculum, she would seek out help from others, "I had to ask several people in the department for assistance and what I found was that most of them could not explain clear

enough for me to understand and then I found the right teacher and I had an epiphany"

(Reflection, January 2007). Sometimes, Ellen would search for other resources to help her with

the topic, as she stated at the beginning of the year that she found an old math textbook to help

her.

Kate routinely used strategies in her classroom that she learned from other teachers,

whether those in her school or those in her graduate courses. Though she initially needed a push

to do so, she observed the teaching of others and used what she learned to modify her own

practice. As a result of reflecting upon her first year of teaching, Kate explained that she looked

forward to a new approach to teaching mathematics. "Last year we kind of were like, 'Now

we're doing geometry. Now we're doing probability.' And this [coming] year I've … actually

like planned out the whole year to kind of talk about each of the topics … with like a focus on

algebra and how like finding the unknown [in every problem] makes a difference" (2nd

Interview, summer 2007). Thus, both Kate and Ellen have found ways to supplement their

learning and become more effective educators in ways that continue their learning as teachers of

mathematics.

Discussion

These two case studies inform us about the influences and supports that teachers are both

receiving and seeking out as well as the supports/influences that may be making a difference.

We found specifically that even with multiple formal supports in place, these teachers actively

sought out colleagues with whom to collaborate though this collaboration was, in Kate's case,

facilitated by the schedule at her school. Furthermore, we found that these teachers spoke

positively about their work with colleagues leading us to believe that they greatly value and

appreciate such work. That the teachers sought out and valued collaborations with their peers

more so than working with other individuals such as mentors, math specialists and administrators leads us to believe that support models should find ways to facilitate such collaborative work.

That teachers value such work can be attributed, in part, to the fact that these collaborations are voluntarily sought out, focus on specific day to day teaching strategies and lack the power issues that may arise when one is working with a supervisor or mentor. This is consistent with prior research (Johnson, 2004; Kardos, 2004a; Taylor, 2004). Focusing on why the teachers felt they needed to supplement the formal supports provides educators and policy makers with information about how best to strengthen such formal supports. An example of this involves the frequency with which teachers met with their mentors as opposed to with their peers. Peer collaborations were happening much more frequently allowing peers to be a consistent, daily presence in one's work life. Increasing the frequency and length of visits might strengthen mentor models. Interactions focused on content and teachers' immediate concerns were greatly valued by teachers. This again has implications for how professional development models can be conceived and organized so as to be well received by teachers and, therefore, more likely to be both valued and acted upon.

The collaborations these teachers sought out and engaged in also support prior research on learning as a social, active process furthered by interactions with others (Dewey, 1997; Franke, 1998; Lave and Wenger, 2003; Vygotsky, 1978). Lave and Wenger (2003) argue that learning occurs in social settings and propose a framework for understanding this learning based on communities of practice of which we are all a part. In such communities those with more experience are at the center of the practice being developed and those with less experience work their way, through social engagement towards the center. Applying this to our own work, we notice that the teachers in this study actively sought out and established their own communities

of practice, learning in social situations with their peers. They worked collaboratively with other

teachers learning from them in order to move towards the center with respect to teaching. A

similar and congruous idea is put forth by Vygotsky (1978) who speaks of scaffolding, a process

where those with more experience serve to pull others up to their level of understanding. The

research presented in this paper supports these theories of learning giving us yet another example

of the creation of human knowledge through social interaction.

The research presented here in addition to prior research (Gellert, 2008; Gonzalez, 2008)

on learning through social interaction supports the need to foster collaborations between new

teachers and their peers. Doing so would support school-specific and consistent interactions, in

keeping with best induction practices as advocated by Kardos (2004b) and would seem a

valuable way to support new teachers. Furthermore, it seems that the teachers were most

influenced by those supports within their school. Our work, though it doesn't speak to the

effectiveness of school-specific supports per se, does support the idea that school-specific

supports are valuable to teachers and should be considered as part of any support system for new

teachers.

Additionally teachers who are supported both within and outside of their school tend to

stay longer in the profession and better their teaching practices in ways that those who only

receive outside supports/influences cannot (Kardos, 2004a). Although the NYCTF mentorship

model involves numerous individuals to assist the beginning teacher, these mostly come from

outside of the individual's school. There are, in some cases formal school-based support people

such as math coaches. Though there is no definitive work on the success of math coaches, from

the larger study upon which we draw (Foote, M., et. al, 2009; Smith & Guingne, 2009) these

seem to be a hit or miss situation. For example, Kate mentioned the infrequent nature of her

interaction with both mentors and coach

> If you came in every Tuesday or if you came in every three days and said,
>
> 'How is this going and how is this going?' it's fine, but if it's that irregular
>
> I'm just going to lie to you and say everything's fine, because you're not
>
> going to be able to offer me anything that I don't already get (2nd
>
> interview, Summer 2007).

At some schools the math coach is very involved in the teachers' lives and a presence in

their classrooms while in other schools the math coach may not even be licensed in mathematics.

This indicates that though math coaches can be seen as school-based supports, they are not

necessarily supports of the type advocated by the literature. One individual at the school offering

support is far from the coordinated sustained effort that Kardos (2004a) recommends.

Finally, one needs to consider the issue of local supports. There exists a need to infuse

new ideas and strategies into schools so as to press teachers and others to reconsider their

practices as part of active reflection. An over-reliance on school-based collaboration if not

tempered with outside supports may lead to maintenance of the status quo. Without some

outside influences, patterns of inefficiency present in some schools may continue to persist. This

is a particularly dangerous reality if what exists is not meeting the needs of students. While

awareness of this concern is necessary, it may be remedied by the involvement of outside

professional developers in addition to school-based supports that include peer collaboration. The

New Teacher Project (2007), for example, suggested that mentors be trained extensively. In

doing so, mentors are able to infuse outside information into the culture of the school as needed.

Most importantly, the benefits of mentoring that take the form of collaboration among teachers is

a valuable asset for in-service teachers, especially new teachers, and should be used to help them

transition into the profession. This transition, as studies have shown, is likely to have positive

impacts on retaining teachers in the profession (Ingersoll and Smith, 2004; NCTAF, 2005).

Implications, Limitations, and Unanswered Questions

The work presented has implications for teacher development and support models,

especially those aimed at supporting new teachers. Examining the characteristics of peer

collaboration provides us with some guidance as to the support models that the teachers value.

This can then inform how such models are designed in the future. The characteristics of value

described in the findings section may serve to justify changing mentoring and supports for in-

service teaching to include peer collaboration perhaps through the use of communities of

practice. The role of communities of practice for continuous learning is clear and has

implications for teacher development and support models (Gellert, 2008; Gonzalez, 2008).

Furthermore, this work has implications for issues of educational equity as well.

Specifically, the NYC Teaching Fellows program was initiated as a way of meeting the need for

teachers in high need schools. The students at high need schools are disproportionately taught by

teachers who like those in this study, have a limited amount of educational training before

becoming a teacher of record. It becomes imperative for support structures to be put in place so

that these teachers and the students that they serve can be successful.

Given these implications it is important to make note of the limitations of this study. The

two participants in this study, although part of a larger study, were observed using ethnographic

methods to develop case studies. The generalizability of case study results is a limitation even in

the context of specifics such as alternative certification, mathematics teaching, and The New

York City Public schools. Furthermore, recognizing that the researchers did not set out to

compare and contrast the participants, similar patterns from the data developed regardless of setting and situation, in the face of comparisons and contrasts.

As with any research study, our work presented has left us with many unanswered questions that may be considered for future work in this area. We note that teachers value collaborations with peers and suggest this be included in models of professional development and support prompting us to question how best to structure these collaborations. Such questions include but are not limited to:

- How do we best set up peer collaborations? Should these be teacher-initiated?

- How can structural realities of time and content be addressed in the collaborations?

- Who should pair peers and on what should these pairings be based?

Additionally, we noted the issues that arise when multiple providers of support have inconsistent messages that they pass onto the new teachers leading us to ask:

- How do we coordinate support across multiple providers?

Finally, no strategy can be put forth without considering how it fits with the current realities in schools. That is:

- How can peer collaboration be incorporated into current practices, if possible? Do new ways of conceiving school and teacher practices need to be developed to support peer collaboration?

The questions presented here are only a handful of those that our research has spurred and which may drive future work, including our own, in the field of teacher preparation and support. With respect to our work presented here, we feel Ellen herself said it best when in a post-observation interview (March 2007) she remarked that, "Colleagues are the most supportive."

Research about how we use this information to support new teachers in the future seems a valuable endeavor for educators and policy makers to pursue.

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