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STRESSES EXPERIENCED BY NOVICE TEACHERS
ATTEMPTING TO TEACH IN THE SPIRIT
OF THE NCTM STANDARDS

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STRESSES EXPERIENCED BY NOVICE TEACHERS ATTEMPTING TO TEACH IN THE SPIRIT OF THE NCTM STANDARDS

By

Gary M. Lewis

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ABSTRACT

STRESSES EXPERIENCED BY NOVICE TEACHERS
ATTEMPTING TO TEACH IN THE SPIRIT OF THE NCTM STANDARDS

By

Gary M. Lewis

In this study, I examine the experiences of six novice secondary mathematics teachers who I observed attempting to implement aspects of the NCTM (1991) *Professional Standards for Teaching Mathematics*. The study found that attempting such teaching added only modestly and in complex ways to these novices' teaching stresses, except when they were attempting to manage classroom discourse that focused on utilizing student thinking, conjectures, and mathematical verification in central ways with the teacher acting in a facilitative role. Novices found orchestrating such discourse demanding. Given the many directions such conversations could take, novices found that, at times, those discussions pushed on their mathematical and pedagogical content knowledge to evaluate student ideas, respond to their questions, and choose between the many directions that such student-centered conversations often suggested. I also found several new types of stresses not previously reported in the teacher education research literature, some of which were related to novices' attempts to enact elements of the NCTM (1991) Standards in their teaching.

These novices identified socially-oriented coping resources (i.e. social relationships in the presence of or without a teacher learning community) as the most effective in alleviating their teaching stresses, while looking to their own experiences and resources was also important, particularly those without formally organized social resources (such as teacher learning communities). These results suggested that novices

attempting ambitious teaching do so because they have commitments that lead them to persevere in such teaching and are able to find resources to support them in those attempts. Novices with access to teacher learning communities reported experiencing less stress than those who built their own social networks.

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I also thank the members of the Mathematics Learning and Research Group (MLRG) at Michigan State University (MSU) for their ongoing help and support while I was working on this dissertation and the pilot study that led up to it.

Many of the faculty of the Department of Teacher Education deserves my thanks, as well, for their help in preparing the framework for this study and locating prospective participants, including (but not limited to) Mary Kennedy, BetsAnn Smith, Peter Youngs, and Kelly Hodges.

Perhaps most importantly, I thank my family who has made this effort meaningful and worthwhile. I thank my wife, Renee, for her help and support during the many years of graduate school that it took to prepare for and to complete this dissertation. I am grateful for her hours of listening to me read meaningless text to her as she acted as a sounding board, so that we could make sense of it all. I am grateful for her unseen influence in raising our children and supporting me in my work. Without her help and support, I would never have been able to finish this dissertation or complete my degree. I

also thank my two children, Alexis and Joshua, for their sacrifices of my time and their patience and understanding while I have been completing this dissertation and degree.

Finally, I thank the six teachers who participated in this study and the other prospective participants who allowed me to observe in their classrooms and were open to the idea of participation. Without the help of the six novices who participated in particular, I would never have learned what I did about the first few years of teaching and the challenges that novices face. I admire them for their commitment to implementing interesting and ambitious teaching. And I wish them all the best in their continued efforts in and commitment to high quality secondary mathematics teaching.

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Chapter 1: Introduction

I begin by explaining how I became interested in the topic of my dissertation. Broadly, the topic that I address in this study is how attempting adventurous and innovative teaching of the type portrayed in the NCTM (1991) *Professional Standards for Teaching Mathematics* adds to or changes the challenges that novice teachers already experience and what types of supports might best help novices meet those new or modified challenges.

I begin this section by discussing how my interns' and my own experiences of learning to teach while attempting to enact elements of the NCTM (1991) Standards have motivated this study. I also look at how the mathematics education literature and current educational policy issues led me to consider this topic for my dissertation. The literature and issues to which I refer include novice teachers' stresses in general and while enacting elements of the NCTM Standards, the challenges involved in hiring a sufficient number of teachers to meet employers' demands during the current decade, and the difficulties teacher educators encounter as they try to prepare, employ, and retain novices in the field with dispositions and capabilities aligned with such adventurous teaching.

Personal Experiences

While considering a topic for my practicum and dissertation studies, I served as a secondary mathematics field instructor. My interns talked with me about their challenges and stresses during their internships, which at times related to their attempts at NCTM (1991) Standards-based teaching and the contexts in which those attempts were made.

For example, one intern, Ms. Apple (pseudonym), crafted, with the help of her mentor teacher, many interesting lessons involving whole-class discussions and mathematical argumentation and justification that used student data explorations and observations as a springboard for those discussions. Near the end of her internship, she complained that she couldn't handle the stress of the "chaotic" environment in her mentor teacher's classroom. She had a very different classroom management style than her mentor teacher did. And she said that she had consistently felt unable to change the environment that he had set up, where students talked most of the time, even at times while the teacher was talking without addressing the issue and without consequences. While the environment made students comfortable and communicative during whole-class discussions, it also made her feel very conflicted. It was hard to decide when students were working, when they were momentarily off task, and when they had been off task for too long and needed to get back to work. She said that she preferred a quieter classroom, but that she enjoyed engaging in NCTM Standards-based teaching and, in my opinion, did so quite successfully for an intern. After completing her internship, she chose to work as a computer programmer, rather than to continue her teaching career. I wondered if placing her with a teacher with a less flexible management style who still enacted elements of the NCTM Standards would have kept her in the field.

I admit that this example may relate more strongly to Ms. Apple's differences in classroom management philosophy with her mentor than to her desire to implement NCTM (1991) Standards-based teaching. But her belief that the environment was chaotic and that it contributed to having an engaged, communicative group of students while pursuing the discourse goals described by the NCTM Standards leads me to believe that

she may have been somewhat conflicted as to how to implement NCTM Standards-based teaching in the more structured teaching environment that she preferred in her classroom.

On the other hand, Mr. Banks (pseudonym) rarely attempted any teaching that could reasonably be called NCTM (1991) Standards-based. During my last observation of his internship teaching (after I had admittedly pressed him to attempt Standards-based teaching to broaden his pedagogical repertoire), Mr. Banks' questions elicited a great number of student ideas and responses, but he struggled to interpret those student responses or use them in meaningful ways in the discussion. At one point, when a student idea was not in the exact format that he had expected, he said, "Well, I don't know what you're talking about, but here's how you do it." He went on to show the students how to work the problem. Mr. Banks looked surprised when I explained to him after the discussion that the student's idea was correct, although not mathematically formalized. Mr. Banks' quick and immediate dismissal of a student idea seemed to suggest that he may have been uncomfortable exploring an unclear (to him, at least) and potentially fruitless student idea. In this case, Mr. Banks stress, if he experienced any, appeared more due to the mismatch between his teaching beliefs and my own (as well as the teacher education program I represented in my role as field instructor). It appears unlikely that he would have attempted such a discussion-intensive lesson without my pointed promptings to do so.

At times while supervising my interns, experiences like these led me to wonder whether I expected too much as I encouraged them to acquire teaching skills aligned with the NCTM (1991) Standards. The question seemed in some ways naïve, because the internship year is, in my mind, incredibly demanding of all teacher candidates, regardless

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of their teaching philosophy. While I pondered the stresses that attempting adventurous teaching imposed and how those new stresses interacted with existing stresses, I also knew that my interns expressed feeling a great deal of satisfaction and enjoyment from implementing such teaching.

For example, one of Ms. Craft's most memorable lessons was when she set up a 4-hole miniature golf course in the school auditorium. She had her geometry students predict, then experiment with, how hitting a golf ball at varying angles would correlate with the angle at which it rebounded from the sidewall of the course. Then they applied their theories to playing on the miniature golf course that she had built. The students loved the activity, which included collecting their own data and making sense of the results, formulating hypotheses and testing them against other groups' data and hypotheses, and applying their established theories in a realistic setting. Ms. Craft felt that it was one of her best activities all year, both because of how engaged the students were in the activity itself, as well as how engaged they were in the mathematical discussions before, during, and after the activity. She said that her students had worked harder and learned more on that unit than on any other all year. But it was also clear that she had put a great deal of time and effort into that activity, which suggested to me that that might have added to both her stress and her satisfaction in teaching.

While I was supervising teacher interns, I also worked as a graduate research assistant on John P. (Jack) Smith's *Mathematical Transitions Project* (e.g. Smith et al., 2000). We researched the challenges that students experienced as they moved between middle school, secondary, and college mathematics curricula that differed greatly in terms of their underlying pedagogical models; in other words, we studied how students

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fared when moving back and forth between curricula more aligned with the NCTM (1989; 1991; 2000) Standards and those that were more traditional in their implicit pedagogy. The study mirrored my own questions in some ways, although I was also interested in how teachers experienced such challenges, as well their students. I realized that my own experiences as a student teacher and as a novice teacher involved several examples of such transitions of my own but in the role of a teacher. So I digress to describe those experiences and how they have played into my concerns for novice secondary teachers who are attempting to enact a mathematical pedagogy very different from the one they experienced as K-12 students.

During my mathematics teaching experiences as a graduate student in mathematics and mathematics education during my three years at The Ohio State University, I taught fairly traditionally, using a very traditional curriculum. My pedagogy consisted mainly of lecturing and practice with a set of homework problems similar to the few model problems presented during the class lecture.

While seeking a Master's degree in Mathematics Education during my last year at Ohio State, I was exposed to a variety of literature in mathematics education, including constructivist models of mathematics education. In particular, the NCTM (1989; 1991) Standards proposed a model that was at once radical but intriguing. My course instructors often modeled the pedagogy that we might attempt in brief activities that gave me brief glimpses of what such teaching might look like. Although I was always open to student ideas and suggestions on how to make our classes more meaningful or useful, I had never before considered a pedagogy that gave such an active role to students in creating the content of the course. But given how poorly most of my family and friends said that they

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understood mathematics and the low grades that they consistently achieved, I felt like it was a promising way to engage the many students that I had known who were so disenchanted with mathematics, even if I myself did not fit into that group. So I began attempting to use an innovative pedagogy in university mathematics courses such as groupwork and student problem presentations, but there was little time in the curriculum for many meaningful deviations from the prescribed course content. So my hands were tied to some degree, even while I was learning about interesting pedagogical alternatives that I longed to attempt to implement more fully and faithfully with the students in my university mathematics courses.

For my internship, I was placed in a "regular" classroom in the same urban school outside the technology-rich program, with a mentor teacher and a field instructor who practiced the "sink or swim" approach to learning to teach. With few material, technological, or human resources on which to rely, innovative teaching was incredibly challenging. Although I experienced what I perceived to be a reasonable degree of success and planned some lessons that turned out to be very enjoyable and engaging for the students, I was impatient with the slow pace at which I was able to change the school's traditional curriculum materials and constantly put pressure on myself to create more dynamic lesson plans, because my teaching was not up to my personal standards, as I had acquired them from my university instructors and courses.

The materials were not even remotely engaging to the students in my lower sections in particular, because they had all failed algebra one to three times and were now retaking the course. They had seen this same textbook during each attempt, which made their familiarity with it problematic. Often they believed that they already knew the

content, because they had seen it before, even if they had not mastered it. And the lessons were very boring, because there was nothing new in them unless I personally brought that material into the lesson. I had them hand in their textbooks, because it was very discouraging for the students to work with them. I created as many activities as I had time for, borrowed worksheets from other teachers, and found activities and worksheets in books or on the Internet that were not familiar to my students to dispel their boredom as best I could.

The few activities that I was able to formulate were very engaging to the students and, in my mind, appeared successful in helping them learn the mathematics that I wanted. For example, I had my students make their own clinometers, measure distances and angles of variation on objects outside the school, and then explore how the measurements taken with the clinometers involved ratio-and-proportion. That activity was very popular with the students and engaged them in mathematics discussions to a degree that I had previously hoped, but not necessarily believed, possible. Since these were non-college intending students who had failed algebra at least once (and in some cases as many as three times), getting them to engage in mathematics again and to believe that there was something interesting to learn seemed like a great feat, indeed. It also made it more likely that they would pass the class, as relatively many of them did that semester.

In my first teaching position, I worked for two years with mathematically talented secondary students in a small Midwestern city. We used the NSF-funded Core-Plus Mathematics Project (CPMP) materials with these students, marketed under the title, *Contemporary mathematics in context* (Coxford, Fey, Hirsch, & Schoen, 1996). I found the mathematics in the curriculum to be interesting and often new to me, the implicit,

arguably Standards-based[1] pedagogy inspiring, and the students articulate and motivated. Unfortunately, there were also distractions that lessened my enjoyment.

Because I was hired two days before the start of the academic year, I did not receive training in the curriculum until after my first year teaching. I struggled to learn the mathematics, the implicit pedagogical model, and the technology applications embedded in the lessons. My mentor in the science department was of little help with such matters. My relationship with my team teaching partner, Mr. Hochstedter (pseudonym), was surprisingly competitive (and not by my choice). The principal mandated using Mr. Hochstedter's tests. Since Mr. Hochstedter was a much more traditional teacher than I was, this created conflicts between us. For example, Mr. Hochstedter often turned the lessons into lectures, emphasizing and drilling students in the concepts that he believed were most important in the curriculum. But he was evasive when I asked him to share his notes or ideas with me of what to emphasize in the curriculum. He generally presented me with the test a day or two before we gave it, so I had to supplement my instruction as I reviewed with my students the day before the test. My students strongly complained about the academic disadvantages incurred by that lesson structure. Eventually, I began curving my students' test scores, to Mr. Hochstedter's chagrin, but that appeared to appease my students, at least to some degree.

While these more personal events were discouraging, I was also troubled by my students' and their parents' reactions to the curriculum. The students often questioned the validity of the content and pedagogy. They wondered whether the curriculum covered content that appeared on standardized tests, like the Academic College Test (ACT) and

[1] Note: Since C. Hirsch was an author of the CPMP materials and of the NCTM (1989) *Curriculum and evaluation standards for school mathematics* a few years prior, there is a strong correlation between the pedagogies suggested by those documents.

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the Scholastic Aptitude Test (SAT), and whether it was preparing them for the mathematics and science courses that they would take in college. At times, their parents voiced similar concerns.

The math teachers in our department also battled to create consensus about our department's pedagogical philosophy. While all of the teachers appreciated some merits of the curriculum, there were more conservative and more liberal implementations of CPMP. At one extreme, some teachers valued the pedagogical model and followed the curriculum verbatim almost always, while at the other extreme, some teachers said that they mainly valued the new content and lectured from the curriculum most of the time. Often lively discussions about the faithfulness or extremity of individual teachers' pedagogy erupted at faculty meetings. The dogmatism of the teachers in both camps reminded me of D. C. Phillips (1995) descriptions of "the good, the bad, and the ugly" sides of constructivism.

At least some of us were attempting to use student ideas meaningfully in our mathematical discussions in the classroom. Because those teachers were openly and actively discussing pedagogical and epistemological issues with their peers (even though those conversations turned to pointed needling, at times), we appeared to qualify to some extent for the "good" in Phillips' description of constructivism.

The "bad" (Phillips, 1995) was embodied by the less rational, more radical implementations of constructivism that a few teachers exhibited. For example, during my first few months teaching, I asked one teacher whether she felt like we were preparing our students for their college math courses with our very literal implementation of CPMP with our gifted students. She said that she would send them off to college and let their

math professors figure out what to do with them. Having come from a math department, I knew that if any student, even one labeled as gifted in high school, did not meet the expectations of the department, he or she would end up either being placed in low-level math courses or doing poorly in or failing more advanced math courses. So I did not find her suggestion particularly helpful in wrestling with how to tailor the curriculum to my students' needs, nor did I believe her to be rationally thinking about how to implement a constructivist pedagogy, like the one portrayed in CPMP.

I think that we qualified for the "ugly" side of Phillips (1995) description of constructivism, because several teachers followed constructivist principles and the curriculum blindly. In one faculty meeting, a staff member said heatedly, "You just don't believe in CPMP." The other teacher retorted, "CPMP is a curriculum, not a religion." Clearly, the former teacher was a very literal implementer of the curriculum, while the latter was one of those who generally lectured from it. In this example, the "ugly" part of the curriculum was found in the teacher's idea that you need to believe in a curriculum, rather than use it as a, possibly very valuable, pedagogical tool. So all three of Phillips' descriptions of aspects of constructivist ideology and debate appeared to be represented in our own staff meetings and implementations of the curriculum.

My pedagogy was, at least in my opinion, on the fence between both of these groups. At times, I abbreviated lessons when the central concept was obvious to the students, either allowing them to explain the central idea of the activity to the class using the models provided in the text and probing to see if they understood subtleties that the lesson uncovered. At other times, I supplemented with activities or even worksheets, if I felt that their academic trajectories dictated that I do so. But for the most part, I remained

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faithful to the pedagogical model and to the deep mathematical content of the curriculum, even during these modifications.

In refusing to voice my own opinions about the curriculum, I became the object of both traditional and the progressive teachers' indoctrination efforts. Their increasing urgency to get me to join one camp or the other only added to my stress as a novice teacher with so much to learn from these more veteran teachers who clearly wanted my loyalty in their own private "math war." I did learn a great deal from the summer workshops following my first and second year of teaching CPMP. But I took the first CPMP course workshop after my last year of teaching, which explained how to set up groupwork (finally!). And while the administration was dedicated to the CPMP curriculum and provided forums for our ongoing discussions of the curriculum and how to make sure that the content aligned well with the science departments needs, they did little to assuage these frictions between the two groups of teachers. The principal was a scientist who moved to education. He did little to support me with management issues or other concerns, so I was left to deal with any student or parent issues myself.

My inexperience and the lack of support for my professional growth during this formative period made the political battles that I was embroiled in with parents, students, and fellow teachers all the more difficult. All of these events added to my internal struggles to define myself professionally. This setting was on the whole a highly frustrating environment in which to learn to teach, particularly with a new and unfamiliar pedagogy to which I was cautiously, but increasingly openly, devoted.

Finally, I taught for a year at a rural, Midwestern high school bordering a small, Midwestern city. The math department was progressive in its attitudes, but was only

preparing to change from a more traditional textbook to the CPMP curriculum the following year. They asked me to do as much as possible to prepare students for the CPMP curriculum the following year. While the environment was friendly, there were few, if any, supports or resources for my continued professional growth. I fought bravely to continue exploratory activities which I did with some success, but too often for my taste, I found myself in the comfortable but less personally satisfying activity of lecturing from the traditional text that they still used. Happily, my students openly voiced their appreciation for my (modest) changes to the advanced algebra and geometry texts that created a more social, engaging, and exploratory environment during that year.

In summary, I went through a few different pedagogical transitions in my own teaching career, moving between settings that were less conducive to NCTM (1991) Standards-based teaching and those that were more conducive to such teaching. I have taught in many different contexts which allow me to see the challenges that my interns faced through many different contextual lenses, in terms of support for such teaching, as well as in terms of demographic factors like diversity, SES, and school size and location. I heard about and viewed some of my interns' struggles to enact aspects of the NCTM (1991) Standards during their internships. Those experiences led me to wonder what types of challenges attempting NCTM Standards-based teaching imposes on interns and novices and how teacher educators can better support them in the face of such challenges. All of these experiences together, both personal and viewed through my interns' eyes, provided me with the beginnings of a framework for studying these issues.

It is likely obvious to the reader at this point in the discussion that my empathy for my interns was born from personal experiences, from observations and discussions of my

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interns' experiences learning to teach, from my research experiences, and from readings of the literature. I turn now to discuss how researchers, teacher educators, and current employment trends underscore the importance of the issues examined by this study.

Concerns in the Field

I have become increasingly aware of research emphasizing the importance of this study. There is widespread, though unsystematic, evidence in the literature that novices experience challenges while attempting NCTM (1991) Standards-based teaching. There is also an ongoing teacher shortage which would make losing more teachers due to increasing their challenges during the stressful novice years problematic. Finally, there is a high novice teacher turnover rate that makes it difficult to meet schools' demands for mathematics teachers and for teacher educators to change the current mathematics teaching practices in the field through novice teachers. The latter two issues make retention a high priority in the field. I will address each of these issues in turn, describing how each adds to the significance of the current study.

The literature examining individual interns' and novices' attempts to enact NCTM (1991) Standards-based teaching is peppered with accounts of challenges experienced while attempting such teaching. For example, VanZoest and Bohl (2000) tell of an intern who wanted to talk with her mentor about classroom management issues, while he was more focused on helping her understand the new mathematical topics and pedagogy that he wanted her to employ during her student teaching. Although classroom management is traditionally an issue for interns, the lack of discussion of those issues was due, at least in part, to the mentor teacher's focus on helping the intern learn about NCTM Standards-

based teaching. So the intern's challenges or stresses here relate to her attempts at Standards-based teaching because planning for those attempts interfered with other concerns that were initially more pressing to her.

Similarly, Wilcox, Schram, Lappan, and Lanier (1991) found, after a progressive teacher education internship experience that was arguably aligned with the NCTM (1991) Standards[2], that some novices were very frustrated when moving to more traditional teaching contexts that did not support such teaching. For example, Allison struggled to create a classroom learning community in her first teaching job because of the context. She complained that the class periods were too short to use the discovery mode of teaching. She also felt overwhelmed by more general concerns, including how much preparation she had to do each day and the wide variety of ability levels of her students. Allison met with challenges that stifled her opportunities to teach in more discovery-oriented, or NCTM (1991) Standards-based, ways. Because this example shows how a beginning teacher can experience stress as a result of her desires to enact the pedagogy suggested by the NCTM Standards that are frustrated by her teaching context, it is arguable related to her attempts, or at least to her desires to attempt, teaching consonant with that document.

But I had seen examples in the literature of novices struggling to engage with a pedagogy that they did not entirely understand. For example, Ms. Daniels (Borko et al., 1992) struggled to explain why the algorithm for the division of fractions algorithm, rather than just having them memorize it. When her explanation didn't work out, she promised to talk with the students about it the next day. She never did return to address

[2] G. Lappan who was involved in this study was also an author of both the NCTM (1989) *Curriculum and evaluation standards for school mathematics* and the NCTM (1991) *Professional standards for teaching mathematics*. The course descriptions aligned with several of the new standards found in these documents.

the topic, at least as far as the researchers noticed. While such incidents are common in the literature, there is generally no follow-up on the effect on the intern or novice teacher, particularly when the teacher is committed to ongoing attempts at such teaching. In my dissertation, I am concerned with the struggles of novice mathematics teachers who are committed to ongoing attempts at teaching consonant with the NCTM (1991) Standards and which coping resources novices employ to be able to make such attempts. I also wish to understand the intensity of those challenges, whether they are modestly or intensely demanding, in relation to novices' other generally predicted stresses.

I will describe more examples of such events in Chapter 2: Review of the Related Literature, but I have illustrated here that there is at least some evidence that interns and novices experience frustration when attempting to enact elements of the NCTM (1991) Standards in their classrooms beyond the challenges expected while engaging in a more conservative or traditional pedagogy.

While the concerns that interns and novices face as they attempt to implement aspects of the NCTM (1991) Standards may seem fairly common in the literature, I felt like the research represented mainly isolated instances of such challenges, much like the one that Mr. Banks experienced. These experiences have often been labeled as dilemmas (e.g. Lampert, 1985) or obstacles. But the construct of such experiences as dilemmas or obstacles does not consider the impact on the teacher in comparison to the other challenges that teacher faced, only how effectively they implement innovative teaching and what choices they make in the moment. Stress or challenge, rather than dilemma or obstacle, also further helps to consider whether the teacher continued to engage in such

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activities, how common such experiences were, and how the teachers dealt with the stress those incidents caused.

Additionally, there is a highly charged political environment that may work against novice mathematics teachers who wish to implement any type of school reform (e.g. Kohn, 1998). This may take the form of criticism from parents, students, colleagues, or administrators; or it may also take the form of a well organized and heavily financed parent group, such as the "Mathematically Correct" organization (Becker & Jacob, 2000).

There is also a very high turnover rate for new teachers of approximately 50% in the first five years. By the 2008-2009 academic school year, we will be nearing the end of a period when a relatively large proportion of the current teaching force will have retired according to the U.S. Department of Education's National Center for Education Statistics (Hussar, 1999). They estimate that somewhere between 1.7 and 2.7 million teachers will have retired and been replaced by novices. As a result, many new mathematics teachers have and will enter the profession, but probably not as many as the U.S. public educational system will need, given the chronic shortfall of mathematics teachers that appears endemic to our K-12 educational system. In consequence, we, as mathematics teacher educators, need to hire and retain a disproportionately large number of teachers in comparison to our past efforts.

Since we are also attempting to foment a movement in mathematics teacher education towards, what I and many teacher educators deem, the "high quality mathematics teaching" aligned with the NCTM (1989; 1991; 2000) Standards, this is a critical time to ensure that we are retaining as many teachers as possible, particularly our most promising and qualified novices. Teacher educators make a huge investment in

novices to instill in them a vision of what such high quality mathematics teaching looks like and to develop in them the skills, dispositions, and capabilities to enact such teaching. We need to attract and retain novices who are most likely to attempt such teaching, including those who could potentially choose to leave the profession most easily. These novices are the most knowledgeable about mathematics and/or possess social skills that enable them to be the most adept at teaching the mathematical subject matter in ways consonant with the NCTM (1991) Teaching Standards.

As a result, our challenge is great. We need to find a way to retain our most talented teachers who, in the opinion of at least some teacher educators (e.g. Farber, 1991), are the most likely to leave the field of mathematics education. And we need to do this while working against the current high retirement and low retention trends, while attempting to hold on to our ideals of instilling an understanding of what high quality mathematics teaching is and developing capacities to implement such teaching in our mathematics teacher candidates. By doing so, we attempt to retain those novices who we are training to teach in ways consonant with the NCTM (1991) Standards. And while many of those novice may not choose to teach in such ways, some will certainly gain an appreciation for the value of what we deem to be high quality mathematics teaching and invest in making such skills, aptitudes, and dispositions a greater part of their pedagogical repertoire and professional development trajectories. Such retention increases the chance that practicing teachers will be able to more effectively understand and attempt to engage in the types of mathematically rich tasks and classroom discourse that they may learn about in their continued professional development, particularly those involving university collaborations, teacher learning communities, and continuing university coursework.

Issues and Questions

In summary, in considering the topic of this study, I was concerned about my personal experiences with attempting to enact elements of the NCTM (1991) Standards in my own secondary mathematics classroom. The challenges that I and my interns faced surprised me and led me to wonder whether we, as teacher educators, expect too much of our novice teachers by adding the expectation of attempting this high quality mathematics teaching early in their careers. But this concern worked directly against the great satisfaction that many of my interns and I derived from engaging in such teaching. For me, at least, it matched my own belief system and ideals well and engaged the students effectively while deepening their understanding of key mathematical concepts.

I also realized that these demands were being placed on novice teachers in a highly charged political environment that may spill over into the workplace at times, as in the case of the Mathematically Correct (Becker & Jacob, 2000) movement, but likely in more subtle ways, through the actions of teaching colleagues, administrators, parents, or students. These demands, by adding more stress to the difficult novice years of teaching, may unwittingly push talented teachers out of the field, which would add to the attrition problem following from the current trends due to high veteran mathematics teacher retirement, low teacher candidate enrollment, and low novice teacher retention in the high demand field of mathematics education.

I began to formulate my research questions very broadly at first. I wondered how attempting to enact elements of the NCTM (1991) Standards plays into or modifies the stresses that novices already experience. I was also curious about how teacher educators,

colleagues, and school administrators could help to support novices as they attempt to enact these elements in their teaching, to make such attempts a more reasonable and practicable pursuit. In this study, I attempt to address these two broad issues, which I will spell out more specifically and in finer detail in the Methods chapter.

The issues that I am studying have the potential to capture the attention of many groups. They will interest teacher educators, as they consider how best to prepare and to offer ongoing support to novices who continue their attempts to enact the NCTM (1991) Standards. They also inform teacher educators how to advise those who interact with such novices about how best to support and nurture their blossoming pedagogical skills.

Some colleagues, department chairs, curriculum coordinators, and administrators of novice teachers are invested in implementing teaching consonant with the NCTM (1991) Standards. Such individuals will be interested in understanding the challenges novices may be experiencing as they attempt to enact such teaching, so that they can help to support them in the process of becoming a teacher and in obtaining some of the new and unique pedagogical strategies and dispositions aligned with the NCTM (1991) Standards. As a result, such colleagues and administrators can help retain progressive-thinking novices and build a young cadre of teachers who will, in time, take the places of their veteran mentors and administrators who retire and leave the field. It is a great opportunity for more veteran teachers and administrators to leave behind a legacy that will help ensure that there is what they may also deem to be high quality mathematics teaching in the future of America's youth in the K-12 educational system.

On a more theoretical level, teacher education researchers, psychologists, and anthropologists may also be interested in these issues. Because this study touches on

issues of teacher stress and coping broadly, it may be of interest to psychologists and anthropologists who have interest in how stress affects specific actors in the human services occupations, in this case, secondary mathematics teachers. Teacher education researchers who want to understand how novices experience attempting to enact a pedagogy very different than the one they generally have experienced in their K-12 and, at least to some degree, university educations may also be interested in this study. Even though my study is focused on high school teachers, it is not difficult to imagine that middle school and, to some degree, elementary teachers, will share similar challenges as they attempt to enact elements of the NCTM (1991) Standards in their classrooms.

Finally, this study is likely interest policy makers who wish to understand how to structure educational careers and professional development opportunities in the first few years. Such attention to detail could help novices maximize their professional learning and encourage the optimal use of their limited resources in dealing with the challenges of attempting to enact elements of the NCTM (1991) Standards. It could also help policy makers suggest better ways to provide novices with the most effective resources or make them more available and more easily accessible.

At this point, I move to present a review of the related literature in the chapter that follows, giving greater attention to many of the issues that I have touched on here briefly, including in particular, a more thorough review of the stresses and challenges that novices face, both as they attempt to learn to teach and as they attempt to enact a pedagogy very different from the one that they experienced as K-12 students that is aligned with the NCTM (1991) Standards.

Chapter 2: Review of the Related Literature

In Chapter 1, I described how my personal experiences attempting to teach in the spirit of the NCTM (1991) Standards were filled with challenges that included conflicts with students, parents, administrators, and colleagues. I was at times conflicted myself about the strength of my understanding of and commitment to such teaching, at least as it was portrayed by the various camps of teachers where I taught. I saw some of my interns struggle to understand, interpret, and put such teaching into practice at my own admonition. The literature indicates that much of the teaching workforce, including mathematics teachers, will retire during the next few years. This turnover implies a need to heighten new teacher support and retention above and beyond our past efforts. But it is also a great opportunity for mathematics teacher educators to have a strong and possibly lasting impact on teaching practice.

In the current chapter, I turn my attention to the literature that discusses teacher stress in greater detail; in particular, I first reviewed the literature that examines and describes stress in general, then the stresses of teachers, and then more specifically teachers' stresses while attempting to implement aspects of the NCTM (1991) Standards in their mathematics teaching. The latter challenges have generally been framed as dilemmas of teaching or as challenges related to implementing a new pedagogy (rather than looking at teacher stress as a whole and the place of pedagogical challenges in that framework). But those studies were helpful in developing an understanding of the types of challenges that interns, novices and experienced teachers reported or that observations suggested to both motivate and to begin to build a framework for the current study.

General and Teacher Stress Literature

A recent review of the teacher stress literature (Kyriacou, 1998) identified teaching as one of the most stressful of the human service occupations, particularly when self-report measures were used. Kyriacou further asserted that somewhere between a fifth and a quarter of all teachers experience a great deal of stress fairly frequently, while Travers and Cooper (1996) extended the possible range to as high as one-third.

On the other hand, some researchers suggested that such widespread claims about teaching as a high stress profession were exaggerated. Pithers and Fogarty (1995) found that teachers exhibited higher stress on only one of several scales as compared to a group of non-teachers, while Bentz, Holliseter, and Edgerton (1971, in Travers and Cooper, 1996) found that teachers' mental health was slightly better than that of the general public, and only one in three teachers reported even moderate or mild emotional symptoms. Clearly, the findings about the magnitude of stresses that teachers experience have been mixed, but the majority of studies indicate that teachers are more highly stressed than their counterparts in similar professions. But few researchers, if any, that I could find, suggested that the first few years of teaching are not highly stressful.

The stresses of teaching have been studied from two different perspectives. The first perspective is that of teacher stress, which focuses on the immediacy of events and situations in teaching that cause teachers stress. The second perspective is that of teacher burnout, which is the result of continued failed efforts to deal with the stresses that a teacher experiences. I begin with the more severe of these two, teacher burnout, then

return to discuss the more fleeting foundational components of teacher burnout, namely teacher stresses.

The foundational literature on stress further complicates our understanding of teacher stress. Although stress is often portrayed as an inhibitor in models of human behavior, it can also act as an activator or energizer of learned responses (e.g. Yerkes & Dodson, 1908). Adding stress can have positive effects on human performance up to a point where any further stress erodes performance, but the difficulty in determining how much stress is too much depends as much on the individual's talents, resources, and personality as on the amount of stress (Abouserie, 1994; Pithers, 1995). Dunham (1980) suggests that stress can also demonstrate positive effects, such as developing better coping skills, an increased sense of self-concept, more effective teaching styles and behavior, more positive relationships with students, and improved interpersonal relationships with other teachers. Another variable adding to the complexity of ways that individuals experience stress is task complexity (or the number of steps involved in completing a set task) or task difficulty (Standish & Champion, 1960).

In summary, the general research literature tells us that the context in which practitioners teach and their individual talents, resources, and personalities also play into the stresses that they experience. Stress is good up to an optimal point, after which performance erodes. But individual differences in how individuals experience events makes it difficult to judge what the optimal level of stress for any given teacher may be, because each teacher's ability to deal with various stresses effectively depends on so many different variables.

Teacher Burnout

Many researchers have found it useful to characterize the stresses of teaching by studying the related phenomenon of teacher burnout (Blase, 1982, 1986; Byrne, 1994; Cunningham, 1983). These researchers generally define teacher burnout as the end result of sustained stress over a long period, often described as decreasing teacher productivity over time (DeMoulin, 1991). Farber (1984) further refines this definition of burnout as "the final step in a progression of unsuccessful attempts to cope with negative stress conditions" (p. 324). He questions whether teachers burn out, due to overwork resulting from a passion for their teaching, or whether they are "worn out," becoming less invested in their teaching and in their students over time. Because I am studying novice teachers, I feel that they have generally not been teaching long enough to experience burnout. As a result, I choose to operationalize the challenges novice teachers face as teacher stress.

Teacher Stress, More Specifically

Cox (1975; 1978) and Kyriacou and Sutcliffe (1978) identified two different characterizations of stress in the research literature. The first characterizes stress as "pressure exerted by the environment on an individual." The second describes stress as "a state or response pattern." Kyriacou and Sutcliff and Cox argued that these two conceptualizations of teacher stress are not mutually exclusive.

As a result, Kyriacou and Sutcliffe (1978) characterize teacher stress as a response syndrome of negative affect (such as anger or depression) by a teacher usually accompanied by potentially pathogenic physiological and biochemical changes resulting from aspects of the teacher's job and mediated by the perception that the demands made

constitute a threat to the teacher's self-esteem or well-being and by coping mechanisms activated to reduce the perceived threat. In other words, teacher stress involves the teacher perceiving a teaching situation or event in the teaching context as challenging and feeling a negative emotion about it; such emotions are in some ways alleviated to some degree by coping resources (such as getting advice from teaching peers) that the teacher employs.

Six major categories of environmental factors involved in teacher stress are repeatedly cited in the literature (Phillips, 1993; Kyriacou, 1989), as follows: poor motivation of students, poor student discipline, poor working conditions, time pressure and work overload, low status and opportunities—including pay, promotion, and career development, and poor school ethos—including conflict with colleagues and administrators. A recent preliminary study (Lewis, 2004) on the stresses of learning to teach by the NCTM Standards adds new subcategories to several of the aforementioned categories such as challenges related to the textbook, technology, and preparing students for standardized tests, as well as introducing the new category of pedagogical concerns.

The Stresses of Learning to Teach

Before discussing the stresses novices experience during their first few years, I want to clarify that I define a novice teacher as a teacher with less than three full years of teaching experience, as is generally accepted by many researchers (e.g. Berliner, 1988).

Novice teachers struggle with survival skills during the first few years of teaching. It is widely known that learning classroom management is a primary concern to most incoming teachers. Nearly all novices believe the well-worn maxim "if you can't

control your class, you can't teach." An example of a novice teacher struggling to learn such skills in a difficult context is found in Sedlak, Wheeler, Pullin, and Cusick's (1986) study of bargaining in teaching. The observer was surprised by the complete lack of student engagement that one novice teacher faced in a particularly difficult class, with students ignoring her, refusing to work, and generally making jokes throughout the class period. After the class was over, she complained that she did not know what to do, cried, and pleaded with the researcher for help. Prospective teachers appear to lack many of the tools needed in their careers, including management skills and the well-practiced routines that help free cognitive resources for the more intellectual tasks involved in teaching (Berliner, 1988).

Lortie (1975) explains that due to the overwhelming workload imposed on beginning teachers, they have been shown to be highly stressed during their first few years of teaching. He argues that in great part this is due to the "sink or swim" model of teacher induction in the United States, in which novice teachers are expected to carry the same workload as their more experienced colleagues with little or no external support.

Borko and Putnam (1996) hypothesized that new teachers may be too stressed to learn efficiently from their experiences. Given the continued prevalence of Lortie's "sink or swim" model of teacher induction in the United States, researchers' and teacher educators' concerns that novice teachers may be too stressed to learn effectively from their experiences appear warranted.

Teaching Consonant with the NCTM Standards and Related Stresses

When I talk about NCTM (1991) Standards-based teaching, I refer to teaching that attempts to meaningfully implement aspects of those Standards. I define Standards-based teaching (SBT) using the six principles listed in *Professional Standards for Teaching Mathematics* (NCTM, 1991) (see Figure 1).

- Worthwhile Mathematical Tasks
- The Teacher's Role in Discourse
- Students' Role in Discourse
- Tools for Enhancing Discourse
- Learning Environment
- Analysis of Teaching and Learning

Figure 1. List of the characteristics of NCTM Standards-based teaching.

First, *Worthwhile Mathematical Tasks* involves creating challenging mathematical activities that explore worthwhile and meaningful mathematics and encourage students to gain and communicate connected, deep mathematical knowledge. Second, *The Teacher's Role in Discourse* describes the teacher's role as facilitator of student mathematical discussions by posing meaningful questions, determining issues to pursue, encouraging students to justify their ideas, and deciding when to formalize mathematical language and notation. Third, *Students' Role in Discourse* describes how students contribute to meaningful class discussions as mathematically authoritative participants, relying on evidence and argument.

Fourth, *Tools for Enhancing Discourse* involves amplifying discussions using technology, concrete materials, and multiple representations of mathematical concepts, including oral, visual, written, and conventional representations. Fifth, *Learning Environment* describes creating suitable time, space, materials, and ambience to allow

students to grapple collaboratively with significant mathematical ideas and to take mathematical risks. Sixth, *Analysis of Teaching and Learning* describes gathering information to assess students based on these principles and to evaluate the impact of the environment and tasks that the teacher employed.

While some researchers have studied teachers' attempts to implement a pedagogy consonant with the NCTM (1991) Standards, very few, if any, have looked at their data through the lens of teacher stress. Those that have studied such phenomena have more often looked at these issues as dilemmas in teaching or as challenges of acquiring new knowledge, skills, and capacities. I look through such studies here with the lens of teacher stress, focusing in this first section on the efforts of experienced teachers, in an effort to show that the literature suggests that that attempting teaching consonant with the NCTM Standards generates challenges for more experienced teachers. As a result, it stands to reason that less experienced teachers would experience at least as much, if not more challenges than their more experienced counterparts.

I review these studies in order of relevance to the current study, citing those related to secondary teachers first, then to middle school, and finally to elementary teachers. While my focus in this dissertation is on novice secondary teachers, I feel that there is something to learn from looking across these bodies of literature, particularly given that the research in each area is thin, but taken together there is a good deal of data.

Chazan (2000): Teaching lower-track high school students.

Chazan (2000) talked about his attempts to teach non-college intending secondary students using a teacher-written curriculum that involved rich mathematical tasks,

mathematical discussion and justification, and student mathematical conjectures about concepts that was arguably based on the NCTM (1991) Standards. In Chazan's teaching experiment with Ms. Bethell, they noticed that the non-college intending students they taught were often disengaged in math class. He said, "My first year was a rude awakening" (Chazan, 2000, p. 27). Their students often resisted their attempts to bring them into mathematical conversations, but at other times, the students participated actively. Generally, they could not predict the level of student participation beforehand.

> As a teacher of a lower-track math class in a high school, I found issues of "student motivation" an important part of my subjective experience of teaching. Students' engagement in class varied dramatically, and it was hard to predict. Sometimes, students were quite engaged. When students were disengaged, on some occasions, they made their views known loudly and forcefully, and at other times, disengagement was expressed in quiet and sullen ways. However, on a regular basis, the students that Sandy [Bethell] and I taught were not motivated; they did not come to class ready to work on the academic tasks we had so carefully designed or chosen. Sometimes we were able to overcome initial disengagement. At other times, there were serious issues that occupied students' minds and made doing mathematics relatively unimportant: Someone had stolen property from their locker, or a classmate was pregnant and planning to get married and drop out of school When then had to decide how to respond. And, sometimes, we did not find out what was on their minds or why they did not want to invest their all in our studies (Chazan, 2000, p. 38).

Chazan offered specific examples of students who were disengaged with school and, in particular, with mathematics class. Joe and Bob two were examples of the 35% to 40% of students who dropped or failed Algebra 1 each semester who exhibited "classroom behaviors that I found perplexing" (Chazan, p. 29). Joe was very bright and articulate. Chazan expected him to be an excellent student, but found that Joe would only engage in class activities when Chazan was physically nearby. Some days, Joe would

happily disengage when Chazan was not nearby, while on other days, he would explode if he was not receiving what he felt was adequate attention from Chazan. Bob, too, was inconsistently engaged. One day, he drew two faces on his knees and had them talk to each other loudly and then proceeded to teach the rest of the class how to clap loudly with only one hand, disrupting the class numerous times throughout the hour. But the following day, Bob was the driving force behind his group's perseverance in exploring an extension to the mathematical task that Chazan posed. So the inconsistency of students' engagement in mathematics was another challenge that Chazan dealt with, including that the disengaged students were a moving target, depending on the day that the lesson was held. Chazan elaborated further in the following quote.

Chazan (2000) also noticed that some students didn't engage in his mathematics lessons because they thought that they knew the material already; they had seen these topics so many times over the years that they looked familiar, even though they may not have mastered them. For example, Danielle felt that she knew the material during one lesson, because she had memorized a number of faulty algebraic rules. What added to the challenge of teaching Danielle was that she had no means of evaluating her solutions to determine whether they were correct. So students felt like they knew the material, in spite of having memorized many faulty rules; because they had no means of evaluating their answers, they did not even realize that their work was very often incorrect.

In other words, while Chazan's lens was not that of stress, he used words and talked in ways that suggested that he experienced students' disengagement and undesirable behaviors that detracted from his attempts at NCTM (1991) Standards-based teaching as stressful.

Romagnano (1994): Disengaged middle school students.

In an experiment attempting teaching arguably in the spirit of the NCTM (1991) Standards, Romagnano (1994) found that at times he didn't like how directive his teaching was, in spite of his best efforts to incite discussions involving his students in roles like those advocated in the NCTM (1991) Standards. While Romagnano often talked about his and his team teaching partner's challenges in terms of dilemmas, he also talked about frustrations and difficulties that they experienced along the way. While a dilemma suggests a sort of psychological tension that could be considered a stress, I will focus on those passages that most clearly appear to describe events that appeared to be the most obviously stressful for Romagnano[3].

Like Chazan (2000), Romagnano (1994) felt frustrated when his students did not choose to engage in class activities and discussions by taking the more central role that he and his team teaching partner, Ms. Curry, wanted. He, like Chazan, was particularly frustrated when the most capable students chose not to participate. For example, he said two students, Paul and Neil, were "giving me crap all the time" and "are not putting in any effort...even though they do know, and they've show me that they know more than a lot of other [students]" (Romagnano, p. 73).

Another aspect of Romagnano's (1994) and Curry's difficulties with students' disengagement is that they had chosen each mathematical problem carefully and with several mathematical goals in mind for that problem. But those problems could not

[3] Romagnano had 14 years teaching experience at the beginning of this study, while Ms. Curry was in her first year of formal teaching after substitute teaching the year prior. I will focus on Mr. Romagnano's stresses here and discuss Ms. Curry's stresses in the next section when I talk about novices' stresses.

always be geared specifically towards students' interests due to mathematical content demands.

> We were faced with a dilemma. We wanted to do problems that were real so that students would not ask why we were doing them. These problems would require our students to use a significant amount of cognitive energy... But it was precisely this lack of clarity, level of commitment, and the frustration it caused that led our students to disengage. The "genuine problems" I chose were of little interest to them, or grew tiresome for them quickly... On the other hand, the problems the students found most interesting were only of marginal interest to me as I tried to teach about functions. Ms. Curry had done several "consumer math" topics, such as developing a budget and buying stocks, during the year prior to the study. These applications of basic skills were the topics that had the most relevance for our students... If we chose only problems such as these, for which we had to stretch to include the mathematics I wanted to stress, we risked sending the message that functions is not a particularly important concept. We also would seem to be saying that what our students were then interested in is all that is truly important about mathematics (Romagnano, 1994, pp. 80-81).

While the problems often did expose the mathematical concepts that Romagnano and Curry wanted, some students complained at times that, while the problems were better than working in the textbook, they were still boring. For example, Sandy told Ms. Curry, "I don't like it very much. It's better than bookwork, but kind boring." Dr. Romagnano wondered, "Is it a good problem if students don't like it?" (Romagnano, 1994, p. 79).

So, like Chazan, Dr. Romagnano and Ms. Curry faced issues of student disengagement in mathematics class. And it also appeared that there was a tension between the type of problems that the students found most relevant to their personal lives and the type of authentic problems that would allow Dr. Romagnano and Ms. Curry to teach the mathematical content of functions that they wanted to share with their students.

And they encountered these challenges as they attempted to teach in the spirit of the NCTM (1991) Standards.

Heaton (2000): Figuring out what a pattern is.

In describing the dilemmas of student disengagement in class activities, discussions, and with the curriculum as frustrating and difficult, Romagnano (1994) suggests that he did experience some degree of stress as he attempted to implement a pedagogy and curriculum based on the NCTM (1989; 1991) Standards.

In studying her attempts to implement teaching consonant with the NCTM (1989; 1991) Standards, Heaton (2000) relied on the Comprehensive School Mathematics Program (McREL, 1986) curriculum. She had taught elementary school for nine years and chose to return to try NCTM Standards-based teaching as an experiment. She said that the first few weeks of attempting this type of teaching were "wrought with difficulties and frustration" (Heaton, 2000, p.19).

Heaton describes what appeared to be her first lesson on finding patterns in a table of data (where the output was 12 more than the input). The students noticed many patterns, but most of them were not relevant to the mathematical concept that she wanted to explore and that the teacher's guide suggested. For example, one student noticed that for an input of 8000 and an output of 8012, both numbers started with "80." The student called that a pattern. Heaton was unsure of what to do with such observations and went home "distraught and troubled by the day's events" (Heaton, 2000, p.28).

Heaton said that not only did she not know what she herself meant by a pattern, but she also didn't know how to move the conversation forward. She was frustrated with

the teacher's guide, because it provided her ideas of what types of student ideas to expect that were constructive and helpful, but failed to help her understand what to do with the other ideas she was getting from her students. Heaton also felt discouraged by her failed attempts to get her students to engage in mathematical discussions. Even though some students were offering their ideas, many of those ideas seemed irrelevant. She felt that there had to be more to her role as a facilitator of discussions than just asking questions.

While Heaton's (2000) difficulties were resolved over the course of her teaching experiment, it was clear that she did undergo many stresses in attempting to teach in ways consonant with the NCTM (1991) Standards that would not have been problematic if she had chosen to teach in the ways to which she had grown accustomed during her previous nine years of teaching.

There is evidence that all of the seasoned teachers that I have mentioned in this section experienced stresses while attempting teaching consonant with the NCTM (1991) Standards. These teachers talked about their frustrations with getting students to engage in mathematical explorations and discussions, with getting students to appreciate meaningful mathematical problems that they posed, and with their own inability to orchestrate the type of meaningful mathematical conversations that they wanted to have with their students. At least logically, such stresses may be even more severe for novices who are attempting such teaching but do not yet have access to many of the basic skills, knowledge, and capacities that their more veteran colleagues have developed. So I now turn to consider the literature that has reported the challenges faced by beginning teachers who are attempting to enact important aspects of the NCTM Standards.

Stresses of Learning to Teach While Attempting to Implement the NCTM Standards

Learning to teach while attempting to implement the NCTM (1991) Standards appears, at least theoretically, to be a daunting task. While few studies have directly addressed this issue, the literature is peppered with reports of events that appear challenging to student teachers and novices who are attempting to teach in ways consonant with the NCTM Standards. As in the previous section, I will look across all levels of K-12 education, but mention secondary teachers and interns first, then middle school teachers and interns, and finally elementary teachers' and interns' purported stresses.

Alice in Van Zoest & Bohl (2000; 2002): Talking past her mentor teacher.

Van Zoest and Bohl (2000; 2002) studied a secondary student teacher, Alice, and her cooperating teacher, Gregory, who both shared reform-based ideals and were working with the Core-Plus Mathematics Project (CPMP) (Coxford, Fey, Hirsch, & Schoen, 1996) materials. Their conversations focused on Alice's understanding of the content, much of which was new to her, as well as considering questions to focus on during classroom discussions in order to direct students' conversations towards the type of mathematical understandings that they were trying to foster. Alice was a bit frustrated at first by Gregory's focus on mathematical content, when she felt that she needed more help with management issues. The following is a quote from Alice's journal and then an analysis of the situation by Van Zoest and Bohl.

"He was more concerned with, 'well does this power model fit it [better] with 1/x^2, or is the 1/x^3 [better]?' To me, I wasn't concerned about which one was actually better, I just wanted [the students] to be doing it. So it's hard because I get impatient because I really want to know how to teach it..."

> [Alice's] journals indicated that her biggest concern throughout the experience was classroom management, and that her pedagogical concerns centered mostly around wanting to know procedures for running activities and orchestrating productive student groups. Although she desired to help students understand mathematics better by engaging them with it, she was apparently at a point in her own development where she was not quite ready to engage with it herself (Van Zoest & Bohl, 2000, p. 16).

The interviewers also reported that Alice felt "frustrated by her need to rethink her plans every day" (Van Zoest & Bohl, 2000, p. 13). She explained as follows:

> It is the night before...that I sit down and formally write out the lesson plan. I do this because I can never seem to predict where we will end up...I find it so awfully hard do navigate the timing of this stuff, because most of the time I just don't know how the kids are going to react and how things will go. I cannot [overstate] the amount of frustrated energy I have spent on this. This material many times seems to depend so much on the students themselves and whether or not I can hit upon the appropriate strategy of questioning and explanation (Van Zoest & Bohl, 2000, p. 13).

Although Alice also balanced such quotes with others that expressed her positive feelings for and experiences with the curriculum, it is clear from these quotes that she experienced challenges while learning to implement CPMP and its implicit pedagogy that is strongly aligned with the NCTM (1991) Standards. While Alice also came to a greater appreciation of the conversations that she and Gregory had about the mathematical

content of the curriculum and eventually felt more confident in dealing with management issues, it is important to note her reported frustration in a placement that many would consider ideal for learning about NCTM Standards-based teaching (e.g. Vacc & Bright, 1999). In other words, Alice did experience stress related to her attempts at NCTM Standards-based teaching that, according to the researchers, dissipated over time.

Ms. Curry in Romagnano (1994): Innovative teaching outside one's subject-matter expertise.

In Romagnano's (1994) study, Ms. Curry was beginning her formal teaching middle school after gaining certification and after a year substitute teaching. She was certified to teach science, but was asked to teach both science and math that year. She and Dr. Romagnano collaboratively taught their general math sections. It was also clear that she was undergoing what appeared to be stress, at times, during the dilemmas that Romagnano described.

While discussing the dilemma they faced in deciding how much to tell the students, Ms. Curry and Mr. Romagnano explained that they wanted to let students work things out for themselves and come up with their own ideas as much as possible. While scaffolding a graphing activity, one of Ms. Curry's students, Charles, complained that he didn't know how to graph. Ms. Curry angrily voiced her frustration. "We're doing it! Right now! I'm getting a little upset here. We're going through the steps, and I don't see anybody starting it" (Romagnano, 1994, p. 106). She was frustrated that Charles did not realize that she was talking about just that and that other students were not paying attention, as well.

Ms. Curry also described how she herself at times struggled with mathematical content during class discussions. She also shared Romagnano's previously described difficulties in getting students to engage in working on the carefully chosen set of mathematical problems, which could not always be geared towards the students' interests. For the students, these problems were boring at times, creating difficulties for the teachers related to students' lack of engagement in the assignments.

In summary, Ms. Curry reported a few challenges during this year-long teaching experiment. She appeared frustrated by her students' inability to understand her scaffolding at times in developing student autonomy on these activities. And she was also concerned that her students did not always wish to engage in the carefully chosen problem sets that she had helped Dr. Romagnano craft. So there was evidence that she too experienced stresses related to her attempts at NCTM (1991) Standards-based teaching.

Ms. Daniels in Borko et al. (1992): Missing deep conceptual understanding.

In the Learning to Teach Mathematics project (Borko et al.; Eisenhart et al., 1993), one participant, Ms. Daniels, struggled in her middle school student teaching because she possessed a very limited number of representations for mathematical concepts. The researchers found evidence that her conceptual understanding of how a factor tree gives the prime factorization of a number and why zero is not a counting number (Eisenhart et al.). They also found a great deal of evidence that she did not understand why the division of fractions algorithm worked (Borko et al.).

It appeared that Ms. Daniels difficulties, at least with explaining multiplication and division of fractions, had at least some roots in her mathematics methods course (Borko et al., 1992). The instructor attempted to use paper-folding activities to illustrate two algorithms, multiplication of fractions and division of fractions. First, to demonstrate how to find 1/4 of 1/2 using paper folding, the instructor had the teacher candidates take a piece of paper and start by creating 1/2 by folding the paper in half.

> A student asked, "How do you explain that you always do the second number first?" the response was, "If I want one fourth of one half, that says I have to have the half first" The students wondered aloud, "Do you think they [my students] will understand?" the instructor repeated his verbal description, but the student's difficulties persisted... They faltered when trying to explain...what the conceptual link was between paper folding and the algorithm... At one point a student said, "I'd be terrified if something like this came up in my class." The students' problems seemed to increase with the move to division of fractions. The instructor believed that the ground work for division of fractions had been laid during...multiplication... For division of fractions...he continued by saying that 1 divided by 2/3 is the same as asking, "How many 2/3's are there in 1?" He demonstrated the problem by folding a strip of paper into thirds, tearing of two of the thirds, and showing that half of a two-thirds segment is left. Therefore, 1 divided by 2/3 is 1 1/2... The student teachers' responses suggested that they did not recognize the conceptual distinction... Their confusion was exemplified in their repeated requests for an "explanation" of the invert-and-multiply rule and their disorientation when the response took the form of verification (Borko et al., 1992, pp. 213-214).

So, although these student teachers, and in particular, Ms. Daniels, had been given some tools for verifying that the algorithms worked, they still did not understand that they had been given verifications for the algorithms and not justifications for how the algorithms for multiplication and division of fractions could be conceptually developed

by their students. It was clear that the entire class was uncomfortable with this lesson and that at least one student teacher was "terrified."

To illustrate how this caused difficulties in her teaching, the researchers shared a teaching episode where a student asked why the division of fractions algorithm worked (Borko et al., 1992). Ms. Daniels was reviewing multiplication of fractions during her student teaching when a student, Elise, asked why you flip the numbers and multiply if you're dividing. Ms. Daniels struggled at the board to reproduce the paper folding activity that would have verified the answer, rather than helping Elise see why you use the specific algorithm for division of fractions. But she could not recall how to do it and began to actually produce the representation for multiplication of fractions.

> Ms. Daniels realized that she had made an error. She paused for about 2 minutes, studying the board. She then decided to abandon the attempt to provide a concrete example, saying, "Well, I am just trying to who you so you can visualize what happens when you divide fractions, but it is kind of hard to see. We'll just use the rule for right now and let me see if I can think of a different way of explaining it to you. OK? But for right now, just invert the second number and then multiply." Ms. Daniels stood at the board, working on the division problem... After a few minutes ...she said to the researcher..., "I just did multiplication." She did not indicate to the students that the example illustrated multiplication. Further, she did not attempt a correct representation on the following day (Borko et al., 1992, p. 198).

She promised the children to look into it, but never returned to address the subject to the researchers' knowledge. While Ms. Daniels said that her explanation wasn't very good, she was pleased with the lesson overall. What leads me to believe that she may have experienced stress in this teaching episode is that she paused for several minutes, she explained herself to the researcher but not to the children, and she did not return to

discuss the topic again as she told the children that she would. It was also clear that many of the teacher candidates expected to be stressed if this topic ever came up in their textbook because of the instruction that they had received in their methods course. So while this episode is less clearly stressful than others, there is at least an indication that such a situation is potentially stressful for a student teacher or a novice teacher, particularly one committed to returning to teach topics in the spirit of the NCTM (1991) Standards.

Allison in Wilcox et al. (1991): Learning community interrupted.

The Teacher Education and Learning to Teach at Michigan State University researchers prepared a sequence of mathematical content courses, a methods course, and a seminar designed to expose interns to a teacher learning community (Wilcox et al.). The classroom community was especially helpful as a site for "posing problem situations, offering conjectures and arguments about problems and their solutions, and reflecting upon understandings and the connections and relationships among various mathematical ideas" (Wilcox et al., p. 34), emphases that the NCTM (1991) *Professional Standards for Teaching Mathematics* also suggest.

One student, Allison, struggled to create a classroom learning community at her field placement and continued to struggle with similar challenges to her efforts to teach for conceptual understanding at her first teaching job. In spite of having access to rich curricular materials, Allison felt constrained by the school's 45-minute class periods. Allison said, "I get so frustrated. These classes are so short. I don't have time for the

discovery mode. I feel like sometimes I have to *tell* them...the formulas. It's so frustrating (Wilcox et al., 1991, emphasis in original)."

Allison also felt overwhelmed by the amount of preparation required and the wide range of ability levels among her students. For these reasons, she gave up all attempts at group work, developing a sense of community, and conceptual understanding and replaced them with a self-paced, self-study course of instruction in mathematics.

Schweitzer (1996): Frustrations of implementing a new pedagogy.

Ms. Schweitzer had a year of teaching experience when she began her attempts to implement an innovative elementary mathematics curriculum. In the accounts of teaching experiments from the SummerMath for Teachers inservice program (Schweitzer), she recounts her struggles with implementing NCTM (1991) Standards-based mathematics teaching. At first, Ms. Schweitzer had difficulty posing meaningful questions. Then she noticed that, although the students were answering her questions more often, they were still not listening to each other's comments during whole class discussions nor were they talking to each other while they were working on problems. Ms. Schweitzer described feeling frustrated, discouraged, and disappointed by these early attempts at innovative mathematics teaching. She also tells us that when she talked with the teachers at SummerMath, she was relieved to find that the other teachers were feeling similarly frustrated. The following quote from her journal illustrates Ms. Schweitzer's frustration:

> I feel so discouraged. I've been looking and looking for signs of a child who has learned something that I wanted her or him to learn, but I haven't

> seen any. I am so frustrated that lately I've just wanted math to go away! ...I've tried to create math lessons that were engaging and meaningful, but the children seem inattentive during discussions and my questions often are answered with silence. I've tried to use resource books to set up activities that are "proven" in order to stimulate thinking and talking, but nothing happens except that I get even more frustrated. So I try to listen to the kids for a direction to go in, but I guess I don't know what I'm hearing yet because that doesn't help either (Schweitzer, 1996, p. 55).

Ms. Schweitzer also felt frustrated, as she insinuates in her journal entry above that the resource books and problem sets felt like disjoint sets of problems. She did not feel like she knew what direction her mathematics curriculum would take that year. So there was a great deal of frustration for Ms. Schweitzer in her first attempts to create discussions with her students, the activities that she was posing, and the curriculum that she was trying to piece together. Eventually, however, she did find greater success in implementing this curriculum, after an idea from Deborah Schifter, her SummerMath instructor, helped her see how to scaffold students' thinking and activities more successfully.

All of these examples from novices' and interns' experiences appear to demonstrate the stress that attempting to enact elements of the NCTM (1991) Standards can impose on beginning teachers. These teachers and interns expressed their difficulties with their mentor's emphasis on deep mathematical content and questioning techniques at the expense of management issues. They described frustrations related to implementing a pedagogy that required students to meaningfully and actively participate in exploratory activities and classroom discussions. Observations suggested that they experienced frustrations at their lack of conceptual of mathematics. Some of these issues resolved

themselves and some went unresolved, but all appeared to cause these novices and interns stress.

While I did not directly address my resources for coping with teaching stresses in Chapter 1, I did have a variety of resources in each of my teaching contexts, such as my colleagues, myself, curricular materials, and physical resources. I do think it was clear that the effectiveness of those resources in relieving my teaching stresses definitely varied between contexts. I now turn to a discussion of the coping resources that the literature argues that people in general employ in dealing with their stresses, relying primarily on the seminal work of Lazarus (1966; 1976). I then more specifically identify coping resources suggested in and described by various studies in the teacher education literature.

Coping Resources

Coping resources have mainly been described in the general stress literature, but have not been addressed often in the teacher stress literature. In the general stress literature, Lazarus (1976) described behavioral and cognitive strategies for coping with stress. For behavioral strategies, he described direct action, or actual behaviors that change a person's relationship to their environment. The behavioral strategies he described as direct action included preparation against harm, aggression, and escape.

Preparation against harm describes actions that reduce or eliminate the perceived stress, as when a student studies intensely prior to taking a test, or when a teacher prepares an entertaining lesson carefully constructed to the students' needs. Both of these events reduce the likelihood of experiencing stress. In the former, the student's intense

studying makes the probability of receiving a good grade more likely. In the latter, the teacher's preparations make it more likely that the students will enjoy the lesson and will learn from it, rather than feeling bored and frustrated. Aggression is the targeting of the source of stress and destroying it or inducing injury. Such action is generally not effective, because it is often not appropriate in the particular setting. Escape is the third form of direct action, involving leaving the situation in which the stress takes place.

Palliation describes the process of moderating stress to reduce its psychological and physiological impact, using symptom-directed or intrapsychic strategies (Lazarus, 1976). Symptom-directed strategies include the use of alcohol or illegal or prescription drugs, as well as exercise, muscle relaxation, and other body-centered techniques.

Intrapsychic strategies of palliation are cognitive defense mechanisms against stress (Lazarus, 1976). These strategies include identification, displacement, repression, denial, reaction formation, projection, and intellectualization.

Identification is the process of recognizing and internalizing characteristics of others. The most significant identification process is how children develop their personalities and socialization processes from their parents. The identification process is also used to describe why victims, like Jews in Nazi concentration camps, began to think and act like their captors. Identification helps the victims to show themselves as worthy of friendship and camaraderie rather than anger, as they adopt the culture of the oppressor. Displacement is the process of expressing aggression towards a target other than the source of stress, particularly if that source of stress is more powerful than the victim. This action helps the victim express anger towards a target in a safer environment, although clearly that anger is misplaced. Repression is an unconscious defense

mechanism by which a thought, idea, or wish, in other words an internal stress, remains unacknowledged and unexpressed. It is crucial that it be unconscious, otherwise it is suppression. Repression helps the victim avoid pain due to breaking an internal proscription or punishment from an external source.

Denial is the act of denying that an external source of stress exists, which may involve elaborate processing of information to find the stressful information false to avoid feeling or dealing with that particular stress. This may occur when a patient is diagnosed with cancer and finds reason to discredit the doctor's credentials or motives, the laboratory's results or procedures, etc. Reaction formation is when a person expresses the opposite of what they are feeling to avoid expressing their true feelings. Because the magnitude of that expression must be the same, the expression often comes across as exaggerated or insincere. Projection is the act of finding evidence of a trait, attitude, or behavior in one's self and, rather than acknowledging it, projecting it onto another person. Intellectualization is the process of detaching one's self emotionally from a threatening situation by treating it analytically, as a subject for study or curiosity. For example, a physician treating a patient with cancer may wish to think of it as an ordinary case of chronic illness, rather than acknowledging it as a human situation involving death and loss.

Many of the aforementioned strategies might not be revealed while interviewing or observing a novice teacher. For example, some actions are highly personal and/or embarrassing (such as aggression or using palliative techniques like drugs or alcohol), while others may be difficult to verbalize because they are abstract (like intellectualization). But of those previously-listed strategies, I could hear about examples

of preparation for harm, modest forms of denial, and possibly mild forms of displaced social aggression. As an example of preparation for harm, the teacher might prepare a very engaging lesson for his or her students. An example of denial would be if a teacher said that sometimes the students' behaviors really get under her skin until she thinks about how she was at that age and reminds herself that she is the mature adult, while they are still children. Finally, a teacher might report she vents to her husband when she is feeling really frustrated, which is a mild form of aggression that gives her a release from her stress.

While there is little in the teacher stress literature that explicitly and directly discussed coping resources, the teacher education literature on learning to teach suggest several coping resources that were used with varying degrees of effectiveness. For example, many teachers talk about the significance of the role of a teacher learning community in their professional growth (e.g. Fennema, 1996). Some talk about how a teacher educator helped them understand a concept that they attempted to teach to their students (Borko et al., 1992; Eisenhart et al., 1993). Others talk about how curricular materials (e.g. Van Zoest & Bohl, 2002) or a curricular framework (e.g. Fennema) helps make their teaching more effective and enjoyable. Some teachers or interns talk about how situations that were originally stressful become less so over time (Van Zoest & Bohl) as the intern developed strategies on her own for dealing with management issues; so the intern herself was actually her own coping resource. These examples from the literature are also somewhat representative of the coping resources that I found during this study, as I will shortly explain.

Lazarus' (1976) seminal work, in particular, gave me an idea of which resources to look for during observations and what to ask about during interviews with these novices. But the data arising from my study actually inspired the categories of teacher resources that I chose and refined using a grounded analysis of the data (Glaser & Strauss, 1967). I will discuss this process in greater detail in Chapter 3. As a result, I define coping resources as means of avoiding, alleviating, or eliminating teaching stress; such resources take the form of physical assets, social relationships, or resources arising from one's own knowledge, skills, or capacities.

Chapter 3: Methods

In this chapter, I discuss the pilot study that prepared me to perform this dissertation research. I then describe the methodology of the current study. I define the key terms that I use, such as teacher stress and coping resources for dealing with that stress. I also review my methods during participant recruitment. I discuss the steps in the data collection process. Finally, I describe the data analysis that I performed on the data once it was collected.

Review of Pilot Study

My pilot study researched the sources of stress that both novice teachers and interns experienced as a (heterogeneous) group. I sought to find out which sources of stress novices and interns reported, which were related to their attempts at SBT and which were new to the literature, and how surveys and interviews complemented each other as means of gathering information on sources of teacher stress.

The pilot study consisted of a survey and a follow-up semi-structured interview. The survey asked about the sources of teachers' stress while teaching, their pedagogical style and beliefs, their teaching goals, etc. Out of approximately 100 surveys sent out to teachers, 19 were returned. I conducted follow-up interviews with 9 novice teachers and interns that probed their sources of teaching stress and indirectly and subtly examined how their pedagogical style influenced those sources, analyzing the 5 participants' interviews who had attempted Standards-based teaching and had completed their internship by the end of the study.

While the survey worked relatively well at uncovering sources of teaching stress, it showed no indications of when participants were attempting SBT. The interviews, on the other hand, were filled with descriptions of teacher attempts at SBT, even though those attempts were not directly solicited until the last few minutes of each interview; in other words, teachers were only asked to describe their teaching, but not how it intersected with the NCTM Standards until the very end of the interview. Another surprising result was that the sources of each teacher's stress varied markedly between their survey and interview responses. Results suggested that the teachers may have reported sources of stress that they had experienced within a few days prior to taking the survey, while they spoke about the full scope of sources of their stress that they experienced across all of their teaching experiences during the semi-structured interviews.

I was also surprised at how many of the novices I spoke with reported attempting SBT at various times during their internship and first few years of teaching. I wondered whether such events were observable, or whether their perceived attempts at SBT were not visibly in the spirit of the NCTM Standards to any meaningful degree (e.g., Cohen, 1990).

The pilot study identified several new categories of sources of teacher and intern stress, including Learning to teach in new ways, Challenges associated with professional development, Learning and teaching unfamiliar content, Preparing students for standardized tests, Working with technology, and Managing classroom discussions, as well as demonstrating the validity of many categories already present in the teacher stress literature.

My pilot study also demonstrated the difficulty with which teachers talked about the construct of NCTM (1991) Standards-based teaching. Teachers failed to engage with the concept on the survey and struggled to understand and speak in terms of such teaching, even with extensive explanations during the interview. They often confused the NCTM Standards with state and district standards, and, although such documents do overlap to some degree, they are generally written for very different purposes.

Limits of Existing Literature

Some survey researchers have emphasized that few researchers, if any, have gone into classrooms in an effort to more deeply understand the challenges that novice teachers face in any systematic way (e.g., Manthei, Gilmore, Tuck, & Adair, 1996). Most of the literature in this area has been conducted using surveys.

Given the findings of my pilot study (Lewis, 2004) about the immediacy of events reported on the survey, concerns about how observable teacher attempts at SBT were, and the difficulties teachers experienced at engaging with the construct of SBT, it appeared crucial to situate further studies on the intersection of novices' attempts at SBT and their challenges in the context of their classrooms accompanied by semi-structured interviews, allowing opportunities for researcher observation of teaching, explanation of challenging constructs, and probing for the time, duration, and impact of reported sources of teaching stress.

Conducting semi-structured interviews with participants gives me, as a researcher, the advantage of probing to determine when the participant is talking about the sources of their immediate stresses and how those sources relate to the usual sources of their stress,

as well as allowing me to broaden the discussion to the bigger picture of participants' teaching stresses throughout the course of the year. As a result, using observations as a springboard for discussion together with semi-structured interviews may help me, as the researcher, understand the bigger picture of sources of teaching stress, including which sources are consistently the most challenging for teachers or have been in the past, how those sources have changed over time, and which resources teachers employed to mediate the resulting stresses.

I have used the existing stress and teacher stress literature to develop definitions of the constructs of teacher stress and coping resources for dealing with teaching stress.

Definition of Teacher Stress

I define teacher stress as the psychological state resulting from teachers' perceptions of teaching related events as demanding, challenging, and/or frustrating. This definition meets my ability to identify and analyze the perceived stresses that teachers report.

My definition of teacher stress is a modified version of Kyriacou and Sutcliffe's (1978) to meet my purposes and the tools here in this study for two reasons. Because I am not researching physiological or biological factors related to this study, I omit any reference to such elements of teacher stress. I also view the expectation that stress is a "response syndrome" or "creates a demand that constitutes a threat to a teacher's self-esteem or well being" as too great of a bar to reach in the modest interview and observation format that was reasonable to perform with the six teachers I invited to participate in this study. So I omitted such references in the definition used in this study.

This definition also does not include a reference to coping resources, because I have not yet defined them. I do so below and talk about how they relate to teacher stress.

Definition of Coping Resources

I define coping resources as physical, psychological, or social means of dealing with, avoiding, or alleviating stress, whether targeted at the symptoms or sources of that stress or at changing the classroom context to alleviate or eliminate that stress. For example, a teacher might engage in yoga, meditation, vent to her spouse or colleagues, or justify such stresses, like saying "Oh, they're just kids and that's how kids are." Such mechanisms are aimed primarily at dealing with the aftermath of stressful events. On the other hand, discussing new classroom management techniques with a colleague or creating more interesting lessons to engage the students are aimed at dealing with the sources of stress, which in these two examples are problematic student behaviors and lack of student interest/motivation, respectively. Such strategies may be intentionally sought or unintentionally found and employed. Finally, as previously mentioned, creating more engaging lessons would aim to draw students into the discourse of the classroom and to engage them by changing the classroom context to one where learning is a more attractive choice for at least some of the students.

My definition relates to Lazarus' (1966) and Kyriacou's (1981), but I have chosen to be more specific in my discussion of "targeting sources of stress," (i.e. employing proactive strategies to alleviate or avoid stress altogether), rather than including that idea under "preparing for harm," as Lazarus includes such actions. In my study, examples of the types of proactive strategies that Lazarus describes abound and include planning

lessons that will better engage students in classroom activities, creating contracts with students about how they will improve their behaviors, etc. Such constructive activities also assert teachers' and students' shared responsibility in promoting a classroom environment conducive to learning, as well as emphasizing the personal power that teachers have in dealing with the challenges that they encounter.

I also acknowledge that many stresses that teachers perceive are also seen after being subject to the mediating forces of the teacher's coping resources, which vary with each individual teacher and teaching context. As a result, my definition of teaching stress remains intact, with the understanding that many times, I view those stresses after coping resources have been employed on them to alleviate them partially or completely.

As a reminder, my purpose in working on this study is to help teacher educators and school administrators to understand the stresses that novices experience and to allow them to judge for themselves which of those experiences are the most constructive, because stress impairs the reasoning and reflective thinking which are the hallmarks of learning from one's experience. If teacher educators and school administrators hope that novice teachers will continue to learn from their experiences, they need to find ways to help them limit those stresses, whether by shielding them from some of the initial stresses, offering them scaffolding by providing access to appropriate coping resources, and teaching them how to employ such resources in more effectively dealing with their teaching stresses.

In response to these issues, I have constructed my dissertation study around the following research questions. The numbered questions unpack the general research questions that are mentioned first.

Research Questions

Which stresses do novice teachers attempting NCTM (1991) Standards-based teaching experience and how do they respond to them? In what ways are those stresses related to their attempts at Standards-based teaching?

1. What sources of teacher stress do novice secondary mathematics teachers who have exhibited some elements of NCTM (1991) Standards-based teaching experience in their teaching?
2. a. Which of those sources of teaching stress are predicted by the existing literature and which are new to the literature?
   b. Which sources of teaching stress are related to their attempts at Standards-based teaching and how are they related?
3. What sort of impact do the sources of teaching stress that novice teachers experience have on them, i.e. do they judge them to be facilitative, neutral, or debilitative?
4. What coping resources do novice teachers utilize to mediate the teaching stresses deriving from the different sources of teaching stress that they experience?

Overview of Method: Main Steps

As a result of my research of the literature, I have chosen to use teaching observation as a central tool in this study. As mentioned previously, I hope to be able to understand the challenges that teacher's face in the context of their daily teaching environment and to use my observations and the teacher's comments on those observations as a springboard for inquiry. I intend that this process, as previously described, will open up opportunities for situating a discussion of the sources of each teacher's stresses in the classroom, while allowing me to expand the conversation to gain a broader understanding of the sources of stress that each teacher regularly experiences and how those sources have changed over time.

I chose to look at a three- to five-day "subunit" in each teacher's classroom, or a series of lessons that were somewhat related and cohesive. I asked each teacher for three to five days when they would be covering related topics that would be a good time to observe. I avoided "project days" when they did not appear to be an integral part of the teacher's pedagogical strategies. In this way, I hoped to see a slice of the teacher's teaching experiences and to be able to follow a topic through its development, if possible.

I also chose to hold an interview beforehand, to get demographic data and an idea of what the teacher's overall impression of his or her challenges were before beginning the observations. Afterwards, I planned a second interview to review the observation data, to discuss the teachers' perceptions of their challenges in more depth, and to learn about the coping resources that they use to meet those challenges.

To attempt to answer my research questions, during the interviews I asked the teachers to elaborate on the sources of their teaching stresses. By looking at the

observations and reading the interview transcripts, I hoped to learn about the sources of their teaching stresses and to be able to identify at least some instances in which those sources were related to their attempts at SBT. In the data analysis, I will compare the sources of teaching stress mentioned during the interviews to the ones predicted by the existing literature including those predicted by my pilot study. Finally, during the interviews primarily, I hoped to find out which coping resources the teachers employed to meet the demands imposed on them by their teaching contexts and by their expectations of themselves and of the individuals and resources in those contexts.

Locating and Soliciting Participants

To begin locating and soliciting participants, I talked with a fifth-year secondary mathematics content/methods instructor of a progressive, highly ranked teacher education program of a Midwestern university (hereafter, MU) who helped create a list of recent graduates teaching at the middle and high school levels who were most likely attempting SBT based on their classroom participation, field placements, and observations of their student teaching. I found out where many of those graduates were employed by talking with the fifth-year instructor, their MU field instructors, and members of their student teaching cohort.

I ranked the graduates based on the fifth-year instructor's comments and the practical issues involved in data collection (i.e. distance from MU) in the order in which I hoped to solicit their participation, omitting graduates who had already participated in my practicum study. But in the course of data collection, I found that each teacher's

availability and suitability as a participant were the actual limitations in finding, locating, and recruiting participants.

I contacted all prospective participants at their schools within a reasonable driving radius of MU to see if they would let me sit in on one of their classes, explaining that I was looking for prospective participants for a study on the challenges of teachers who were relatively new to the profession. I omitted any mention of Standards-based teaching until the end of the data collection process for several reasons. First, I was concerned that participants might feel that they were being evaluated. Since they had had that experience as interns, I felt certain that they would know what I was looking for and might alter their teaching accordingly, yielding inauthentic data. Second, I didn't want to elicit feelings that the Math Wars tend to bring out in teachers, either for or against educational reform. I wanted to avoid teachers changing their teaching and conversations to reflect their personal biases in regard to such issues that would also yield less authentic data than I might otherwise find.

As I sought to recruit a cadre of participants, the most salient feature of recruiting participants was the difficulty of the process. It was difficult to determine where all of the prospective participants currently taught. As mentioned previously, I spoke extensively with their prior university content and field instructors, as well as to members of their cohort to eventually locate a satisfactory number of participants. Because novice teachers are often very busy, or even overwhelmed, during their first few years of teaching, it proved difficult to persuade them to participate in additional extracurricular activities outside of their already assigned duties.

Screening of Prospective Participants

I returned to those teachers' classes who were willing to participate. I conducted a screening observation in a class that the teacher described as talkative and where much of that talk focused on mathematics. I took field notes during the observation, paying close attention for and recording any evidence of SBT in each class that I observed.

After each screening observation, I analyzed the events in the field notes for evidence of SBT using an instrument that I created for that purpose (see Appendix A), based on the NCTM (1991) *Professional standards for teaching mathematics*. Using that instrument, I categorized each event that represented a non-trivial attempt at SBT into one of the six categories listed in the NCTM Teaching Standards, as previously mentioned.

To digress, an example of a trivial attempt would be if a teacher asked a question involving more than a right or wrong answer and then said "Never mind," and moved forward immediately with the lesson as if deciding on a different pedagogical move. If the teacher asked the question, waited a few seconds, asked a few students to respond or attempt the question, but no one engaged with the idea, so she decided to ask simpler short-answer questions instead, that would constitute a non-trivial attempt at SBT in this analysis.

As another example of a trivial attempt at SBT, a teacher could give out a project that called for student exploration and then lead the class through the entire project by lecturing and asking students simple short-answer questions requiring right or wrong answers. On the other hand, if the teacher did try to get the participant's to generate some

of the mathematical ideas or conjectures themselves, even though she was lecturing, that would be an example of a non-trivial attempt at SBT.

So by "non-trivial," I mean that the teacher did not entirely subvert her own attempt at SBT. On the other hand, if the students subverted those attempts or failed to engage with them, I considered that to be a non-trivial attempt, because the teacher had made a good faith effort to enact teaching consonant with the NCTM Standards.

After classifying all of the participant's non-trivial attempts at SBT, I looked across these events, using the screening instrument, for each prospective participant and judged each teacher as having attempted SBT if I found non-trivial, observable attempts at SBT in at least two of those six categories.

In one screening observation, the participant did not meet my criteria, but there was good reason to believe that she might attempt SBT due to an overwhelmingly positive content/methods instructor recommendation, so I returned for a second screening observation. That participant qualified for participation at the end of the second screening observation.

Of the 30 teachers recommended by the fifth-year content/methods instructor as most likely to be attempting SBT (see Figure 2), 4 had already participated in my pilot study, so I removed them from the list of prospective participants. 4 of the others that I located were too far from MU for me to practically recruit them as participants. I could not locate 4 of the remaining prospective participants. This left me with a list of 18 prospective participants. I contacted the remaining teachers in the order of their proximity and availability to participate in a screening observation. Of the remaining 18 prospective participants, I contacted the 13 for participation who taught closest to the MU campus

(i.e. less than one and a half hours from MU). 2 of those teachers elected not to participate. Of the 11 teachers who I screened for participation, 7 met my criterion for having attempted SBT during their screening observation(s). The remaining 5 prospective participants, located between one and a half and three hours from MU, were not contacted, because my sample was already complete.

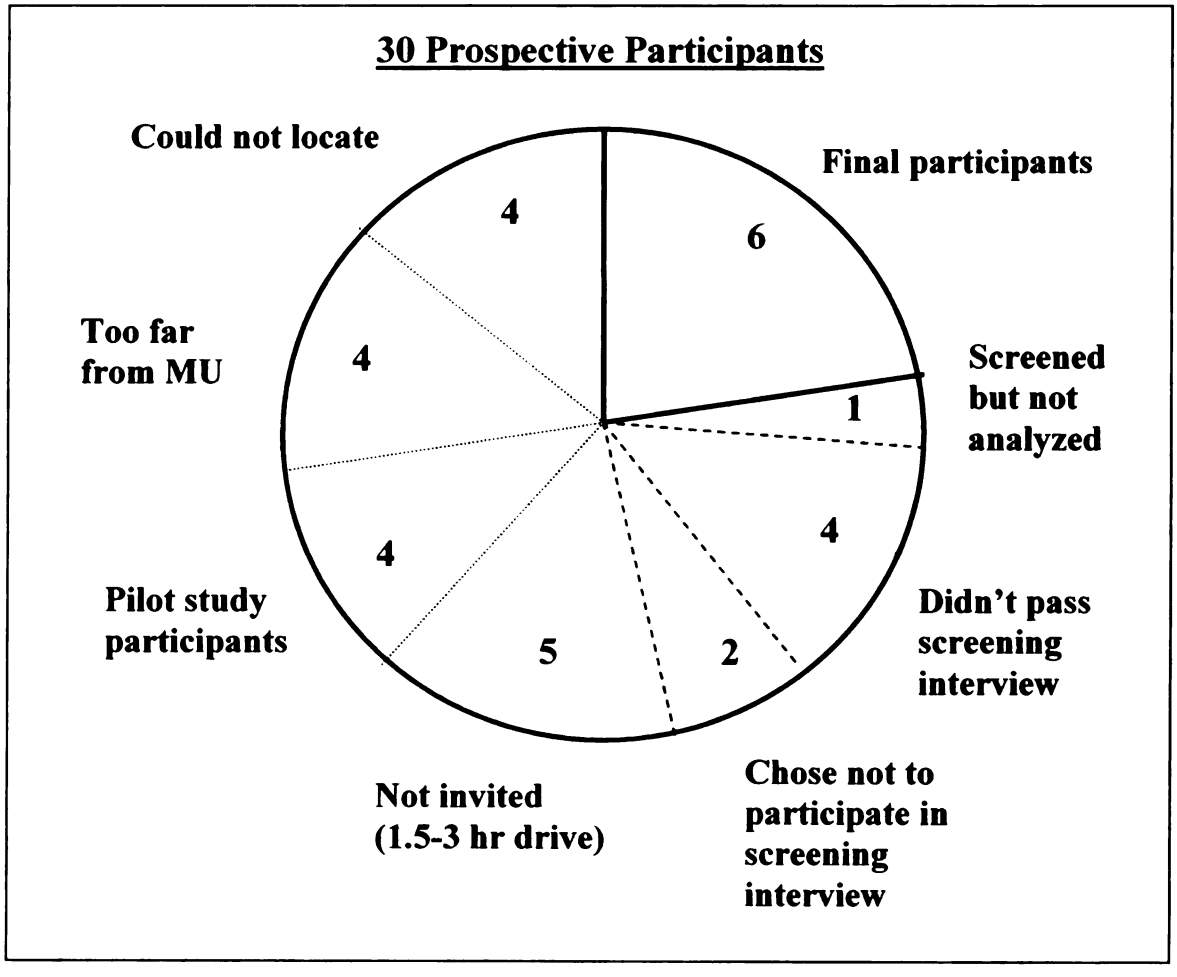


Figure 2. Number of prospective participants who were chosen for or how they were eliminated from the sample.

Those 7 participants who met my criteria for SBT during the screening observation were invited to participate; others were sent a letter thanking them for their

willingness to participate and explaining that only a limited number of participants could be chosen. But of those 7 qualifying participants, only 6 made visible, non-trivial attempts at SBT during their classroom observations as research participants. The 6 participants who attempted SBT during my classroom observations after being invited to participate in this study are the focus of my analyses. The 1 participant that made no visible attempts at SBT after the screening interview was dropped from the analysis.

Actual Sample—Description

Table 1

Participant Demographic Data

Participant Name	**Years Teaching**	**School**	**Context**	**Class Observed**	**Contrast Class**	**Other Classes**
Mr. Jones	1.25	Maple	Rural	Integrated 2 (Alg1/Geom)	Integrated 1B	None
Ms. Boone	2.50	Maple	Rural	Integrated 3 (Alg2)	Integrated 2	AP Calculus
Ms. Grant	2.00	Elm	Urban	Algebra 1	Algebra 1C	Algebra 2C
Ms. Riley	1.25	Holly	Semi-rural	Advanced Algebra	Geometry	None
Ms. Wells	1.50	Redwood	Urban	Geometry	Algebra 1	None
Ms. Price	2.75	Linden	Semi-rural	Geometry	Algebra 1B	Algebra 2

My sample consisted of 6 teachers, each with less than three years of teaching experience. 1 of the participants was male and 5 were female. The participants taught in a variety of settings, including, roughly categorized, 2 rural (Mr. Jones and Ms. Boone), 2 semi-rural (Ms. Riley and Ms. Price), and 2 urban (Ms. Wells and Ms. Grant) schools

(see Table 1). Also notice that participants had a variety of experience levels, although none of them were first-year teachers.

Only 2 of the 4 first-year teachers who I screened, Ms. Riley and Ms. Wells, met my criteria for attempting SBT. Unfortunately, both of those teachers asked me to wait until the following year for data collection. They both told me that they had way too much on their plates to participate at that time, but that they would be willing to participate the following year. I also attempted to contact Mr. Jones during his first year of teaching, but was unable to locate him until the following academic year.

Data Collection

Screening observations.

The aforementioned screening observation(s) were used to select participants who were making a reasonable number of non-trivial attempts at SBT. For the screening observation(s), I asked each prospective participant to select a class in which they felt most comfortable being observed and where the students were talkative and where much of that talk focused on mathematics. I took extensive field notes of each prospective participant's class, particularly focusing on events where the teacher appeared to attempt SBT. After the class, I judged whether the teacher had met my criterion for attempting SBT during the observation, as mentioned previously, by seeing whether the participant demonstrated non-trivial attempts in at least two of the six categories mentioned in the NCTM (1991) *Professional standards for teaching mathematics*.

Pre-observation interview.

I met with each participant for an approximately one-hour audiotaped interview to ask about their field experiences, first experiences teaching, curriculum used, perceptions of that curriculum, resources for teaching, other demographic information, and generally about the challenges they had encountered to date during their teaching experiences. I also asked each participant either during or around the time of this interview to think of a series of three to five lessons on related topics that would be convenient for me to observe and videotape. I asked the teacher what challenging issues they expected to encounter during this series of lessons.

Because I wanted to get a general picture of the challenges that each teacher faced on a daily basis before observing them or focusing on specific classroom events, I chose to ask questions about their challenges more generally, as well, in their teaching context. I also asked them what resources they had for meeting the challenges that they faced on a daily basis inside the classroom. At times, I referred back to these ideas during the final interview, if the teacher mentioned them again or mentioned a related challenge or incident.

Classroom observations.

I videotaped a series of at least three lessons about related mathematical topics in a class in which each participant felt comfortable being observed (hereafter 'focus class') and where the class was talkative and much of that talk focused on mathematics in hopes of finding an environment where each participant would feel most comfortable attempting SBT. For most participants, this was the class in which I held the screening interview, except for two, Ms. Price and Ms. Riley.

Ms. Price participated the year following her screening observation, teaching a section of the same Geometry course in which I observed her for the screening observation. Ms. Riley also participated the year following her screening observation. Because she was teaching at a new school and I was observing a different class and textbook series, I counted her first observation as a screening interview, which she passed, while I observed her the following year. I discuss these events in more detail in the Results chapter.

I focused on a class where students were constructively talkative with the intention of getting an idea of what their teaching looked like under the best circumstances in their teaching context, as well as getting an idea of the challenges that they might experience over a series of days in their classroom. I videotaped one to two additional days in some participants' classes when doing so allowed me to see the end of an activity, project, or conversation in which the class was engaged, or when I needed a substitute for a videotaped day that appeared to be less than half a period of typical, related, constructive work. Observations were either postponed or extended several times during the study. One observation was postponed by a cancelled class hour (Ms. Price's class). Another set of observations was extended by a pop quiz (Ms. Wells' class) and an atypical day in the computer lab that did not necessarily link to other classroom events (Ms. Wells' class). Finally, a set of observations was extended by a continuing whole-class activity and discussion that lasted two additional observation days (Mr. Jones).

For the sake of contrast, I also videotaped one class period (hereafter 'contrast class') in the class where each participant reported that their challenges were most different from those experienced in the focus class. The challenges in these classes

usually, but not always, related to classroom management. In this way, I hoped to get an idea of the range of challenges that the teachers experienced across their classes and to facilitate a conversation about as many of the challenges that they experienced as possible for the modest investment of time that I was able to practically solicit from the participants.

Teaching log.

Each participant kept a daily teaching log during observations, discussing events that were surprising, challenging, or unexpected to them during videotaping. In this way, I hoped to bring to mind all events that were potentially stressful for the teacher. During conversations with teacher researchers prior to the current research, I heard that many teachers experience surprising or unexpected events as stressful, even though they may not readily identify or immediately register them as such. As a result, I used those adjectives to elicit as many potentially stressful events in the teaching log as possible.

Artifacts.

I asked each participant for copies of their lesson plans and the assignments that were handed out, worked on, or discussed in the focus class during my observations. I also requested their lesson plans, but no participant actually used formal lesson plans. Most participants said that they made mental rather than written plans, at times writing their ideas on a worksheet or a piece of scratch paper, so there were few formal lesson plans for these observations.

Selecting video clips.

I selected three video clips to discuss with each participant that lasted altogether approximately ten minutes.

First, I reviewed the videotapes to find all events that appeared to be stressful to the teacher; in other words, I looked for and noted in detail when I identified physical or verbal cues that the participant may have been experiencing stress in the video clips. Examples of physical cues included a teacher rolling her eyes or staring fixedly at the class while occasionally glancing at a clock or wristwatch. Examples of verbal cues included raising her voice or a verbal reprimand (like saying, 'That's not appropriate language' or 'I'll be holding the whole class for 15 seconds after the bell rings today'). I made sure that the detail in these notes was sufficient to identify SBT-related events and situations. For each event, I listed the starting and ending times of those events on the videotape and wrote a summary, paying particular attention to give enough detail to be able to identify the sources of stress and whether there were SBT-related components for each potentially stressful event.

I then carefully selected the events that also appeared to be related to attempts at SBT; in other words, I identified apparently challenging events that non-trivially satisfied at least one aspect of any of the six NCTM (1991) *Professional standards for teaching mathematics*. I made a list of three to five events that appeared to represent the sources of each participant's SBT-related teaching stresses and then, if there were less than five events, added in events that represented classes of events in the data that were not necessarily related to SBT.

After reviewing the videotapes of the observations, I read through the unexpected, surprising, and challenging events that the participant had noted in the teaching log. I looked for related groups of events, particularly those that also coincided with participants' attempts at SBT by the participant's explanation or by my observation of those events. I identified three to five events from the teaching log that appeared to be representative of patterns in that data, giving preference to those related to SBT. After that, I gave preference to isolated events that appeared related to attempts at SBT, then to a those events that represented patterns of challenges in the data not related to SBT. Isolated events not related to SBT generally were not part of this list.

From these two sets of events, the list generated from my review of the observation videotapes and from my review of the teacher's teaching log, I looked for overlap in the two lists of events, focusing on those most strongly related to attempts at SBT. If there was more than one event related to a single source of stress, I chose one to represent that source of stress. In this process, I also tried to choose the events that represented the overlaps in the two lists that were most readily observed and understood in the observation tapes, selecting the participant-identified events from the teaching log, wherever possible. Where the teacher described an abstract idea, like "general chattiness of the class was out of hand," I chose a video clip from the list I had created as I reviewed the observations that appeared to represent that concern in a clear, observable way to facilitate meaningful discussion during the Post-Observation Interview.

After I had found episodes most strongly related to SBT representative of the overlap I saw in the teaching log and the videotaped observations, I chose other events that related to attempts at SBT. Finally, if I still needed another event, I chose events that

were reported as or appeared to be the most challenging or frequent for each participant. As a result of this process, I selected and refined a final list of 3 events. I then created video clips of those events, each lasting from about 15 seconds to four minutes that I could share with the teacher during the Post-Observation Interview. I edited the video clips to be generally about a chunk of the lesson, perhaps focusing on solving one problem, discussing one or a series of questions, or looking at one or a series of interchanges with a student, depending on the event and source of stress that the clip was intended to represent. As mentioned previously, I tried to limit the total viewing time to ten minutes or less for each participant's three video clips.

For a few teachers, I selected a fourth video clip when one of the clips appeared that it might be too poignant to present, when it was difficult to find one clip that exactly fit comments in the teaching log, or where the judgment of and event as stressful appeared to be difficult to judge because it was subtle, if it was a stress at all for the teacher. An example of the latter occurred in Ms. Wells' class, when I couldn't find an event where student talking was clearly causing her stress. So I chose two clips that I considered borderline cases to show her, in case the event in the first clip was not actually stressful for her.

Generally, these clips contained only one of the sources of teaching stress that I had identified, although at times there appeared to be several sources present, but one of those sources was the primary focus for my research purposes. This was often due to the distribution of challenges in the course of classroom events. For example, while Ms. Price presented a problem involving the area of a regular polygon, I was primarily interested in the challenges that related to the misbehavior of the student who had asked

the question, but Ms. Price also made several mistakes due to a copy error during the same clip. Since the participant mentioned both of these challenges during the presentation of the clip, we talked about both, even though I had chosen the misbehavior as the primary reason for viewing the clip.

This process was intentionally designed to bring stressful events related to participants' attempts at SBT into the conversation during the Post-Observation Interview and to situate those events in the classroom context. Table 2 lists the three events for which I created video clips for each of the 6 participants whose data I analyzed for this study, omitting alternate clips that were selected but not viewed during the Post-Observation Interview.

Table 2

Three Potentially Stressful Events Novices Viewed During the Final Interview

Participant	Event 1	Event 2	Event 3
Ms. Boone	A student swore in class.	Teacher felt the "general chattiness of the class" was excessive.	Teacher was surprised by an interesting student idea in familiar lesson.
Mr. Jones	Students didn't see how drawing triangles helped determine validity of prospective congruence theorems (i.e. SSA, ASA, SSS, SAS, AAS, etc.).	Teacher struggled to get students to explain intuitively why ASA proves congruence.	Teacher struggled with getting students to understand the "path" to take to prove a geometric conjecture and to properly justify assertions.
Ms. Grant	Students didn't see how changing "c" altered the graph of the equation $y=x^2+c$.	Teacher struggled to use results of class discussions to predict the shape of the graph of the equation $y=ax^2+bx+c$.	Students struggled to use the calculator to find an x-intercept using left and right bounds.

Table 2 (continued)

Ms. Riley	Teacher tries to review absolute value, but realizes that students don't remember it.	Students struggle to solve by completing the square.	Students solve a completing the square problem, but teacher later realizes that they made a mistake.
Ms. Price	Student confuses two formulas, then starts talking with friends even after the teacher looks at him several times, so she confronts him.	Student says they divided the regular hexagon into 6 equilateral triangles, but class can't prove triangles are equilateral.	Students attempt to rearrange 8 pieces of a circle into a 'parallelogram,' but aren't sure what the shape they found really is.
Ms. Wells	Students struggle to find lengths of sides using the angle bisector and the Pythagorean theorem.	A student conjecture that the four triangles created by the midsegments of a triangle are congruent surprised the teacher.	Teacher has to repeatedly shush the class during a quiz and threatens to take points off one student's quiz.

Post-observation interview.

During the Post-Observation Interview, I met with each participant for one to two hours to discuss the three video clips of specific events that were challenging to them during my observations of the focus class during formal participation in the study. By design, the selection process favored events that coincided with attempts at SBT.

To put these events in the bigger picture of classroom events, I also asked about all of the other related events from the teaching log, as well as about the most salient challenges from the notes I took while reviewing the observation video tapes, particularly patterns of events that were not represented in the video clips. For example, if the teacher had an entry in her teaching log about Responding to problematic student behaviors and I had several others in my notes, but none of the events were represented in the video clips, then after our discussions of the video clips, I would talk about what the teacher had

written in the teaching log and, during that discussion and bring up a few of my observations in the video clips to see whether the teacher viewed those events as stressful and how they may have related to her planned pedagogy.

After that, I showed participants a list of the top 8 categories of challenges that teachers mentioned during my pilot study (Lewis, 2004) and asked them to discuss their challenges in each of those categories of events, as well. At this point, many participants pointed out which was their top challenge, as well as mentioning other salient challenges, and pointing out which events or situations were not really challenging for them. In this way, I got an idea of all of the challenges in the classroom that were meaningful and salient for the teacher and whether the challenges that they had discussed from the video clips (which generally favored incidents related to SBT) were actually meaningful, salient, and/or regularly occurring for the teachers in their teaching contexts. I then asked how representative those challenges were of the ones that the participating teachers experienced each day in their teaching and whether there were others that had not arisen during our discussions.

I also asked each participant about the resources they had for dealing with the challenges they encountered and whether those resources were meeting their needs. I also asked how well they felt that the graduate program had prepared them for teaching. Throughout this conversation, I referred back to the challenges and resources that teachers mentioned during the first interview, if the teacher mentioned them again or mentioned a related challenge or resource to facilitate making connections among the various challenges and resources that each teacher mentioned. These questions were

designed to determine which resources teachers found most helpful in meeting their challenges and where they judged such resources were lacking.

Data Analysis

Before beginning the analysis, as mentioned above, I transcribed verbatim each participant's interview audiotapes, summarizing events not directly related to the interviews, like small talk at the beginning of the interview, an announcement over the loudspeaker, interruptions by students, parents, colleagues, or administrators, etc. If the conversation following such events related to our discussions of the sources of teacher stress, I transcribed those events; otherwise, I summarized those portions of our conversations, as well.

Coding analysis: Research question 1.

As a reminder, my first research question asks "What sources of teacher stress do novice secondary and middle school mathematics teachers who have exhibited some elements of Standards-based teaching experience in their teaching?"

To answer my first research question (and to later help answer my second and third research questions), I reviewed the interviews for any mention of sources of teaching stress by each participant, as previously described. I broke out challenges reported by each participant from the interview transcripts as "chunks" of information. These data chunks were from one sentence to several pages long and could include one or several interviewer and participant "turns" talking, as long as the participant stayed on the

topic of the same challenge. I summarized each of those data chunks in a short sentence at the top of each data chunk in the file to facilitate analyzing the data.

As a reminder, my definition of teacher stress is "the psychological state resulting from teachers' perceptions of teaching related events as demanding, challenging, and/or frustrating," which are also mediated by the personality of and the coping resources utilized by each teacher.

I operationalized my definition of teacher stress using teachers' statements that they found something challenging for them or that it was accompanied by negative affect.

In my analysis, some of the words in a data chunk that indicated that a situation or event was challenging for the teacher included the following: hard, difficult, stress, challenge, etc. Other words were not strong enough to meet this condition. For example, words like "issue" did not clearly indicate stress to me.

Some of the words that indicated that a situation or event was accompanied by negative affect included the following: hate, frustrate, disappoint, bother, peeve, irritate, annoy, etc. Words like "concerned" were not strong enough to indicate negative emotion in this analysis.

Also, I judged that a negative description of an event indicated negative affect as well, such as "a bad thing" or my sixth hour class is "out of control." Words like "an unusual situation" were not strong enough to be considered a negative description.

During the first pass at the data analysis, however, I collected a broader array of data chunks to look at before giving my definition of teacher stress such precision. As a result, I looked for any words that might be considered as indications of stress, qualify as negative emotion and/or negative descriptions of an event or situation, or express a

participant's unmet teaching goal(s). In this first rough pass at the data, I gathered all of the examples and non-examples listed above, including those using wording to weak to be considered as stress under my operationalized definition. For example, an unmet teaching goal that I captured in the first pass at the data was subsequently removed from the analysis, because I judged that it was not strong enough to be categorized as a teaching stress. Ms. Grant's assertion that "good lessons are a combination of a lot of things, and I feel like I don't have that opportunity at this school" (Ms. Grant, Pre, 5.25-5.41) is a non-example of teacher stress, because Ms. Grant used words like "issue" and "concern." So this passage was included in my first pass at the data, but was removed during my second pass.

In sharpening my operationalized definition of teacher stress to the one previously described, I eliminated nearly all non-examples from the list; however, for those statements that used wording that I considered borderline in describing a stress or difficulty, such as "concern" or "issue," I looked to see if there were other data chunks that identified that event or situation as a source of stress. If so, I felt that there was justification to say that those more modest wordings in the data chunks identified and elaborated on a teacher's sources of stress, so I kept those data chunks into the file with the sources of stress, rather than removing them.

I also removed all data chunks that talked about unmet teaching goals from the list of sources of teaching stress that did not explicitly use words that identified them as stressful events or situations (or did not include borderline words and have other stresses in that category in the final analysis) and placed them into a separate list. In other words, the two lists, teaching stresses and unmet teaching goals, are mutually exclusive. If a data

chunk qualified for both lists, it remained in the list of data chunks describing sources of teacher stress only; otherwise, it was placed in a file for data chunks relating to unmet teaching goals that were not clearly sources of stress for that teacher.

I created the list of data chunks on unmet teaching goals, because previous studies (e.g., Lewis 2004) have suggested that one of teachers' most important priorities is to be able to teach in ways congruent with their teaching beliefs. Teachers often experience unmet teaching goals as stressful. Although these teachers did not always talk about their unmet goals as being stressful to them, I wanted the opportunity to later think about this data and what it might reveal about the existing data set and the participants' teaching contexts.

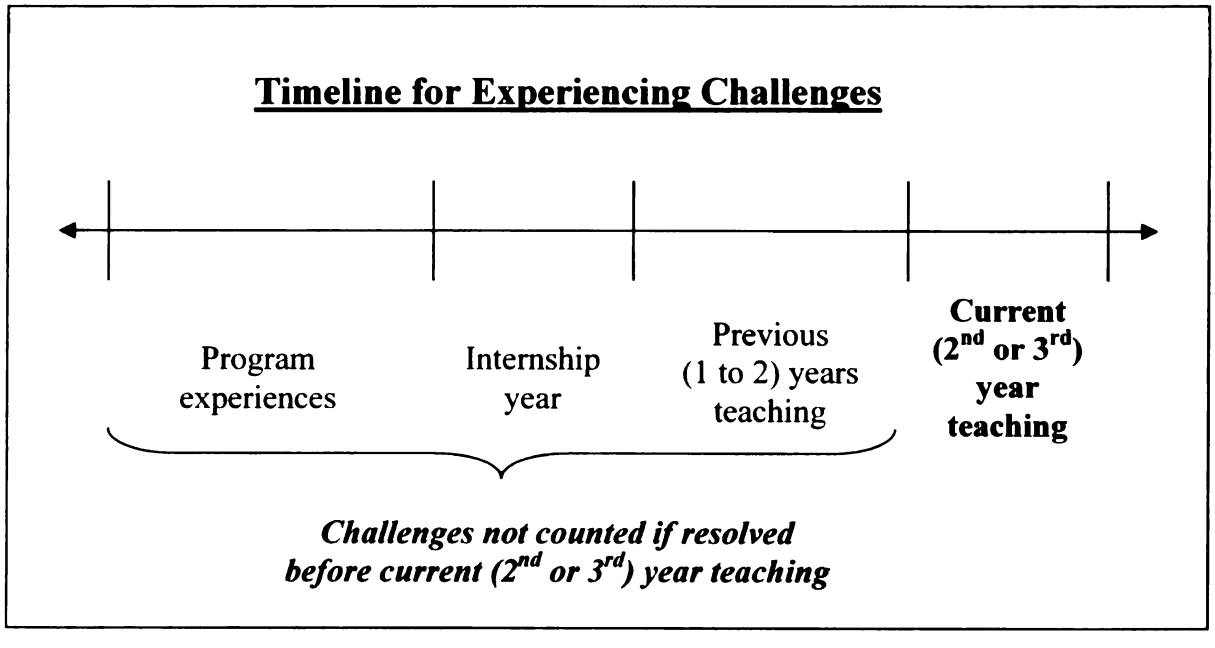


Figure 3. Timeline for including challenges novices experienced in the analysis.

I also judged when each teaching stress occurred. If it occurred prior to the teaching year in which the teacher participated in the study, I placed it in a "past stress"

file. If it happened in the current teaching year, I left it in the teaching stress file. If it was an issue which the teacher reported as a continuing challenge during the first few years of teaching, I labeled it as a "now and past" stress and placed the data chunk in both the past and current stress files. The focus of my analyses hereafter will be primarily the current teacher stress data, but I saved the past stress data as a context in which to view the current teacher stress data (see Figure 3).

In some cases, it was not possible to completely separate two sources of teaching stress; yet, if it was clear that there was at least one sentence in the data chunk where the participant was talking about each source separately, I coded the chunk under both categories. If there was a single source of stress related to two or more different categories of sources of stress and I could not find separate passages discussing the distinct sources or the stress appeared to be more strongly related to one source category than another, I revised the category definitions, so that that data chunk would fit into a single category. For example, in the following passage, notice that the teacher talks about a source of stress that might qualify in two categories, Challenges associated with professional development and After hours work/long hours.

> Ms. B: The first year, we had two days required at the beginning of the year, kind of inservice type days that... the novice teachers were required to go to. We got to go to [a teambuilding experience]. It was so fun... It was a really great way to build some camaraderie between the new teachers. We did problem solving. It was a great experience in team building and all that stuff. It was great. The next year we came back. And we weren't doing [the teambuilding experience], even though every one of us said, "This is great! We want to do this again next year." But they didn't listen. So right off the bat we were kind of like... All of a sudden we were looking at the calendar of events. And not only are we [not] doing those two days [of teambuilding], all of a sudden twelve hours got built in through the year... We still had to do the two days at the

> beginning of the year doing something else. And then there was this additional 12 hours tacked on. And I'm like, "That's huge." That's like an extra day and a half of work, so we went from two to three and a half days... And it was just, everything that was going on, we got really frustrated (Post, 9.1-9.15).

Since the professional development was a relatively short-lived event, the source of stress appeared more aligned with professional development than the amount of time involved in that activity. I decided to word the categories so that this data chunk landed in Challenges associated with professional development. I revised the category descriptions accordingly.

I also ignored interview text, at times, if the participant was momentarily distracted or taken off topic while continuously discussing the same challenging situation or event. For example, if we were talking about lack of student engagement in class and then a student interrupted to ask a question and the teacher talked about that for a few turns before returning to the original challenge, lack of student engagement, then I ignored the interruption and the few turns resulting from it. Such events, or at least portions of those events, were generally paraphrased in the transcripts, so this was relatively simple to do.

Also, if the teacher talked for several turns about details that did not relate to why the event or situation was challenging and then continued elaborating on the same topic, I omitted the irrelevant turns from the text being analyzed, but kept the chunk as a single chunk still, because the participant had continued to talk about the same challenge during our conversation. Usually this data was also paraphrased either during transcription or for the analysis, since oftentimes, such data gave identifying information that would not ensure the confidentiality of a participant's and their students' identities.

I separated the challenges participants reported experiencing in the current school year into coding categories. I initially developed these coding categories during a pilot study that researched the challenges that a group of interns and novice teachers reported facing. At first, I began with the categories of (sources of) teaching stress cited in the teacher and student teacher stress literature based primarily on survey research. Recall that the most commonly cited (sources of) teaching stress in that literature include the following: Poor motivation of students, Poor student discipline, Poor working conditions, Time pressure and work overload, Low status and opportunities—including pay, promotion, and career development, Poor school ethos—including conflict with colleagues and administrators, Being observed and evaluated by university faculty and staff, Being observed and evaluated by mentor teacher, and University coursework concerns (Phillips, 1993; Kyriacou, 1989; Miller & Fraser, 2000; Murray-Harvey et al., 2000; Hart, 1987).

I then spoke informally with teachers and teacher educators to refine those categories to also include new sources of teaching stress, including sources related to or coinciding with attempts at SBT. While analyzing the pilot study data, I further refined those categories as I reviewed and coded the data. I added several new categories of sources of teacher stress (Lewis, 2004), including the following: Learning to teach in new ways, Challenges associated with professional development, Learning and teaching unfamiliar content, Preparing students for standardized tests, Working with technology, and Managing classroom discussions.

For this study, I eliminated sources of teaching stress related exclusively to the student teaching/internship experience, namely Being observed and evaluated by

university faculty and staff, Being observed and evaluated by mentor teacher, and University coursework concerns (Miller & Fraser, 2000; Murray-Harvey et al., 2000; Hart, 1987). I then added to and refined the existing categories in the literature, including from my own pilot study (Lewis, 2004) similar to the open coding method described by Glaser and Strauss (1967). In other words, the coding for this study employs an educated "top-down" method, based on the existing codes in the literature and adding to and refining those codes as the analysis continued during my pilot and, currently, my dissertation study. My analysis yielded the 22 categories of sources of teacher stress that are named and defined in Table 3 that follows. Appendix B names and defines the list of categories of the sources of teacher stress, but also illustrates each category with a teacher example.

Table 3

Teacher Stress Coding Category Titles and Definitions

Code title	**Code definition**
Managing classroom discussions	Stresses deriving from teachers' attempts to involve students actively in classroom discussions and contribute ideas that the teacher anticipates or hopes to solicit to that discussion, while the teacher primarily acts as a facilitator for the discussion. (If the teacher has difficulty getting students to participate in conversation and calls it a shared problem or it is unclear why they do not participate, it belongs in this category. If the teacher characterizes them as resisting participation or lacking interest, put it in Lack of student interest/motivation.)
Responding to unexpected student ideas	Stresses deriving from teachers' attempts to engage with and pursue unexpected student ideas offered during classroom discussions.
Creating, aligning, modifying, or implementing curricula	Stresses deriving from teachers' attempts to organize, create, modify, and implement the school's chosen curriculum, or to align it with the NCTM Standards or Michigan's State Standards. These stresses include how well the chosen textbook or curriculum fits the teacher's pedagogical goals.

Table 3 (continued)

Directing students' explorations of mathematics	Stresses deriving from engaging students in activities where they explored, alone or in pairs or small groups, a problem or situation. (If the teacher characterizes students as not participating and describes it as a shared problem or does not explain why they do not participate, place it here; otherwise, if the teacher characterizes it as student lack of interest or resistance to participation, place it under Lack of student interest/motivation.)
Working with technology	Stresses deriving from teachers' attempts to integrate technology into the curriculum. These stresses could be related to the pedagogy they wished to employ, the time that teaching students how to use technology took, the lack of availability of resources to perform such teaching, or the teacher's lack of knowledge about the technology that they wished to employ.
Relationships and communications with colleagues	Stresses deriving from teachers' interactions with their peers. Such stresses often related to differences in beliefs about classroom management or "teaching style," including pedagogical, teacher collaboration, and classroom management issues.
Lack of student interest / motivation	Stresses deriving from teachers' attempts to engage students in their lessons and/or students' resistance to engaging in those lessons, whether their resistance took the form of avoiding any participation or whether they avoided meaningful, rather than superficial, engagement. (If it is clear that chattiness is slowing students' or the class' progress, it was coded here; otherwise, it was coded as Responding to problematic student behaviors.)
Learning and teaching unfamiliar content	Stresses deriving from teachers' attempts to teach content that they had either never seen before (e.g., graph theory or statistics), had not seen recently (e.g., geometry), or had had limited opportunities to learn (e.g., calculus).
Planning lessons	Stresses deriving from teachers' attempts to prepare individual lessons. Sometimes this involved creating or adapting existing lessons to their curricular objectives. (If the stress related to tailoring lessons for students of varying ability levels, it was placed in the Teaching students of varying ability levels category. If teachers related planning interesting lessons to lack of student motivation, it went in Lack of student interest/motivation; otherwise, it goes here.)
Responding to problematic student behaviors	Stresses deriving from teachers' attempts to deal with student behaviors that were inappropriate for the classroom or irritating to the teacher, such as loud or excessive talking, disrespectful remarks to the teacher or other students, whining about an assignment or lesson, etc. (If the teacher says that the talking or chattiness is delaying progress or occurs while the teacher or other students talking to the class, it was coded as Lack of student interest / motivation. If the issue is talked about generally or the timing is unclear, this is the default code.)

Table 3 (continued)

Finding and utilizing resources	Stresses deriving from teachers' attempts to find physical, curricular, or human resources to meet their pedagogical goals. Often these involved Internet and library searches that met with limited or low rates of success, or unsuccessfully trying to get the students to be resources for each other.
After hours work / long hours	Stresses deriving from teachers' attempts to manage extracurricular work hours so that they could complete their preparation and grading for their classes and think about management issues, while also attempting to have a personal life outside of school. (If professional development took a lot of time, it was still coded as Challenges associated with professional development.)
Challenges associated with professional development	Stresses deriving from teachers' feeling about the adequacy of their professional development experiences. At times, this frustration related to the number of hours required by the state in which they taught. At other times, it related to the school- or district-provided professional development experiences which they viewed as maladapted or inadequate to their needs. (If professional development took a lot of time, it was still coded as Challenges associated with professional development.)
Student diversity issues	Stresses deriving from teachers' attempts to relate to and involve all students, including students' whose racial, linguistic, or ethnic background was different from the teacher's or some of their peers.
Dealing with class length, pace, or schedule	Stresses deriving from teachers' attempts to deal with the challenges related to the length of class periods, the pace at which they felt obliged to teach due to an agreed upon teaching curriculum or schedule, or the demands of their particular schedule, including the number of preps, types of classes, room changes, or unexpected events like fire drills, team practices or competitions, assemblies. (Pace issues related to Teaching students of varying ability levels were placed in that category instead of here. Pace issues related to a test given in all sections of a course in the school were placed in Preparing for, administering, and evaluating standardized tests instead of here.)
Assessing student understanding	Stresses deriving from trying to assess whether students understand the mathematics that they are learning, whether formally or informally. This category does not included standardized tests, as defined in Preparing for, administering, and evaluating standardized tests category.
Preparing for, administering, and evaluating standardized tests	Stresses deriving from teachers' attempts to prepare students for standardized tests, including modifying lesson plans and curriculum, administering those tests, evaluating the tests where applicable, and determining how to utilize feedback from those tests to inform one's teaching. Such tests included Federal- and State-mandated tests, as well as school- or district-created and/or -mandated tests.

Table 3 (continued)

Teaching students of varying ability levels	Stresses deriving from teachers' attempts to effectively teach students with a variety of perceived or measured ability levels within a single class.
Relationships and communications with parents	Stresses deriving from teachers' interactions with parents. Often, these stressful events involved parental disapproval of the teacher's responses to student misbehaviors or the parent's reaction to their child's low grades.
Teacher boredom	Stresses deriving from trying to deal with one's own boredom while teaching when the content, lesson format, or students were not particularly engaging for the teacher. These stresses could be short-lived or persistent.
Relationships and communications with administrators	Stresses deriving from administrators' decisions that made the working environment less comfortable for the teacher or from teachers' attempts to enlist administrators help with classroom management, professional development, and pedagogical concerns.
Relationships and communications with students	Stresses deriving from maintaining or lacking relationships with students.

While there is overlap between these categories, I attempted to define the categories in ways that would allow for as little overlap as possible. I did this by identifying and listing chunks of data that were difficult to code. One file listed chunks of data where the code was "unclear." Another file listed chunks where there appeared to be two or more "intertwined" codes that could not be easily separated into distinct "chunks" of data. I looked at each data chunk for which the coding was unclear. If there was no existing category for the particular "chunk" of data, it was placed into a newly invented "Other" category, like Other: Controlling emotions which talks about the challenges of a teacher who couldn't return to her classroom after an intense encounter with a parent. I eventually turned each "Other" category into its own category or melded that data in with the existing categories, possibly revising their definitions to include the new data

chunk(s). For example, the Other: Controlling emotions category involved a single participant and described the aftermath of a parent confrontation, so I placed that data chunk under Relationships and communications with parents and eliminated the Other: Controlling emotions category.

In order to determine the sources of teaching stress that were more salient or meaningful to participants, I judged the categories of challenges that appeared to be "main" (i.e. having a meaningful and significant impact) or simply "mentioned" (i.e. not having a particularly meaningful or significant impact, but still mentioned by the participant) by looking at several different variables, each of which on its own suggested that the participant may have perceived the situation or event as a meaningful or salient challenge.

First, I looked for "repetition within" a single interview for each category, i.e. whether the source of stress was mentioned in more than one chunk within a single interview for each category. In other words, I looked at whether the participant returned to discuss the topic again after we discussed another topic. Such repetition suggested that the teacher may have been emphasizing such events as meaningful.

I looked for "repetition between" the two interviews, or whether the source of stress was mentioned in both interviews. This type of repetition seemed to show a consistent concern for such events across our interviews, so this also seemed to be a reason to identify such events as potentially meaningful for the teacher.

I looked for how much "detail" the participant used in describing the event as an indicator of that challenge. Because detail in describing an event or situation can often identify when one is troubled by or has thought a great deal about the event, detail may

reflect an event's importance to the teacher. If the participant used at least three phrases detailing—not merely naming—a particular challenge, I considered that to meet my criterion for using detail in that particular instance.

I also looked for the use of "magnitude words" in each interview, namely, I looked for words that indicated the magnitude of the challenges the teacher was facing or that related to strong feelings the participant was having about those challenges, like that is a "huge problem," or "that was really frustrating." The use of such words appears to denote the salience of difficulties or negative emotions on the part of the teacher related to those challenges. I also noted when the teachers used dismissive words when referring to their teaching challenges. If the participant used dismissive wording, like "but that really isn't that big of a deal for me" or "it used to be really frustrating to me, but not anymore," I coded that as canceling one use of magnitude words about that specific data chunk if magnitude words were used, or to cancel the entire statement that the event or situation was challenging if magnitude words were not used.

I looked for the participant's own choice of a "top stress," if that surfaced in the interview. I generally asked each participant to name her top challenge or stress. I considered it significant if a participant used wording to identify one source of stress in particular. Clearly, if a participant meets this criterion, they also meet the criterion for using magnitude words simultaneously. This gives more weight to this criterion, which appears to help in accurately reflecting participants' perceptions of their most salient and important challenges.

Finally, I judged each participant in the five aforementioned criteria for each category of sources of stress. If a category for a particular participant met the criteria in at

least three of the above categories (i.e. repetition within, repetition between, detail, magnitude words, and top stress), I considered that category to be a "main" source of teaching stress, or one that was particularly salient and meaningful for the participant. If the category met two or fewer of those criteria, I considered it to be a "mentioned" source of teaching stress, or one that was less salient or less meaningful to the participant.

While the choice of the number of criteria that distinguished a "main" from a "mentioned" source of stress was difficult, I wanted a way to judge which categories of sources of stress appeared the most meaningful and salient for the participants. I could picture a participant meeting two of the criteria for a "main" source of stress without it being particularly meaningful for them. For example, using "repetition between" and "repetition within" for one coding category may signify events that occur relatively frequently but are merely a minor irritation. But I had a more difficult time picturing a challenge as a minor irritation or a relatively insignificant concern if it met three or more of those criteria. On the other hand, requiring that participants meet four of the criteria seemed too high, because, for example, if the participant did not name a source of stress as their top challenge, that challenge would have to meet every other criteria to be considered a main source of stress. That seemed like an exceptionally high standard. So meeting three criteria seemed like a reasonable bar for judging whether each source of stress was "main" or simply "mentioned."

Coding analysis: Research question 2a.

Research question 2a asks "Which of those sources of teaching stress are predicted by the existing literature and which are new to the literature?"

I returned to the research literature on teacher stress to determine whether the sources of stress that I had found related to those categories. Several clearly related to that list, such as Responding to student misbehaviors and Lack of student interest/motivation, while others did not, such as Working with technology and Preparing for, administering, and evaluating standardized tests. I elaborate more on the results of this analysis in the Results chapter of this study.

Coding analysis: Research question 2b.

Research question 2b asks "Which sources of teaching stress are related to their attempts at Standards-based teaching and how are they related?

To answer the second half of my second research question, I returned to the raw data, searching for any evidence of non-trivial attempts at SBT in all of the categories of sources of teacher stress. I read participant reports in the interview transcripts, read the participants' journals, and watched the participants' videotapes, where the videotapes gave me information about a classroom event to which the teacher was referring. For each chunk from the interview data for which there was sufficient evidence, I listed the NCTM (1991) Teaching Standard(s) that the teacher, students, activity, or situation met that related to challenge(s) reported and/or observed in that chunk of data. Of course, in some cases no Standard applied explicitly enough, so that the data chunk needed to be dismissed, while in other situations, one or more Standard(s) applied to the teacher's actions, students' actions, chosen classroom activity, or teaching situation. Because the Teaching Standards are not a mutually exclusive list of categories, but overlap and interrelate, the focus of this analysis was primarily to find out whether an event met a

particular Teaching Standard. I do not pretend that the list of the Standards met is in any way exact or exhaustive, simply that the specific Standard(s) listed were met in each event. They could easily be interpreted as meeting a different Standard(s) by another researcher, but I believe that the judgment as to whether or not they relate to attempts at SBT would be very similar.

While some of the categories of sources of stress referenced the Teaching Standards, there were three in particular that appeared directly related to teaching actions referenced by the Standards and were often, if not always, related to those actions, namely Managing classroom discussions, Responding to unexpected student ideas, and Directing student-led explorations of mathematics.

Managing classroom discussions describes the process of trying to actively involve students in the discourse of the classroom. While some of these processes could be considered less central to discourse than to asking for answers, the act of trying to have a discussion with students is a central aspect of creating discourse. For this reason, this category is included as one of the three that I describe as being centrally related to SBT.

Responding to unexpected student ideas is clearly a special case of the above category that was separated out in the course of defining specific categories. Because teachers found it challenging to engage with the unexpected student ideas that surfaced during discussions, but only reported those experiences as stressful when they attempted to engage with the unexpected comments, this category of teacher stress appears directly related to the Teaching Standards, as well.

Finally, Directing student-led explorations of mathematics is another category directly related to the Teaching Standards. Because such explorations involve students actively pursuing mathematical knowledge independently, it appeared that the students would most often be constructing mathematical ideas and formulating conjectures independently during such activities. There were very few exceptions to this premise in the data, as well.

There were also other categories for which one might imagine a connection to the Teaching Standards, but in the data, no such connection was found. These categories include the following: Relationships and communications with students, Teaching students of varying ability levels, Relationships and communications with parents, Preparing for, administering, and evaluating standardized tests, Teacher boredom, Challenges associated with professional development, and Relationships and communications with administrators.

Finally, the remaining 12 of the 22 categories were inconsistently related to Standards-based teaching. They were not necessarily directly linked to the NCTM (1991) *Professional standards for teaching mathematics* in the way that they were defined, but they did intersect at times with teaching attempts consonant with that document. An example of such a category includes Working with technology. While the fourth Teaching Standard, "Using tools to enhance discourse" describes the importance of using technology in this process, it was not always clear that teachers would be using technology in ways other than to check answers or to make arithmetic calculations less burdensome on assignments. For this reason, I was not comfortable classifying this category as directly related to the Teaching Standards. On the other hand, there was data

in my data set that indicated that Ms. Grant used calculators to facilitate classroom discourse.

Another example is the category Finding and utilizing resources. While at least one teacher, Ms. Grant, did seek activities involving classroom discourse online, it is easy to imagine a teacher who simply was looking for resources like technology, textbooks, paper, access to a photocopier, etc. that at times are challenging for urban teachers (Farber, 1984; Abel & Sewell, 1999), so that I felt confident listing this as possibly, but not directly, related to SBT attempts. There were other categories that the teachers did not explicitly connect in any way to those attempts during the interviews.

In determining whether attempts to teach according to the NCTM (1991) Teaching Standards was a salient component of their sources of teaching stress overall, I decided that if at least half of a teacher's main sources of stress or at least half of all of the teacher's non-empty categories of sources of stress related to the NCTM Teaching Standards, then attempts at SBT were a salient component of the sources of stress that the teacher experienced. I later eliminated the second half of this criterion, so that at least half of each teacher's main sources of stress indicated that such attempts were a salient component of their sources of teaching stress, because this simpler criterion yielded the same results as the more complex one.

Coding analysis: Research question 3.

Research question 3 asks "What sort of impact do the sources of teaching stress that novice teachers experiences have on them, i.e. do they judge them to be facilitative, neutral, or debilitative?"

The data that I collected for this research question was modest, because teachers struggled to engage with the ideas of constructive, neutral, and debilitative sources of teaching stress. I sorted this data into the categories of sources of teaching stress as mentioned above and identified how the teacher describe each source, whether it was a constructive, neutral, or debilitative force in their teaching environment.

Coding analysis: Research question 4.

Research question 4 asks "What coping resources do novice teachers utilize to mediate the teaching stresses deriving from the different sources of teaching stress that they experience?"

To answer the fourth research question, I need to digress to a discussion of the literature before describing my definitions and conceptual definitions and proceeding. Lazarus (1966, 1976) describes the general methods of coping with stress as two types: direct action and palliation. Direct action involves actual behavior aimed at changing the person's relationship to their environment and includes preparation for harm, aggression, and avoidance. Preparation for harm includes acting to reduce the actual danger (such as studying intensely for a final exam) or its threat value (such as denying the importance or fairness of the final exam, working harder at other assignments to offset the anticipated detriment to one's grade, etc.). Aggression involves acting aggressively towards a target that allows a release of tension, which may simply be a target that is more vulnerable rather than the actual cause of the stress. Avoidance involves finding a means of escape from a stressful situation, rather than acting in ways that could alleviate or eliminate the stress.

Palliation, or reducing the impact of stress without acting on its root causes or modifying the environment, encompasses moderating stress by reducing its psychophysiological effects. This can be achieved through symptom-directed or intra-psychic modes. Symptom-directed modes include using alcohol, prescription or non-prescription drugs, training in muscle relaxation, and other body-centered techniques. Intrapsychic methods describes cognitive defense mechanisms, including identification, displacement, repression, denial, reaction formation, projection, and intellectualization.

Kyriacou (1981) gives a definition similar to Lazarus' (1966, 1976) in describing stress, but as it relates more specifically to teaching; however, Kyriacou also points out that means of mediating such stresses might also be external to the teacher. My definition expands Lazarus' and Kyriacou's definitions to include the proactive strategies that teachers employ to eliminate, alleviate, or avoid stress altogether, rather than the slightly Lazarus' slightly narrower category or preparing for harm; such proactive strategies include planning lessons that will better engage students in classroom activities, actively working to strengthen relationships with their students, etc. Such constructive activities also assert teachers' and students' shared responsibility in promoting a classroom environment conducive to learning, as well as emphasizing the personal power that teachers have as agents of change in the face of the challenges that they encounter. I define coping resources more specifically as means of avoiding, alleviating, or eliminating teaching stress.

During the interviews when teachers spoke about teaching resources, I mostly heard teachers share direct actions that alleviated or avoided, stress. Only occasionally did I hear about teachers using intrapsychic methods to reduce their teaching stresses, as

my interviews were not structured to explore any specific category of teaching resources directly, unless such information was volunteered by the participant. For example, no teacher mentioned symptom-directed means for dealing with stress, like exercise, meditation, alcohol, etc. So my definition focuses more on the direct actions, intrapsychic methods, and physical and social resources (including external interventions) that I was more likely to hear discussed by the teachers during our interviews.

In creating my own categories of coping resources for teacher stress, I looked at all of the teaching resources that teachers shared with me, whether internal or external to the teacher, in the context of the observations and interviews. For me, a teaching resource is a physical or virtual (as in Internet) asset, social interaction or intervention, strategy, idea, or psychological technique that had the potential to help the teacher be more effective or comfortable in the act of teaching. It is also important to mention that here I am defining teaching broadly, as all acts and thinking related to classroom teaching, regardless of where or when those actions or thoughts took place, so the teacher might be planning at home, creating curriculum with other teachers after school, or grading at the library on the weekends, but in my definition, those are all construed as acts comprising the act of teaching.

I used the grounded or open coding method described by Glaser and Strauss (1966, 1976), similar to the methods that I employed in coding my teaching stress data for these participants; however, for the teacher coping resources, the literature is much less complete. As a result, this analysis was closer to being a truly open coding method or more grounded in the actual coping resources data than was the teacher stress data analysis.

As a result of employing this grounded coding of the data, I found that the data fell into four general coding categories, as follows: Social, Self, Collective, and Physical coping resources. In beginning this analysis, I looked for all of the teaching resources that participants reported, then I narrowed that list of resources to only those that teachers directly linked as using in an attempt to alleviate their teaching stresses. If the teacher said that s/he generally employed a teaching resource to alleviate stress without elaborating on which specific categories of stress s/he meant, I judged that that coping resource alleviated "GENERAL" stresses, a miscellaneous category that I introduced only for the coping resources analysis.

Teachers' coping mechanisms always involved the use of teaching resources, if the teacher is considered as their own potential resource. Like Kyriacou (1981), I too believe that people and resources external to the teaching environment can influence teachers' experiences of stress. These people and resources can inspire the teacher to actions. The people can also take action themselves to reduce or eliminate stress (as when a principal reprimands a student or permanently switches them to another teacher's class). Therefore, in summary, the actions that the teacher takes depend on the teacher's own thoughts and ideas, the thoughts, ideas, and supportive words or actions of others (such as a spouse, professional colleagues, administrators, friends, relatives, etc.) and/or the physical resources that they find that help them to deal with or alleviate those challenges (such as books, the Internet, hands on materials, manipulatives, calculators, etc.). I attend to these categories of coping resources in this analysis.

Coping resources take the form of physical assets, social relationships, or self as means of dealing with, avoiding, or alleviating stress, whether targeted at the symptoms

or sources of that stress, including changing the classroom context or the teacher's perceptions of or relationship to it.

I will give a few examples of these categories of resources. When faced with challenging student behaviors, a teacher might vent to his/her spouse or colleagues or shrug off stresses, like saying "Oh, they're just kids and that's how kids are." Such mechanisms are aimed primarily at dealing with the aftermath of stressful events. The first, venting to a spouse or colleague, would be using social relationships to deal with those events. The second, mentally shrugging off such events uses psychological means within one's self to cope with such stresses. On the other hand, asking a colleague for more engaging classroom lessons or working on more engaging lessons on one's own would target problems with lack of student interest/motivation by attempting to change the classroom context. The former involves the use of social relationships, while the latter involves the use of self as a resource to alleviate stress.

I operationalize my definition of coping resources as resources for teaching that I could link to avoiding, alleviating, or eliminating the effects of at least one specific stress statement from the stress data analysis for that teacher or to their stresses generally. Because of how I conducted the stress analysis, I only linked these coping resources to stress(es) from the school year in which the interview was held. Teachers also reported when some coping resources helped them deal with stress generally, but were not specific enough to pinpoint an exact stress passage from the stress data analysis.

I define the coping resource of physical assets as artifacts or virtual materials that the teacher uses to avoid, alleviate, or eliminate stress. These physical materials may take many forms, but are all external to the teacher, such as the physical arrangement of the

classroom, textbooks, books about pedagogy or classroom management, using the Internet as a source of other teacher's lessons or software, graphing calculators, hands on materials, manipulatives that make one's teaching more interesting to the students, etc. I operationalize the definition of physical assets as a teacher statement of a coping resource that primarily emphasizes finding and using physical materials in order to deal with one's teaching stresses. When I say "primarily emphasizes," I refer to the subjective aspect of this analysis that is difficult to reduce. I will say more about this later, after discussing the remaining subcategories of coping resources.

I define the coping resource of social relationships as communications with or actions taken by another person or persons about one's teaching (as I have broadly defined "teaching") to avoid, alleviate, or eliminate stress. That communication may take the form of venting, asking for and receiving advice about pedagogy or classroom management, creating curriculum, inciting the other participant to intervene in your classroom, etc. I operationalize the definition of social relationships in two separate categories. First, I define social resources as a teacher statement describing communication(s) to another teacher or teachers where the teacher emphasizes his/her role in asking for and receiving help, whether that help allows the teacher to vent about the stress or whether the teacher seeks advice about how to deal with the situation causing that stress. Second, I define collective resources as a teacher statement describing communication(s) to another teacher or teachers where the teacher emphasizes himself or herself as an active participant in a community of at least three people that meets on a regular or ongoing basis to work on curriculum, pedagogy, or other salient teaching issues. So collective resources are never dyadic in the data, while social resources may or

may not be. What distinguishes the two categories when three or more people (including the participant) are involved is the regular, ongoing, and purposeful nature of the work (rather than just venting, for example), as described by the participant.

I define the coping resource of self as using one's self as a resource, including thought patterns and creative processes to avoid, alleviate, or eliminate stress. The resource of self includes such activities as intrapsychic methods (reassuring self, justifying or interpreting events, etc.), creating or modifying lesson plans, coming up with new ideas about how to deal with students' behaviors, etc. I operationalize the definition of the Self coping resources as a teacher resource statement that primarily emphasizes using intrapsychic methods or one's own creative abilities as means of dealing with one's teaching stresses.

Admittedly, the "self" category could be thought of as the default category, since teachers may have initially found a coping resource through social means or as physical assets and then integrated them into their teaching, so that now they describe them as their own. This process of appropriation and integration is subtle. Since these teachers are novices, this phenomenon is less likely to be a problem than for more experienced teachers, but that possibility does need formal acknowledgement. As a result, it also seems appropriate to include coping resources in this category where the source is unclear, since ultimately it is the self that decides whether, how, and to what extent to implement such ideas in the classroom (McLaughlin, 1987).

Also, when I say "primarily emphasizes" for each category, I would like to clarify that there was overlap in the data. Some passages involved more than one of the four categories, but I looked to see if there was a salient resource in each. For example, when

talking about physical assets, if those materials were already in existence, I coded the teaching resource as being a physical asset. In other words, if a colleague gave the novice a worksheet that helped alleviate stresses related to Lesson planning or Lack of student interest/motivation, I coded that coping resource as Physical, because the worksheet (not the colleague) was the primary resource that acted to alleviate the stress.

If the teacher or others were acting to create the physical assets (for example, a student exploration activity), I coded it under Self, Social, or Collective, depending on which code applied, because the act of creation appeared to me to be the salient aspect of the coping resource. If self intersected with social or collective, I generally judged the resources to be social or collective resources, since self can generally be considered as a part of those resources, as well.

In summary, to code for RQ4a, I looked at all of the interviews and coded any teaching resources (including teaching strategies that could be considered a resource) that the participant mentioned. In looking for teaching resources, I first reviewed the passages in the teacher stress data analysis; then, I returned to the original interviews and further expanded the data set, adding new teaching resource passages or modifying existing passages to include more of the teacher's words that made it clearer what teaching resource was used and how effectively. At times passages contained more than one teaching resource, so I gave each teaching resource in the passage its own line in the data analysis table.

After finding a preliminary list of teaching resources, I looked in the teacher stress data to see whether the teacher mentioned specific stress(es) related to each coping resource. If the participant mentioned a stress in the stress data analysis (or mentioned

that the teaching resource helped avoid, alleviate, or eliminate stress in general), then that teaching resource was judged to be a coping resource. If I could not find a stress that the teacher had mentioned that related to the specific teaching resource, then I eliminated that teaching resource from the coping resources analysis. I also kept track of teaching resources that related to stresses participants had experienced in the past that I had noted, but not included, in the stress data analysis. Although I kept track of them, they were not included, in the coping resources data analysis. The frequency with which such mentions were made by the teacher in the coping resources passage is denoted by T in Table 4.

At times, the connections between the coping resource and teaching stress(es) were clear, because the passage from the coping resources data overlapped or nearly overlapped with the stress analysis data, so the connection was clear and unquestionable (i.e. the teacher had made the connection during the interview). At other times where there was not a clear and compelling link, as the researcher, I had to look for possible links between the stress data and the teaching resources data based on the information in the teaching resource passage and judge whether the teacher resource appeared to alleviate a teacher stress in the analysis, retaining only those teaching resources as coping resources that met that standard. The frequency with which the researcher found related stresses in the stress data and judged them to be related to the coping resource is denoted by R in Table 4.

For example, Ms. Riley mentioned that she talks to her mentor when she needs help with the content in her Algebra 2 class (Ms. R, Pre, 7.35-8.39). Notice that Ms. Riley's comment about the teaching challenge that her mentor was helping her with in this passage are not strongly stated (i.e. "needs help" was not considered to be a

statement of stress for the purposes of my analysis, although the potential for causing stress is clear). But in the stress data analysis, I noticed that she spoke more specifically about her challenges with the Algebra 2 content at the beginning of the year, explaining that she couldn't remember the content well at first. She said, "At first, I was really scared. I thought [the content of Algebra 2] was really hard" (Ms. R, Pre, 6.6). As a result, I judged that that specific passage in Ms. Riley's coping resource analysis should be retained, since it dealt with a stress passage present in the stress data analysis.

Table 4

Identifying Source of Stress-Coping Links

Participant	Teacher	Researcher	Total	Researcher percentage
Ms. Boone	3	19	22	86.4%
Ms. Grant	5	11	16	68.8%
Mr. Jones	15	11	26	42.3%
Ms. Riley	5	7	12	58.3%
Ms. Price	10	10	20	50.0%
Ms. Wells	15	7	22	31.8%
Total	53	65	118	55.1%

Note. This table indicates the frequency with which the teacher (T) or the researcher (R) linked each coping resource with a specific stress or stresses that it alleviated.

In Table 4, notice that more than half of these links between statements of coping resources overall were made by the researcher. Half or more of the links were made by the researcher in 4 of the 6 cases, as well. While this number may seem high, the reader may also recall that the researcher had to have at least some evidence from the coping resource passages before looking for passages in the stress analysis data. So this is clearly an indication of researcher involvement in creating links in the analysis between these two data sets, but does not necessarily do great damage to the validity of the results;

however, I did want to acknowledge the frequency of this process and expose the process to closer scrutiny.

In judging how successful these resources were at modifying the teachers' teaching environments or situations to help alleviate teachers' stresses, I looked at whether the participants talked about the stress alleviation directly, or whether they talked about the resources using strongly positive ("helpful" or "cool"), moderately positive ("pretty good," "okay," or it works "sometimes"), or negative ("not really helpful" or "it still happens," respectively) language. If the teacher used strongly positive language to describe the stress, I judged that the stress was successfully alleviated and rated the participant statement as Y (for Yes). I judged that moderately positive language indicated that stress was somewhat alleviated and rated it as S (for Somewhat). Finally, I judged that negative language indicated that the stress was not alleviated to a meaningful degree for the teacher and rated it as N (for No).

If such language was not present, I looked at the resource to see if I could judge whether it even had the potential of being effective. If the teacher avoided the stress (like "I bailed" on the problem or "I've decided not to teach that anymore"), I judged that the attempt was not successful at alleviating the stress (at least not directly), because it avoided the root cause of the stress. If it was unclear whether the stress was effectively mediated, I judged the coping resource's success in alleviating stress as "unclear" (or U).

I looked at the results in each category for each participant. In each case, I looked at the collection of all effectiveness ratings (Y, S, N, or U), ignoring the U judgments. I counted Y as +1, S as 0, and N as -1. For the judgments of each category for each individual participant, I placed the lower boundary at +0.5 for effectiveness and the upper

boundary at -0.5 for ineffectiveness, inclusive of the endpoints when determining the effectiveness of coping resources for each stress category; therefore, the range for somewhat effective coping resources for individual participants' stresses was (-0.5, +0.5).

To explain, I chose these cutoffs for the coping resources in each individual teacher stress categories, because it generally meant that if there were two adjacent effectiveness ratings that the students chose (i.e. Y [effective] and S [somewhat effective]), the most frequent one would be chosen. That seemed to match what the teachers were emphasizing in their speech patterns. While teacher ratings generally included similar ratings for coping resources within a single stress category, I also noticed that there were two instances where a teacher rated coping resources related to a single stress category as Y or N (but not S). Those two teachers' were Mr. Jones for Responding to problematic student behaviors and Ms. Riley for Managing classroom discussions. While it could be stressful for him and at times his resources were ineffective, overall Mr. Jones said that he had sufficient resources for Responding to problematic student behaviors and that he had it "under control." On the other hand, Ms. Riley said that the two situations were anomalies when she dropped a topic and didn't return to it (so the resources were judged to be ineffective in those two cases), but that she generally felt comfortable and effective Managing classroom discussions. But there was no rule that would have accommodated both of their positions. So I chose to place both of them in the "Somewhat" category by choosing the +0.5 and -0.5 cutoffs.

I chose to calculate the effectiveness scores for participants' coping resources overall (or across all stress categories) somewhat differently. I found the average score for these entries, then determined the overall score for that category of coping resources

as follows: effective (Y) if the average is greater than 1/3, somewhat effective (S) if the average was between -1/3 and +1/3 (including the endpoints), and ineffective (N) if the average was less than -1/3.

I initially struggled with where to place the cutoffs for effective, somewhat effective, and ineffective scores for participants' coping resources. I wanted the cutoffs symmetric, because the scale that I had created was symmetric. So I considered whether to place the bar for effectiveness and ineffectiveness of coping resources at +1/3 and -1/3 or +1/2 and -1/2, respectively. Those seemed like two logical places to locate the cutoff, because the former divided the interval [-1, 1] into three equal parts, while the latter was a more conservative cutoff, providing only half of a unit for each effectiveness and ineffectiveness scores for coping resources. The latter cutoffs also coincided with the cutoffs for the individual categories of teacher stress by participant.

Because Ms. Riley was the only teacher initially in this range, I mainly considered her data in making this decision. Ms. Riley felt that her new school was providing her with many of the coping resources that she needed, particularly compared to the school where she taught the previous year, but also in general. That told me that she needed to be included with those who I had rated as possessing effective coping resources overall; therefore, for my calculations to match her own evaluation of the effectiveness of her coping resources, I needed to place the bar lower than +.40 to indicate a successful transition. As a result, I chose +1/3 and -1/3 as the cutoffs for this judgment.

Because I felt like the +1/3 and -1/3 cutoffs were already quite large for determining effective and ineffective coping resources, I excluded the endpoints on those intervals. In other words, the average for ineffective coping resources fell in the [-1, -1/3)

range, somewhat effective fell in the [-1/3, 1/3] range, and effective fell in the (1/3, 1] range. I also determined scores for each participant for major stresses and for SBT-related major stresses. Those scores were determined using the same algorithm, with cutoffs at +1/3 and –1/3 and the corresponding intervals of effectiveness previously described.

Chapter 4: Introduction to Participants and Their Attempts at NCTM Standards-Based Teaching

In this chapter, I introduce the reader to each participant, including their teaching contexts, and the classes that I observed during this study. I then talk briefly about the challenges I encountered while searching for novices who were attempting NCTM (1991) Standards-based teaching (SBT). This seems important to my study, because I am interested in this phenomenon, which is the driving force behind many of the new curricula, teacher education programs, teacher development programs, and teacher collaboratives across the U.S. Finally, I describe at least one example of an attempt to enact elements of the NCTM (1991) Standards that I observed in each novice's classroom in this study to help the reader get an idea of what form these novices' attempts at SBT took.

The purpose of this introduction—to my six teachers, the contexts of their teaching, and the examples of Standards-based teaching that I observed in their classrooms—is to frame the main results chapters that follow. In Chapter 5, I analyze the various sources of stress that the teachers reported in some detail and assess the influence of their attempts at Standards-based teaching on the stress they felt in their teaching work. Next, in Chapter 6, I analyze the resources that they employed to address the sources of stress that I identified in Chapter 5. Collectively, I hope that these three chapters provide a detailed portrait of six beginning teachers, how their attempts at SBT contributed to the stresses they felt in their teaching, and how they responded to that stress.

Introduction to Participants

I now proceed to give a brief overview of each teacher's experiences and teaching context, describing the schools where they worked, the textbooks they were assigned, the classes they taught, and the two classes that I observed (focal and contrast). I also foreshadow the main themes in each case study that follows in the next chapter.

Ms. Boone.

Ms. Boone taught at Maple High School with about 1100 students and located in a rural town on the outskirts of a medium-sized city. Ms. Boone was nearing the end of the first semester of her third year teaching at Maple High School when I observed and interviewed her. She appeared to have a strong rapport with her students and was very positive and upbeat.

Ms. Boone taught Integrated 3, Integrated 2, and AP Calculus. Integrated 3 was mainly an Algebra 2 course with other topics like graph theory and statistics interspersed. Integrated 2, as mentioned above, is a mix of traditional Algebra 1 and Geometry topics. AP Calculus covers topics traditionally seen in most advanced placement calculus courses. For the screening and focus class observations, I observed Ms. Boone in a section of Integrated 3, because, as the reader may recall, I asked all participants to choose their most constructively talkative class for the screening observation and for the focus class. For the contrast class, I observed a section of Integrated 2 that Ms. Boone suggested because she felt that that was the only other class that she felt comfortable being observed in. She felt uncomfortable being observed in Calculus, where her

challenges were reportedly the most different from those in the focus class, so a section of Integrated 2 was really the only remaining class most different from the first.

As stated previously, the Integrated courses are based loosely on ideas from the McDougall Littell, *Integrated Mathematics* textbook series. The actual curriculum was created by the work of the teacher collaborative that initially forged the curriculum over a summer and has continued to modify and update the curriculum on an ongoing basis, so she used the textbook very little for those courses. The AP calculus course was based on the Smith and Minton, *Calculus* (2nd edition) textbook. Ms. Boone had to create this course on her own. She found herself using the book more than she was accustomed to initially, but gradually pulled in more outside resources as the semester progressed.

Ms. Boone reported many challenges and many Main challenges compared with the other novices. Her Main challenges generally focused on issues of student behavior (e.g., talking during tests), lack of student interest/motivation, and curriculum alignment and workload, such as working long hours to plan or rework her lessons.

Ms. Grant.

Ms. Grant taught at Elm High School that enrolled about 1500 students and located in the urban center of a medium-sized city. The student population is very diverse, including ESL students who speak 24 different languages.

Ms. Grant appeared to have an excellent rapport and to connect exceptionally well with her students. She felt like she was able to build relationships with her students by intentionally and genuinely taking an interest in their traditions and cultures (Post, 26.1-

26.9). My limited observations of and visits to her classroom, including her interactions with students during passing time and after school, tended to confirm this assertion.

Ms. Grant was certified to teach both English and Mathematics, although she currently only teaches mathematics. I observed Ms. Grant near the end of her second year teaching at Elm. Before graduating, Ms. Grant taught as a long-term substitute at a local professional development school, Hamilton High, which she very much enjoyed. This detail merits mention, because it gives the reader a frame for understanding why Ms. Grant's current teaching placement was relatively unsatisfying for her, particularly in terms of her interactions with colleagues.

During the semester that I observed Ms. Grant, she taught Algebra 1, Algebra 1C, and Algebra 2C. Algebra 1C and 2C were two in a sequence of three slower-paced standard high school Algebra 1 courses. For the screening and focus class observations, I observed Ms. Grant in an Algebra 1 section. I observed an Algebra 1C section for the contrast class observation that she described as completely out of control, so the challenges were the most different in that class. All of these courses are based on the McDougall Littell Algebra 1 textbook, but Ms. Grant reported using these books very little for her actual lessons, using them more as a problem base for homework assignments than for instruction.

Ms. Grant reported many different Main stresses as compared to the other novices in this study, such as problems working with technology, modifying curriculum, relationships with colleagues and her own boredom with teaching mathematics. Several of her stress categories, e.g., working with technology and relationships with colleagues, were unique to her alone, as I describe in her case study.

Mr. Jones.

Mr. Jones, like Ms. Boone, worked at Maple High School, with about 1100 students and located in a rural town. Mr. Jones was in the middle of the first semester of his first year as a permanent teacher at Maple High during his participation in this study. For at least the first half of the previous year, he taught at Maple as a long-term substitute. He also completed his fifth-year internship at Maple High.

As a secondary student, Mr. Jones attended a professional development high school affiliated with Midwestern University with which the author has had repeated and extended contact during Mr. Jones' secondary years. The teachers voluntarily engaged in a teacher learning community. They shared a teacher written curriculum that varied in style and content across classes. But they did all incorporate many aspects of the NCTM (1991) Standards in their classroom discussions and teaching.

Like Ms. Grant and Ms. Boone, Mr. Jones was very well liked by his students and clearly had a strong rapport with them. During the year I observed him, Mr. Jones taught his school's Integrated 2 and Integrated 1B courses. The Integrated courses at Maple High School are a sequence of courses with spiraling content strands in algebra (1 and 2), geometry, statistics, and graph theory. The Integrated 1 course, which takes a year for regular track and college bound students, is split into two years for lower-track students, Integrated 1A and 1B, so they can move more slowly and look more deeply into the content. The Integrated 2 class is a regular- and college-track, year-long course primarily taken by sophomores and advanced freshmen. All of the Integrated courses at Maple High School are based on the McDougall Littell, *Integrated Mathematics* textbook series.

As I mentioned in Ms. Boone's case, Mr. Jones used the materials of the teacher collaborative that were based on the Integrated Mathematics textbooks, so he reported rarely taking them off the shelves.

Mr. Jones an Integrated 2 section for the focus class. He chose his first hour Integrated 1B class, because they were usually very hesitant to take part in the mathematical conversations that he encouraged in his classes.

Mr. Jones, like Ms. Grant, also reported many stresses, many of which were related to SBT. Mr. Jones' Main stresses related to student-focused issues, including Lack of student interest/motivation and Responding to problematic student behaviors, as well as to his attempts to engage students in meaningful ways in the classroom discourse to build and assess their understanding of mathematics.

Ms. Price.

Ms. Price taught at Linden High School with approximately 2100 students located in a semi-rural community located about 10 miles from a very large city. Ms. Price appeared to have a good, professional rapport with her students.

Ms. Price taught Geometry, Algebra 1B, and Algebra 2. Algebra 1B was the second year of a slow-paced Algebra 1 course. Algebra 2 was a fairly traditional, year-long Algebra 2 course. For the screening and focus class observations, I sat in on a section of Ms. Price's Geometry course. For the contrast class, I observed in a section of her Algebra 1B class, because she described that class as providing her most different challenges because of the classroom management issues in that class section.

In her Geometry course, Ms. Price used *Exploring Geometry* published by Key Curriculum Press. For Algebra 2, she and a colleague were piloting the *Discovering Algebra 2* text from Key Curriculum Press. Ms. Price used the Glencoe *Algebra 1* textbook in Algebra 1. She liked the approach of the Serra textbook in particular. She talked about how she supplemented the textbook by including investigative and group activities in her classroom. She also said that she was considering whether to change the approach the textbook's approach to teaching circles. So Ms. Price did appear to extend or modify the curriculum at times from the written textbook.

While Ms. Price reported quite a few challenges, few were Main challenges or related to her attempts at SBT. The two challenges that were judged as Main challenges related to issues of student behavior and students' lack of interest or motivation in her classroom. While these issues of student behavior and engagement were among the most common with the other teachers, as well, she appeared to experience fewer additional stresses that qualified as Main.

Ms. Riley.

I performed Ms. Riley's first screening observation in a Geometry course at Western High School with about 2500 students located in a medium-sized city. Ms. Riley was very unhappy with her teaching experiences at Western. While she enjoyed her colleagues, she said that classroom management was difficult, because the administration gave minimal consequences for misbehavior setting the wrong tone at the school. After the screening observation, Ms. Riley asked to postpone participation in this study until

the following year. That summer, Ms. Riley was offered a teaching position at Holly High, the school she attended as a K-12 student, which she accepted.

While participating in this study, Ms. Riley taught at Holly High School with approximately 2500 students located in a small city. Holly operated on the trimester system. Each class lasts for 75 minutes every school day and students take five courses per trimester. During participation in this study, Ms. Riley was nearing the end of her first trimester at Holly and was in her second year of teaching.

Though I had already screened Ms. Riley for participation, I counted the first observation at Holly in an Algebra 2 section as a second screening observation because I needed to acknowledge that different school contexts might show a different pedagogy from her. Since she again qualified for participation, I completed her data collection at Holly. I observed Ms. Riley in Geometry for the contrast class, because she said that it was the most different from her other classes, but then qualified that statement by explaining that none of her classes at Holly were nearly as challenging as her classes at Western High. All of the courses that Ms. Riley taught used the University of Chicago School Mathematics Project (UCSMP) textbooks. Ms. Riley reported that the UCSMP textbooks did not contain many real world applications of the mathematics, so she enjoyed supplementing the materials in that way. She reported finding other resources to supplement the text online or through colleagues, as well. But she also reported that she used the same tests and quizzes as her colleagues, which were the ones from the book.

Ms. Riley's Main stresses were diversely related to issues of student engagement, managing classroom discussions, the trimester schedule that she worked under, and her communications with administrators, as will be discussed further in her case study. The

first two stresses, student engagement and managing classroom discussions were particularly common across this group.

Ms. Wells.

Like Ms. Riley, Ms. Wells asked to postpone participation until her second year of teaching. She taught at Redwood High School with approximately 1100 students in a diverse student body in a suburb of a very large city. Redwood is located in its own district, even though its service area lies within the city limits. By standardized test scores, it ranked as one of the best schools in that city.

Ms. Wells appeared to have a strong rapport with her students. She was very tolerant of student talking and other behaviors that did not detract from other students' work. Ms. Wells said that she arrived at school early each morning and stayed until late each night helping her students and completing her work.

Ms. Wells did not qualify for participation in the first screening observation. Because her 5th year content/methods instructor described her as the most likely in her cohort to be attempting SBT, I returned for a second observation in the same Geometry class which she passed, so I commenced with data collection in that class. For a contrast class, I observed a section of Algebra 1, because she said that her management issues in that class were considerably greater than in her other classes. Those are the only two classes that she taught that year.

Ms. Wells and her colleagues used three different textbooks that the district made available to them, the McDougall Littell series, the Prentice Hall series, and the *Cognitive Tutor*, a Carnegie-Mellon University computer-based algebra curriculum. She described

how her department worked together to piece these curricula together and to supplement it with materials and ideas of their own, circumventing the administration's expectation that they use the *Cognitive Tutor* curriculum exclusively.

Ms. Wells reported relatively few stresses or Main stresses. The few Main stresses that she reported related to issues of student behavior, motivation, and to the long hours that she worked.

Preamble: The Search for Standards-Based Teaching

Next I briefly consider how these six novices' teaching involved attempts to implement aspects of the NCTM (1991) Standards and foreshadow the results of the more thorough analysis in the chapter that follows. My purpose in looking at these novices' attempts at Standards-based teaching (SBT) is to follow up on previous studies assessing whether the Standards are having an impact on the quality of teaching for novices educated about the meaning and implementation of this document. Because the NCTM (1991) Standards describe what the authors judge to be quality teaching practices, there is clearly a subjective quality to the importance of seeking for such practices. Clearly, I align myself with those who deem such practices to be worthwhile and beneficial to students and teachers alike.

One significant overall result of this study, as explained in the Methods chapter, was that SBT was not particularly common, even when searching among the most promising graduates of progressive Midwestern University's secondary mathematics education program. Of the 11 novice teachers who I screened for this study, only 7 were observed attempting aspects of SBT during screening. And of those 7, one did not

attempt SBT in any meaningful way during his participation in the study, so he was dropped from the analysis. He was, in effect, a "false positive" from his initial screening. And, as a reminder, my criterion for attempting SBT was a relatively modest bar, namely attempts in at least two of the six standards articulated in the NCTM (1991) *Principles and Standards for Teaching Mathematics*.

I struggled to find appropriate novice teachers, even though a major goal of Midwestern University's and many other universities' teacher education programs across the United States is to develop and graduate novices with such abilities and propensities. This underscores how challenging the task of Standards-based teacher preparation is. These results also show that attempts at such teaching are occurring more frequently, in contrast to the absence of such teaching in some previous studies by mathematics teacher educators studying implementation of NCTM Standards-based teaching (e.g., Wilcox et al., 1991).

Examples of Standards-Based Teaching from Participant Observations

I would like to illustrate what I describe as meaningful attempts at SBT for the participants in this study. I offer the following excerpts from my observations in each teacher's classroom to give the reader an idea of the evidence that I had that these teachers were attempting SBT.

Ms. Boone: Taking a student's conjecture seriously.

While observing Ms. Boone teach a lesson on graph theory, her student Danielle hypothesized that it would take a minimum of eight roads to join nine locations on a map.

Ms. Boone stopped for a moment and hesitated. She asked the student if she was saying that it would always take one less road than the number of locations to join them on the map with a minimum number of roads. Danielle affirmed that she was. Ms. Boone paused and thought for a few tense moments, then said that it looked to her like that was true. She made the proof of that conjecture a homework problem for the entire class. Afterwards, she told me that she had never had a student make that conjecture in the three previous times that she taught the class. She said that she was going to incorporate that conjecture into that unit in the future, because she thought that it was interesting and important for the students to learn.

I judged this segment of Ms. Boone's teaching as a non-trivial attempt at SBT, because she considered a student's idea seriously and made it a part of the curriculum, rather than dismissing it as a tangential fact. In so doing, she clearly valued the student's conjecture and the mathematical thinking that generated it and demonstrated her judgment to the class by assigning a homework problem based on the conjecture. This would meet NCTM Standard 3: *Students' role in discourse*, because the student offered a conjecture that was non-trivial and meaningful. The teacher not only considered that an interesting find, but also made it a part of the current (and future) curriculum of her course, meeting Standard 2: *Teacher's role in discourse*.

Ms. Grant: Exploring effects of changing parameters on graphs of quadratic functions.

Ms. Grant had her students explore the effect of changing the a, b, and c coefficients on the graph of the general quadratic equation, $y=ax^2+bx+c$. She asked the

students to create a table that described what happened when they changed the coefficients in the equation one at a time. She had not considered how the a and c coefficients interacted with the b coefficient, and the effect of changing the b coefficient in the equation on the graph is more complicated to describe in a general manner than is the case for a and c. She also had not considered that if the equation were written in the form $y=a(x-h)^2+k$, the effect of changing a coefficient would be much easier to describe. So when it came time for students to predict the effect of changes in the b coefficient on the shape of an arbitrary quadratic equation, the students' prediction (e.g., that the graph would move up and to the right) proved inaccurate.

Although Ms. Grant was not adequately prepared to teach this topic, because she herself had not explored the mathematics completely, she also made moves that led me to classify this episode as a non-trivial attempt at NCTM Standards-based teaching. First of all, she had the students explore a significant and worthwhile mathematical task (exploring how changing each parameter in a quadratic equation affects the shape of the graph) and organize the resulting data, thus addressing Standard 1: *Worthwhile mathematical tasks*. Second, she had the students discuss and describe their results to help them all understand how changing the coefficients in the equation affected the graph. This meets Standard 3: *Students' role in discourse*, because the students were offering mathematically significant conjectures to the discussion. It also meets Standard 2: *Teacher's role in discourse*, because Ms. Grant was acting as a facilitator, rather than an authority at many points in that discussion.

Mr. Jones: Exploring prospective congruence conditions for triangles.

Mr. Jones taught a lesson where he engaged students are engaged in an activity to discover the congruence theorems for triangles, including such conditions as SSS, SSA, ASA, AAA, etc. They explored all possible congruence theorems abbreviated as a list of all three-letter combinations of the letters A (angle) and S (side) where repetitions were permitted. The students were supposed to try to draw to different triangles to identify those conditions that were not sufficient to prove congruence. After the students had attempted to draw two different triangles for each possible congruence theorem, they discussed the results as a class and whether each condition was sufficient to prove congruence.

This episode was an example of Mr. Jones' attempts at SBT, because he engaged students' in a worthwhile mathematical task (Standard 1), an open exploration of the sufficient conditions for congruence in 2-D figures. The students made conjectures (Standard 3) and listened to other student's conjectures that they, at times, validated or refuted with mathematical evidence (Standard 5). As a reminder, Standard 5 refers to setting up an environment in the classroom that supports mathematical discussions. In this discussion, Mr. Jones often acted as a facilitator of the students' mathematical reasoning, meeting Standard 2, as well.

Ms. Price: Motivating the formula for the area of a circle.

In a lesson about the properties of a circle, Ms. Price had her students cut out a circle and then cut it into 16 congruent sectors (see Figure 4). She then asked the students to use those pieces to create a new geometric shape for which they knew the area to see if they could figure out the area of the circle from it. The students all worked to create

different shapes and eventually nearly all of the students (in my range of sight and by the teacher's account) had created the shape shown in Figure 4.

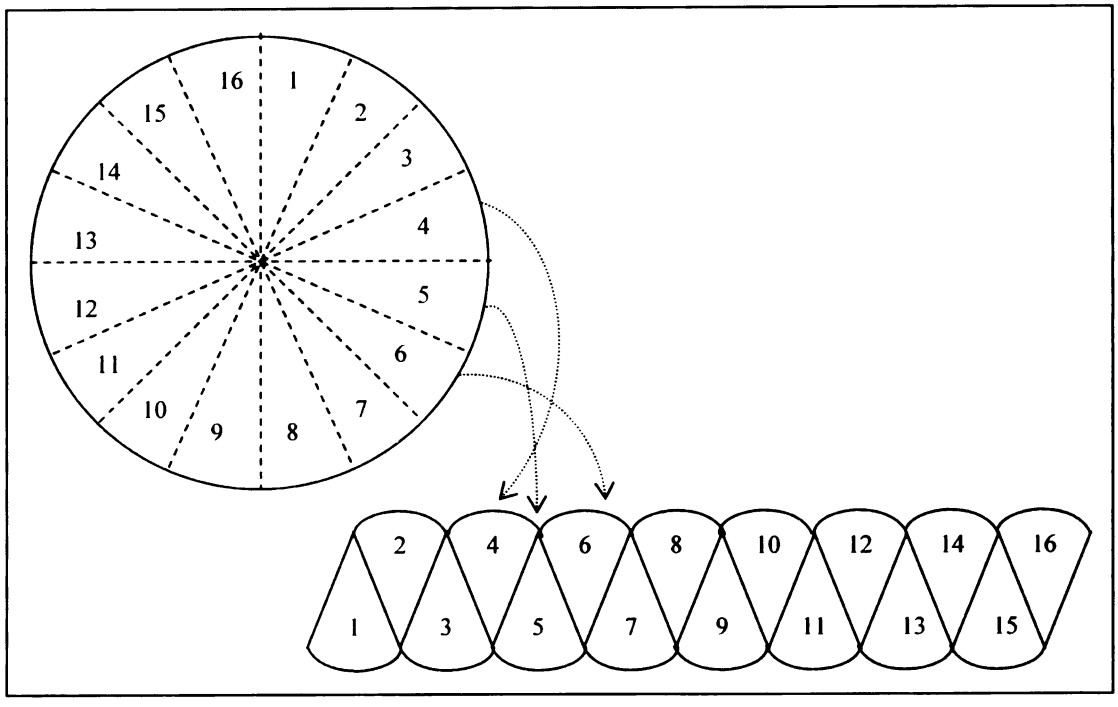


Figure 4. Diagram showing how Ms. Price's students rearranged cut sectors of a circle (with arrows denoting movement) to create a "parallelogram" to determine the area.

Ms. Price asked them what type of shape they had made. One student said that it was a rectangle, but a second student said that it was a parallelogram. A third student agreed with the second and said that a rectangle has to have perpendicular sides, but that two of the sides weren't perpendicular to the other two. Ms. Price, agreeing with the latter two students, reminded them that they had just learned the formula for the circumference of a circle. She explained how to derive the formula for a circle using A=b*h (Area=base*height). She explained that the bases had length $2\Pi R/2 = \Pi R$, while the height was R, because that was the radius. She wrote $A=bh= (\Pi R)*R= \Pi R^2$.

This is an example of an attempt at Standards-based teaching, because Ms. Price had the students "prove" (in an approximate sense) the area of a circle by decomposing the circle into sectors and then rearranging the sectors into a shape whose area they already knew. Then they offered solutions (Standard 3: *Students' role in discourse*) and used mathematical arguments to determine which of their answers was most useful in this situation (Standard 5: *Learning environment*). Admittedly, this relatively popular intuitive "proof" of the formula for the area of a circle is flawed in that the object formed is not a parallelogram, nor is it intuitively obvious that its area is the same as that of a parallelogram with base ΠR and height R. But the process by which the teacher enacted the task (i.e. allowing students to use mathematical arguments to determine what shape the circle sectors took on) was aligned with the NCTM Standards to a meaningful degree.

Ms. Riley: Using difficult problems to help understand the quadratic formula.

During a lesson on completing the square, Ms. Riley asked her students to attempt to solve the problem $4x^2+16+k$ during a class discussion by finding the k that would complete the square and allow them to factor the expression. This was the first completing the square problem that the students had encountered where the coefficient of x^2 was not 1. The students tried to work the problem. More than one student offered suggestions as to how to solve it. Finally, the class came to a consensus, finding the solution to be k=64. Ms. Riley continued with the lesson, but noticed a few minutes later that their solution was incorrect. She tried to explain why their answer was incorrect but fell short, because the students could not understand why they had to factor out the 4 in front of the x^2 term before solving finding the constant, k, that would allow them to

complete the square. Then she asked the students to ignore that problem and told them that it wouldn't be on the test and moved forward with the rest of the lesson. During the post-observation interview, she explained to me that that problem was not part of the curriculum and that colleagues had told her not to cover it, but she wanted to help the students understand the quadratic formula, so she had attempted it anyway. When it didn't work out and she could see that she wouldn't have time to teach the topic, she decided not to attempt teaching it again.

Even though Ms. Riley had not sufficiently prepared her students to address and solve this problem effectively, there were elements of SBT in her efforts. Ms. Riley allowed the students to offer suggestions about how to solve a problem and to come to a consensus on that solution (meeting Standard 3). She acted as a facilitator during that discussion (meeting Standard 2). Though she had not adequately prepared the students to tackle such a problem, she did clearly attempt to engage them in offering mathematical ideas that they defended with (albeit incorrect) mathematical arguments in attempting to solve this problem.

Ms. Wells: Formulating conjectures about properties of a triangle's midsegments.

While I only observed relatively modest attempts at SBT in Ms. Wells' class, one of those attempts resulted in evaluating a student conjecture that was interesting. Ms. Wells held up a picture of a triangle with all three midsegments drawn connecting the three sides. She asked students if they could see anything that was true about one side and the midsegment that ran parallel to that side. One student said that they would all be congruent. Ms. Wells probed and found out that the student meant that all four triangles

in the diagram would be congruent. She had to think on her feet a bit. She said that that would be true for the diagram and said she did not know if it would always be true for any triangle. After a few tense moments, she decided and told the class that the statement was always true.

Because Ms. Wells asked her students for conjectures about the diagram and did not dismiss a conjecture out of hand that was not precisely what she had asked for, she allowed students to have a role in formulating the content of the course. This meets, at least in part, NCTM Standard 3: *The students' role in discourse*.

Summary

These six beginning teachers were among the few that I observed from their respective cohorts attempting SBT, even though they were carefully selected by their fifth year content/methods teacher. Their attempts were, at times, mathematically limited or misguided, although they clearly made meaningful attempts to implement the NCTM (1991) Standards in their classrooms. But each made some honest attempts at aspects of pedagogy proposed in the NCTM Standards, and most involved efforts to engage their students in the search for and discussion of mathematical relationships, in their own, as opposed to direct instruction of those relationships. In the next chapter, I explore each participant's observed teaching more thoroughly and carefully, looking at each participant's experiences, identifying teaching challenges they reported, and how those challenges related to their attempts at SBT. This chapter also examines the challenges/sources of stress of these teachers when aggregated as a group.

Chapter 5: Stress Analysis

In this chapter, I present the results from the stress analysis, including which sources of stress novice teachers reported who exhibited some elements of NCTM Standards-based teaching (SBT). This helps answer Research Question 1, "What sources of teacher stress do novice secondary and middle school mathematics teachers who have exhibited some elements of Standards-based teaching experience in their teaching?" I do this by looking at each individual teacher's salient stresses, then by looking at some of the patterns in the novices' stresses as a group.

By NCTM Standards-based teaching, or SBT, I mean teaching that is consonant at least to some degree with the NCTM (1991) *Principles and Standards for Teaching Mathematics*. I analyze which sources of stress were "Main" and which were merely "mentioned" for these participants. As a reminder, Main sources of stress met specific criteria that indicated the novice teachers were attributing emphasis to those stresses, namely using detail, magnitude words, repetition within an interview, repetition between interviews, and/or reporting it as a top stress. Teachers also reported that some stresses were their "top" stresses; I report these stresses as well that were entirely a subset of their Main stresses for all of these novices. For more detail on the criteria by which I judged whether a stress was "Main" or merely "mentioned," I refer the reader back to the Methods chapter.

As a reminder, I use the term "sources of stress" to indicate a focus on the origins of the aggregate teacher stresses that these novices reported. For ease of expression, I will refer to "stresses" when I distinguish and analyze these sources of stress.

I first look at the salient stresses for individuals and then across the results for the entire group in this analysis to determine which stresses were predicted by and which were new to the literature. This answers Research Question 2a, namely "While novice teachers attempt Standards-based teaching, which stresses are predicted by the existing literature and which are new to the literature?"

I also analyze for the group as a whole how the reported stresses related to participants' attempts at Standards-based teaching (SBT) to answer Research Question 2b, specifically "Which sources of teaching stress are related to their attempts at Standards-based teaching and how are they related?"

Finally, I analyze whether each participant judged any of their stresses to be facilitative (or constructive), neutral, or debilitative (or nonconstructive) to answer Research Question 3, "What sort of impact do the sources of teaching stress that novice teachers experiences have on them, i.e. do they judge them to be facilitative, neutral, or debilitative?"

In summary, I begin by looking at the individual participants' cases, determining which sources of stress (hereafter "stresses") they reported and which of those stresses were reported or judged as being top or Main stresses respectively. Then I discuss overall patterns that I saw in the teacher stress data, including salient stresses reported, how reported stresses relate to those predicted by the existing teacher stress literature, which stresses related to novices' SBT attempts, and whether teachers described those stresses as facilitative, neutral, or debilitative.

Overview of Stresses for Each Teacher

I begin this chapter by listing all of the stress categories that each novice reported during our interviews, distinguishing between stresses they declared as "Top" for them, stresses that were "Main" as scored by my criteria (repetition within, repetition between, detail, magnitude, reported as top; see Chapter 3 for details), and finally those that were merely mentioned sometime, but not with compelling emphasis, in the interviews. To refine this description, I then give examples of the actual stresses that novices reported that fit into those stress categories and were most important to each novice, according to the following guidelines. When novices reported two or more top stresses, I give examples of all those stresses[4]. When they reported a single "Top" stress, I share an example of that stress, followed by examples of all of their other Main stresses. Although my criteria did not overtly require it, the top stresses were always a subset of teachers' Main stresses. As a result, top stresses are entered twice in the teacher summary tables below, as both "Top" and "Main" stresses. In all 6 cases, teachers generated at least one "Top" stress and at least one additional "Main" stress.

Ms. Boone: Reported stresses.

Ms. Boone reported the second highest number of categories of teaching stresses overall, 13 of the 22. She also reported the highest number of Main stresses (6 of those 13) and the highest number of top stresses (3 of those 6 Main stresses. Ms. Boone's Top teaching stress categories were Challenges associated with professional development, Relationships and communications with administrators, and Responding to problematic student behaviors.

[4] Despite my efforts to get the novices to name their single top stress, some named more than one "top" stress.

Table 5

Ms. Boone's Top, Main, and Mentioned Sources of Stress

Stress salience	Stress categories
Top stress(es)	Relationships and communications with administrators Challenges associated with professional development Responding to problematic student behaviors
Main stresses (M)	[Relationships and communications with administrators] [Challenges associated with professional development] [Responding to problematic student behaviors] Creating, aligning, modifying, or implementing curricula Lack of student interest/motivation After hours work/long hours
Mentioned stresses (m)	Managing classroom discussions Relationships and communications with students Teaching students of varying ability levels Learning and teaching unfamiliar content Relationships and communications with parents Teacher boredom Dealing with class length, pace, or schedule

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

While Ms. Boone reported her Relationships and communications with administrators were generally good, she was very frustrated that the administration had added on additional professional development hours and required her and her cohort of 2nd year teachers to attend what turned out to be a new teacher orientation geared towards first-year teachers. Ms. Boone and her peers had all described what they wanted to do for that professional development experience, work on more teambuilding as they had done the previous year. So they were all very disappointed that their professional development was such also an irrelevant experience, because it was also completely unrelated to their original request.

> Ms. B: And I had to go. And I was a second year teacher. We had like two first year teachers. And the rest of us, ...we're all in our second or third

> year. And we just felt like it was such a cop out to [require us to attend a new teacher orientation]. And we were so frustrated... So we went to the principal and expressed our frustration with it... We were just like, "You know what? This is not helpful to us. It is a waste of time. Let us do something else." So we had a meeting with the principal. And we had all these great ideas. Why not require us to go to a conference in our subject area? We have the [regional education headquarters] right here. Why not require us to go to pick one or two classes? Something that could be helpful. If we want to build a website, maybe we should go to the website class, or something like that... We had a ton of ideas (Post, 9.23-10.2).

The previous quote also related to Ms. Boone's Challenges associated with professional development, because the nature of the professional development was part of the problem, as was the administration's failure to listen and to act on feedback about her professional development experiences and goals.

Ms. Boone also reported feeling frustrated by Responding to student behaviors, especially when the students didn't listen to her when she was talking or when they talked while other students were finishing up quizzes or tests.

> Ms. B: ...There's one thing that happened in class the other day that stresses me out more than anything in the world. And that's when kids are done with their quizzes or tests and start talking before everybody's done with it. That is my number one stress. I literally will get a headache, because I'm trying to keep them quiet, or trying to keep them working on something. And I get, I just get very, very annoyed, because I know when I'm trying hard to work on something, I can't concentrate if there's any kind of noise going on... So I get very, very stressed about that (Post, 6.23-6.34).

Ms. Boone wanted to ensure that all of her students could concentrate and put for their best efforts on the quizzes. As a result, she felt very annoyed when she couldn't get students who finished early to comply with her wish for silence while others were finishing up.

Ms. Boone's three remaining Main stresses that were not top stresses were: Creating, aligning, modifying, or implementing curricula, Lack of student interest/motivation, and After hours work/long hours. For Creating, aligning, modifying, or implementing curricula, Ms Boone mentioned, for example, how she is working on creating the AP calculus curriculum and was also constantly modifying and reworking her lessons to improve them in the Integrated courses that she had taught for several years. For Lack of student interest/motivation, Ms. Boone mentioned that she felt annoyed when her students were not listening or are bored with a lesson, which was represented a few times in our observations. Ms. Boone's challenges with Creating, aligning, modifying, or implementing curricula related to how hard she worked at creating lessons for the AP calculus course that she taught, as well as reworking old lessons that she felt could have been better structured, needed more hands-on activities or additional content to meet her state's mathematics standards.

Ms. Grant: Reported stresses.

Ms. Grant reported stresses in more categories than any other participant, with 15 of the 22 stress categories overall. She reported the median number of Main stress categories with four, namely Teacher boredom, Lack of student interest/motivation, Working with technology, and Relationships and communications with colleagues. She reported that two of those Main stress categories were top stresses, Teacher boredom and Lack of student interest/motivation.

Table 6

Ms. Grant's Top, Main, and Mentioned Sources of Stress

Stress salience	**Stress categories**
Top stress(es)	Teacher boredom Lack of student interest/motivation
Main stresses (M)	[Teacher boredom] [Lack of student interest/motivation] Working with technology Relationships and communications with colleagues
Mentioned stresses (m)	Directing student explorations of mathematics Managing classroom discussions Responding to unexpected student ideas Creating, aligning, modifying, or implementing curricula Planning lessons Learning and teaching unfamiliar content Relationships and communications with parents Responding to problematic student behaviors Preparing for, administering, and evaluating standardized tests Finding and utilizing resources Student diversity

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

Ms. Grant said that teaching math is really boring for her, and although she is willing to be there for the students, they don't really enjoy or wish to engage with the content readily. A passage relating to both of her top stresses, Teacher boredom and Lack of student interest/motivation, follows:

> Ms. G: I think like the biggest thing that might push me out of teaching math, because I think about it sometimes, because I know what it's like to teach English. And I know what social studies teachers do, is that I'll help students be problem solvers and I'll help those who need it, because I'm helpful. And I'll just do this to be very helpful and encouraging and I want to make them, not like math, but be successful at math when they maybe haven't in the past. And I'm just discouraged by how dull it is for me sometimes… Teaching it can be very, very dull. And I can get into it, but it's so not authentic, I think, for the students. Like "It doesn't make sense for her to be all excited about solving for y." And it drives me crazy that like 4 weeks later, they still want me to solve for y and show the subtract 4

> on both sides and then divide by 3, like if it was a linear equation... Like that's what frustrates me the most probably. Because they tune in and tune out whenever they feel like it. And I'm like willing to be really committed to them. But like it's boring for me to stand up there... So if I could teach solving linear equations for a month, or something, or two months. And I could do it in a lot of ways, a lot of interesting ways, creative... then I wouldn't mind. But because I'm limited to this amount of time and these students, all I can keep saying is you know, "Now subtract 3 on both sides." So that's probably what would push me out [of teaching math]... And that's why I'm looking always (Post, 19.34-20.20).

This passage succinctly summarized Ms. Grant's biggest complaints relating to Teacher boredom, primarily that teaching math was boring compared to teaching English (her teaching minor) or social studies (the subject her husband teaches at Maple High School). Ms. Grant felt like it was so much easier to have meaningful conversations with the students in English and social studies, while in mathematics, there were some topics that just do not lend themselves well to whole-class discussion, like algebraic manipulations (e.g., getting the x's on one side and the numbers on the other).

With regards to Lack of student interest/motivation, Ms. Grant felt frustrated, because she teaches mostly unsuccessful math students. They don't engage with the content, because "they're not motivated... I teach mostly unsuccessful math students. And so they find themselves as kind of losers at math" (Ms. G, Post, 15.10-15.37).

Ms. Grant also mentioned several challenges related to her other two main stresses, Working with technology and Relationships and communications with colleagues. For Working with technology, neither the middle school teachers nor the other high school teachers were training the students how to use graphing calculators, so she had to teach them everything. That to her was very frustrating since even the middle school teachers have graphing calculators, but they are more worried about how the

students treat the calculators than that they learn to use them. She felt like those teachers had a professional obligation to teach the students about technology and that that obligation was more important than the calculators, which were materials which could be repurchased, if damaged. So because she wishes to use the graphing calculators in her instruction, she has to go through the keystrokes step-by-step for students in each lesson, often taking up a lot of time. I will share the specific quote when discussing stress categories that are new to the literature.

For Relationships and communications with colleagues, Ms. Grant felt a little bit let down by her experiences at Elm High School, particularly relating to the type of conversations that they had in the lunch room. During her senior year (the year before her 5th year internship), she worked as a part-time sub at Hamilton High School, a local professional development school.

Mr. Jones: Reported stresses.

Mr. Jones reported the second highest number of teaching stress categories overall, 13 of the 22. He also reported the second highest number of main stresses, 5 of his 13), namely Managing classroom discussions, Lack of student interest/motivation, Assessing student understanding, Responding to problematic student behaviors, and Dealing with class length, pace, or schedule. Of these five, Mr. Jones' top stresses were Lack of student interest/motivation and Managing classroom discussions, which I will describe using examples from his interviews.

While Managing classroom discussions, Mr. Jones found it challenging to present content in terms that students could understand, as well as making sure that a great deal of the ideas and information came from the students rather than from himself.

Table 7

Mr. Jones' Top, Main, and Mentioned Sources of Stress

Stress salience	**Stress categories**
Top stress(es)	Managing classroom discussions Lack of student interest/motivation
Main stresses (M)	[Managing classroom discussions] [Lack of student interest/motivation] Responding to problematic student behaviors Dealing with class length, pace, or schedule Assessing student understanding
Mentioned stresses (m)	Directing student explorations of mathematics Creating, aligning, modifying, or implementing curricula Planning lessons Teaching students of varying ability levels Learning and teaching unfamiliar content Preparing for, administering, and evaluating standardized tests After hours work/long hours Challenges associated with professional development

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

> Mr. J: Yeah, as a facilitator, as someone that's trying to lead a discussion or actually get them to start thinking about this path that they have to take, it's very hard to put [the idea of proof] in terms that they understand besides—I wish I would have given more time for students to think about and more students to think about, maybe they didn't like this idea of a path. Maybe they could have changed it. Maybe some students that were really struggling with it, but finally got it, have them explain how they understood exactly what this meant in order to prove these two angles are equal. And I see on the test that I'm grading now, they did really struggle with the proof, the proof part there… Thinking back now, I wish I would have done something different, as far as having students talking about it more than just, you know, me talking up there. I mean, I noticed from the three video clips that I do a lot of work. I do more work than I should be doing. And I should have students have more responsibility for what's being said in class. And I think that if they would have maybe described

> what they were thinking, especially the struggling students once they did figure it out... Maybe having them discuss that more. That's what I'll change for next year (Post, 10.3-11.13).

Mr. Jones also explained that he wanted the students to be more engaged in discussions and in-class activities, but maybe it wasn't just the students, but also the questions that he was posing that were creating the discrepancy between what he wanted to see and what was happening in the classroom. He also mentioned that he wanted to be doing less talking and acting more like a facilitator during discussion, but that that wasn't always what was happening in class.

For Lack of student interest/motivation, Mr. Jones mentioned that one of his challenges in this area was getting students to engage in his slower-paced courses, in particular. In that class, not only are students in the lower track, but they are also exposed to the same content two to three days in a row. He felt like that could get a little boring for them at times, as well as being difficult for the teacher to make interesting the second or third day s/he covers that topic.

> Mr. J: My first hour..., they're challenging in a motivational kind of way. They don't seem to want to discuss mathematics. It's first hour, but it's really hard to motivate them. They are on a lower, I guess, track you could call [it]. They're in a 1B, which is, if you take Integrated 1 and break it up in two semesters, they're taking the second semester and they spread that out over the whole year. So they're seeing—the material that a normal class would see in just one semester, they're seeing it over a whole year. So it's a lot slower pace. They have a lot of time to see material, which could be boring sometimes. And it's a real challenge to make it really interesting for them and to get them excited about it when they don't really care, because they already know, "I'm in the slower track. Who cares about me? I don't care about math" (Pre, 3.32-3.42).

Here Mr. Jones identifies a challenge that other teachers, including Ms. Grant, also mentioned. Specifically, he says that getting students engaged in mathematics lessons in his lower-track courses was challenging. This appears to be a relatively common issue for these teachers.

Mr. Jones' three remaining Main stresses were: Responding to problematic student behaviors, Dealing with class length, pace, or schedule, and Assessing student understanding. For Responding to problematic student behaviors, Mr. Jones mentioned that he has one student whose misbehavior has led other students who were once respectful to begin talking across the class during whole class discussions and in-class work time. For Dealing with class length, pace, or schedule, Mr. Jones mentioned how difficult it was to keep up with the schedule that he and the other teachers had agreed on at the beginning of the semester, even though he was at the same place as the department chair who he worked with jointly on planning.

For Assessing student understanding, Mr. Jones described how difficult the performance assessments were at the end of the semester for him and the students. At Maple High School, they have performance assessments where students prepare and present a project in groups. Each project is challenging and has multiple parts, so that the students must divide up the project to complete it. These assessments were difficult for them, because each student has to prepare part of the project, so they have to rely on each other for help. But it is also difficult, because every person in the group must have an understanding of every part of the multi-problem project. The students complained a lot about the projects and presentation, because they had to rely on classmates for their grades, at least in part, because they were partly graded as a group and partly as

individuals. Also, Mr. Jones had to be prepared to ask questions that would help him know whether the students truly understood the entire assignment and not just their part.

Ms. Price: Reported stresses.

Ms. Price reported about as many stress categories as the other teachers, 12 of the 22; however, she reported the fewest main stresses, only 2, namely Responding to problematic student behaviors and Lack of student interest/motivation, where the former was her single "top" stress.

Table 8

Ms. Price's Top, Main, and Mentioned Sources of Stress

Stress salience	**Stress categories**
Top stress(es)	Responding to problematic student behaviors
Main stresses (M)	[Responding to problematic student behaviors] Lack of student interest/motivation
Mentioned stresses (m)	Managing classroom discussions Creating, aligning, modifying, or implementing curricula Planning lessons Teaching students of varying ability levels Learning and teaching unfamiliar content Relationships and communications with parents Dealing with class length, pace, or schedule After hours work/long hours Assessing student understanding Relationships and communications with administrators

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

Ms. Price said that it was difficult to be consistent every time in Responding to problematic student behaviors. She also described how frustrated she became when she did everything she could think of when dealing with student misbehavior and nothing seems to work, because the student doesn't care and their parents either don't respond or

aren't interested in correcting their children's behavior. She said that it is a challenge that she has become better at dealing with, but still continues to work on improving. Ms. Price mentioned how difficult it was at times to get some students' behaviors under control.

> Ms. P: And sometimes dealing with student behaviors, you know it's so hard to be consistent every single time. It involves, I think it involves lots of work, calling parents, following up on the kid, making sure they serve their detentions—if they don't, you've got to refer them to the administrator—talk to the administrators about the kids, talking to the parents, talking to the kid before or after class. I mean, it's just really, it's hard, I feel like. And it's exhausting. And sometimes I just feel like, "Ugh!" You know like, it becomes tiring, I think...like, it's not making any progress. Nothing's getting through to this kid. (Post, 11.40-12.06).

Clearly Ms. Price expressed struggling with student discipline, sometimes even when she was using all of her resources.

With respect to her other Main stress, Lack of student interest/motivation, Ms. Price mentioned how difficult it felt to get students engaged at times with all of the outside things that they had to do, like early morning and after school athletic practices, other classes, and so forth.

> Ms. P: I mean, like you saw in my sixth hour...class. It's kind of these kids, you know, with too many friends in a class, their inability to just focus, you know? They don't like math. They've had a long, hard day. And you have to somehow get them to do something for an hour. And some days it seems like it's just impossible. (Post, 11.34-11.40)

So Ms. Price reported that she felt like she could not always get her students to engage with her mathematics lessons, to really do something in class.

Ms. Riley: Reported stresses.

Ms. Riley reported the fewest stress categories of any teacher with 8 of the 22; however, she was judged to have experienced the median number of Main stresses with a total of 4, including Lack of student interest/motivation, Dealing with class length, pace, or schedule, Relationships and communications with administrators, and Managing classroom discussions.

Table 9

Ms. Riley's Top, Main, and Mentioned Sources of Stress

Stress salience	**Stress categories**
Top stress(es)	Lack of student interest/motivation
Main stresses (M)	[Lack of student interest/motivation] Dealing with class length, pace, or schedule Managing classroom discussions Relationships and communications with administrators
Mentioned stresses (m)	Learning and teaching unfamiliar content Relationships and communications with parents Responding to problematic student behaviors Preparing for, administering, and evaluating standardized tests

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

Ms. Riley said that Lack of student interest/motivation was her top challenge. She said that in at least one of her classes where the kids were really bright, it was hard to get them to respond to her personality or to get them interested in the lessons. They would also do their work quickly, but then she couldn't move forward because of the way the schedule is set up for her school's trimester schedule, so they are often bored.

> Ms. R: Yeah, [in my fourth hour class] they're just, they're smart. And they just want to do the work and get it over with and move on. So they're a little bit bored. So they end up having time at the end of the class to just

> pick their noses and you know, do nothing. Because I can't really go on and leave the other first and second hour behind, because those individuals are so—they need to be in the same spot... Normally I would keep going. I wouldn't probably do a whole other section, but I would introduce the next section. I would come up with more problems for them to do. You know, just stuff like that so... And you know, they're just naturally quiet though. They're bored during the lesson, too... Like I can't get them to—like normally, if I would be kind of like showy and clowny in front of the class for everybody like I was in second hour, you know, they laugh and they participate and they, you know, make jokes. And these guys would just be like [silence]... You know, like they would have just no expression. No, nothing, you know? Sometimes I feel like, "Is this thing on? Is this thing on?" (Pre, 4.16-4.40)

For Dealing with class length, pace or schedule, Ms. Riley mentioned that one of the challenges was trying to teach a semester's worth of content in a single trimester due to her school having adopted a trimester schedule.

> Ms. R: So you've got three trimesters, but they're like semesters. And instead of having a class go all three [trimesters], you do it in two. And so we have the same amount of material to do in two-thirds of the year... But the exchange for that is that you get 75-minute classes, rather than 50-whatever minute classes.
> I: Okay. So you get one and a half times the class time?
> Ms. R: Correct.
> I: And 2/3 [of a year]. So 3/2 times 2/3 should equal out in theory.
> Ms. R: In theory.
> I: But you said you don't love it.
> Ms. R: It's great on paper. [Laughter.] What you get into is very regimented schedules... You are very, very on schedule, on time (Pre, 3.37-4.13).

Ms. Riley emphasized in this quote how she felt like she ended up with a very regimented schedule as a result of the trimester schedule that her school had adopted. This also dovetails with her concerns about Lack of student interest/motivation, because

she mentioned that she felt very constrained by the trimester schedule that her school operated under.

Ms. Riley's challenges with Managing classroom discussions were related to having difficulty explaining concepts in class, making mathematical mistakes in the classes I observed and then trying to fix them, and being surprised by some things that the students did and didn't know during those discussions. In the following example, Ms. Riley was struggling with helping the students understand why they used certain, specific steps when completing the square.

> Ms. R: I was challenged by the fact that I did not think that they were getting it. And I was trying to come up with other ways to explain myself. And I was having a lot of trouble...and it really, really was stumping me, because they weren't getting it at all...
> I: Yeah. And how did that resolve itself?
> Ms. R: I think how it resolved itself was I got to the point where I said, like in my head, "We do not have enough time to tinker with 'Do these kids have deep, meaningful understanding of what's going on? Or can they just find h dividing by 2?'" You know? And so I think that some of them, hopefully a lot of them got the understanding of what's going on and why you divide h by 2. But I think it got to the point where I was like, "Forget it... Just divide this number by 2 and square it. Just do it." [Laughs.] ...I just dropped it, because I couldn't handle it anymore... Their faces were sheer terror... I feel like we got so off course with that, so out of what I wanted to do. I mean it was ruined from there. (Post, 3.15-4.12).

Ms. Riley had difficulty explaining to students why completing the square worked. She ended up just dropping the explanation, because her students were getting confused and upset by her explanations of it, rather than gaining mathematical understanding from it.

Ms. Riley's challenges with Relationships and communications with administrators related primarily to the new teacher orientation she attended, where high expectations were voiced for the new teachers' performances that made her feel very, very nervous.

> Ms. R: I am enjoying it more. At the beginning of the year, I was very, very frightened. Not of the students, but they have high, high expectations here..., the administration and the parents and the school in general. And I was really worried that I would not meet those expectations, that I was—you know, they, I don't want to say intimidate, but I was, after those six days of new teacher training, I was definitely worried that I could not do enough to be a good teacher at this district... It was basically, we were given the impression that as new teachers, we would be watched very closely, our progress and our, you know, style and everything would be watched very closely. And it was very important on how many people we were passing and how many people we were not passing... That would, I would say, would be the biggest thing. And then there was a lot of work. "Here's this book. Read this. Here's this book. Read this." And there was a lot of homework, too. And I was like, "Holy cow! I cannot do this all year." [But] that's calmed down considerably (Pre, 13.40-14.24).

Ms. Riley was concerned that the expectations both inside and outside of the classroom would be unreasonable and she would not be able to meet them, but eventually she found out that the expectations were more reasonable than she had expected as the school year got underway.

Ms. Wells: Reported stresses.

Of the 6 participants, Ms. Wells reported the second fewest number of stress categories, 9 of the 22, and the second fewest number of Main stresses, 3, namely After hours work/long hours, Responding to problematic student behaviors, and Lack of

student interest/motivation. Overall, she seemed to me to be least stressed teacher in the sample.

Table 10

Ms. Wells' Top, Main, and Mentioned Sources of Stress

Stress salience	**Stress categories**
Top stress(es)	After hours work/long hours
Main stresses (M)	[After hours work/long hours] Responding to problematic student behaviors Lack of student interest/motivation
Mentioned stresses (m)	Directing student explorations of mathematics Creating, aligning, modifying, or implementing curricula Relationships and communications with students Learning and teaching unfamiliar content Dealing with class length, pace, or schedule Challenges associated with professional development

Note. Brackets indicate stresses that were top, but then are necessarily also Main.

For After hours work/long hours, Ms. Wells said that the long hours that she worked was her top stress. She is often at school very late planning, grading, and helping her students.

> Ms. W: I try to get here by 7. And then I do random things in the morning, whether it's like making copies or getting the agenda on the board or whatever it is before the kids come in at 7:50. You know, teach my normal six-hour day. And then afterwards, I usually put in 2, 3, maybe 4 hours after school here, doing miscellaneous things, helping students, planning for the next day, copies, whatever it is, checking e-mail, regular stuff. And then I still end up taking a lot of it home. You know, 6:00 will roll around. And I'll say, "I'm ready to go home, but then I'll still have to take home a stack of papers to grade. Or I'll have to take home some plans or write a test when I get home. Or make a review...and then I'll usually stay up until 11:00 trying to get stuff done, just to stay on top of everything. And by the time Friday rolls around, I usually don't do anything on Friday night. And Saturday, a lot of times, if I can pull myself away, here and there I might take an hour out of the day to do a few

> grading things or whatever. But then on Sundays, that's the day that it kind of hits. And you're like, "Okay, I've got to get ready for this week. I've got to get all this grading done." So you end up putting almost a full day in on Sunday. And it's just really time consuming outside... So that's really my biggest challenge is trying to find a balance... (Pre, 18.41-21.20).

Ms. Wells worked late into the evening hours grading and planning at home during the week, took a little time off on Saturday, and then worked all day Sunday trying to get caught up on grading and planning.

In terms of Responding to student behaviors, Ms. Wells worried when students are joking around that it will escalate into a fight. For her, that is stressful, because those situations can escalate very quickly.

> Ms. W: Okay. Student behaviors, I mean, that's always a major stress. I mean, when you've got kids joking around. And you've got other things going on... But the students' behavior is always a challenge, because I mean, you've always got kids that are goofy and joking around and, "Are you joking or are you really about to punch each other?" It's like, and it only takes a split-second for it to escalate. Whatever. So that's always a stressor (Post, 15.42-16.15).

Ms. Wells mentioned struggling with specific student behaviors other than joking, such as student talking while she is talking at the front of the class, talking while other students are trying to finish a quiz or test, students who will not work unless she was physically present to answer every question that they had, etc. Her frustration with student talking at inappropriate times also related to her challenges with Lack of student interest/motivation in her mathematics class.

In discussing Lack of student interest/motivation, Ms. Wells also said that she wishes that her homework turn-in rates, which are 30% or less in all of her classes, were

better. She also described how difficult it was, at times, to get them to work on assignments in class.

> Ms. W: [Students' lack of motivation] is a big one at this school, and in general, overall in my classes. I mean if you, you could kind of see it from those graphs back there.... And those are goals that they set at the beginning of the year... Almost all 5 of my classes said, "We want 80% of the class to turn in homework every day." So... then they should all have all of their homework, right? 80% of the class should. And their homework scores are awful... You've got maybe [listing off percentages for each class period] 10[%], 30[%], 15[%], 10[%]. 30% of the class turning in homework every day is just not acceptable... In every class, it's probably only about 30% of the kids that actually do their homework every day consistently, bring it in complete.... And you limit it. I mean half the time, I'm giving them... only like 12 problems a night. 12 problems should not even take them more than half an hour, if they paid attention in class. And when I'm giving them 15 minutes in class to get started, there's really no reason for them not to have it. So it's just them not doing it. It's them being lazy... (Post, 16.16-17.21).

So getting students to meet their own goals for turning in homework was stressful for Ms. Wells, as well as trying to keep them engaged in class. But later in the interviews, she said that that stress has lightened up a bit since she implemented a ticket out policy where students have to submit an assignment before they can leave her class.

The summaries above give the reader some sense of the factors that contributed to each individual's stress as a classroom teacher. But because these teachers were alike in many ways, it also makes sense to examine their collective experience. In the next section, I look across these novices' stresses and consider which were salient (i.e. "top," and in some cases, "Main" stresses) for the group as a whole and which are common, but not necessarily salient, for this group.

Salient Stresses Overall

In the analysis that follows, I define being a "salient" stress as being a "Main" stress for each participant. For all participants, being a "Top" stress also implies being a "Main" stress, even though my criteria for "Main" stresses did not overtly require it.

The first six stress categories listed in Table 11 are the most common stresses that are salient for the six novices in this study taken as a group: Lack of student interest/motivation, Responding to problematic student behaviors, Dealing with class length, pace, or schedule, Managing classroom discussions, After hours work/long hours, and Relationships and communications with administrators. Note that these 6 categories collectively represent 8 of 10 "Top" stress categories and 18 of 24 "Main" stresses reported by these novices. So there is good reason empirically for focusing on these 6 categories to understand the experiences of the group.

I will discuss each of these stresses only briefly, as most of them have been described with examples in the previous section about each individual teacher's salient stresses. I refer the reader back to that section for specific quotes from the novices' interviews. The first group of 6 stress categories in Table 11 contains those categories that at least one teacher reported two novices reported as a Main stress. The second group of 6 stress categories contains those that were Main stresses for exactly one novice. The third group of stress categories represent those that were only "mentioned" stresses for any novice reporting them.

Lack of student interest/motivation was the most common Main stress and was also a top stress for more novices than any other category. This stress was very common and relatively similar across participants. Novices tried to get student participation from

all of their students; in particular, they struggled to elicit participation of the students in their lower-track courses.

Table 11

Stress Categories Sorted by Frequency as Main Stresses

Stress category names	Stresses		
	Top	**Main**	**Mentioned**
Lack of student interest/motivation	G, J, R	B, G, J, R, P, W	
Responding to problematic student behaviors	B, P	B, P, J, W	G, R
Dealing with class length, pace, or schedule		J, R	B, P, W
Managing classroom discussions	J	J, R	G, P
After hours work/long hours	W	B, W	J, P
Relationships and communications with administrators	B	B, R	P
Creating, aligning, modifying, or implementing curricula		B	G, J, P, W
Challenges associated with professional development	B	B	J, W
Teacher boredom	G	G	B
Assessing student understanding		J	P
Working with technology		G	
Relationships and communications with colleagues		G	
Learning and teaching unfamiliar content			B, G, J, R, P, W
Relationships and communications with parents			B, G, R, P
Planning lessons			G, J, P
Directing student explorations of mathematics			G, J, W
Teaching students of varying ability levels			B, J, P
Preparing for, implementing, and evaluating standardized tests			G, J, R
Responding to unexpected student ideas			B, G
Relationships and communications with students			B, W
Finding and utilizing resources			G
Student diversity issues			G
Total	**10**	**24**	**46**

Note. First initial of last name represents each teacher (i.e. "B" represents Ms. Boone, etc.)

An example of Lack of student interest/motivation surfaced during Ms. Grant's interview, because her students didn't want to engage with her teaching. She felt like she didn't enjoy teaching math as much as she might have enjoyed teaching another subject, like her teaching minor, English, because it was easier to foment conversations that were more interesting and relevant to the students' lives. She said that she wanted to help her students, but they wouldn't put forth any effort.

Responding to problematic student behaviors was both the second most common Main teaching stress and the second most common top stress category that novices mentioned. There were a variety of storylines here that varied from individual, irritating student behaviors, like swearing or chattiness, to patterns of individual student behavior that the novice couldn't get the student to control. During Ms. Price's stress story, she said that she tried using all of her resources to deal with inappropriate student behaviors, talking to the student, to the school administrators, and to the student's parents, but sometimes none of her resources helped.

I judged that both Ms. Riley and Mr. Jones experienced Dealing with class length, pace, or schedule as a Main stress. Both said that they had agreed on a schedule at the beginning of the year that was difficult to keep up with and that they were going to give a uniform final exam with the rest of their department. But Ms. Riley was on the trimester schedule and had to reach the exact same point in the material as her peers, while Mr. Jones was teaching with his mentor and they had to make a reasonable amount of progress by the end of the semester.

Mr. Jones and Ms. Riley were also the only two teachers who experienced Managing classroom discussions as a Main stress as well. Both Mr. Jones and Ms. Riley

experienced stress related to challenges in getting participation from their students. Both of their discussion went awry. But while Ms. Riley decided to bail on those discussions and avoid them the following year, Mr. Jones continued to work during class and to reflect on those challenges afterwards to improve the lessons for the following year.

For After hours work/long hours, both Ms. Boone and Ms. Wells expressed similar concerns. They both had put in many hours outside of school to meet the demands of their jobs. And while their workloads had become somewhat more reasonable, they still required an inordinate amount of their time outside of school hours.

Finally, for Relationships and communications with administrators, Ms. Boone and Ms. Riley were judged as experiencing Main stresses for very different reasons. Ms. Boone described how frustrated she felt when the administrators sent her and her colleagues to a first-year teacher orientation during her second year of teaching. Ms. Riley, on the other hand, was very intimidated by the high expectations expressed by the administration at her orientation before her first year teaching at Holly High School which was her second year of certified teaching.

So it is clear that, while aspects of these experiences were common across this set of teachers, there was also a great deal of diversity within each category of stresses, even for the Main stresses that teachers experienced.

There were also several commonly reported stresses in Table 11 that were not particularly salient for any teacher, namely Learning and teaching unfamiliar content, Relationships and communications with parents, Planning lessons, Directing student explorations of mathematics, Teaching students of varying ability levels, and Preparing

for, implementing, and evaluating standardized tests. This appears to suggest that some of the most common stresses that teachers experience are not particularly poignant.

Now that I have reviewed the salient and common stresses in this case study, I return to the categories in the teacher stress literature to compare these stresses with the ones predicted by the literature to determine whether this research study uncovered any new categories of teaching stress.

Stresses Named in the Literature and New

I initially based the definitions of these teacher stress categories loosely on the existing categories in the teacher stress literature. I modified those categories during my pilot study (Lewis, 2004) in iterative fashion as I analyzed that data set. In this study, I continued to iteratively refine the categories created during the pilot study while analyzing this new data set. As a result, some of the stress categories that I mention in this study have not been described in the existing literature (see "New to literature" column in Table 12), some match those reported in the literature very closely (see "Existing" column), and others only partially overlap with the literature and are partially unique to this study (see "Partly new" column).

I list these categories in Table 12. As in Table 11, the first group of 6 stress categories in Table 12 consists of those categories that at least two novices reported as a Main stress. The second group of 6 stress categories contains those that were Main stresses for exactly one novice. The third group of stress categories represent those that were only "mentioned" stresses for any novice reporting them. So these stress categories are listed in terms of their salience for the novices in this study (see Table 12).

Table 12

Teacher Stress Categories Reported in or New to the Literature

Stress category names	Status of category		
	Existing	Partially new	New to literature
Lack of student interest/motivation	X		
Responding to problematic student behaviors	X		
Dealing with class length, pace, or schedule	X		
After hours work/long hours	X		
Relationships and communications with administrators	X		
Managing classroom discussions		X	
Relationships and communications with colleagues	X		
Challenges associated with professional development	X		
Creating, aligning, modifying, or implementing curricula		X	
Assessing student understanding		X	
Working with technology			X
Teacher boredom			X
Learning and teaching unfamiliar content	X		
Relationships and communications with parents	X		
Planning lessons	X		
Teaching students of varying ability levels	X		
Preparing for, implementing, and evaluating standardized tests	X		
Relationships and communications with students	X		
Finding and utilizing resources	X		
Student diversity issues		X	
Directing student explorations of mathematics			X
Responding to unexpected student ideas			X

Note. First set of stress categories were Top stresses for at least one novice; second set were Main stresses for at least one novice but not a Top stress; third set were only judged as mentioned stresses for novices.

While I could go into great detail about how these "Existing" categories overlap with the stress categories listed in the related literature, the most important stress categories to discuss appear to be those partially or completely new to the literature,

particularly those that were Top or Main stresses for these novices. It is those 5 categories that I will now discuss.

Managing classroom discussions was the only new or partially new stress that was a Top stress for these novices. Managing classroom discussions overlaps in part with *Poor student discipline* because it describes how students can choose not to participate or to be contentious in the classroom during whole-class discussions. But Managing classroom discussions also has the added expectation that much of the mathematically meaningful content of lessons comes from the students, as well as the possibility of opening up those ideas to mathematical scrutiny by the other students in the classroom and the stresses that orchestrating such activities can impose on the teacher.

For Managing classroom discussions, recall that Mr. Jones felt frustrated by how much of the talking that he was doing when he wanted more information to come from the students. He felt like it was a combination of the questions he was posing and how the students were responding to them and to each other that were making this challenging.

There were four stress categories that were Main stresses for some of these novices but were not a Top stress for any of them that were also new or partly new to the teacher stress literature. The two stresses that were new to the teacher stress literature were Working with technology and Teacher boredom. The two stresses that were partially new to the teacher stress literature were Creating, aligning, modifying, or implementing curricula and Assessing student understanding. I will discuss the former two stress categories and share examples of them, while I will only briefly discuss the latter two categories without examples.

Working with technology is a relatively new phenomenon primarily because technology itself was not common in educational settings until the last few decades. For Working with technology, Ms. Grant described how challenging it could be to get her students to understand how to use calculators in her classroom.

> Ms. G: Some of them think they did it all wrong when the graph doesn't appear on the screen. And they don't realize that they aren't looking at the right window. And at this point, I feel like they should know the basic keystrokes of entering an equation, using zoom efficiently, and finding a good window...So I try to spend more time doing it... [And] they just don't know yet how to troubleshoot themselves. So I feel like I have to wind around the room. And I have like people calling me all the time (Post, 12.17-14.19).

So using calculators could make teaching more demanding and stressful for Ms. Grant. But Ms. Grant also mentioned that she continued to engage in that struggle, because it also allowed her to teach students useful skills and opened up possibilities for mathematical discussions for which the mathematical operations that would need to precede those discussions might have been too tedious to undertake.

Teacher boredom was also not in the existing literature, possibly because boredom is not usually something that is considered to be stressful, although it was for two of the novices in this study. For Teacher boredom, the reader may recall how Ms. Grant described how boring teaching mathematics was for her compared to other subjects, such as English (her teaching minor) or social studies (the subject that her husband taught).

Creating, aligning, modifying, or implementing curricula relates to *Time pressure and work overload.* But there also exists the possibility of creating series of lessons and

activities that have exploratory activities and whole-class discussions at their core, where students play a meaningful role in developing, explaining, and substantiating mathematical concepts, as well as placing those ideas under the mathematical scrutiny of the rest of the students in the class.

Assessing student understanding relates to possible conflicts with parents over student achievement as Caspari (1976) mentioned, while it also introduces the idea that assessment can be a formative experience. It can be stressful, because the students are learning, as well as being responsible for the learning of other students in their group. Both experiences can be frustrating for the students and, as a result, for their teachers.

In summary, many of the stresses reported in the teacher stress literature were also reported in this study. In addition, there were four new categories to the literature and four categories that contained at least some new types of stresses that have not been reported in past studies of teacher stress. What this analysis does not speak about is how any of those categories of teaching stress related to participants' attempts at SBT, which is the topic that I address next.

Stresses Related to SBT and Otherwise

It is unclear from a brief overview of the data on top, Main, and mentioned stresses whether their attempts to enact some part of the vision of NCTM's (1991) Teaching Standards contributed to the stress that these teachers reported and, if it did, how great was that contribution. Table 13 displays the same information as Table 11, "top," "Main," and "mentioned" stress categories for each teacher, but when my analysis of the interview data indicated a teacher's attempts to enact some aspect of NCTM

Standards-based teaching (SBT) was linked the source of stress they reported, the teacher's initial is listed in boldface.

Table 13

Top, Main, and Mentioned Stresses with SBT Links

Stress category names	Stresses		
	Top	**Main**	**Mentioned**
Lack of student interest/motivation	**G, J, R**	B, G, **J**, R, P, W	
Responding to problematic student behaviors	**B, P**	B, P, **J**, W	G, R
Dealing with class length, pace, or schedule		J, **R**	B, P, W
Managing classroom discussions	**J**	**J, R**	**G, P**
After hours work/long hours	**W**	**B**, W	**J**, P
Relationships and communications w/administrators	**B**	**B, R**	**P**
Creating, aligning, modifying, or implementing curricula		**B**	**G**, J, P, **W**
Challenges associated with professional development	B	B	J, W
Teacher boredom	G	G	B
Assessing student understanding		**J**	P
Working with technology		**G**	
Relationships and communications w/colleagues		**G**	
Learning and teaching unfamiliar content			B, **G**, J, R, P, W
Relationships and communications with parents			B, G, R, P
Planning lessons			**G, J, P**
Directing student explorations of mathematics			**G, J**, W
Teaching students of varying ability levels			B, J, P
Preparing for, implementing, and evaluating standardized tests			G, J, R
Responding to unexpected student ideas			**B, G**
Relationships and communications with students			B, W
Finding and utilizing resources			**G**
Student diversity issues			**G**
Total	**24**	**46**	**70**
Number SBT-related	**11**	**14**	**25**
Percent SBT-related	**45.8%**	**30.4%**	**35.7%**

Note. First initial of last name represents each teacher (i.e. "B" represents Ms. Boone, etc.)

Table 13 also summarizes the number and percent of "top," "Main," and "mentioned" stresses related to SBT. Summing teachers within categories, Table 13 shows that in approximately half of the cases of Main stress, there was some connection to a teacher's attempts at SBT, while only about one-third of the cases of the Mentioned stress categories were so related. Using this view without further reflection, it would appear that there is a powerful relationship between these novice teachers' stresses and their attempts at SBT. But if one keeps in mind that even one mention of an SBT link to a stress category qualifies the category as relating to SBT, it is clear that further analysis is needed to determine whether SBT is a prominent theme in these novices' teaching stresses.

The entries in Table 14 make it clearer why I am hesitant to state that SBT is a prominent factor in these teachers' stresses. As the reader may recall, I divided the data into chunks where the novice talked about a single stress category wherever possible. As long as the participant talked about the same source(s) of stress, that turn or sequence of turns was coded as a single data chunk; therefore, data chunks could last for only part a single turn in the conversation or for several turns or pages. One reference to SBT in the data chunk implied that that chunk was related to attempts at SBT. The stress categories shown in italics are those related to SBT. The most salient 6 categories are shown in boldface. Note that one stress category was both strongly related to SBT (italicized categories) and salient (bolded categories) for my 6 teachers.

Table 14

Teacher Stress Categories Listed by Proportion Related to SBT

Teacher Stress Category	SBT	Total	% SBT
Directing student explorations of mathematics	*4*	*4*	*100.0%*
Planning lessons	*3*	*3*	*100.0%*
Relationships and communications with colleagues	*2*	*2*	*100.0%*
Responding to unexpected student ideas	*2*	*2*	*100.0%*
Managing classroom discussions	*10*	*17*	*58.8%*
Finding and utilizing resources	*1*	*2*	*50.0%*
Student diversity issues	*1*	*2*	*50.0%*
Assessing student understanding	1	3	33.3%
Working with technology	1	4	25.0%
After hours work/long hours	2	10	20.0%
Creating, aligning, modifying, or implementing curricula	2	11	18.2%
Learning and teaching unfamiliar content	1	7	14.3%
Responding to problematic student behaviors	2	25	8.0%
Dealing with class length, pace, or schedule	1	13	7.7%
Lack of student interest/motivation	1	29	3.4%
Preparing for, administering, and evaluating standardized tests	0	3	0.0%
Challenges associated with professional development	0	3	0.0%
Relationships and communications with administrators	0	5	0.0%
Relationships and communications with parents	0	4	0.0%
Relationships and communications with students	0	4	0.0%
Teacher boredom	0	2	0.0%
Teaching students of varying ability levels	0	4	0.0%
TOTAL	**34**	**159**	**21.4%**

Note. Italicized categories indicate those most strongly linked to novices' attempts at SBT (i.e. ≥ 50% of data chunks related to SBT). Bolded categories indicate those novices most commonly reported.

In Table 14, only the first 7 of the 22 teacher stress categories contain a substantial proportion (≥ 50%) of data chunks related to attempts at SBT. And of those 7 stress categories, only Managing classroom discussions was reported with relatively high frequency (i.e. at least ten data chunks) compared with the other 22 stresses in the table. I reported the example in the previous section about how Mr. Jones struggled to get students to engage meaningfully in their whole class discussions. He wanted most of the information to come from the students. This stress relates to Mr. Jones' attempts to

implement Standard 3, *Students' role in discourse*, because he was trying to bring students into a more central role in the classroom where they actively contributed meaningful mathematical ideas to the discussions.

Of the 7 categories in Table 14 that relate most strongly to attempts at SBT, Planning lessons, Relationships and communications with colleagues, Finding and utilizing resources, and Student diversity issues are interesting, because the definitions of those categories do not necessarily suggest strong links to attempts at SBT. But none of these were salient for these teachers. On the other hand, Relationships and communications with colleagues was a Main stress for Ms. Grant, primarily because she had difficulty finding teachers who thought the way that she did, particularly about treating the students humanely when disciplining them. While this is a worthy goal, it is not the primary domain of the NCTM (1991) Teaching Standards.

For the other 3 categories, Directing student explorations of mathematics, Responding to unexpected student ideas, and Managing classroom discussions (which was already discussed), the relationship to instruction that uses student inquiry and active student participation in discourse is at least slightly more obvious. For example, if a teacher is Directing student explorations of mathematics, it means that the activity is constructivist or discovery-based, so that the student is working at sense-making, which would make the activity worthwhile, fulfilling Standard 1, *Worthwhile mathematical tasks*. If a teacher did not intend to use unexpected student ideas as a meaningful part of the lesson, Responding to unexpected student ideas would not be stressful, because they would simply be dismissed. When a teacher treats such ideas as valid mathematical conjectures, s/he is working at least to meet Standard 3, *The students' role in discourse*.

It is also interesting to note that of all of these seven categories of teacher stress, only two were judged as Main stresses for at least one participant, namely Relationships and communications with colleagues and Managing classroom discussions (see Table 13). Relationships and communications with colleagues was judged to be a Main stress for the only teacher who reported it as a stress, while Managing classroom discussions was judged to be a Main stress by 2 of the 4 novices reporting that stress. Both of these stress categories were related to SBT for all of the teachers reporting them.

Because it appears that only Managing classroom discussions was a salient stress for the group of novices out of the seven stresses strongly related to attempts at SBT, it appears that these novices' attempts at SBT only contribute modestly to the teaching stresses that they experience.

I will give an example of the most frequently reported SBT-related category, Managing classroom discussions. This latter category was mentioned by four teachers, all of whom related it at least once to their attempts at SBT. Two of those four described their challenges with enough emphasis for this category to be judged as Main for them, although it is unclear whether all of those statements related to their attempts at SBT.

I will also illustrate what these stresses looked like with examples from two of the categories with the largest proportion of SBT-related data, namely Directing student explorations of mathematics and Planning lessons, which were mentioned by 4 and 3 teachers, respectively and neither of which was a Main stress for those teachers.

For example, two teachers described the challenges they faced Directing student explorations of mathematics, as students grappled with explorations of mathematical problems in the classroom. For example, during student explorations of prospective

congruency properties, Mr. Jones found that they did not understand the reasoning behind the instructions for the assignment, namely why they were attempting to create two different triangles using a prospective congruence theorem like SSA. As a result, Mr. Jones had to explain the assignment to several students individually, then to the class as a whole with what he perceived as limited success. Implementing a lesson that was based on student exploration of geometric concepts qualified this episode as relating to SBT.

> Mr. J: The challenging part was probably trying to get them to understand what they were doing, as far as why they were drawing two triangles, and telling them that we're trying to draw two triangles that are not congruent. They didn't really understand why. They didn't really understand why we cared about two congruent triangles. So maybe trying to do a better job of explaining why we want to figure out about two congruent triangles, or even why it was important, why we came to say they're congruent. Why do we have to have a minimum set of criteria? It would be very important to lay that out before we even tried to have any kind of activity where they had to figure out why the two triangles were congruent or not... And it's not an activity that's necessarily completely—the idea of it as far as them working with congruent triangles and seeing that there is a criteria that they need in order to prove two things, two triangles are congruent. But maybe a different activity. But it's going to require some thought (Post, 2.42-4.17).

Teachers reporting Planning lessons as an SBT-related stress struggled to find something interesting and engaging that would involve their students more in their lessons and connect to their experiences more than the textbooks that they were teaching from. For example, Ms. Price mentioned that she wanted to plan lessons to involve her students more and was co-planning with a colleague while they were piloting a new textbook with a more investigative approach to mathematics then their current textbook, namely *Discovering Algebra 2* by Key Curriculum Press.

> Ms. P: Yeah, like I feel like I have more sort of time right now, in that I have, I usually know where things are going. So I have more time to think about my lessons, rather than just make sure I have a lesson ready to go. So I can think more. My challenges now are just kind of making the lessons better, a lot of them. I was thinking of better ways to approach things or maybe hands on activities or computer lab, so it's not so—you know, to get the kids more involved. Things like that. That's what I kind of feel like I focus on a lot... And I'm also focusing on, because I'm teaching a new book. I'm teaching algebra 2 before which I've not taught before. And I'm teaching it out of a new book. I'm piloting that. So another teacher and I are having ongoing conversations about things we like about the book and things we don't like. And I'm finding myself having to supplement the book at certain points, and then skipping certain parts. So that's kind of a challenge, but hopefully it'll pay off in the end, when we finally use the book (Pre, 7.1-7.20).

Finally, an example of Managing classroom discussions comes from Mr. Jones' interviews. Mr. Jones was the only teacher who listed Managing classroom discussions as a "top" stress. Mr. Jones had a difficult time explaining why the ASA condition was sufficient to imply congruency conceptually. He had chosen to develop the proof conceptually, but the students struggled to understand what he was talking about, which made it more difficult for him to move forward with the discussion that he had planned. He also felt frustrated that he had not adhered to his pedagogical goal of having the students talk more than he did during the discussion. This frustration also appeared to be related to his frustration at trying to set up the conversation and the instructions for the task clearly enough so that the students could more meaningfully engage in that conversation. But he also wasn't entirely disappointed with the results of that discussion.

> Mr. J: I think I had only heard from three students about their ideas from the ASA criterion, but to me it was really hard to describe to all the students exactly how that relationship was in fact enough information. So I think that the students did a good job of talking about how the sides related. And I think that's what I wanted when I initially said, "Well, how

> could you describe in your best words how this works?" ...[But] I think that I did a little bit more talking than I should have... I remember the looks on the students' faces. Some of them got it. Some of them didn't. But I think that was okay for them to be frustrated right away. It was our first look at it. And I think it was okay for them to be frustrated with that, and maybe not understand exactly how the sides A, B matched up with the angle, and how all the sides and angles had to match up.
> ...
> Mr. J: I was frustrated with myself. And I think the students were frustrated... That was criteria number 4 and I wanted to talk about all of [the prospective congruence theorems] that day, so it was probably very frustrating to see that. And the students were maybe not getting it... It was a little frustrating that our conversation wasn't as meaningful, I thought, as it should have been (Post, 4.29-6.6).

Facilitative vs. Debilitative Stresses

I have described how these novices' stresses intersected with the existing teacher stress literature and how they interacted with their attempts at SBT, reporting that SBT appeared to contribute modest additional stress to novices' teaching lives. What I have not described is what type of impact the stresses these novices described appeared to have on them overall. That is what I attempt to address in the next section.

I asked five of the six participants which stresses were constructive or facilitative and which were nonconstructive or debilitative[5]. I gave the teachers examples of what one teacher called good stress (e.g., kids fighting her when she tries to get them to discuss ideas, concepts, and conjectures in mathematics class, because she feels she's doing her job well when she encourages this) and bad stress (e.g., when kids don't turn in their homework, because they can't move forward and there was little or nothing she could do to improve the situation). But I did not formally define these two constructs, because I wanted teachers to give me examples using their own definitions of these constructs.

[5] My interview with Ms. Boone went very long, so I either did not remember or did not choose to ask her this question.

Table 15

Novices' Facilitative and Debilitative Stresses

Participant	Stresses	
	Facilitative	**Debilitative**
Ms. Boone	[Not asked]	[Not asked]
Mr. Jones	Any challenge is constructive, because he learns from them and faces them with a positive attitude.	[None mentioned]
Ms. Grant	To be persistent with the students and almost to trick them, so that they can see that they can do math and be successful [Lack of student interest/motivation]. Technology issues, because they're "fixable," or in other words, because the students will work at becoming better, even though their skills and confidence are low [Working with technology].	[None mentioned]
Ms. Riley	Good stress is when they've attempted the homework, but got all the answers wrong [opposite of Lack of student interest/ motivation].	Bad stress is when they come in and haven't attempted homework or when they shut down and won't even try [Lack of student interest/ motivation]. Stresses for Ms. Riley are all pretty much bad, because stress takes it toll on her.
Ms. Price	If a student asks a questions and it catches her off guard and makes her think [Responding to unexpected student ideas]. Trying to come up with ways to get the students more engaged [Lack of student interest/motivation].	Behavioral issues, kids being off task, having to contact parents and write referrals. She says that these are things that she has no control over (e.g. a kid shouting out something in class) [Responding to problematic student behaviors].
Ms. Wells	The ways that she has now structured the grading system (using stamps for full effort to cut down on her grading and giving the students a warm up and a ticket out to assess understanding and as a means of getting them to start their homework in class) [After hours work/long hours].	[None mentioned]

All five novices described stresses that they felt were either constructive or facilitative. But even after being given an example of a stress that a teacher in the practicum or pilot study considered to be "bad stress" or debilitative, only two participants, Ms. Riley and Ms. Price, offered stresses that they considered to be nonconstructive. Table 15 summarizes the responses of the teachers to this question.

For the two teachers who offered examples of nonconstructive stress, both talked about Lack of student interest/motivation. Ms. Riley talked about students who haven't attempted their homework or when they shut down or won't even try. Ms. Price talked about students being off task. Ms. Price also talked behavioral issues, like a student shouting out something during class that she has no control over, as "bad" stress. Ms. Riley also said that all stress for her is bad, because they take their toll on her.

Of the five teachers who mentioned stresses that they considered constructive, one teacher, only Mr. Jones talked about all of his teaching challenges as being constructive, because he learns from them all. Ms. Wells said that her new method of grading has been a positive outcome that has at least partially resolved the time challenges (After hours work/long hours) that she faces. While it was not entirely clear that Ms. Wells understood the question, it was clear that she felt like her new grading system was a positive outgrowth of her time management and student engagement issues.

Ms. Grant said that being persistent with students and tricking them into seeing that they can be successful was a constructive stress for her (i.e. working on Lack of student interest/motivation). She also said that technology issues were constructive stresses for her, because they were "fixable" (i.e. Working with technology).

Ms. Price talked about students' ideas catching her off guard (i.e. Responding to unexpected student ideas) as good stress (which also relates to her attempts at SBT, because that only causes stress if the teacher is attending to student ideas). She also mentioned trying to get students more engaged, in other words, Lack of student interest/motivation, as a positive and constructive challenge. Like Ms. Price, Ms. Riley's constructive stress also related to student engagement, or Lack of student interest/motivation, describing positive stress as attempting all of the problems but getting them wrong, while negative stress for her was when students hadn't attempted any problems at all.

Ms. Grant, Ms. Price, Ms. Riley, and to some degree Ms. Wells all talked specifically about stresses related to Lack of student interest/motivation when discussing which stresses were constructive and nonconstructive. Ms. Grant and Ms. Wells talked about those issues as constructive. Ms. Riley talked about the Lack of student interest/motivation as being nonconstructive. And Ms. Price talked about issues of student engagement as being both nonconstructive and constructive. This strange phenomenon appears to have more to do with Ms. Price's assertion of how much control she has over the situation. Ms. Grant described student engagement as something she could control. Ms. Wells talked about how she responded to the challenge of motivating students and managing her time by implementing bell work, ticket out, and stamping homework. Ms. Riley described it as something that was frustrating; since she was talking about lack of student homework completion, that too would be out of her control once the students were in class. In Ms. Price's case, it could be either. If it was related to Responding to problematic student behaviors, Ms. Price was concerned that she could not

change it. But she did speak of the challenge of working to alter lessons to be more engaging as a constructive stress. That was an aspect of Lack of student interest/motivation that was clearly under her control.

Summary

In summary, these novices experienced many of the stresses predicted by the literature and several others that are, in some cases partially and in some cases completely, new to the literature. Also, as predicted by the literature, many of their salient stresses appeared to be related to their attempts to keep students engaged in the subject matter (in this case, mathematics) and to meet their classroom management goals. There was no clear pattern relating a participant's stresses to attempts at SBT. And it appeared that attempting SBT contributed only very modestly (at greatest) to these participants' teaching stresses.

Finally, there was some variance in the ways that novices viewed their challenges, from being entirely positive as opportunities for growth to being entirely negative because they took a toll on their resources. The novices generally identified the challenges of getting students motivated and engaged in their classrooms as constructive. But when students regularly misbehaved or chose not to participate, particularly if the teacher felt powerless to correct the situation effectively, the teachers described that as debilitative stress, because there was so little they could do about those challenges.

In the next chapter, I describe how novices coped with these challenges and, at times, whether they viewed those coping resources as effective.

Chapter 6: Coping Resources

In this second phase of the analysis, I examine and analyze the coping resources that these six novices reported. I also consider how those resources connect to the sources of teaching stress and to their reported and observed attempts at NCTM (1991) Standards-based teaching (SBT).

As a reminder, I define coping resources as means of avoiding, alleviating, or eliminating teaching stress; such resources take the form of physical assets, social relationships, or self. These three types of resources are means of dealing with, avoiding, or alleviating stress, whether targeted at the symptoms or at the sources of that stress. These resources may change the classroom context or the teacher's perceptions of that context or their relationship to it. I provide a conceptual mapping that shows how teacher stress is created and how coping resources mediate those stresses in Appendix C.

Coping Resource Framework: Categories of Resources and Examples

Before proceeding to the coping resources data analysis, I summarize the framework that I used in analyzing the data set. I invite the reader to review the Methods chapter for greater detail on this framework. Using the grounded or open coding method described by Glaser and Strauss (1967), I developed coding categories. In beginning the analysis, I looked for all of the teaching resources participants reported. As a reminder, by teaching resources, I mean any physical or virtual (i.e. Internet-derived) asset, social interaction or intervention, strategy, idea, or psychological technique that had the potential to help the teacher be more effective or comfortable in the act of teaching or to

alleviate stresses associated with teaching activities (see Appendix C). It is also important to reemphasize here that I have defined teaching broadly, as all acts and thinking related to classroom teaching, regardless of where or when those actions or thoughts took place.

After finding all teaching resources participants reported, I narrowed the list to only those that teachers attempted to use to alleviate their teaching stresses. If the teacher talked about the resource as alleviating stress generally, I placed that coping resource in the "GENERAL" stress category, a miscellaneous category only used when coding for coping resources. Then I sorted it into the four following categories that appeared to describe trends in the data: Social, Collective, Self, and Physical.

As a reminder, Social resources consisted of obtaining help or advice from peers, such as administrators, other teachers, friends, relatives, students, parents, etc. Collective resources were a specific subclass of Social resources involving a group of peers that met regularly in an organized fashion and with a specific purpose in mind (i.e. not for informal venting or sharing of information about students). Self as a resource involved using one's own creative ideas, pedagogical strategies, management strategies, or intrapsychic methods to alleviate stress. Physical coping resources involved using existing physical materials to cope with stresses, including the Internet, books, other teacher's lesson plans, new seating arrangements, etc.

Clearly there are some overlaps between these categories. I invite the reader to review the Methods chapter for a more thorough description of these categories and how overlaps between them were resolved. But one particular overlap needs to be readdressed at this time, namely the difference between Social and Collective coping resources.

A teacher community (a Collective coping resource) can create interactions that act as Social coping resources for teachers. During interviews, it was not always clear whether the Social coping interactions teachers experienced would have occurred without the framework of their teacher community. So it is possible that some coping resources coded as Social should have been coded as Collective. Because of the strong and often blurred relationship between these two categories, at times I will group them together as "socially oriented" coping resources and at other times and at other times separately, when creating a distinction between the two sheds more light on the novice's coping.

Finally, I looked to see if there were links between the coping resources these novices employed and their attempts at SBT. In the next section, I show the prominence of these coping resource categories in alleviating the participants' teaching stresses.

Results: Group Analysis

Before beginning to describe the results of the group analysis, I foreshadow results presented in this chapter. I begin by looking at those coping resources that participants reported most frequently, as well as those that they identified as their most effective, or "top," coping resources. I then consider for which categories of teaching stress novices most commonly reported coping resources and what type of resources they reported. I look across the group at how effective each participant found their coping resources for teaching stress categories judged to be a Main stress for at least one novice. I look at each participant's case study individually to discuss which stresses they reported coping resources and whether those coping resources supported or related to the participant's attempts at SBT. Finally, I discuss and summarize the results of this chapter.

Most frequently reported coping resources.

In looking across the results for each participant's coping resources sorted by category (see Table 16), some very striking results become evident. Clearly, Social is the most frequently mentioned category of coping resources overall and for each individual participant. The Self category is the second most frequently mentioned category for the group as a whole as well as for each participant. The Physical and Collective categories are both infrequently reported by all participants and their overall percentages are quite small compared to the percentage of Social and Self coping resources.

Table 16

Frequency of Report of Coping Resource Categories

	Social	Collective	Self	Physical	Total
Ms. B	11	1	7	3	22
Ms. G	8	0	5	3	16
Mr. J	15	2	8	1	26
Ms. P	13	0	5	2	20
Ms. R	7	0	5	0	12
Ms. W	12	3	5	2	22
Total	66	6	35	11	118
Percent	55.9%	5.1%	29.7%	9.3%	100.0%

You will notice in Table 16 that I have chosen to list Collective next to Social coping resources rather than keeping the categories in the order of frequency of report. I digress to explain this choice. This is in keeping with the close ties that I previously described between these two categories that I previously described.

Most effective, or "top," coping resources.

When the participants were asked what their most effective coping or "top" resources were in alleviating their teaching stresses, I judged that all of their answers indicated that they judged their socially oriented coping resources as their most effective and important. All of the novices except for Ms. Wells candidly and clearly stated that their most effective coping resource was their teaching colleague(s).

Although Ms. Wells was not asked[6] which coping resource was her most effective, 15 of her 22 reported coping resources were socially-oriented (i.e. Social or Collective) (see Table 16). This was the highest percentage of socially-oriented coping resources (68.2%) of any participant in this study; therefore, she was judged by the researcher as valuing those resources as most effective overall, as well. Because Ms. Wells also said during our interviews how helpful all of her teaching peers were without emphasizing any teacher over another, I judged that her teaching peers in general were her most effective resource, particularly for dealing with curriculum-related stresses.

So Ms. Boone and Ms. Price reported and Ms. Wells was judged as rating their teaching colleagues as their most effective teaching resources. All three of them described many teachers with whom they conversed, but they did not rank one resource above another when asked directly; indeed, Ms. Wells, in particular, specifically stated that there was not one person that she valued as a resource more than another.

Ms. Riley and Mr. Jones reported that their mentors were their most important coping resources. Ms. Riley reported a single mentor, while Mr. Jones circumstances were unusual, so he actually had access to two mentors, his internship year mentor and his formal teaching mentor. I will elaborate on this situation in Mr. Jones' case study. Mr.

[6] Ms. Wells was not asked this question either because her final interview ran long or due to interviewer error.

Jones also volunteered (prior to being asked) a second top coping resource, namely keeping himself and his students organized, which falls in the Self category.

So the top coping resources were generally socially oriented with one exception where a teacher mentioned two "top" coping resources. In the next section, I discuss what types of stresses each category of coping resources was employed to alleviate.

Coping resources overall.

Table 17

Coping Resource Category Frequency Listed by Connection to Teacher Stress Category

Stress categories	Social	Collective	Self	Physical	Total
Responding to problematic student behaviors	24		7		31
Creating, aligning, modifying, or implementing curricula	9	4	2	6	21
GENERAL	11		3		14
Lack of student interest/motivation	5	1	5	1	12
Managing classroom discussions	5		6		11
Planning lessons	6		2	3	11
Learning and teaching unfamiliar content	7		3		10
Working with technology	6		1		7
After hours work/long hours	2		3		5
Challenges associated with professional development	3				3
Relationships and communications with students	1		1		2
Responding to unexpected student ideas			1		1
Relationships and communications with parents			1		1
Teaching students of varying abilities				1	1
Dealing with class length, pace, or schedule	1				1
Student diversity issues			1		1
Assessing student understanding			1		1
Relationships and communications with administrators	1				1
Directing student explorations of mathematics					0
Relationships and communications with peers					0
Preparing for, administering and evaluating standardized tests					0
Finding and utilizing resources					0
Teacher boredom					0
TOTAL	81	5	37	11	134

Note. I judged coping resources as effective (E), somewhat effective (S), or ineffective (I), as listed in the table for the Social, Collective, Self, and Physical categories of coping resources.

Table 17 lists the 22 categories of teaching stresses that the four different categories of coping resources were employed to alleviate. One result that Table 17 suggests is that Social and Self coping resources were both used to alleviate a wide variety of categories of teaching stress. It is also clear from Table 17 that, while less commonly reported, Collective and Physical coping resources were primarily used for alleviating stresses related to Creating, aligning, modifying, or implementing curricula. Physical coping resources also often relieved stresses related to Lesson planning, as mentioned in discussions of the relevant categories of coping resources in this chapter.

The stress categories that teachers most often reported as being addressed by their reported coping resources were Responding to problematic student behaviors, Creating, aligning, modifying, or implementing curricula and in general (i.e. the GENERAL category in Table 17). They also commonly reported that coping resources addressed the following stresses: Lack of student interest/motivation, Managing classroom discussions, Planning lessons, and Learning and teaching unfamiliar content.

I will give an example of each of the two stress categories for which coping resources were most often employed, namely Responding to problematic student behaviors and Creating, aligning, modifying, or implementing curricula. Participants reported Social and Self resources when Responding to problematic student behaviors. An example of a Self coping resource from Ms. Wells' class follows:

> Ms. W: In fifth hour...while we were going through [the exit assignment], they were very, very talkative. And...I'll stand up there and be quiet, and I'll wait...but as soon as I start to talk, they start talking again... So today...instead of dealing with it, I had a select group...that

were really paying attention. So I went over the last example that I had to go over... And made sure the ones that were paying attention really knew how to do it. And then I said, "You know what? Clear your desks, because this is a pop quiz." And I turned their [exit assignment] into a pop quiz... It's just like, "Let their grade take a hit." ...And a lot of parents check... And if they're not in line, we have a two-week break coming up. They're not going to see a lot of free time... (Post, 12.6-13.4).

In the previous example, Ms. Wells gave her students a pop quiz as punishment when they wouldn't stop talking during the discussion of an in-class assignment. The pop quiz was a specific strategy, or Self resource, that she used to deal with flagrant student talking. As a reminder, while such strategies may come from any source, I consider them the teacher's own once acquired, so I judged this to be a Self strategy.

Participants reported coping resources in all four categories to alleviate stresses related to Creating, aligning, modifying, or implementing curricula. An example of a Collective coping resource used for Creating, aligning, modifying, or implementing curricula follows:

Ms. W: So we use [the Heath textbook]. And in all actuality, myself and some of the other teachers, because we have the McDougal Littell series for Algebra 2, we have a couple of floating copies of the geometry one. And a lot of times we'll go to the McDougal Littell one, because it lays it out a little bit nicer. So we can kind of use both... And right now, our algebra text is really outdated. But for now, I guess we have to stay with our outdated one, because we're working with...the Cognitive Tutor, the Carnegie learning program [a computer-based algebra curriculum]... As a department, we're not too thrilled about it, [so] we kind of do both...[Cognitive Tutor] has a computer component and then it also has the workbook component with the student response and problem-based learning approach... So as a department, we all use [the Heath Geometry] text as our primary text... And we all just kind of share. "Oh, did you see the Cognitive Tutor problems for this section?" Or "This unit's really good in the Cognitive Tutor book, so let's use the Cognitive Tutor as our primary text" (Pre, 1.15-3.7).

Ms. Wells said that the department worked together regularly when Creating, aligning, modifying, or implementing curricula. I judged this as a Collective rather than Social coping resource, because there were five teachers that met. Ms. Wells mentioned that her department met regularly to discuss teaching issues, including every day at lunch (Post, 29.23-29.36). She said that it was not just to gripe about students, but to talk about management strategies and curriculum, so I judged this resource to be Collective.

An example of a Physical coping resource used by Ms. Boone to alleviate stresses related to Creating, aligning, modifying, or implementing curricula follows:

> Ms. B: Yeah. I don't use the textbook very much at all. I hate our textbooks... I have big issues with textbooks in general. I just think that they're too busy... So books, that's kind of like my last resort. I really enjoy utilizing the Internet. So I do that a lot... Right now, visual calculus is very useful for me right now for my Calculus class, not for this class so much. There's a [website] called purple math—I can't remember... something like that. The Illuminations website for NCTM. I've gotten some stuff off of there... There are other ones that I frequent (Pre, 7.13-7.40).

Ms. Boone didn't like her textbook for calculus. She also reported that she didn't share much in common in teaching style with the previous calculus teacher, so she resorted to looking on the Internet to find or create activities that helped make Calculus more visual and hands on for her students. This helped alleviate stress related to Creating, aligning, modifying, or implementing curricula in her AP Calculus course.

I now return to the whole group and look at the overall effectiveness of their coping resources for each of their Main stresses (see Table 18). Since these stresses appeared to be the most salient and significant for the participants, I focus my attention on them to determine the effectiveness of these novices' coping resources. In Table 18, I

list only 12 stress categories, because only 12 of the 22 stress categories were Main stresses for at least one participant.

In Table 18, notice that the coping resources are listed as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U) for each participant overall. For each individual coping resource in each category, I made the judgment by first looking at each resource and determining whether the teacher described the resource as being effective, inconsistently or moderately effective which I have labeled as somewhat, or relatively ineffective at alleviating stress. If no coping resource was mentioned or if its alleviating influence on the stress was not clear, I judged that the effectiveness was Unclear.

Table 18

Main Stress Categories and Coping Resource Effectiveness Listed by Participant Initial

Stress categories	Coping resource effectiveness			
	E	S	I	U
Working with technology	G			
Creating, aligning, modifying, or implementing curricula	B			
Assessing student understanding	J			
Lack of student interest/motivation	B, J, W	P	G	R
Responding to problematic student behaviors		B, J, P, W		
Managing classroom discussions		J, R		
After hours work/long hours		B, W		
Relationships and communications with administrators		R		B
Challenges associated with professional development			B	
Dealing with class length, pace, or schedule				J, R
Relationships and communications with colleagues				G
Teacher boredom				G

Note. Categories are listed in order of proportion of effective coping resources judged as Effective (E), somewhat effective (S), Ineffective (I), or Unclear (U).

I judged the overall effectiveness of each participant's coping resources in each stress category by assigning values to each coping resource reported that was judged as Effective (+1), Somewhat effective (0), or Ineffective (-1), then computing the average of

those scores. If the average effectiveness fell in the range of (1/2, 1], I judged that the coping resources were effective for that category of stress. If it fell in [-1/2, +1/2], I judged that the coping resources were somewhat effective for that stress. And if it fell in [-1, -1/2), I judged that the coping resources were ineffective for that stress.

One notable trend in Table 18 is that teachers described coping resources for their Main stresses with similar levels of effectiveness as other participants. For the four Main stress categories with more than one teacher listed, all of the teachers employing coping resources to alleviate those stresses did so with similar levels of effectiveness.

It is also clear from Table 18 that teachers had either effective or somewhat effective coping resources for the majority of their Main stresses. Only 2 of the 18 Main stresses novices reported were judged overall as having ineffective coping resources associated with them. Notice also that there were an additional 6 stress categories for which there was insufficient evidence to judge the effectiveness of their coping resources.

In Table 18, notice that there are four Main stress categories for which teachers primarily reported effective coping resources, namely Working with technology, Creating, aligning, modifying, or implementing curricula, Assessing student understanding, and Lack of student interest/motivation. I share an example from the most commonly reported of these, Lack of student interest/motivation, from Ms. Wells' class, for which she reported effective coping resources:

> Ms. W: ...And then the kids also generate some ideas. We follow the Baldridge model that we've been trying, as a school, to implement... We ask the kids for feedback, like, "How would you like to learn these? How would you like to learn this topic?" Or "What's working for you?" And like I said, that's where I got the feedback from the kids saying, "We need worksheets. We don't like to do homework from the book, because

> the questions are really confusing, so it's easier when you give us a worksheet." ...So I get feedback from them, too, like and some of them are like, "We like to do groupwork." And so that steers my thinking, and I'm like, "Well, how can I design things with a more group feel." They generate a lot of the ideas to help you think (Pre, 13.41-14.7).

Ms. Wells said that this strategy was effective at getting students more engaged in her lessons, because she directly addressed students' concerns and let them come up with teaching strategies that were effective for them. She later reported being consistently open to student suggestions about how to improve her teaching (Post 21.9-21.14).

Responding to problematic student behaviors, Managing classroom discussions, After hours work/long hours, and Relationships and communications with administrators were Main stresses for which participants appeared to have somewhat effective coping resources. An example of how Ms. Price employed a somewhat effective Social coping resource for the most commonly reported of these stress categories, namely Responding to problematic student behaviors, follows:

> Ms. P: I can't just have a discipline plan that's going to work for every student. I kind of have to take it case by case... The administrators will be supportive sometimes, too. Sometimes you'll talk to an administrator about a particular student and you'll set up a plan where if this student comes in and they're not doing the things they're supposed to be doing. They'll get sent down there right away, so they don't become a problem.
> I: Is there a particular administrator you generally talk to?
> Ms. P: Well, it's alphabetical for the kids, so it depends. We have three assistant principals, so if my student has the last name "B," I have to go to this one. So I don't really get to pick. I've talked to [the principal] about a couple [of] students where the parents have called here or I've had to call the parents. But usually it's an assistant principal (Pre, 8.8-8.22).

Ms. Price expressed that the administrators were only sometimes supportive. She also mentioned a plan for assigning students to an assistant principal that sorted them by

their last names. So she was dealing with different assistant principals, depending on the student. So I judged that she was saying, at least in this case, that her administrators were only somewhat effective, because they were "supportive sometimes."

Challenges associated with professional development is the only Main category for which participants (in this case, Ms. Boone) reported having ineffective coping resources. In Ms. Boone's case study, I will share the specific quote involving her Challenges associated with professional development and how she attempted to employ her coping resources to deal with them in her case study. Here, I summarize those explanations.

Ms. Boone was disappointed and frustrated that a district-sponsored workshop she was required to attend as a second-year teacher was a first-year teacher orientation. She and her peers had specifically asked the administration for a teambuilding experience. The teachers went to the administration afterwards to talk about what they would like the following year, but because the group couldn't agree, the administration told them to take courses at the university, which was also not a satisfying resolution for Ms. Boone.

Finally, there were three Main stress categories for which it was unclear whether participants' had any coping resources that helped them deal with those challenges, namely Relationships and communications with colleagues, Teacher boredom, and Dealing with class length, pace, or schedule. Due to this lack of data, it was difficult to know whether they had means of alleviating those stresses or not.

An example of one of these categories that did not have any coping resources overtly linked to it was Ms. Riley's struggles with Dealing with class length, pace, or schedule. Ms. Riley clearly stated that the trimester schedule was challenging, because of

the very regimented schedule it caused her to keep. She said that she had to cover the same number of topics in two-thirds the number of days each semester, but got longer class periods in exchange. She did not report any coping resources for dealing with that stress, nor did she report an absence of resources for dealing with that stress, except perhaps for "very regimented schedules." As a result, the effectiveness of her resources for Dealing with class length, pace, or schedule were judged to be "Unclear."

In summary, it was clear that these teachers felt that their coping resources were effective or somewhat effective to meet nearly all of the Main stresses for which they reported coping resources. Indeed, there was only 1 Main stress of the 12 listed in Table 18 for which teachers overall reported ineffective coping resources and 3 for which the effectiveness of their resources were unclear.

I now turn to consider each novice's coping resources individually, reflecting on how the participants described coping with the Main stresses that they experienced, how effective those resources were, and whether those coping resources supported any of the novices' attempts at SBT.

Coping Resources: Results by Participant

In the following participant summaries, I describe and share examples of their top coping resource(s). Then I examine how effective their coping resources were at alleviating their Main stresses (which implies, as a reminder, all of their top stresses, as well). Finally, I attempt to determine whether their coping resources appeared to support their attempts at SBT from the available data.

Ms. Boone.

Ms. Boone reported that her most important coping resources were socially oriented. While it was unclear whether she meant Social or Collective, Ms. Boone did report coping resources in both areas. The following quote illustrates Ms. Boone's report of her most effective coping resources:

> I: Which of the resources that you've talked about have been most effective?
> Ms. B: I'd say my peers, teachers. I've got a lot of friends that happen to be teachers that teach here. So they're my resources as far as like little things. If I'm having a big issue, I have other people in the building that I can go to. And for me, talking things out helps so much... So communication with my fellow peers and teachers and colleagues is definitely the biggest thing that helps relieve that stress and the biggest resource that I have to fall back on (Post, 15.20-15.34).

In this passage, Ms. Boone's stresses were coded as GENERAL stresses. The coping resource(s) that Ms. Boone employed in meeting those stresses were her fellow peers, teachers, and colleagues.

In Table 19, Ms. Boone's reported stresses are listed with the coping resources she used to alleviate them and the frequency of report and effectiveness of those resources. The stresses are sorted by average overall effectiveness of the coping resources employed to alleviate them. I eliminated ties by listing categories with the most coping resource statements first. I used this same methodology for all novices' tables in this chapter.

Ms. Boone mentioned effective coping resources for two of her six Main stresses, Creating, aligning, modifying, or implementing curricula and Lack of student interest/motivation. She mentioned having somewhat effective resources for dealing with

Responding to problematic student behaviors and After hours work/long hours. Ms. Boone reported ineffective coping resources for dealing with her Challenges associated with professional development. She did not report any coping resources for Relationships and communications with administrators[7]. I give examples of each of these stress categories and the coping resources she employed to alleviate them.

Table 19

Coping Resource Effectiveness for Ms. Boone's Main Stresses

Stress categories for Ms. Boone	Coping Resource Frequency and Effectiveness				Overall
	E	S	I	U	
Creating, aligning, modifying, or implementing curricula	4				E
Lack of student interest/motivation	1				E
Responding to problematic student behaviors	2	2			S
After hours work/long hours	1	1			S
Challenges associated with professional development			2		I
Relationships and communications with administrators					U
TOTAL	14	5	3	0	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

For Creating, aligning, modifying, or implementing curricula, Ms. Boone was judged as having effective coping resources, including her math colleagues.

> Ms. B: We generally are very collaborative. So a lot of what we come up with comes from us talking it out and creating our own problems... We used to [talk] a lot more last year, because Ms. Horne and I used to have the same prep... Ideally, [this year] the grand plan was to meet once every one to two weeks. We've been more on a 3-week schedule. Pretty much whenever a unit starts, we'll get together and talk (Pre, 7.43-8.33).

[7] Because coping resources were asked for generally, but not specifically related to any teaching stress, it is difficult to judge exactly what the lack of data means for any given teaching stress.

Ms. Boone later identified Ms. Horne, Ms. Knowles, and Mr. Jones (also a participant in this study) as specific colleagues with whom she shares ideas. They are Social coping resources, because Ms. Boone did not describe them as meeting as a group, so the resource was not necessarily Collective.

For Lack of student interest/motivation, Ms. Boone reported effective coping resources. An example of a Self coping resource she reported follows:

> Ms. B: And I've just found the best way to address it is to address it with that student right away. You know, just call them out on it. "I see you're not doing your work," you know. And I think that that helps so much... It can be so easy if you have a kid there that's not motivated and not causing a distraction to ignore them. But that's not doing anybody any good, so (Post, 12.40-13.12).

While she realized that it would be easy to ignore a disengaged student who was not causing any distractions, Ms. Boone chose to address those issues immediately and directly to motivate the student to participate. Because she said that that it was the best way to address the behavior and that "it helped so much," I judged this resource as effective at helping her deal with student engagement.

For both Responding to problematic student behaviors and After hours work/long hours, Ms. Boone's coping resources were only somewhat effective overall (see Table 19). In discussing Responding to problematic student behaviors, she described how she calmed herself down when she felt like the students' behaviors were stressing her out.

> Ms. B: As far as discipline goes, that can be stressful sometimes. But if I find myself getting stressed out about it, I try to remind myself that they

> are high school students. And that they are young. And that this is how they act. And that I'm the adult. And I need to respond to it in a mature way. And that calms me down (Post, 11.13-11.17).

I judged this coping resource as somewhat effective, because it did not appear to be a long-term plan for dealing with this stress. It seemed like it helped Ms. Boone deal with the immediate impact of the stress, but did not actually changing student behavior. An example of a Self coping resource that was only somewhat effective at alleviating stresses in the category of <u>After hours work/long hours</u> follows:

> Ms. B: [I need help with]...the amount of time I spend doing things. Like if somehow they could find out a way to give me more time or resources... [But] I have noticed within myself, I've gotten faster at doing certain types of things. And I don't him and haw and change and mess with the font and this and that, you know, quite as much as I used to (Post, 15.40-16.6).

While it appeared Ms. Boone was developing strategies to alleviate her stresses related to <u>After hours work/long hours</u>, she said that she still had trouble with the amount of time that, in particular, planning took her, even though things had improved over time.

Finally, one stress category for which Ms. Boone appeared to have relatively ineffective coping resources was <u>Challenges associated with professional development</u>. She specifically mentioned those Social resources in the following excerpt:

> Ms. B: We had two first year teachers. And the rest of us...were all in our second or third year. And we felt like it was such a cop out to [send us to a new teacher orientation] ...So we went to the principal and expressed our frustration... We had all these great ideas. Why not require us to go to a conference in our subject area? ...Maybe we should go to [a] website class...We were like, why don't we do a book review... And they took

down all these ideas, [but]...it just never really went anywhere (Post, 9.23-10.2).

Ms. Boone and her colleagues tried to come up with a better professional development plan, but they couldn't agree on one, so they ended up taking MU courses the next year. So I judged that her Social coping resources for dealing with her Challenges associated with professional development were ineffective.

Three of Ms. Boone's six Main stresses were also related to her attempts at SBT, namely Creating, aligning, modifying and implementing curricula, Responding to problematic student behaviors, and After hours work/long hours.

For Responding to problematic student behaviors and After hours work/long hours, there were no clear instances where coping resources helped resolved stresses related to her attempts at SBT. However, for Creating, aligning, modifying and implementing curricula, Ms. Boone's struggles were related to her attempts at SBT in at least one of her descriptions of the related stresses.

Ms. Boone was trying to teach in hands-on, exploratory ways to develop intuitive mathematical concepts in her Calculus class, so she looked for resources on the Internet, particularly at the visual calculus and Java applets that could make her Calculus class more discovery-oriented. This related to her attempts at SBT, because she was trying to engage the students in worthwhile mathematical activities (NCTM Standard 1) that would develop their understanding of the mathematical concepts in Calculus.

Overall, Ms. Boone's coping resources appeared to be only somewhat effective, because the effectiveness of her resources were quite mixed (in terms of being effective, somewhat effective, and ineffective) for her Main stresses.

Ms. Grant.

Like Ms. Boone, Ms. Grant's most important resources were socially oriented. While she mentioned several teaching colleagues and relatives that she interacted with about her teaching stresses, she named her department chair as her top coping resource. A quote that describes her relationship with her department chair follows:

> Ms. G: Probably my department chair is my best support, just because he needs support from me, too, a lot. We're good at like bouncing things off each other...and he's gone through the MU program (Post, 22.26-24.18).

Interestingly, Ms. Grant felt like her department chair was a good support, because they both helped and supported each other, rather than feeling like that support was only in her service. Even though they were not teaching similar courses, she could go to him to share ideas and to talk about her teaching.

Like her peers, Ms. Grant reported Social and Self coping resources, in that order, with the greatest frequency for dealing with her teaching stresses. For Social resources, Ms. Grant says she talks to different people depending on the problem. For example, she vented to her husband, got technical help and teaching ideas from the computer teacher, got teaching ideas from the department chair, and talked to the principal about teaching and discipline. Her Self category included several strategies, such as creative lesson planning, palliation, exploring cultural differences to allow students to teach her something, and moving away from tasks that went awry during in-class discussions.

Table 20

Coping Resource Effectiveness for Ms. Grant's Main Stresses

Stress categories for Ms. Grant	Coping Resource Frequency and Effectiveness				Overall
	E	S	I	U	
Working with technology	4	3			E
Lack of student interest/motivation		1	1		S
Relationships and communications with colleagues					U
Teacher boredom					U
TOTAL	4	4	1	0	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

Ms. Grant's four Main challenges were Working with technology, Lack of student interest/motivation, Relationships and communications with colleagues, and Teacher boredom (see Table 20). For the last two, Relationships and communications with colleagues and Teacher boredom, it was unclear whether she had any coping resources for dealing with her challenges in those categories.

For Working with technology, her coping resources were effective at dealing with this category of stress, with Social coping resources being the most frequently mentioned. An example of an effective Social coping resource for Working with technology follows:

> Ms. G: And at this point, I feel like they should know the basic keystrokes of entering an equation, using zoom efficiently, and finding a good window...and they just don't know yet how to troubleshoot themselves. So I feel like I have to wind around the room. And I have like people calling me all the time.
> Ms. G: ...And I actually had to talk to the computer teacher about it, because I thought, "Geez, he teaches this stuff all the time, like step by step things. You know, how does he not go crazy?" And he suggested having people who are really proficient actually act as kind of like monitors while it's going on. It's a good idea, you know, helping people. It helps when they have friends next to them, you know. The more I use it,

> the better I can point things out before they're lost in CalculatorLand (Post, 12.17-14.29).

So Ms. Grant felt frustrated by how little knowledge her students had of the calculator, even though they were supposed to have learned how to use them in middle school. But she got help from the computer teacher who suggested that she use proficient students as teachers' aides to help her get her other students' questions answered in a more timely fashion and with less running around. And she pointed out that it was a helpful strategy that worked even better the more that she used it. Because she talked about it as positive and improving, I judged that this coping resource was effective.

For Ms. Grant's remaining Main challenge, Lack of student interest/motivation, she had few coping resources. Her coping resources were only somewhat effective at alleviating her stress. An example of a Physical coping resource that was somewhat effective at alleviating stress due to Lack of student interest/motivation follows:

> Ms. G: I'm looking for published, engaging [resources] on the Internet... [But] so much of the things they call engaging lessons are still just kind of different ways to do notes. Or like just a little piece of something. It's not really pushing them to the next level that I want. The book provides projects and things, but those again aren't pushing them really. It's like you're going to make a carnival, so choose some rides and how much would it cost? It's [just] not there... My most successful spots are the virtual manipulatives, so that way I can plan a lesson and they have something to do during it (Post, 16.35-17.16).

Clearly Ms. Grant found many different types of resources on the Internet, but only a few of them, particularly virtual manipulatives, were effective at helping her to do the kind of teaching that she wanted to do. Because so few of the things that she found

were useful to her, I judged that these Physical resources were only somewhat effective at alleviating her stresses related to Lack of student interest/motivation.

Two of Ms. Grant's four Main stresses, namely Working with technology and Relationships and communications with colleagues, related to her attempts at SBT. There were no instances that I found relating Relationships and communications with colleagues to Ms. Grant's attempts at SBT.

There were at least two instances where Working with technology appeared to relate Ms. Grant's coping resources to her attempts at SBT. First, the computer teacher advised her to use student as monitors who were advanced technology users to help her answer student questions. This allowed her to use technology in her classroom in ways where she and the class would explore concepts with the calculator (Post, 2.16-2.30).

The second instance, also shared in a quote above, related to Ms. Grant's attempts to find resources online. She found that many of the things online were only different ways for students to take notes (i.e. used the lecture format) or were not worthwhile mathematical tasks, like the carnival projects. She felt like the virtual manipulatives were some of the only engaging activities that pushed her students mathematically. Since Ms. Grant describes the virtual manipulatives as engaging tasks that push her students mathematically, she meets the first NCTM (1991) Standard, *Worthwhile mathematical tasks*, so it appears that these resources supported her attempts at SBT.

Overall, because Ms. Grant's coping resources for the only two Main challenges for which she identified resources were effective in one case and somewhat effective in the other, I judged that her coping resources were somewhat effective.

Mr. Jones.

Mr. Jones reported that his top coping resource were working with his mentor teachers, which is a Social coping resource, and keeping himself and his students organized, which is a Self coping resource. Because Mr. Jones was hired by the school where he interned, he continued to seek help from his internship-year mentor, as well as seeking out his current, school-assigned teaching mentor for help and advice. A quote describing his interactions with these two mentors follows:

> I: Which of your resources are most effective in dealing with these things?
> Mr. J: ...If I'm really struggling or really frustrated, I like to try to figure things out for myself. But if I get to the point that I can't do it, I usually go to my mentor teachers. My mentor this year, Ms. Knowles, I talk to quite a bit. And you know, if she's not there, I talk to my mentor that I had when I interned here, [Ms. Horne] (Post, 23.10-23.18).

So Mr. Jones said that he liked to go to his mentor teachers if he was really struggling or frustrated. He generally went to talk with his current mentor teacher, Ms. Knowles, and if she was not available, he would talk with his mentor teacher from his internship at Maple High School, Ms. Horne.

Mr. Jones also talked about a second top coping resource, keeping himself and his students organized.

> Mr. J: The best thing that helps me to deal with my stress on a daily basis is probably my organization. I'm kind of a stickler about being organized. And I make sure my students are organized, so that helps me and it helps them. So it does help the stress level that I'm organized about my work [and do] good planning... It [keeps] me from worrying about "What do I have to do tomorrow? Where do I look for things?" (Pre, 1.14-1.33).

Mr. Jones said that his organization helped him deal with daily teaching stresses, so he didn't have to wonder where things were or what his plans were for the next day.

While Mr. Jones reported that his Social and Self coping resources were his most effective coping resources, he, like the other novices, reported Social resources with greater frequency than any other category (see Table 16). In addition to receiving help from his mentors, he also mentioned how administrators helped him with management issues, observed his teaching, and gave him constructive criticism.

Table 21

Coping Resource Effectiveness for Mr. Jones' Main Stresses

Stress categories for Mr. Jones	Coping Resource Frequency and Effectiveness				Overall
	E	S	I	U	
Lack of student interest/motivation	4	2			E
Assessing student understanding	1			1	E
Responding to problematic student behaviors	2		1	3	S
Managing classroom discussions		3			S
Dealing with class length, pace, or schedule					U
TOTAL	7	5	1	4	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

Mr. Jones' five Main stresses were Lack of student interest/motivation, Assessing student understanding, Responding to problematic student behaviors, Managing classroom discussions, and Dealing with class, length, pace, or schedule (see Table 21). For Dealing with class length, pace, or schedule, Mr. Jones did not report whether he had any coping resources to address those concerns.

For Lack of student interest/motivation, Mr. Jones' mentioned Social, Collective, and Self coping resources which were effective overall in alleviating those stresses. An

example of an effective Collective coping resource for the stress category of Lack of student interest/motivation follows:

> Mr. J: My first hour [is] challenging in a motivational kind of way...They're in a 1B, which is, if you take Integrated 1 and break it up in two semesters, they're taking the second semester, and they spread that out over the whole year...so it's a lot slower-pace. They have a lot of time to see material, which could be boring sometimes. And it's a real challenge to make it really interesting for them and to get them excited about it when they don't really care, because they already know, "I'm in the slower track. Who cares about me? I don't care about math." So...[for] the 1B, we just pull things from anywhere, so we use the textbook, but we come up with a lot of things on our own... As a math department, we probably work together every single day [during] lunch time, between classes, before and after school for 20 or 30 minutes (Pre, 3.32-4.18).

So Mr. Jones' Collective resource involved working with his department pretty much every day, talking about how to make lessons interesting for their students, particularly for those in the slow-paced sections of the Integrated courses that he taught.

For Mr. Jones' stresses while Assessing student understanding, his Self coping resources appeared to be effective at helping him deal with those stresses. An example of a Self coping resource that alleviated stresses in several categories, including the Assessing student understanding category, follows:

> Mr. J: Well, I'd say [my organization] eliminates me from worrying about "What do I have to do tomorrow? Where do I look for things?" I have three different systems that I use to organize all of my different plans. I have the system up here with the hanging folders with all of the assignments up there for myself, labeled by subject...and for each unit. So for the Integrated 2 course that you're going to be looking at, I had the first three units in there and all of the worksheets that they've done (Pre, 1.14-1.33).

The stresses alleviated by Mr. Jones' organization include Planning lessons, Assessing student understanding, and GENERAL, but here we are focusing on the Main stress of Assessing student understanding and how Mr. Jones' organization helped alleviate that stress for him. It appeared that being able to find hard the blank and completed assignments helped to alleviate Mr. Jones' stresses in this area.

For Responding to problematic student behaviors, Mr. Jones' only resources were Social. And they appeared to be effective at alleviating those stresses. An example of a Social coping resource for Responding to problematic student behaviors follows:

> Mr. J: I usually talk to the assistant principal, Mr. Thomas. He's a former teacher in the Inner-City School District. And he has a lot of different strategies for discipline. I usually go talk to him about strategies for that. And with my former mentor teacher when I interned here, Ms. Knowles, we worked really hard on class management. And so I think I have a good strategy for class management, as far as discipline, behavior. I am pretty strict about that..., so I usually don't have too big of a problem (Pre, 5.40-6.2).

Mr. Jones said that he had a good strategy for classroom management, so I judged that his resources for Responding to problematic student behaviors were effective. While Mr. Jones said discipline wasn't usually a big problem, at other points during our interviews he talked about the ongoing discipline challenges that he still faced, particularly during his first and sixth hour classes (Post, 18.24-18.31) and later named it as his third biggest teaching challenge (Post, 21.41-22.2), so there is evidence that classroom management was a challenge for him.

Mr. Jones' coping resources were only somewhat successful at alleviating his stresses related to Managing classroom discussions. An example of a somewhat effective Self coping resource for the stress category of Managing classroom discussions follows:

> Mr. J: I step back and—even in the middle of a lesson—I look at things. And I take 30 seconds or a minute [while] students are working. And I think "What could be done differently right now?" ...Say second hour, I do one thing. And I take a look back. And maybe during my prep, during third hour, I think, "Okay. This is what I was going to change for 5th hour and 6th hour." ...I need to make sure that [the students] are actually doing the talking. I need to change the lesson some way... Next year, I'll have a better idea from this year what needs to be done to help students the best (Post, 12.23-12.39).

So when Mr. Jones felt like he was doing too much of the talking during a lesson, he would mentally step back, think about his original lesson plan, and decide what he could do differently that would get the students more centrally involved in the discussion.

Four of Mr. Jones' five Main stresses, namely Managing classroom discussions, Responding to problematic student behaviors, Lack of student interest/motivation, and Assessing student understanding, related to his attempts at SBT. Of those four, I could not find a clear link between attempts at SBT and coping resources for Responding to problematic student behaviors or Assessing student understanding. For Managing classroom discussions and Lack of student interest/motivation, I found coping resources that supported his attempts at SBT while he experienced teaching stress(es).

For Managing classroom discussions, Mr. Jones mentioned two coping resources related to his attempts at SBT. First, he mentioned using the analogy of a path which he described as only somewhat effective at helping the students understand proof during class discussions. For similar reasons, I judged that it was only somewhat effective at

relieving the associated teaching stresses. Second, as illustrated in one of the previous quotes, Mr. Jones mentioned that if he felt like he was doing too much of the talking during a discussion, he would reflect on how to get the students more involved.

For Lack of student interest/motivation, Mr. Jones works on one lesson a week to try to make it engaging, as a way of bringing students into the classroom discussions that he tries to incite. So it is clear that Mr. Jones did have some coping resources that supported his attempts at SBT. Overall, Mr. Jones' resources were judged to be effective in alleviating his Main challenges.

Ms. Price.

Ms. Price reported that her "top" or most effective coping resource(s) were Social. She talked about other teachers helping her in general, but did not identify any colleague specifically as the most helpful. When asked about her mentor teacher, she said that she was assigned one, but their teaching styles were so different that she rarely went to talk with him about any of her issues or concerns. He follows the book very closely, while she is more interested in discovery-based approaches to teaching and learning.

Table 22

Coping Resource Effectiveness for Ms. Price's Main Stresses

Stress categories for Ms. Price	Coping Resource Frequency and Effectiveness				Overall
	E	S	I	U	
Responding to problematic student behaviors		11			S
Lack of student interest/motivation		2			S
TOTAL	0	13	0	0	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

Ms. Price reported the category of Social coping resources more frequently than any of the other categories (see Table 22). She mainly talked with other teachers about Planning lessons and Responding to problematic student behaviors and also talked to administrators about Responding to problematic student behaviors.

Ms. Price's two Main stresses were Responding to problematic student behaviors and Lack of student interest/motivation (see Table 22). For Responding to problematic student behaviors, the Social and Self resources she reported were only somewhat effective. For Lack of student interest/motivation, the Self resources she reported were also only somewhat effective.

I previously shared an example of a somewhat effective Social coping resource for Responding to problematic student behaviors. Ms. Price said that when she needed help with disciplining her students, the administrators are supportive sometimes. My judgment that this describes administrators as only somewhat effective at alleviating stress was reinforced by her expressions of concern about the administrators' interventions. She said that sometimes an administrator only gave students a verbal reprimand for a serious issue, like loud arguing in class, and then sends them back to her room. But she wanted the students out of the class for the rest of the hour, due to the risk of a physical fight. So I judged that this coping resource was only somewhat effective at alleviating her stresses related to Responding to problematic student behaviors.

An example of a somewhat effective Self coping resource for the stress category of Lack of student interest/motivation follows:

> Ms. P: One challenge that's probably going to be ongoing is getting kids genuinely motivated or actually wanting to do whatever it is you're doing in your class on that particular day. Because sometimes they'd rather sleep. Sometimes there's an assembly. Sometimes they have something going on after school. And just trying to get them to at least focus for that hour on what they need to do, trying to make the most of it, [is difficult]. But I don't know if that's something that necessarily has an answer, other than, the better the lesson plans are, the more engaged the kids... (Pre, 8.27-9.9).

So Ms. Price had a continuing struggle to get students engaged in her classes. She said that she felt like there wasn't a solution, except that the better she could make her lesson plans, the more engaged the kids would be. Because of how she phrased the situation here as not being completely solvable, I judged that this coping resource was only somewhat effective at alleviating her concerns relating to the Lack of student interest/motivation.

Ms. Price did not mention any coping resources linked to SBT-related Main stresses. Overall, Ms. Price's coping resources were judged to be somewhat effective at helping her deal with her two Main teaching stresses.

Ms. Riley.

Ms. Riley said that her top coping resources were Social; in particular, she mentioned how helpful her mentor teacher was at Holly High School. They talked frequently after school to discuss any issues that Ms. Riley was having and met for lunch once a week to discuss any issues that had come up in her teaching, as well. Ms. Riley reported the fewest different categories of coping resources, citing only two, Social and Self (see Table 16). She reported them nearly the same number of times, as well.

Table 23

Coping Resource Effectiveness for Ms. Riley's Main Stresses

Stress categories for Ms. Riley	Coping Resource Frequency and Effectiveness				Overall
	E	S	I	U	
Relationships and communications with administrators		1			S
Managing classroom discussions	1		2		S
Lack of student interest/motivation					U
Dealing with class length, pace, or schedule					U
TOTAL	1	1	2	0	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

Ms. Riley's four Main stresses were Relationships and communications with administrators, Managing classroom discussions, Lack of student interest/motivation, and Dealing with class length, pace, or schedule (see Table 23). For the last two categories, Lack of student interest/motivation and Dealing with class length, pace, or schedule, it was unclear whether Ms. Riley had any resources for coping with her stresses.

For Relationships and communications with administrators, Ms. Riley reported a single somewhat effective Social coping resource. An example of that resource follows:

> Ms. R: This is the first year of the two schools [being linked as one]... So there were a ton of problems. And actually at the beginning [of the year], they weren't letting the kids go four minutes early. They were supposed to just leave. There was no bell. We were just supposed to let them go two minutes early and then let them come two minutes late... And it just, the teachers basically were like, "No! We can't do this anymore." And so the administrators came up with the 4-minute bell at the end. It's pretty good. Because by the end, everybody's working and doing stuff. So that's working well. So then I can take tardies. And the kids have 9 minutes to get over, plenty of time (Pre, 1.33-2.9).

So Ms. Riley's coping resource in this case was the administration changing the bell system that started and ended class. While her wording here might lead the reader to think that this coping resource was effective, just prior to explaining this situation, Ms. Riley complained that at the end of class, she can't really do anything, so the last four minutes of class are "shot" (Pre, 1.14-1.21). So I coded this coping resource as only somewhat effective.

Overall, I judged that her resources were somewhat effective at helping her to deal with stresses related to Managing classroom discussions. Surprisingly, Ms. Riley's Social coping resources were effective at helping her deal with Managing classroom discussions, while her Self resources were ineffective. An example of an ineffective Self coping resource for the stress category of Managing classroom discussions follows:

> Ms. R: ...Well, I was challenged by the fact that I did not think that they were getting [why you need to complete the square]. And I was trying to come up with other ways to explain myself. And I was having a lot of trouble... And they're good at telling me when they don't get it. They shake their head, "No, don't go on."
> I: Yeah. And how did that resolve itself?
> Ms. R: I don't know if it ever did... I just dropped it, because I couldn't handle it anymore... I think how it resolved itself was I got to the point where I said, like in my head, "We do not have enough time to tinker with [this]... Forget it... Just divide this number by 2 and square it. Just do it." [Laughs.] ...I feel like we got so off course with that, so out of what I wanted to do. I mean it was ruined from there (Post, 3.15-4.12).

So Ms. Riley's Self resource for dealing with her challenge with Managing classroom discussions here was to discontinue the discussion and to revert to direct instruction. Since this diverged from the major goal of her lesson, namely to help students understand why they were completing the square, and because Ms. Riley said the lesson

was ruined from there, I judged that this coping resource was ineffective at helping Ms. Riley cope with her teaching stress in this instance.

Two of Ms. Riley's four Main stresses, namely Managing classroom discussions and Dealing with class length, pace, or schedule related to her attempts at SBT. Ms. Riley did not report resources for dealing with either category of teaching stresses as they related to her attempts at SBT.

Overall, I judged that Ms. Riley's coping resources were somewhat effective at alleviating her stresses.

Ms. Wells.

Although Ms. Wells was not directly asked what her top coping resource(s) were, she was judged as having her socially oriented coping resources as her most effective or top coping resources. I based this judgment on how frequently she mentioned those resources, more often than any other participant. She talked about other teachers in general as being resources, without heavily emphasizing any one person, with the possible exception of her department chair who led their group of teachers. She said that her mentor teacher was a resource for her, but no more than any of the other teacher in the department with whom she worked and shared ideas and resources.

Ms. Wells mentioned how she regularly met with her peers at lunch every day to talk. They also talked before and after school. Much of it was informal, but they bounced ideas off each other and shared resources, lesson plans, etc. She also mentioned that they got together sometimes to talk about curriculum and work on it, although the structure appeared loose from her comments. She said that her department was very cohesive, even

compared to other departments at her school, meeting together each day to talk about meaningful and constructive ways of dealing with students, as well as "hash out their differences" on the curriculum at lunch (Pre, 4.28-4.30).

Ms. Wells reported experiencing three Main stresses, Lack of student interest/motivation, Responding to problematic student behaviors, and After hours work/long hours (see Table 24). For Lack of student interest/motivation, she reported that her Social coping resources were effective. I shared an example of an effective Social coping resource for the stress category of Lack of student interest/motivation previously. Ms. Wells felt like the feedback that she got from her students was very helpful in getting them more engaged in the classroom. I judged that this Social coping resource was effective at alleviating stresses due to Lack of student interest/motivation.

Table 24

Coping Resource Effectiveness for Ms. Wells' Main Stresses

Stress categories for Ms. Wells	Coping Resource Frequency and Effectiveness				**Overall**
	E	**S**	**I**	**U**	
Lack of student interest/motivation	1				E
Responding to problematic student behaviors	3	3	1		S
After hours work/long hours		3			S
TOTAL	4	6	1	0	N/A

Note. Coping resource effectiveness is rated above as Effective (E), Somewhat effective (S), Ineffective (I), or Unclear (U), then judged their overall effectiveness ("Overall" column), as previously described.

For Responding to problematic student behaviors, Ms. Wells reported that both her Social and Self coping resources were only somewhat effective. An example of somewhat effective Self and Social coping resources for the stress category of Responding to problematic student behaviors follows:

Ms. W: We have what we call a Student Responsibility Center [SRC]... It's an actual room where they go... If two kids are having a verbal confrontation and somebody needs to go, you can send them down there. And it's basically to cool off... They sit down with the teacher in there whose job it is to run the SRC... And...once they've been to the SRC, they're not allowed to come back to the classroom until they've...had a discussion about their plan... I don't have to use [the SRC] that often. I probably should in some of my classes... I tend to be a little bit more lenient with things like giving the kids more warnings and things like that. I probably could be more firm in sending them out... I use it for more extreme cases... (Pre, 15.20-16.39).

Ms. Wells described the Student Responsibility Center as a place where she could send students who were having a verbal confrontation so that they could cool down. This was a Social resource, since the teacher there dealt with more severe student disciplinary issues. Since she called it okay and said that she tends to be more lenient and try to resolve things in her own classroom, I judged that this resource was only somewhat effective. It appeared to be too harsh for most situations that she faced with her students.

Clearly, Ms. Wells also describes a Self coping resource here, namely, issuing warnings. But again, she also described herself as probably needing to be more firm in this area. It appeared that neither of these strategies were ideal for Ms. Wells' self-perceived needs when Responding to problematic student behaviors.

For After hours work/long hours, Ms. Wells reported that both her Social and Self coping resources were only somewhat effective. An example of a somewhat effective Self coping resource for the stress category of After hours work/long hours follows:

Ms. W: I try to get here by 7... I make copies or get the agenda on the board...before the kids come in at 7:50. [I] teach my normal six-hour day. Then I usually put in 2, 3, maybe 4 hours after school...helping

> students. planning for the next day, copies, checking e-mail... And then I still end up taking a lot of it home... [And I] end up putting a full day in on Sunday... But then...I came into this year thinking, "Okay. What can I do to alleviate some of my grading stress?" So...now I stamp the homework [for completeness] so I don't have to bring it home...And then...I feel comfortable going over it in class, because...the ones that have tried it get credit for it... So then we can go over it... So it's gotten better, but I still do put in a lot of time outside of school (Pre, 18.41-21.20).

Ms. Wells began stamping homework for completeness, so that she didn't have so much to take home to grade. But she also mentioned that she still finds her job very time consuming outside of school hours, so I judged that this coping resource was only somewhat effective at alleviating stresses related to <u>After hours work/long hours</u>.

Because Ms. Wells had no stresses related to her attempts at SBT, there was also no overlap between her coping resources and her attempts at SBT. Ms. Wells' coping resources for alleviating her Main stresses were judged as somewhat effective overall.

Discussion

Social resources, particularly these novices' teaching colleagues appeared to be the most important means of coping with teaching stresses, particularly when they were attempting to change the environment, rather than just alleviate the symptoms. This also included Collective coping resources that were related to Social resources, since many of the social interactions were with people that participated in the teacher collaborative. While all teachers mentioned social interactions as helpful regardless of whether they had access to a teacher collaborative group, there may have been some building of those relationships and interactions that made them more effective as coping resources due to the existence or structure of the teacher collaborative; this conjecture lacks adequate

support in my data, but the result is suggested by the very positive comments teachers made about their teacher collaboratives, as well as by the teacher collaboratives literature.

Self as a coping resource was also an important means of dealing with teaching stresses. Using one's creative abilities, experiences, and known management and pedagogical strategies were important tools in resolving the sources of teaching stress in the environment. Self was also a means of diminishing teaching stress by reframing the issue, like saying "that's the way kids are" or remembering that the student is not an adult and "I need to respond in a mature manner."

Physical resources was possibly the least mentioned coping resource (if you consider collective resources as a category of the Social category), even though all but one teacher mentioned them.

Nearly all of the participant cases mirror these overall frequency patterns for coping resources. The case studies also identify marked differences in which coping resources each teacher employed and how they selected those resources. In particular, Ms. Grant picked and chose among the teachers at her school, a less cohesive context than most in this study, to find teachers who shared similar ideas about classroom management or pedagogy, or had stronger ability than her in certain areas, like technology. Ms. Price was similar in this respect. But Ms. Boone and Ms. Riley tended to look for teachers who they had relationships with as mentors or colleagues for help with difficult problems. Similarly, Mr. Jones tended to talk with teachers who were teaching the same sections of the class, but also with administrators with whom he had strong relationships. On the other hand, Ms. Wells felt comfortable talking with any of the other math teachers at her school, likely due to the highly cohesive nature of their department.

While such departments are highly desirable, it is unclear whether they can be created or whether they are organic and must simply be enjoyed when encountered. Ms. Wells reported that other departments in her school were not nearly as cohesive as hers. Research on middle and high school academic departments reinforces what she suggests, that cohesiveness and collaboration in one department generally does not imply such cordial relations in other departments at the same school; moreover, high school departments, schools, and districts play a role in supporting or undermining a shared technical culture, strong service ethic, and professional commitment. In other words, such activities are generally fostered in organizations such as teacher learning communities (Talbert & McLaughlin, 1994).

From these case studies, it appears that novices had few supports for dealing with Main stresses related to attempts at SBT. But what is even clearer from the previous chapter is that few of their Main stresses related to their attempts at SBT. So while they have little support for SBT-related stresses, these stresses also appeared to play only a very small role in the big picture of the stresses that these teachers experienced.

On the other hand, the teachers I noticed making the most visible attempts at SBT, namely, Ms. Boone, Ms. Grant, and Mr. Jones, also reported more SBT-related coping resources than the other three teachers. This suggests that novices require coping resources to make meaningful attempts at implementing aspects of SBT in their classrooms.

Finally, when panning out to look at the overall picture of all of the stresses that these novices reported, it is clear that these novices were dealing effectively or somewhat

effectively with nearly all of the stresses that they mentioned having coping resources to attempt to alleviate, including their stresses related to SBT.

Chapter 7: Discussion and Conclusions

As I conclude this dissertation, I review the major findings of this study, including which stresses novices reported, how those stresses compared to categories reported in the existing research literature, how those stresses related to novices' attempts at NCTM (1991) Standards-based teaching (SBT), and which coping resources novices reported. I do so to summarize the results of this dissertation in preparation for the discussion of research literature and significance for teacher educators and future colleagues of novice teachers that follow in this chapter. After broadly reviewing the findings of this study, I will discuss how those findings relate to the existing research literature on teacher stress, NCTM (1991) Standards-based teaching, and coping resources with a focus on teachers' concerns. Finally, I consider follow-up research that the findings of this study suggest.

Top-Level Summary of Major Findings

Novices experienced many stresses previously reported by the literature and several others that are, in some cases partially and in some cases completely, new to the literature. In the existing literature, stresses were listed in the following categories: poor motivation of students, poor student discipline, poor working conditions, time pressure and work overload, low status and opportunities—including pay, promotion, and career development, and poor school ethos—including conflict with colleagues and administrators. These categories entirely subsumed 14 of the 22 categories, as I previously reported in Chapter 5 (see Table 12). Of the remaining eight categories, four were partially new to the literature, namely Managing classroom discussions, Creating,

aligning, modifying, and implementing curricula, Assessing student understanding, and Student diversity issues. The other four categories were new to the literature, namely Directing student explorations of mathematics, Responding to unexpected student ideas, Working with technology, and Teacher boredom.

Of these eight partially and entirely "new" stress categories, all but Teacher boredom related at least in one instance to at least one novice's attempts to implement SBT. Briefly, Managing classroom discussions related to attempting the types of conversations about mathematics that the NCTM (1991) Standards advocates, that opens students' mathematical ideas and conjectures to the class for discussion and mathematical verification which allows students to develop greater insight into underlying mathematical concepts, generally before learning algorithms and procedures. Creating, aligning, modifying, and implementing curricula related to attempts at SBT, because many of these teachers were striving to modify their curricula in ways to better align the pedagogy with the NCTM Standards. Assessing student understanding related to SBT, because teachers assessed students on their presentation of mathematical concepts to the class and/or teacher in ways that exposed their thinking to public mathematical scrutiny. Directing student explorations of mathematics related to novice teachers' attempts to engage students in meaningful explorations of deep mathematical tasks from which they could formulate conjectures and often verify those conjectures as a whole class afterwards, as advocated in the NCTM Standards.

Directing student explorations of mathematics related to the NCTM (1991) Standards because many of these activities required students to explore deep mathematical content and to develop and verify mathematical conjectures. Responding to

unexpected student ideas generally was only stressful for teachers who were attempting to use student ideas in meaningful ways in classroom discourse, rather than simply dismissing them, thus reinforcing the active intellectual role for students that the NCTM Standards advocates. Working with technology related to teachers' attempts to implement technology in ways that allowed students to engage in exploration and discussions of mathematical concepts that they could not readily identify without such tools, as advocated by the NCTM Standards.

It appeared that attempting SBT contributed only modestly to these participants' overall teaching stress. As a reminder, most of the stresses that were salient to the teachers were not strongly related to SBT except for one, Managing classroom discussions. Also, of those stresses that were most often related to participants' attempts at SBT, the only one that was cited with any reasonable frequency to show that it was common in these participants' experiences was Managing classroom discussions. While the contribution of SBT to overall stress was modest, so were participants' overall attempts at SBT. But what was surprising was how many categories of teaching stress, particularly among the new categories, related to novices' attempts at SBT. Of course, I was looking for evidence of such concerns, but these categories were linked with very different teaching activities from the categories listed in the existing literature.

There was some variance in the ways that novices viewed their challenges, from being entirely positive as opportunities for growth to being entirely negative, because all challenges took a toll on their resources. According to the existing literature, this could be due to the amount of stress that they experienced (i.e. their teaching contexts) and/or to their personalities (Abouserie, 1994; Pithers, 1995). The literature predicts that both are

factors in how humans perceive and experience stress, so both of these could be factors in these teachers' perceptions of their teaching challenges.

These novices' top coping resources were Social, whether they resulted from interactions in a teacher community (i.e. Collaborative resources) or were based on individual relationships and interactions (i.e. Social resources). Participants in highly cohesive departments listed the department among their greatest resources. This is not particularly surprising, given how teachers involved in teacher learning communities and in highly cohesive departments valued those resources. The importance of teacher learning communities is also a central theme in the research literature (e.g. McLaughlin, 1993). But it is not clear whether such departments can be constructed in any setting with any group of teachers or what the constraints would be to create such an environment. This issue requires further research.

That Self was also an important coping resource for these novices is not surprising, given the high amount of autonomy and expectations for individual accountability and initiative in U.S. schools today.

These novices were dealing effectively or somewhat effectively with nearly all of the Main stresses that they mentioned having coping resources to attempt to alleviate, including their Main stresses related to SBT. Most of those resources related, in at least one instance, to stresses related to SBT.

Of the six novice teachers in this study, three (Ms. Boone, Ms. Grant, and Mr. Jones) appeared to be making more attempts and more effective attempts at SBT than the other three participants (and more than, of course, the other five prospective participants who did not qualify for participation in this study, because they were not observed

making meaningful attempts at SBT). In other words, I was more likely to see whole class discussions involving presentation of students ideas, mathematical conjecturing and mathematical justification during these three novices' mathematics classes than during the other three novices' classes (or, for that matter, during the other teachers' classes who were screened for participation but who I did not observe making meaningful attempts at SBT). It also appeared unlikely that I would have observed more meaningful attempts at SBT in many other teachers' classes in Ms. Boone's, Ms. Grant's, or Ms. Jones' cohorts, given my method for selecting prospective participants, as described in Chapter 3.

It is not entirely clear why Ms. Boone, Ms. Grant, and Mr. Jones appeared to be making more successful attempts at SBT than their peers. They did not appear to have any more social supports than their peers for such teaching; indeed, all six participants talked about socially-oriented (i.e. Social and/or Collective) coping resources in 50% to 70% of the passages that related to their coping resources, with the three novices under consideration spread across that range.

As a complicating factor, I did not ask directly or specifically how these novices' coping resources related to their attempts at SBT[8]. As a result, I could not code systematically to determine which and what proportion of coping resources supported these novices' attempts at SBT; however, Ms. Boone, Ms. Grant, and Mr. Jones spoke more specifically and pointedly about how their coping resources related to their attempts at SBT than did the other three teachers. For example, in Ms. Boone's and Mr. Jones' cases, they were deeply enmeshed in a teacher learning community that openly encouraged and supported their attempts to teach in the spirit of the NCTM (1991)

[8] Given the strong feelings discussing SBT tends to incite, I avoided specific probing about how novices' coping resources related to SBT. While that lessens the analytic impact of these statements, it also suggests that the connections these novices made to SBT derived from their commitments to SBT, rather than mine.

Standards. And while Ms. Grant's context appeared (by far) the least conducive to attempting such teaching, she also appeared to be the most selective of the group in implementing the resources that she had in meeting her goals and educational commitments, primarily because there were few people that shared all of her educational goals and commitments, including (but not limited to) a desire to enact the NCTM Standards in her teaching. As a reminder, my classroom observations tended to confirm that they were making more meaningful attempts at such teaching.

I would like to suggest several possible causes for the varying number of SBT attempts that I observed in these participants' classrooms. One possibility is that these three novices (Ms. Boone, Ms. Grant, and Mr. Jones) may have held stronger commitments to attempting SBT than did their peers. Their successes in attempting SBT may have been primarily due to how deeply they held their educational goals and, as a result, how systematically they attempted to implement those goals. There is at least some evidence to support this conjecture. For example, Ms. Grant sought out supports actively and selectively to support her SBT attempts, even though her lack of success in attempting meaningful mathematical discussions appeared to be taking its toll on her desire to continue teaching mathematics (as opposed to teaching English, where students expected and more readily engaged in deep, meaningful conversations). She mentioned on more than one occasion that she was considering switching to teaching English instead of mathematics. She reported that her fatigue and boredom with teaching was at least partly due to how her students resisted engaging in meaningful mathematics discussions.

Another example is that Mr. Jones attended a high school where his teachers readily and fully embraced a pedagogy that could reasonably be judged as meaningfully

aligned with the NCTM (1991) Standards; specifically, it would easily clear the modest criteria defining meaningful attempts at SBT in this study[9]. In other words, he had the unusual, but increasingly more common, experience of viewing SBT as part of his "apprenticeship of observation" (Lortie, 1975) as a high school student and possibly earlier, as some of the junior high schools in that district were also attempting such teaching. His commitments may have been prompted by those relatively early and formative experiences in his education.

On the other hand, it is also possible that the educational contexts in which these novices taught may have either influenced them or may have been influenced by them in one of three ways. First, Ms. Boone's, Ms. Grant's, and Mr. Jones' school contexts that led or allowed them to attempt SBT more efficiently than many of their other peers, and if such events occurred, what their character might be. Having a network of social supports for teaching in general may have allowed them to make more meaningful attempts at SBT. Second, attempting SBT more ambitiously may have caused teachers to look for and build up supports and resources for their ongoing attempts at such teaching. Third, the environment at the school, which may have included such elements as a pre-existing teacher learning community, forward-thinking administrators (i.e. principal, assistant principal(s), department chair, curriculum coordinator, etc.), like-minded colleagues, etc. could have created an environment where meaningful SBT attempts were both encouraged and actively supported.

If the context were considered to be the significant element in why these participants appeared to be making more SBT attempts than their peers, then Ms. Grant's

[9] Given the extensive contact that I had with the professional development school for Midwestern University that Mr. Jones attended as a secondary student, I can judge from my observations in those classrooms that they undoubtedly met and surpassed the modest criteria in this study for attempting SBT.

case may have been an example of the second of these three possibilities; in other words, she was a teacher with ambitious teaching goals and decidedly competent social skills who sought out resources specifically to help her meet her pedagogical (and other) goals. On the other hand, Mr. Jones and Ms. Boone were harder to judge. While they were in a context that was arguably very supportive of their attempts at SBT, it is unclear whether they would have done so on their own or whether they could have made less meaningful attempts at such teaching if they had chosen to do otherwise. In other words, it was unclear whether the number of social supports allowed them to meet their own goals, whether the expectations of the community encouraged them to reach for those goals, or whether they looked in the school for these resources because they already had pedagogical goals aligned with SBT. So this remains an open question for them and for all of the novices in this study.

But I must say that there is a good deal of evidence to support that both of these conjectures. These novices held commitments deeply that aligned with the NCTM Standards. And they were very capable and accomplished at finding and implementing resources to support their ongoing attempts to persevere in attempting to enact their pedagogical goals that aligned with the NCTM (1991) Standards. In particular, Ms. Grant showed a great deal of social skill for networking in a less-than-ideal teaching context to support her ongoing efforts to teach according to her deeply held beliefs about education that included pedagogical goals aligned with the NCTM (1991) Standards.

Contribution to the Research Literature

Teacher stress literature.

As stated previously, the novices in this study reported many of the categories of stress reported in the existing teacher stress literature. They also reported some new stresses. In particular, Managing classroom discussions was the most salient stress that was (at least partially) new to the literature. It was a Main stress for two participants and was mentioned by two others; moreover, it was related to SBT attempts in at least one instance for all four of these participants. This category of teacher stress also clearly related, in many cases, to novices' attempts at SBT.

The remaining categories were Main for exactly one participant, as follows: Creating, aligning, modifying, or implementing curricula, Teacher boredom, Assessing student understanding, and Working with technology. These categories were also "mentioned" categories for at least one other teacher, except for Working with technology. As a reminder, all of these categories also related to at least one novice's attempts or reported attempts at SBT, except for Teacher boredom.

Creating, aligning, modifying, or implementing curricula were related at times to trying to align one's curriculum with state content standards, but at other times, those efforts related to teachers' desires to implement a pedagogy more consonant with the NCTM (1991) Standards. This theme is certainly reflected in the many studies relating to more experienced teachers' (e.g. Romagnano, 1994), novices' (e.g. Schweitzer, 1996), and interns' (e.g. Van Zoest & Bohl, 2000, 2002) experiences, including their challenges, while attempting SBT.

Teacher boredom is a surprising addition to the literature, since teachers do not usually talk about being bored, but more often about having too much to do and deriving pleasure from their work with children. This is not reflected in the mathematics education

research literature relating to SBT either. There is some work relating to teacher burnout (e.g. Farber, 1984) that suggests that teachers who burn out invest less and less in their teaching over time. So this may describe the beginning of that phenomenon, but, if so, it is not well documented in the literature.

Assessing student understanding relates to SBT in that novices described their attempts to implement a performance-based group presentation for the class where their mathematical work and knowledge were exposed to public scrutiny, generally by their classmates. While assessment is discussed in the literature from the perspective of the students or from that of a general observer (e.g. Darling-Hammond, Ancess, & Falk, 1995), it is rarely discussed from the teacher's perspective; therefore, this is also an addition to the mathematics education literature on teacher stress.

Working with technology is clearly related to the rise of technology in society, and particularly, in schools during the past few decades. Surprisingly, the literature on novices' SBT teaching attempts talks about this topic very little, if at all, even though technology plays a central role in many of the NSF-funded textbook series that arose from the NCTM (1991) Standards movement, such as CPMP (Coxford, Fey, Hirsch, & Schoen, 1996).

The three remaining previously cited stresses that were new or partially new to the literature, Directing students' explorations of mathematics, Responding to unexpected student ideas, and Student diversity issues, were not Main stresses for any teacher. As previously stated, all three of these stress categories were also related to at least one participant's attempts at SBT.

NCTM Standards-Based Teaching Literature

This study suggests that SBT is still hard to find (Wilcox et al., 1991), even among the graduates of the progressive mathematics teacher education program at Midwestern University (MU). MU has an arguably NCTM (1991) Standards-oriented mathematics teacher education program, so that teachers in this study were given many opportunities to understand, experience, and observe how the NCTM (1991) Standards can be implemented in secondary classrooms. In many (but unfortunately, not in all) cases, the program gave these interns mentors who were selected based on their ability to implement such teaching. And while the set of novices chosen for this study was screened from a carefully selected subset of two subsequent teaching cohorts (see Methods chapter), these novices' observed and reported attempts at SBT as a whole group were relatively modest in number and in character.

The categories of teacher stress identified by this study related to SBT attempts were distributed unsystematically across many different categories for the most part, rather than being confined to a few stress categories and/or teaching activities. So generally, there was not a simple pattern for how SBT affected these novices teaching stresses, except that it could surface in many different ways.

Most stresses reported by the novices in this study related to at least one novice's SBT attempts, but few of those stresses were both salient and common for this group of participants with the single exception of Managing classroom discussions. This suggests that a specific activity that is very challenging for novices relating to their efforts to implement SBT is Managing classroom discussions. While Managing classroom discussions, Smith (1996) pointed out that it is harder and more elusive for teachers to

feel that they are successfully directing learning than during a lecture. There is a great deal of teacher uncertainty inherent in whole-class discussions where students take an active role in sharing their mathematical ideas, offering conjectures, and verifying their own and other students' ideas mathematically. Such a role for students gives them an active voice in suggesting the direction of classroom events. Teachers need a deep understanding of mathematics, pedagogy, pedagogical content knowledge, students' known and likely conceptions of the content, and strong social skills to navigate such discussions. They must maintain social norms while choosing among the many different mathematical themes and concepts that may arise and direct the class in the most fruitful directions to solidify students' blossoming understandings of those concepts. Teachers' deep knowledge of mathematics needs to include a variety of representations for each mathematical concept, multiple ways to describe each mathematical concept, and an understanding of how students may be thinking about each mathematical concept during these discussions. Such a knowledge base appears easier (and much more likely) to develop over time than to acquire from a teacher education program, although a disposition that is open to meaningfully attempting such teaching is most likely acquired during one's K-12 education or early in one's teaching career. That is why it appears that the teacher education program experiences provide the ideal opportunity to have an impact on novices' teaching.

Those novices who were most effectively attempting SBT were generally found in strong departments that supported their pedagogical efforts, namely Mr. Jones and Ms. Boone. Ms. Grant was the only novice making surprisingly effective attempts at such teaching outside of a strong, supportive department that promoted SBT. While other

teachers also talked about having strong departments or many peer resources, such as Ms. Wells and Ms. Price, respectively, they did not often portray those supports as reinforcing their efforts at SBT, but as general resources for more traditional teaching activities and concerns.

On the other hand, it is surprising and perhaps runs counter to McLaughlin's (1993) observations during her study that all six of these novices were making meaningful attempts at SBT, but most of those attempts were outside of teacher learning communities that directly supported SBT. While no teacher reported a school context that discouraged SBT in an organized way, Ms. Grant did talk about a school environment that was clearly a challenging context for making such attempts. Her observations here echo those of Wilcox et al. (1991) who found that few of their novices were still making any meaningful attempts at SBT after leaving their progressive teacher education program, primarily because they lacked strong teaching communities to support their attempts to implement a pedagogy that they valued but was relatively new to them.

While Ms. Grant was making such efforts, it is difficult to say how long she will continue unless she finds more organized and/or effective supports for her blossoming pedagogical skills, dispositions, and habits of mind. Ms. Grant was surprisingly one of the few in her cohort making the most effective SBT attempts, but she was also possibly the most discouraged of the group. As a reminder, she mentioned more than once that she was considering a switch to teaching English in order to find a context where the type of conversations that she wished to have with her students were better supported by the content. She also spoke about how selectively she had to look for supports among her peers, depending on whether she needed help with classroom management, pedagogy,

technology, etc. So the social relationships in her context also added to the challenges and complexity of her teaching at Elm High School.

Coping Resources Literature

The most salient resources for these novices were the socially-oriented categories of coping resources (including the Social and Collective categories). The reader may recall that it was often difficult to tell when a resource existed because of the teacher learning community, so that category was relatively thin. But given the potential of teacher learning communities to quickly and efficiently forge (and give direction to) professional social relationships, we cannot overlook the importance or potential in particular of the Collective category.

That Self was also a salient resource for these novices was not particularly surprising, given the focus in American schooling on independence in teachers' work. Teachers generally do value themselves as resources, but the content of the Self category of coping resources for each novice depended primarily on the experiences that these teachers had had in their educations, both K-12 and post-secondary. As teacher educators, we have an opportunity to have an impact on the content of this category of resources by teaching novices new ways of thinking and of learning about teaching and by giving them new educational experiences that they may not have previously considered and by allowing them to observe teachers, hopefully including ourselves, whose teaching embodies to some degree specific elements of the NCTM (1991) Standards.

Finally, it is interesting that Physical resources were not particularly valued by this group of novices as coping resources. But the research suggests that the value they

placed on one of those physical resources, the textbook, might have been greater if they had been using one of the NSF-funded curricula, such as the CPMP (Coxford, Fey, Hirsch, & Schoen, 1996) materials, as Alice did in Van Zoest and Bohl's (2000, 2002) study.

The coping resources that these teachers mentioned most often included several already described by the coping resources literature (e.g. Lazarus, 1976), but their relationships to the classes of resources that I describe above are not completely clear. I will attempt to relate them, at least in a cursory fashion, to the coping resources which I observed and heard about during my observations and interviews.

For example, Preparation against harm relates to novices' efforts to prepare for classroom events by careful planning to avoid difficult classroom events or situations and by creating discipline and management strategies that help them and students know what to expect when students choose undesirable behaviors. For example, Ms. Price wanted to prepare better mathematics lessons to get her students more interested and engaged in her classroom.

There also appeared to be some Intellectualization that occurred as teachers reflected on and talked to others about classroom events and situations. For example, Ms. Boone mentioned that she was the adult, the students are children, and she had to respond in a mature way, which may have been Intellectualization.

Teachers also may have practiced Identification to some degree in meeting the demands of their teaching, particularly in strong departments. But such a process could have had been synergistic (as appeared to have occurred in Ms. Boone's and Mr. Jones'

cases) or quenching (as may have occurred in Ms. Wells' or Ms. Riley's cases) for their SBT attempts.

Novices also talked about mild forms of Displacement, as when Ms. Grant and Ms. Boone vented about their teaching stresses to a husband and to an administrator and peers, respectively. I also heard of Escape as a strategy, when Ms. Boone described a difficult confrontation with a parent. She chose not to return to her classroom that afternoon, while she was processing the experience with an assistant principal.

There are some strategies that I would have had difficulty identifying. Specifically, Suppression, Repression, Denial, and Projection are all ways that humans avoid reflecting on or acknowledging stress. Since I primarily judged coping resources as those perceived and reported by the teachers, I would not have been able to identify such responses to stress. Not surprisingly, the data did not substantiate that such responses to stress existed for this group of novices.

Reaction formation would also be difficult to identify, because it involves expressing the opposite of what one is feeling. Since I took these teachers at their word and they did not mention misrepresenting events to anyone else (nor were they likely to in a professional interview setting), I did not identify any indication of this coping response.

Likely due to the risk of professional embarrassment, I did not hear of any of the more embarrassing physical Palliation activities, such as drinking or taking drugs, nor did participants report more socially acceptable behaviors in this category, like exercise, meditation, or yoga. Aggression would also be embarrassing for most professionals to

admit in an interview setting with a representative of the teacher education program; not surprisingly, no teacher mentioned a coping response fitting this category either.

Future Research Steps

As I consider future research that might be undertaken to follow up on my dissertation, I feel like this study has covered a lot of the groundwork about the stresses that novice teachers experience. First, it says that those stresses are not particularly acute as they relate to attempts to implement aspects of the NCTM (1991) Standards. One possible exception to this statement may be that attempting the type of classroom discourse that the NCTM (1991) Standards advocates may be a universal and salient stress for novices, and possibly all teachers (Smith, 1996), attempting this type of teaching. This is an area that both begs to be further explored and is enjoying considerable attention as researchers engaged in discourse analysis explore classroom interactions relating to innovative teaching and, in some cases, SBT.

While some important exploratory work has been done in by this study, it is unclear whether these results hold for large groups of participants. And it is also unclear whether this is symptomatic of the alumni of MU's mathematics teacher education program or whether it is true on a broader scale for all such programs. So there is still some work to be considered by other researchers in exploring the how generalizable these results are to the alumni of other progressive mathematics teacher education programs.

As far as how I personally might follow up on this research project, given my personal interest in learning to attempt "ambitious teaching," I am drawn to explore how student and novice teachers begin acquiring the skills, dispositions, and capacities that

help novices and interns develop their teaching in the spirit of the NCTM (1989, 1991, 2000) Standards. Wilcox et al. (1991) partially answered the question as to what mechanisms lead novices to gain a disposition towards working on such interesting teaching, while others retained their traditional beliefs. Their program led novices to believe that they had learned a new way of thinking about mathematics that was important and valid for themselves, but did not necessarily apply to K-12 students. Wilcox et al. reported that they felt like their teachers did not persevere in the face of contextual obstacles at their first jobs.

These observations lead us to a series of questions about how to prepare teacher candidates for such activities. What drives some novices to persevere in their SBT attempts, while others readily abandon them when challenges arise or their pedagogy doesn't yield the expected or desired results? Why do some novices persevere in modifying pedagogically interesting lessons, while others move towards a more traditional pedagogy when a lesson based on developing student understanding, which may include student explorations, conjecturing, and/or whole class discussions, fails? How do we get SBT-minded novices to meaningfully reflect on their teaching, even lessons that appear to have failed, and teach them to turn those into successful efforts to engage students in deep discussions and investigations of significant mathematics? And how can teacher educators, mentors, administrators, and colleagues help support novices in attempting SBT and to learn to persevere in the face of some of these obstacles? While some interesting research has been done in this area (e.g. Van Zoest & Bohl, 2002; Vacc & Bright, 1999; Schweitzer, 1996), there is still much work to do in deciding how best to

support interns and novices as they acquire these teaching skills, dispositions, and capacities.

While I have identified social relationships broadly as being salient in SBT-minded novices' experiences as other researchers have found (e.g. Vacc & Bright, 1999; McLaughlin, 1993), there is much to be understood about how and under what circumstances such structures can be created and strengthened in schools, how to give novices access to such resources, and how to train them to use those resources effectively. There is also the open question of how to help novices develop an interest in these types of activities, as many teacher educators across the nation are researching at a formal or an informal level. Given the considerable social skills that novices need to implement SBT and to create and make use of the resources around them, the question of how to train novices to value and develop those social skills also arises. Is it something that should be made explicit in their programs and in the schools where they teach? Or is that something that people in these programs need to keep in mind in order to effectively implement the type of teaching that they desire? These questions need to be considered as we look to how to continue supporting interns' and novices' attempts to implement aspects of the NCTM (1991) Standards in their teaching.

APPENDICES

Appendix A

Protocol for Identifying Attempts at SBT during Classroom Observations

Standard 2: **The teacher's role in discourse**	**Operationalized**	**[Novice name]**
The teacher of mathematics should orchestrate discourse by-		
A.*posing questions and tasks that elicit, engage, and challenge each student's thinking;	A.*eliciting, engaging, and challenging each student's thinking;	
B.*listening carefully to students' ideas;	B.*listening carefully to students' ideas;	
C.*asking students to clarify and justify their ideas orally and in writing;	C.*asking students to clarify and justify their ideas orally and in writing;	
D.*deciding what to pursue in depth from among the ideas that students bring up during a discussion;	D.*following up on the ideas that students bring up during a discussion;	
E.*deciding when and how to attach mathematical notation and language to students' ideas;	E.*expressing students' ideas using mathematical notation and language;	
F.*deciding when to provide information, when to clarify an issue, when to model, when to lead, and when to let a student struggle with a difficulty;	F.*letting a student or letting the students as a class struggle with a difficulty;	
G.*monitoring students' participation in discussions and deciding when and how to encourage each student to participate.	G.*encouraging each student to participate and be engaged in speaking and listening to ideas.	
Standard 3: **Students' role in discourse**	**Operationalized**	
The teacher of mathematics should promote classroom discourse in which students-		
A.*listen to, respond to, and question the teacher and one another;	A.*listen to, respond to, and question the teacher and one another;	
B.*use a variety of tools to reason, make connections, solve problems, and communicate;	B.*use a variety of tools to reason, make connections, solve problems, and communicate;	
C.*initiate problems and questions;	C.*initiate problems and questions;	
D.*make conjectures and present solutions;	D.*make conjectures and present solutions;	
E.*explore examples and counterexamples to investigate a conjecture;	E.*explore examples and counterexamples to investigate a conjecture;	
F.*try to convince themselves and one another of the validity of particular representations, solutions, conjectures, and answers;	F.*communicate to convince themselves and one another of the validity of particular representations, solutions, conjectures, and answers;	
G.*rely on mathematical evidence and argument to determine validity.	G.*rely on mathematical evidence and argument to determine validity.	

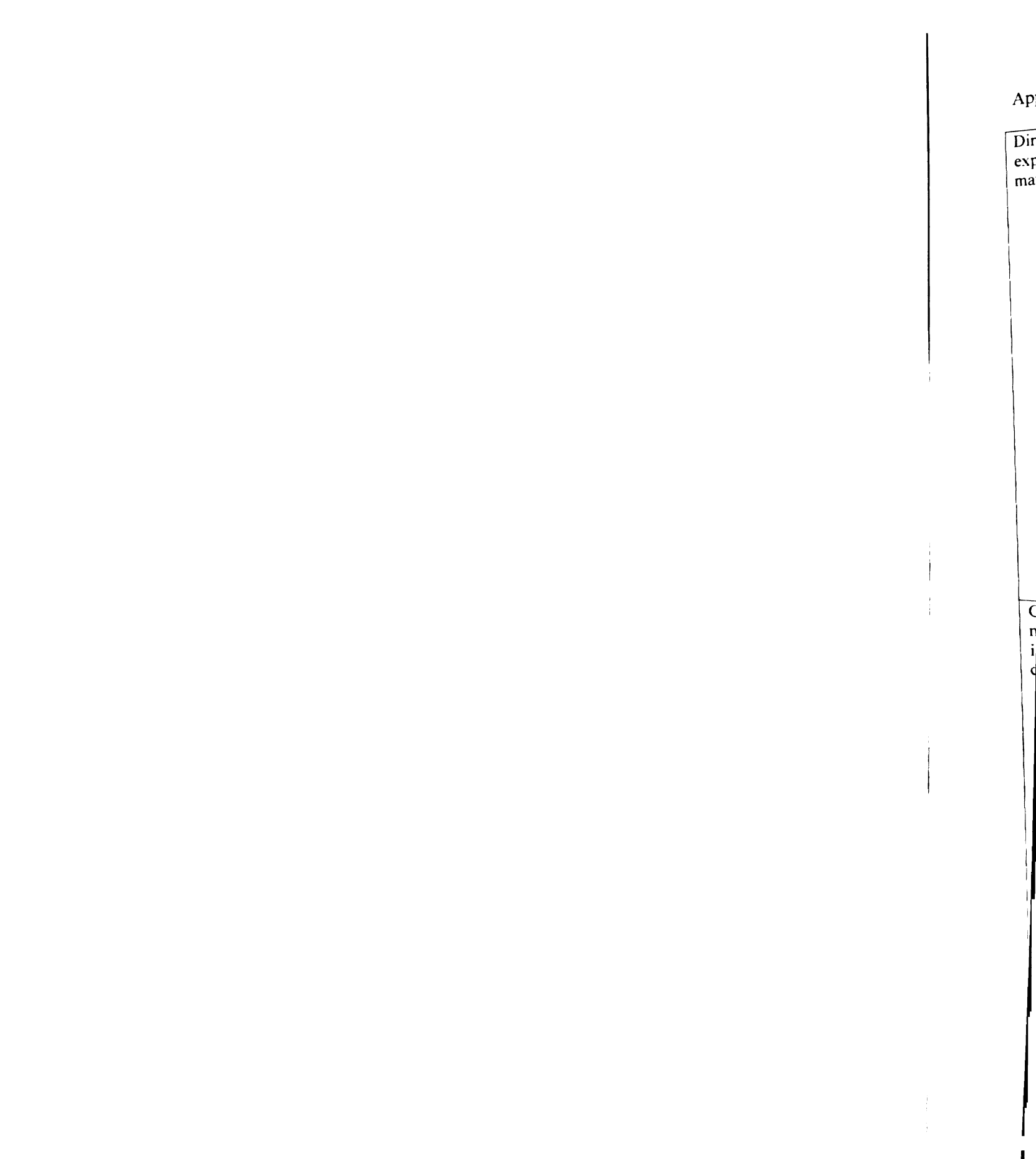
Appendix A (continued)

Standard 5: Learning environment	**Operationalized**	
The teacher of mathematics should create a learning environment that fosters development of each student's mathematical power by-		
A.*providing and structuring the time necessary to explore sound mathematics and grapple with significant ideas and problems;	A.*providing and structuring the time necessary to explore and grapple with significant mathematical ideas and problems;	
B.*using the physical space and materials in ways that facilitate students' learning of mathematics;	B.*using the physical space and materials in ways that facilitate students' learning of mathematics;	
C.*providing a context that encourages the development of mathematical skill and proficiency;	C.*posing questions and tasks that develop students' mathematical skill, proficiency, and understanding;	
D.*respecting and valuing students' ideas, ways of thinking, and mathematical dispositions;	D.*respecting and valuing students' ideas, ways of thinking, and mathematical dispositions;	
and by consistently expecting and encouraging students to-		
E.*work independently or collaboratively to make sense of mathematics;	E.*work independently or collaboratively to make sense of mathematics;	
F.*take intellectual risks by raising questions and formulating conjectures;	F.*raise questions and formulate conjectures;	
G.*display a sense of mathematical competence by validating and supporting ideas with mathematical argument.	G.*validate and support ideas with mathematical argument.	

Appendix B

Teacher Stress Coding Categories, Definitions, and Examples from the Data

Code Title	Code Definition/Description	Examples from the Data
Managing classroom discussions	Stresses deriving from teachers' attempts to involve students actively in classroom discussions and contributing ideas that the teacher anticipated or hoped to elicit in that discussion, while the teacher primarily acted as a facilitator. (If the teacher had difficulty getting students to participate in conversation and called it a shared problem or it was unclear why students did not participate, it belonged in this category. If the teacher characterized students as resisting participation or lacking interest, I placed the passage in Lack of student interest/motivation.)	[Ms. R discusses when she asked the students to attempt a completing the square problem during a class discussion with a number other than one in front of the x^2 term.] Ms. R: We were going to complete the square. And it was the first time that they'd ever seen that at all. And I didn't give them enough examples of the easy, easy ones. We went virtually right into a hard one. And we drowned, because we didn't have the basics of it... After that day, I actually sat down and counted how many steps it would take me in order to do that... And then it was like 8 steps. And I was like, "You know what? I should not have attempted to do this with them"... Ms. R: I feel like the kids should know how it works. You know, just telling them, like we did the quadratic formula yesterday. And there isn't a ton, at least I don't know, of things you can do other than say, "This is the formula. Just use it and trust me." And I just don't like that, you know? And I wish that they would understand what was going on (Post, 4.46-7.25).*
Responding to unexpected student ideas	Stresses deriving from teachers' attempts to engage with and pursue unexpected student ideas offered during classroom discussions (i.e. this is a special case of Managing classroom discussions). (Teachers often reported experiencing such events as more surprising and more stressful than simply facilitating discussions, pushing with immediacy on their content and pedagogical content knowledge.)	[A student said that when you have 8 places that you need to connect with roads, you must have at least 7 roads.] Ms. B: ...When she said that, like I looked, because I was like, "Okay, I'd better figure out right now if this is true or not." So I sat there and I looked. And I was thinking through a couple of examples really fast in my head. And I was like, "Okay, that would be true." So then I gave them that as an assignment to think of "Well, why would that be true?"...[It was challenging] trying to figure it out within 30 seconds to see if it's right or not! (Post, 5.28-5.42)*



Appendix B (continued)

Directing students' explorations of mathematics	Stresses deriving from engaging students in activities where they explored, alone or in pairs or small groups, a problem or situation. (If the teacher characterized students as not participating and described it as or a shared problem or did not explain why, I placed it here; if the teacher characterized it as student lack of interest or resistance to participation, I placed it under Lack of student interest/motivation.)	[Mr. J assigned problems where students tried to create two different triangles that met a specific criterion, such as ASA or SSA, to see whether the condition always implied congruence.] Mr. J: Yeah... The challenging part was probably trying to get them to understand what they were doing, as far as why they were drawing two triangles...that are not congruent... They didn't really understand why we cared about two congruent triangles. So maybe trying to do a better job of explaining why we want to figure out about two congruent triangles, or even why it was important, why we came to say they're congruent. Why do we have to have a minimum set of criteria? It would be very important to lay that out before we even tried to have any kind of activity where they had to figure out why the two triangles were congruent... (Post, 2.42-4.17).*
Creating, aligning, modifying, or implementing curricula	Stresses deriving from teachers' attempts to organize, create, modify, and implement the school's chosen curriculum, or to align it with the NCTM Standards or Michigan's State Standards. These stresses included how well the chosen textbook or curriculum fit the teacher's pedagogical goals.	Ms. W: Our official text...is the Larson Boswell... So we use that one... We have the McDougal Littell series for Algebra 2... And a lot of times we'll go to the McDougal Littell one, because it lays it out a little bit nicer. So we can kind of use both. It's very, it's like they're very parallel... And right now, our algebra text is really outdated. But for now, I guess we have to stay with our outdated one..., because we're working with that program, ...the Cognitive Tutor, the Carnegie learning [computer-based algebra curriculum]... So our board recognizes that as one of them... Because that was supposed to be the new curriculum... As a department, we're not too thrilled about it. We kind of do [all three]... So we're all over the board for our high school [curriculum]. It's kind of bad (Pre, 1.15-3.7).

Appendix B (continued)

Working with technology	Stresses deriving from teachers' attempts to integrate technology into the curriculum. These stresses could be related to the pedagogy they wished to employ, the time that teaching students how to use technology took, the lack of availability of resources to perform such teaching, or the teachers' lack of knowledge about the technology that they wished to employ.	Ms. G: At first, he hit intersect, I think. [Pause.] ...I think I was just like, I'm just going to go through one at a time and show them, because ...it is frustrating, really frustrating... At this point, I feel like they should know the basic keystrokes of entering an equation, using zoom efficiently, and finding a good window. And that's what middle school's not preparing them for... I know the middle schools have them, ...but they'll get taken away for weeks, because maybe like a kid lost one or dropped it on the floor... So I feel like I have to wind around the room. And I have like people calling me all the time (Post, 12.17-14.19).
Relationships and communications with colleagues	Stresses deriving from teachers' interactions with their peers. Such stresses often related to differences in beliefs about classroom management or "teaching style," including pedagogy, collaboration, and classroom management issues.	Ms. G: And then I did a six-week-long long-term sub thing at Hamilton [High School], which was another like ideal—like they brought me in, and I was with the math department and doing these amazing things... It was my senior year, but I got hired as a long-term sub. So I taught 2 or 3 sections of math at Hamilton and spent my lunch hours with the Hamilton teachers [collaborating]... So math is different there. I: That did set your expectations pretty high. Ms. G: Yeah. And what kinds of conversations we should be having in the lunch room, you know. They are very focused. So coming here, it is a bit of a let down (Post, 27.42-28.12).*

Appendix B (continued)

Lack of student interest/motivation	Stresses deriving from teachers' attempts to engage students in their lessons and/or students' resistance to engaging in those lessons in a non-superficial way. (If it is clear that chattiness is slowing students' or the class' progress, I coded the passage here; otherwise, I coded it as Responding to problematic student behaviors. Also, when the challenge is student interest or motivation during discussions or student explorations and the teacher described the responsibility as shared, I coded it as Managing classroom discussions or Directing students' explorations of mathematics, respectively.)	Ms. P: I think one challenge that's probably going to be ongoing is just getting kids genuinely motivated or actually wanting to do whatever it is you're doing in your class on that particular day. Because sometimes they'd rather sleep, [or] there's an assembly, [or] they have something going on after school. And I guess just trying to get them to at least focus for that hour on what they need to do, trying to make the most of it. But I don't know if that's something that necessarily has an answer, other than, the better, I guess, the lesson plans are, the more engaged the kids (Pre, 8.27-9.9).
Learning and teaching unfamiliar content	Stresses deriving from teachers' attempts to teach content that they had never seen before (e.g., graph theory or statistics), had not seen recently (e.g., geometry), or had had limited opportunities to learn (e.g., calculus).	Ms. W: So next year might be kind of challenging, because I think they might try and put me in at either Precalc or Algebra 2. And that will definitely be a challenge, because... I would almost prefer to be at a middle school..., just because the content is... at a different level. ...When I did my internship, there were nights that I could go home and I really could leave it at [school]... And I could still go in and teach. At the middle school content, it's so much easier to wing it on the fly, you know? Ms. W: ...When I took over that Precalc class [for a few weeks], the night before...I was sitting down and saying, "Okay, let me make sure I go through all these homework problems to make sure I know how to do them, because when they ask me, I want to make sure I can." ...I want to know it, so that they're not, "Okay, she doesn't even know what she's talking about." Because that goes so far with them (Post, 22.26-23.21).

Appendix B (continued)

Planning lessons	Stresses deriving from teachers' attempts to prepare individual lessons. This generally involved creating new lessons or adapting existing lessons to their curricular objectives. (If the stress related to tailoring lessons for students of varying ability levels, the passage was placed in the Teaching students of varying ability levels category. If teachers related planning interesting lessons to lack of student motivation, it went in Lack of student interest/motivation.)	Ms. G: No, no, no. My whole internship year, I wrote out a lot of things. But I found that like in the "fast-pacedness" of school, I don't necessarily have time to reflect on all of those lesson plans. Or all of those lessons. I: For five or six classes every day. Ms. G: Yeah, yeah. And that is frustrating (Pre, 4.16-4.20).
Responding to problematic student behaviors	Stresses deriving from teachers' attempts to deal with student behaviors that were inappropriate for the classroom or irritating to the teacher, such as loud or excessive talking, disrespectful remarks to the teacher or other students, whining about an assignment or lesson, etc. (If the teacher said that the talking or chattiness was delaying progress or occurred while the teacher or other students talked to the class, the passage was coded as Lack of student interest/motivation. If the issue was talked about generally or the timing was unclear, this was the default code.)	Ms. P: The students... came in that day and they decided that they were going to talk and whatever... I mean pretty much one of them knows what's going on. And the other one doesn't care. So they talk to each other...And the day you came, I'd just moved their seats. We'd just got new seats there... So like that's been an issue (Post, 1.30-1.40). Ms. R: I have not had so many kids not answer...questions on the test... They're doing horribly. And not on the ones that they tried and got partial credit for... I'm grading these tests and... in the first hour three kids tried every single problem... I don't know when that became acceptable, to not try... It's not like they had a bunch of chicken scratch and then couldn't get to an answer. Completely blank...They're not even attempting to jog their memory. They're just looking at it... And that's the only thing that peeves me is that it's exactly like [the practice test]. I mean, one of the questions, even the numbers were the same (Post, 10.11-10.29)

Appendix B (continued)

Finding and utilizing resources	Stresses deriving from teachers' attempts to find physical, curricular, or human resources to meet their pedagogical goals. Often these resources involved Internet (and sometimes library or curricular) searches that met with limited or low rates of success. This category also included teachers' unsuccessful attempts to get students to be resources for each other.	I: Do you find you're pretty successful at finding things that you like [through Internet searches]? Ms. G: I'm not, actually... So much of it is like tutorials of straight up algebra... [and] notes. I'm looking for more engaging things... And so much of the things they call engaging lessons are still just kind of different ways to do notes... It's not really pushing them to the next level... My most successful spots are the virtual manipulatives... (Post, 16.35-17.14). Ms. G: I guess I struggled with the resources that I don't have in the classroom student-to-student... In general, I would say 40% of my students are absent. And it's not the same 40%... So when that population who's absent is shifting all the time, there's no continuity. It's a whole different approach to teaching than I thought I would have... Doing things in chunks of days is not very good, except like those 10 who show up regularly. Things really have to be day to day (Pre, 7.45-8.18).*
After hours work / long hours	Stresses deriving from teachers' attempts to manage their extracurricular work, such as completing class preparations and grading, thinking about management issues, etc. (If professional development took a lot of time, the passage was coded as Challenges associated with professional development.)	Ms. B: Man. The amount of time I spend doing things. Like if somehow they could find out a way to give me more time or resources... Ms. K can sit down and create a lesson or create a new document that we're using in literally 15 minutes. And it will take me an hour and a half to do the exact same thing. And I just think that that comes with time and maturity and knowing how you like to organize things (Post, 15.45-16.6).

Appendix B (continued)

Challenges associated with professional development	Stresses deriving from teacher perceptions of professional development experiences as time consuming or inadequate. This frustration often related to the number of professional development hours required by their state or the quality of the school- or district-provided professional development experiences. (If professional development took a lot of time, it was still coded as Challenges associated with professional development.)	Ms. B: The first year, we had two days required at the beginning of the year, kind of in-service type days that...the novice teachers were required to go to. We got to go to [a teambuilding experience]. It was so fun... It was a really great way to build some camaraderie between the new teachers... The next year we came back. And we weren't doing [teambuilding], even though every one of us said, "This is great! We want to do this again next year." But they didn't listen... [They sent the second-year teachers to a first-year teacher orientation instead.] And it was just, [with] everything that was going on, we got really frustrated (Post, 9.1-9.15).
Student diversity issues	Stresses deriving from teachers' attempts to relate to and involve all students, including those whose racial, linguistic and/or ethnic background was different from the teacher's and/or some of their peers.	Ms. G: And then this year, instead of like freaking out about what is [the] constitution of the class, the challenge is thinking about who I'm reaching today. And then who different can I reach tomorrow by making a change in what I'm doing. You know, because I have two [or three] days to teach a lesson in the C-series...for one simple topic. How many different ways can I do it so I can reach those different types of students, those different levels and those different languages and those different types of learners?... There's like 24 languages... I think 10% of our population is ESL (Pre, 9.45-10.25).

Appendix B (continued)

Dealing with class length, pace, or schedule	Stresses deriving from teachers' attempts to deal with challenges related to the length of class periods, the pace at which they felt obliged to teach due to an agreed upon teaching curriculum or schedule, or the demands of their particular schedule, including the number of preps, types of classes, room changes, unexpected events (like fire drills, team practices, competitions, and assemblies), etc. (Note: Pace issues related to Teaching students of varying ability levels were placed in that category and not here.)	Mr. J: So I struggle with pace, as far as "Well, what do I do? How do I accommodate all students?" as far as that. So I've kept it. Pretty much where it's at right now is where it needs to be, as far as getting material done. But I always offer extra challenges for the ones that think it's too slow. "Here are extra challenges for you to do." For going too fast, come in to get help or have someone tutor you. Do whatever it takes. You know, there are a lot of resources around the school, especially if you need to get help, so make sure you come in to get help and get caught up if you're behind (Post, 16.4-16.10).
Assessing student understanding	Stresses deriving from trying to assess whether students understood the mathematics that they were learning, whether formally or informally. This category did not include standardized tests, as defined in Preparing for, administering, evaluating, and assessing standardized tests category.	Ms. P: I guess another [challenge] is always like assessing where the students are, like during the class, like trying to feel out. Because especially if the class is dead, it's like, "Do they understand? Or just?" Do you know what I mean? Ms. P: Kind of both [during discussions and when I go around to their desks]. When I go around to their desks, I can tell [if they understand], but if I'm teaching them something new, then sometimes it's hard to tell. You know? (Post, 15.45-16.15)

Appendix B (continued)

Teaching students of varying ability levels	Stresses deriving from teachers' attempts to effectively teach students with a variety of perceived or measured ability levels within a single class.	Mr. J: As opposed to Integrated 1 which takes two semesters, the semester's broken up. The first semester of Integrated 1 is actually 1A, and it's a year. And 1B is the second semester of Integrated 1. So it is a lower track... A lot of them are in there, because the way they tested in, they need a slower pace... I do have a lot of former 1B students in Integrated 2 this year. And they're really struggling with the pace, as far as how the material is presented. So I've been working a lot with pace. I know some students in Integrated 2 feel that the pace is extremely slow and they want it sped up, or for a couple of students, too fast... So I struggle with pace, as far as "Well, what do I do? How do I accommodate all students?" ...Pretty much where it's at right now is where it needs to be, as far as getting material done. But I always offer extra challenges for the ones that think it's too slow... For going too fast, come in to get help or have someone tutor you. Do whatever it takes. ...There are a lot of resources around the school... if you're behind (Post, 15.37-16.16).
Preparing for, administering, and evaluating standardized test	Stresses deriving from teachers' attempts to prepare students for standardized tests, including modifying lesson plans and curriculum, administering those tests, evaluating the tests (where applicable), and determining how to utilize feedback from those tests to inform one's teaching. Such tests included the Federal- and State-mandated tests, as well as school- or district-created and/or -mandated tests.	Ms. R: Another way they're following up, and it's actually for all teachers, is we are going to be analyzing our test scores. Not so much to say, "You're a bad teacher. You're a good teacher." But "Your kids seem to have done better on linear equations. What types of things did you do that I didn't do that can help me out?"...[Grimace.] Ms. R: ...I get nervous as a new teacher that they are going to look at it. And if my kids do poorly, I think they're going to think that I'm a bad teacher. Or it just makes me nervous as a new teacher who doesn't know anything... to have my scores compared to a teacher who has been doing this for fifteen years (Pre, 15.24-15.37).

Appendix B (continued)

Relationships and communications with parents	Stresses deriving from teachers' interactions with parents. Often, these stressful events involved parental disapproval of the teacher's responses to student misbehaviors or the parent's reaction to their child's low grades.	Ms. B: And I had a parent who was absolutely awful to me, ...like ridiculously horrible... That was the first time I'd ever had a parent belittle me. And really make me feel like, "Oh, you've only been teaching for so long? Oh, you're awfully young! ...Oh, you're a female?" You know, that kind of stuff, so that was the first experience I had with that. And that was very unpleasant, so that was very stressful (Pre, 11.34-11.42).
Teacher boredom	Stresses deriving from trying to deal with one's own boredom while teaching because the content, lesson format, or students were not particularly engaging for the teacher. These stresses could be short-lived or persistent.	Ms. G: I think like the biggest thing that might push me out of teaching math, because I think about it sometimes, because I know what it's like to teach English... I want to make them—not like math—but be successful at math when they maybe haven't in the past. And I'm just discouraged by how dull it is for me sometimes (Post, 19.34-19.39).
Relationships and communications with administrators	Stresses deriving from administrators' decisions that made the working environment less comfortable for the teacher or from teachers' attempts to enlist administrators help with classroom management, professional development, and pedagogical concerns.	Ms. R: I am enjoying it more. At the beginning of the year, I was very, very frightened. Not of the students, but they have high, high expectations here... And I was really worried that I would not meet those expectations, that I was—you know, they, I don't want to say intimidate, but I was, after those six days of new teacher training, I was definitely worried that I could not do enough to be a good teacher at this district. Ms. R: We were given the impression that as new teachers, we would be watched very closely, our progress and our style and everything would be watched very closely. And it was very important on how many people we were passing and how many people we were not passing (Pre, 13.40-14.24).

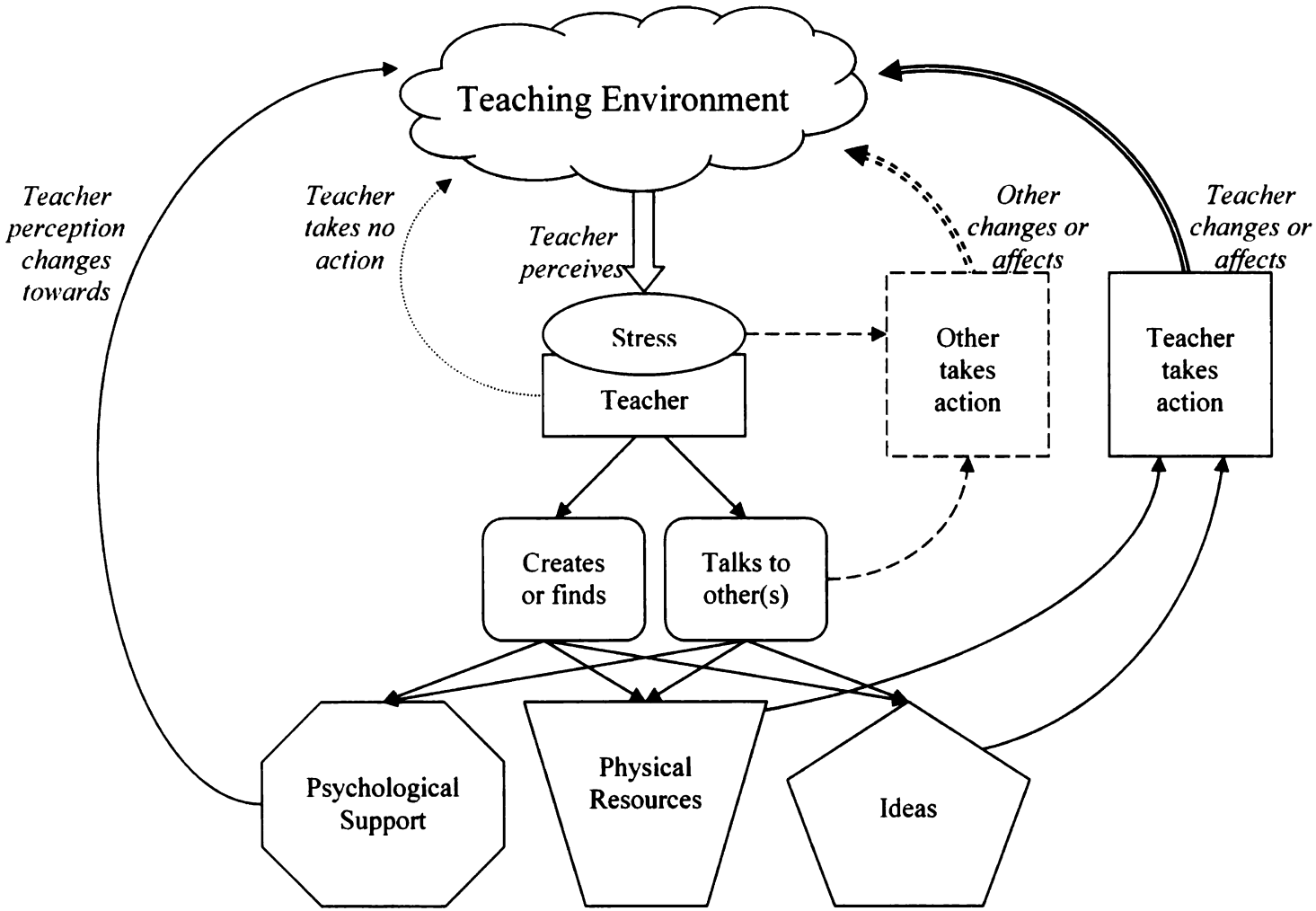
Appendix B (continued)

Relationships with students	Stresses deriving from maintaining or lacking relationships with students.	Ms. W: My mentor [from my internship] is always calling me like, "We might have a position in the district, a middle school position." ...I'm always "If you get a middle school position... and I can work next to you guys, definitely let me know, because that's one that I would consider." You know, because I love the middle school... So it would be a toss up. But if there's nothing that comes up, I'd have to just deal with it and take it as it goes. Ms. W: ...It's hard. As much as the connections that I've made here... With the 7th graders, ...they love to cling onto you... They love to have that connection. And they were so much fun, too. And they buy in to so many things. I can be like, "Okay, guys, let's do this today." (Post, 23.30-24.35).

Note. The "*" after a quote indicates that the content of that quote (as listed in this table) is related to the teacher's attempts at SBT.

Appendix C

Conceptual Mapping of Teachers' Coping Reactions to Stresses



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