

EVALUATION OF THE EXTERNSHIP
WITHIN A MASTER'S DEGREE PROGRAM
FOR MATHEMATICS SPECIALISTS
AT VIRGINIA TECH

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ABSTRACT

The purpose of this evaluation was to determine the effectiveness of an Externship as the capstone experience of a Master's degree program in preparing seventeen teachers to be Mathematics Specialists. This formative evaluation was based on the teacher's perspective and was naturalistic in design utilizing both qualitative and quantitative research methods. Data sources included a teacher survey, teacher interviews, writing prompts, teacher observations, and teacher final project presentations.

This evaluation was designed to answer the question: Do the teachers feel that the requirements of this Masters' Degree Externship have prepared them for their role as a Mathematics Specialist? The success and effectiveness of the Externship was tied directly to the teachers chosen school-based experiences which were designed based on a mathematics needs assessment of their schools. Teachers were found to be involved in all five of the essential components of an externship as outlined in the theoretical framework – application, collaboration, reflection, expectations, and the cohort structure. In addition, teachers were found to integrate their leadership and teaching skills through the engagement of their school colleagues in the improvement of educational experiences for all students. Overall, the teachers felt that the experiences throughout the Externship adequately prepared them for their roles of a mathematics specialist; working effectively with stakeholders; working with issues around curriculum and instruction; planning and delivering professional development; and working as leaders within their schools.

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the field. Thank you for seeing my potential in this area before I even thought I could do the kind of work necessary in the professional development of teachers. I continue to love to teach and to especially teach teachers.

DEDICATION

This dissertation is dedicated to several very important people in my life. First to my mother, who never had the opportunity to go to college, but made sure that I could and would go. Her love and support were unconditional and constant. I miss her daily.

This work is also dedicated to two teachers during my high school days.. As a first year teacher in an Algebra class, Jean Fowlkes started my thinking about the value of mathematics and the teaching of mathematics. She is still impacting students' lives through her teaching – thanks from all of us. One very important person in my development as a teacher was Miss Alma Porter who taught me Trig and Algebra III as a senior in high school. Her enthusiasm and love of teaching mathematics was always evident, her humor in the classroom was infectious, and she sparked my unwavering desire to become a mathematics teacher at the high school level. She kept in touch with me throughout my undergraduate work at Virginia Tech (many years ago). I hope she knew what an impact she had on my professional life.

TABLE OF CONTENTS
CHAPTER ONE: INTRODUCTION

	Page
Abstract	<i>ii</i>
Acknowledgements	<i>iv</i>
Dedication	<i>v</i>
Table of Contents	<i>vi</i>
List of Tables	<i>xii</i>
List of Figures	<i>xiii</i>
List of Appendices	<i>xiii</i>
Introduction	1
Statement of Problem	2
Purpose of the Study	3
Evaluation Questions	3
Significance of the Evaluation	4
Definition of Terms	4
Overview of the Dissertation	5

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction	6
Teachers as Leaders	6
Introduction	6
Teacher as Leader	7

Defining Teacher Leadership	13
Teacher Leadership Roles	14
Shared Leadership	17
Effectiveness of Teacher Leaders	17
An Historical Perspective of Teacher Leaders from the Commonwealth of Virginia	21
A Mathematics Specialist Licensure/Endorsement	28
Summary	28
The Concept of an Internship/Externship	31
The Importance of Collaboration	35
The Importance of Application	36
The Importance of Expectations	37
The Importance of Reflection	38
The Importance of the Cohort Structure	39
Summary and Framework	40
Evaluation of the Externship	43
Overview of Evaluation	43
Evaluation versus Research	47
The Role of the Evaluator from the American Evaluation Association	49
The Role of the Evaluator from Literature	52
Summary	55
The Role of This Evaluator	55

CHAPTER THREE: METHODOLOGY

Background	58
A Mathematics Specialist Licensure/Endorsement	59
Purpose of the Evaluation	61
Evaluation Questions	61
Significance of the Evaluation	62
Evaluation Design	62
Evaluator's Role	64
Procedures	66
Participants	66
Assurance of Confidentiality	67
Data Collection Procedures	68
Externship Survey	68
Process for Coding Externship Survey Questions	70
Writing Prompts	72
Process for Coding Writing Prompts	73
Observations	73
Process for Analyzing Observations	73
Interviews	74
Process for Analyzing Interviews	74
Final Teacher Project Presentation and Analysis	74
Evaluation Data Analysis	75

Evaluation Planning Data Matrix	75
Addressing Quality	75
Credibility	77
Transferability	77
Confirmability	77
Dependability	78
 CHAPTER FOUR: RESULTS AND DISCUSSION	
Introduction	79
Analysis of Writing Prompts	79
September Writing Prompt	80
October Writing Prompt	83
November Writing Prompt	91
December Writing Prompt	97
February Writing Prompt	101
Final Writing Prompt	106
Analysis of Teacher Observations	116
Analysis of Final Teacher Projects	118
Analysis of Teacher Survey	122
Overall Analysis	124
Analysis of Curriculum and Instruction Ranking Items	127
Analysis of Working with Stakeholders Ranking Items	128

Analysis of Professional Development Ranking Items	130
Analysis of Leadership Ranking Items	132
Teacher Frequency Data	135
Overall Analysis	135
Working Effectively with Stakeholders	138
Curriculum and Instruction	140
Professional Development	141
Leadership	142
Analysis of Teacher Identified Most Beneficial Aspects	143
Analysis of Teacher Identified Least Beneficial Aspects	146
Alignment of Externship with Teacher Expectations	148
Analysis of Teacher Interviews	150
Working Effectively with Stakeholders	151
Curriculum and Instruction	153
Professional Development	156
Leadership	158
Benefits Unique to the Externship	160
Summary	164

CHAPTER FIVE: OVERVIEW, CONCLUSIONS, AND RECOMMENDATIONS

Overview	166
Conclusions	168
Overall Conclusions	168
Based on Key Questions	169
General Conclusions	171
Recommendations	174
References	177
Appendices	187

LIST OF TABLES

Table	Page
1 Mathematics Specialist Endorsement Requirement	29
2 Background Characteristics of the Teacher Cohort	67
3 Description of Key Question Categories	71
4 Writing Prompts	72
5 Evaluation Planning Data Matrix	76
6 Incidence of Teacher Expectations by Category	81
7 Areas Identified in Preparation by Category	85
8 Categorization of Teacher Responses on Areas of most Preparation	88
9 Identified Needs by Teacher by Category	90
10 Aspects Going Well by Teacher and Category	92
11 Frustrating Aspects by Teacher and Category	95
12 Aspects Learned by Teacher and Category	99
13 Activities in Which Teachers Were Engaged by Category	102
14 Aspects Having Most Impact by Teacher and Category	107
15 Identified Enhancements by Teacher and Category	113
16 Teacher Observations by Teacher and Category	117
17 Teacher Final Projects by Teacher and Category	119
18 Mean and Standard Deviation for Each Ranking Item by Categories	123
19 Highest and Lowest Ranked Items by Category	125
20 Frequency of Activities by Teacher and Category	136

21	Most Beneficial Aspects of Externship by Teacher and Category	144
22	Least Beneficial Aspects of Externship by Teacher and Category	147
23	Teacher Interview Protocol	151

LIST OF FIGURES

Figure		Page
1	Components of a Mathematics Specialist Externship	41
2	Externship Aligned to Expectations	149

LIST OF APPENDICES

	Page	
A	Externship Syllabi – Fall 2007 and Spring 2008	187
B	Externship Teacher Survey	193
C	Externship Teacher Observation Form	201
D	Externship Teacher Interview Protocol	202
E	IRB Approval Letter	203

CHAPTER ONE

INTRODUCTION

As the Supervisor of Mathematics for a public school system in Virginia in 2005, I had the opportunity of working with Dr. Jesse Wilkins on the development of a new master's program at Virginia Tech designed for the training of Mathematics Specialists. Our initial proposal for the mathematics course components of this program received Virginia Department of Education grant funding to financially support current elementary and middle school teachers entering the program to become the district's first mathematics specialists. In addition I was able to secure financial support from the school district for these teachers to complete the remaining coursework contained in the master's program – the leadership, curriculum and instruction, assessment, and externship courses. As a result we began a collaborative partnership in the development, planning, implementation, and co-teaching of the coursework within this program.

Both Wilkins and I believed in the importance of giving these teachers as many authentic experiences within the role of a mathematics specialist as we could. Therefore, we designed an Externship experience as part of the program for these teachers with requirements and activities that would take the teachers beyond their normal classroom experiences. The first cohort of teachers within the Master's Degree Program in Curriculum and Instruction designed for Mathematics Specialist participated in the Externship throughout school year 2007-2008 and graduated with degrees in May 2008.

With the initiation of a new cohort group of teachers entering this Master's Degree Program in the Fall of 2008, it became essential to reflect upon the successes and needs of the first cohort throughout all of their experiences. This information would inform the new courses within the program.

Statement of the Problem

Seventeen teachers, 14 from a rural, public school system and three from a city public school system, as a cohort were in their last year of a three year Master's Degree program in Curriculum and Instruction working towards certification as Mathematics Specialists. As a part of this program Wilkins and I collaborated to create a full-year externship experience with requirements designed to give these teachers experiences around our understandings of the responsibilities of a mathematics specialist. All of the teachers from the county school system were employed fulltime either as teachers or specialists serving classroom teachers (gifted, technology, mathematics). The three city school participants were already serving in the capacity of Mathematics Specialists with their school system. In order to be involved in this cohort, teachers must have had at least three years of successful teaching at the elementary or middle school levels and been responsible for teaching mathematics at least part of their day. Since I had spent several years working on a Task Force for the Virginia Department of Education to look at possible job descriptions and the endorsement requirements for this new certification of Mathematics Specialist K-8, I had a firm understanding of Virginia's vision for this new position (VMSC, 2005). The requirements of this Externship were designed to give teachers in the cohort experiences outside of their classroom and "normal" teaching

responsibilities, and ones that we thought were needed to broaden the skills of these teachers in working with school administrators, groups of teachers, building-level mathematics goals, and district initiatives. Wilkins and I have co-taught all the class components (mathematics and education) of this program including the Externship.

Purpose of the Study

The purpose of this evaluation was to determine the effectiveness of the Externship as the capstone experience in the education of Mathematics Specialists. The results of this evaluation will be used to determine the continuation of this type of experience in the master's degree program and to make improvements in the Externship requirements that will be used with future cohorts of teachers in the program. This formative evaluation was naturalistic in design utilizing both qualitative and quantitative data analysis and focused on the teacher's perspectives.

Evaluation Questions

This study was designed to answer the question: Do the teachers feel that the requirements of this Masters' Degree Externship have prepared them for their role as a Mathematics Specialist?

- Has the Externship prepared the teachers to work effectively with all the stakeholders in their new role as a Mathematics Specialist?
- Has the Externship prepared the teachers to work effectively with issues related to curriculum and instruction?
- Has the Externship prepared the teachers to develop and deliver effective professional development?

- Has the Externship prepared the teachers for their leadership roles as a Mathematics Specialist?

Significance of the Evaluation

The intent of this study was to provide information that would be used to shape and continue to improve the Externship experience for teachers training to become mathematics specialists. While other schools across the Commonwealth of Virginia offer courses and have established master's degree programs for mathematics specialists, this Virginia Tech program is unique in its inclusion of this type of Externship experience as a requirement, a year-long experience focusing the teachers on a school's mathematical needs. It was therefore essential to evaluate the effectiveness of this experience in meeting the needs of the teachers, to determine the value of this requirement. This evaluation would certainly inform the continuous improvement of the Externship within the Virginia Tech program, but could also inform the other university programs of the importance of the inclusion of such experiences for teachers.

Definition of Terms

The term Externship is used throughout this study as the designation of the experiences in the field in which teachers were involved. Virginia Tech uses this title to describe an experience that is slightly different than the traditional internships required of student teachers and principal candidates.

The education and licensure of a teacher as a Mathematics Specialist is delineated by the Virginia Department of Education through its licensure program

(VDOE, 2007). In general, there are mathematics content, leadership, and curriculum and instruction courses, along with teaching experience required for this licensure.

Overview of the Dissertation

Chapter One includes an introduction, a statement of the study's purpose and significance, key research questions, and definition of terms. Chapter Two provides a review of related literature around teacher leadership and the role of a Mathematics Specialist, the design of an externship, and the evaluation process. Chapter Three describes the methodology used in the study, indicating the study's design, data collection strategies, and the data analysis procedure. Chapter Four contains the results of the study including a discussion of the emerging themes that developed from the various data collection tools. Chapter Five includes an overview, conclusions, and recommendations for the Mathematics Specialist Externship experience.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The Externship within the Master's Degree Program is designed to provide realistic, valuable experiences in the training of teachers as mathematics specialists. This chapter synthesizes the research literature related to the development, implementation, and evaluation of such an externship and is divided into three parts: (a) the development of teachers as leaders, (b) the concept of an externship/internship experience, and (c) the design of an evaluation.

In order to conduct this review, a literature search of the computerized databases Educational Resources Information Center (ERIC) and Dissertation Abstracts was conducted. Dates were not limited in this research because an historical perspective was needed. References within journals, book chapters, dissertations, and related studies led to the identification of additional reference sources that were used.

Teachers as Leaders

Introduction

Through most of the twentieth century, the educational system modeled its leadership style on a top-down vision of school leaders. The principal was seen as the ultimate leader within a school, making all the necessary decisions whether managerial or educational in nature. Calls for educational reform have all included an increasing emphasis on the importance of teacher leadership and teacher quality in school improvement initiatives. The actual roles that teachers have taken on as leaders in schools have evolved over the years with shifts in direction and focus. Prior to the

1980s, the principal was seen as the sole leader of a school, the only one given authority over aspects of school operations, a manager making decisions alone. This top-down approach (Cuban, 1988) to dealing with educational issues was called into question during the 1980's education reform initiatives (National Commission on Excellence in Education, 1983; The Holmes Group, 1986, 1990, 1995; National Commission on Teaching and America's Future, 1996). It was at this time that a focus on leadership shifted to the possibilities of roles that teachers could play in improving school success.

Teacher as Leader

The evolution of the concept of teacher as leader has been described as coming in three waves (Silva, Gimbert, & Nolan, 2000). Throughout these three waves the teacher's role as a leader has developed and changed. During the first of these waves, the emphasis was on the managerial aspects of teacher leadership in maintaining and improving the efficiency of school operations. During this phase teacher leaders served in the roles of department chairs or grade level chairs, and "focused on the effectiveness and efficiency of the system rather than on instructional leadership" (p.780). These teacher leaders ensured that all teachers were working together, maintaining the focus and efforts on the department chair's vision, and the principal remained the decision-maker for the school (Blasé, 1990). It was during this time that the Holmes Group (1986) emphasized the need to reform teacher preparation programs and restructure the teaching force by creating Professional Development Schools built "on the university based curriculum efforts of the 1960s and their attempts to bring the best minds of the university to the task of improving the curriculum of the schools" (p. 2).

Teachers were being directed by outside forces and told the focus for their classrooms. Frymier (1987) described this management focus of the teacher leadership role as causing teachers to be “neutered by the bureaucratic routinization of teaching and learning that has grown out of administrative attempts to control schools” (p. 11). Retzug (1991) suggested that teachers’ lack of autonomy during this time period affected their commitment to change and even their willingness to take on leadership roles.

The second wave in the evolution of teachers as leaders shifted the discussion of teacher roles to have more of an instructional focus. At this time the National Commission on Teaching and America’s Future (1996) included the goal that by 2006, the United States would guarantee that every student would have a caring, competent, and qualified teacher. This report highlighted the importance of instructional practices in the classroom. Therefore, during this wave teacher leaders were seen as instructional leaders and their roles took the form of team leaders, mentors, curriculum developers, and providers of staff development. Teacher leaders often created curriculum packages of materials and activities that could be used in all classrooms and they provided professional development opportunities for teachers outside of their normal teaching schedules. Darling-Hammond (1998) referred to this as “remote controlling of teachers” through the use of “cookie cutter routines” (p.9).

It was during this wave that the National Science Foundation funded Statewide Systemic Initiative (SSI) Programs focused on improving mathematics and science education. “The SSI program invited states to design approaches to systemic reform and implement strategies that fit their particular needs and contexts” (National Science

Foundation, 1998, vii). As an example, Virginia's SSI called Virginia Quality Education in Sciences and Technology (V-QUEST), focused on making high quality mathematics and science education available to all students through professional development activities and pilot projects for teachers, and the development of curriculum materials for teacher use. Approximately 25%-30% of the V-QUEST funds were dedicated to a lead teacher component of the project during its duration, 1992-1996. By the end of summer 1996, 960 teachers from about one-third of Virginia's K-8 schools had been trained as lead teachers (NSF, 1998). In 1997, the Virginia Mathematics and Science Coalition (VMSC) published a whitepaper on the efforts in Virginia to train lead teachers (Critchfield & Pitt, 1997). This report highlighted the various specific initiatives across the Commonwealth aimed at the training of lead teachers. These lead teachers, in most cases, continued in their regular teaching roles and in addition, were:

expected to provide inservice for their colleagues, manage mathematics and science resources, organize schoolwide and community activities, act as liaisons to the central office, and develop effective teaching methods to ensure success for underrepresented students (NSF, 1998, p. 81)

This description of the role of a lead teacher illustrates the vision of teacher leaders that existed during this second wave. The emphasis was on the leadership focus that was out-side of and in addition to a teacher's normal work responsibilities. Wiggenton (1992) cited this as one of the major problems with the roles during this time period – the teacher leaders were acting outside of the normal classroom routines and the teachers' daily schedules. The final report of the V-QUEST project stated that the strategy of preparing only a "select number of teachers to lead reform efforts in their schools and districts proved to be an ineffective approach to comprehensive reform" (NSF, 1998, p.

81). Even though the initiative provided staff development and instructional materials for the teachers, their “lack of prior content knowledge, coupled with insufficient resources, administration support, and release time, contributed to the ineffectiveness of this approach to reform” (p. 81). This specific example of an initiative that was deemed ineffective in its approach to systemic reform during this second wave in the evolution of teacher leaders illustrates the problems that existed throughout this structure of teacher leadership.

Fullan (1993) emphasized the limitations of teacher leadership during this second wave:

Improvements in teaching and learning involve so much more than the distribution of a new package of materials and teaching strategies; they demand the development of practice which necessarily entails questions about values, beliefs and understanding. (p.175)

Teachers, trained during this second wave were not able to affect systemic, whole-school change in the teaching of mathematics. Therefore, the philosophical approach to training teacher leaders evolved into a third wave view. This third wave view tended to enhance the second wave, increased the emphasis on instruction, but shifted the focus away from a teacher receiving outside information and materials to teacher leaders leading from within the classrooms, valuing collegiality and professionalism of teachers.

Sergiovanni and Starratt (1998) emphasized this need to connect to the classroom:

Teacher leadership involves the experimentation and examination of more powerful learning activities with and for students, in the service of enhanced student productions and performances of knowledge and understanding. Based on this leadership with and of students, teacher leaders invite other teachers to similar engagements with students in the learning process. (p.149)

Teacher leaders were seen as teacher collaborators, instructional coaches, and mentors within classrooms. Wasley (1991) expressed this view of a teacher leader whose effectiveness comes in working collegially with other teachers to encourage examination and evaluation of instructional practices as they impact student learning, to “mentor their colleagues, engage in problem solving at the school level, and provide professional growth activities for their colleagues” (p. 5). Silva et al. (2000) described the ability of a teacher leader as one who could “navigate the structures of schools, nurture relationships, model and encourage professional growth, encourage change, and challenge the status quo” (p. 793). Darling-Hammond (1995) described the teacher leader during this wave as a teacher who was open to new ways of doing things and who could model good instructional practices that enhanced student learning and the educational experiences that students would have. Berry and Ginsburg (1990) offered three components of such a teacher leader which included the ability to mentor and coach others, provide professional development, and be involved in making decisions on the school-level. In describing teacher leaders during this phase, Lieberman et al. (1988) included the characteristics of an ability to build trust and rapport, to use resources, to build skill and confidence in other teachers, and to deal with organizational issues. During this third wave, the teacher leader was seen as an instrument within the educational process that could integrate leadership and teaching skills in order to engage colleagues in improving the educational experiences for all students.

Pounder (2006) not only discussed the nature of these three waves in the historical development of teacher leaders, but also situated the characteristics of teacher leadership into current theories of leadership, a process he calls the fourth

wave. Moving away from transactional leadership in which a leader uses a punishment and reward system of leading, transformational leadership can be defined as a “power and influence theory in which the leader acts in mutual ways with followers, appeals to their higher needs, and inspires and motivates followers to move toward a particular purpose” (ASHE, p. 34). Bass (1985) described leadership characteristics that he classified as transformational:

- Idealized influence or charisma – sense of vision and mission, gains respect, excites, and inspires others
- Inspirational motivation – ability to model and focus efforts
- Individual consideration – ability to coach and mentor others, ability to solicit and determine needs of individuals and incorporate these into the organization’s mission
- Intellectual stimulation – ability to stimulate others to reassess situations and rethink the ways things are done (p. 137)

Pounder links the characteristics of teacher leaders to these transformational dimensions. His comparisons include:

- the ability to nurture relationships (Silva, 2000) → Individual consideration
- the ability to be a change agent, challenge current ways of doing things (Silva, 2000) → Intellectual stimulation
- willingness to be open to change, try new ways (Darling-Hammond, 1995) → Intellectual stimulation
- ability to mentor and coach others → Inspirational motivation
- ability to build trust and rapport (York-Barr and Duke, 2004) → Idealized influence or charisma
- ability to promote growth, communicate and listen well (York-Barr and Duke, 2004) → Individual consideration (p.537)

Through this work, it seems that Pounder described the characteristics of effective teacher leaders within a transformational leadership style, rather than describing a new philosophical view of teachers as leaders.

Defining Teacher Leadership

Because of the vast meanings attached to the notion of teacher leadership, it is hard to find one succinct definition of teacher leadership. However, Childs-Bowen, Moller, and Scrivner (2000) offered one of the more complete descriptions of a teacher leader:

Teacher leadership does not focus on developing an alternative track to the administration. In contrast, we believe teachers are leaders when they function in professional learning communities to affect student learning; contribute to school improvement; inspire excellence in practice; and empower stakeholders to participate in educational improvement . (p. 28)

This definition highlights the teacher leader as being separate from school administration, and focused on student learning through improved instruction.

Wasley (1991) described a teacher leader as one who has:

the ability ...to engage colleagues in experimentation and then examination of more powerful instructional practices in the service of more engaged student learning [and] to encourage colleagues to change, to do things they wouldn't ordinarily consider without the influence of the leader. (p. 170)

York-Barr and Duke (2004) suggested that:

teacher leadership is the process by which teachers, individually or collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practice with the aim of increased student learning and achievement. (p.287-288)

Katzenmeyer and Moller (2001) described teacher leaders as those “who are leaders within and beyond the classroom, who identify with and contribute to a community of teacher leaders, and influence others towards improved educational practice” (p.17).

Boles and Troen (1994) also incorporated the notion of a community of learners by adding that teacher leadership is “collective leadership in which teachers develop expertise by working collaboratively” (p.11).

Snell and Swanson (2000) provided a fairly comprehensive definition of teacher leadership that is consistent with other researchers (Lambert et al, 1997; Leithwood, 1992, Katzenmeyer & Moller, 1996; Wasley, 1991) and includes the type of teacher that becomes a teacher leader as “those who are exemplars in their classrooms, effective coaches of their peers, and change agents who contribute to school, district, state, and national educational reform” (p.4).

Crowther and Olsen (1997) offered a much more philosophical definition:

Teacher leadership is essentially an ethical stance that is based on views of both a better world and the power of teaching to shape meaning systems. It manifests in actions that involve the wider community and leads to the creation of new forms of understanding that will enhance the quality of life of the community in the long term. It reaches its potential in contexts where system and school structures are facilitative and appreciative. (p.12)

Together all of these researchers included the dimensions of working with multiple groups in forming a learning community focused on improving student learning. In addition, a teacher leader interacts with other teachers and students in the normal classroom setting to improve instructional strategies and assessment techniques. These leaders are able to mentor and coach others, and to work effectively with other leaders to focus on the improved instruction for all students.

Teacher Leadership Roles

Most authors and researchers over the years have offered descriptions of the roles of teacher leaders instead of stating a specific definition. For example, York-Barr

and Duke (2004) expressed that “the hope for teacher leadership [is] continuous improvement of teaching and learning in our nation’s schools, with the result being increased achievement for every student” (p. 255). Childs-Bowen, Moller, and Scrivner (2000) also expanded on what the teacher leader can do: “teacher leaders can help guide fellow teachers and the school at large toward higher standards of achievement and recognition of individual responsibility for school reform” (p. 33).

Snell and Swanson (2000) developed what they termed the Five Dimensions of teacher leadership which included:

- empowerment – assisting others at becoming risk-takers and problem solvers
- expertise – in the areas of pedagogical content knowledge, assessment, and curriculum development
- reflection – engaging others in reflective dialogue
- collaboration – skillful at communicating, compromising
- flexibility – ability to adapt according to the reflective dialogue and needs (p. 7)

Ash and Persall (2000) discussed the role of the teacher leader as an action researcher, trying out ideas for improvement within the classroom. Little (2000) specifically included the need for a teacher leader to perform classroom observations. Lieberman et al. (2000) referred to the collaborative culture that an effective teacher leader can and should facilitate within a school in order to assist other teachers in their willingness to try new ideas and strategies. Katzenmeyer and Moller (2001) identified three facets of teacher leadership:

- leadership of students or other teachers: facilitator, coach, mentor, trainer, curriculum specialist, creating new approaches, leading study groups;
- leadership of operational tasks: keeping the school organised and moving towards its goals, through roles as Head of Department, action researcher, member of task forces;

- leadership through decision making or partnership: membership of school improvement teams, membership of committees; instigator of partnerships with business, higher education institutions, LEAs, and parent teacher associations. (p.315)

Crowther et al. (2002) captured the ways in which teacher leaders lead:

conveying convictions about a better world; striving for authenticity in their teaching, learning, and assessment practices; facilitating communities of learning through organization-wide processes; confronting barriers in schools' culture and structures; translating ideas into sustainable systems of action' and nurturing a culture of success. (p. 38)

Muijs & Harris (2003) and Day & Harris (2003) described four dimensions of teacher leadership that included being able to make connections within and between schools to enhance teacher development, to work with other teachers on reflection of instructional practices, to serve as an instructional support and expert for other teachers, and to create strong trusting relationships with school faculty and administration. Harris and Muijs (2003) describe teacher leaders as having the leadership skills to help other teachers through coaching and mentoring, to develop tasks to improve teaching and learning, and to develop and model effective teaching strategies. These authors emphasized that this type of leadership “stems from professional collaboration, development, and growth” (p.40), and has as a core its “focus upon improving learning” (p.40).

Additional roles of these leaders included modeling effective instructional practices, encouraging the sharing of best instructional practices, mentoring new teachers, collaborating with teacher colleagues, with the end result being a more professional work environment (Barth, 2001; Hart, 1995; Lieberman & Miller, 1999;

Weiss et al., 1992). Overall teacher leadership roles focus on the improvement of all teachers' abilities to instruct students through collaboration with other teachers, focusing the school on its goals, and through mentoring and coaching. Teacher leaders also assist teachers in the sharing of best instructional practices within all classrooms.

Shared Leadership

Many terms have emerged to describe the position of a teacher leader within the school setting. These terms have included shared leadership, distributed leadership, dispersed leadership, collective leadership, and parallel leadership. Although different phrases may be used to describe this type of position, the philosophies behind this sharing of responsibilities remains consistent and seems to be captured by Crowther et al., (2002) when they introduced the concept of parallel leadership:

parallel leadership encourages a relatedness between teacher leaders and administrator leaders that activates and sustains the knowledge-generating capacity of schools. Parallel leadership is a process whereby teacher leaders and their principals engage in collective action to build school capacity. (p. 38)

In describing the idea of parallel leadership, Crowther et al, further specified that the teacher leader should assume primary responsibility for the pedagogical and instructional leadership of a school, focusing on improvement in the areas of teaching and learning.

Effectiveness of Teacher Leaders

When discussing teacher leadership, it was necessary to consider what made teacher leaders effective. One very important factor was the understanding that colleagues must possess about the ambiguous nature of the leadership role – the focus

of a teacher leader's time and energy was determined by context and needs within a school at a specific time (Hart, 1994; Stone, Horejs, & Lomas, 1997). Hart also described the need for on-going communication and feedback between the teacher leader and colleagues in order to promote support and to make the work more visible at all times. Feiler, Heritage, & Gallimore (2000) in discussing the needs of teacher leaders stated that the "basic requirement is ongoing professional interaction with colleagues, especially a sustained, week-by-week focus on specific teaching and learning issues" (p. 66); and that the teacher leaders needed to "spend a majority of their time in classrooms or working directly with other teachers" (p. 68). School culture has also been recognized as a major influence on any school improvement efforts (Deal & Peterson, 1998; Fullan, 2001; Griffin, 1995; Talbert and McLaughlin, 1994), and therefore, a major influence on the effectiveness of teacher leaders. The faculty and staff within a school must be ready and willing to work towards improvement, a culture must be in place ready to support change efforts in order for any leader to be effective.

In order for a teacher leader to be effective in supporting teachers, he/she must have a deep understanding of content as well as pedagogy. West and Staub (2003) summarized this by saying:

Teaching is a learnable craft – it takes effort, support, deep and flexible content knowledge, a large repertoire of learning strategies and teaching methods, and a basic understanding of theories of learning. We take the stance that professional dialogue on learning and teaching at the school site, in relation to particular students, in specific academic domains, is necessary for developing successful and replicable practices of teaching. (p. xxi-xxii)

In order to be an effective support for all teachers, the teacher leader must have expertise in both areas of content and pedagogy, and how they interact to impact student learning.

Included in this discussion of the things that must be present to ensure the effectiveness of teacher leaders is opportunities for their continuous professional development on the many skills that are needed within the position and to assist them in adapting to the new roles involved within the position of teacher leader (Katzenmeyer & Moller, 2001). Gehrke (1991) and Clemson-Ingram & Fessler (1997) discussed the importance of opportunities to network with others in a very structured way to assist in developing their leadership potential. Harris (2003) emphasized that “attention must be paid to building an infrastructure to support collaboration and creating the internal conditions for mutual learning” (p.321). Lambert (1997) also discussed the importance of professional development time for the teacher leaders and identified the kind of professional development most beneficial as that which provides time for teacher collaboration and reflection on school and classroom practices.

What actually happens within a school is also greatly impacted by the beliefs and vision possessed by the school principal. Several research studies have found that the effectiveness of teacher leadership roles depends on the support that they receive from principals (Camburn et al, 2003; Mangin, 2005). Mangin (2007) frames this in stronger terms as, “teacher leaders require significant support from school principals” (p. 347). A principal’s support can come in many forms ranging from providing the teacher leader with school data records to creating time and participating in the data analysis with all teachers within the school; hiring a lead teacher or specialist to create the culture within

the school around the importance of collaboration; providing the lead teacher or specialist with workspace to manipulating the school schedule to enable all teachers to have full access to the expertise of the teacher leader. Marks and Printy,(2003) and Mangin, (2007) found that school performance in the areas of instructional pedagogy as well as student achievement was more likely to improve when a principal functioned as a transitional leader, supporting teacher leaders as they act as instructional support for classroom teachers. It was also found that “high levels of knowledge and interaction can promote principals’ support for teacher leadership” (Mangin, 2007, p. 349). In order for the position of mathematics specialist to be effective within a school setting, the principal must have a strong understanding and belief in the possible effectiveness of the role and a principal’s vision must mesh with that of the teacher leader or specialist.

Building relationships with teaching colleagues and a principal may actually be the key factor in determining the effectiveness of teacher leaders (Barth, 2001; Childs-Bowen et al., 2000; Crowther et al., 2002; Hart, 1994; LeBlanc & Shelton, 1997; Lieberman, 1988; Silva et al., 2000; York-Barr & Duke, 2004). Barth (2001) emphasized the importance of the principal in stating, “if teacher leadership is crucial to the health and performance of a school, principals are crucial to the health and the performance of teacher leaders” (p. 448).

Crowther et al. (2002), in discussing the idea of parallel leadership, described the principal as being responsible for alignment of resources to support the improvements in teaching and learning, “where we have seen teacher leadership begin to flourish, principals have actively supported it or, at least, encouraged it” (p. 33). The ways that a principal can support and promote teacher leadership included building a school culture

that is supportive of teacher leaders (Bishop, Tinley, & Berman, 1997; Kahrs, 1996; Lieberman, 1998), relinquishing some power and authority to the teacher leader (Barth, 2001), creating opportunities for teacher leaders to lead (Childs-Bowen et al., 2000), supporting the process of reflective practice (Terry, 1999), and creating opportunities for ongoing dialogue around teaching and learning (Conzemius, 1999). Barth (2001) emphasized the importance of the principal's role in saying that teachers may "exercise leadership independently, but few can successfully undertake a school improvement initiative without support from the school principal" (p. 447).

An Historical Perspective of Teacher Leaders from the Commonwealth of Virginia

The Virginia Mathematics and Science Coalition (VCMS, prior to 1993 called the Virginia Mathematics Coalition), the Virginia Department of Education (VDOE), the Virginia Council of Teachers of Mathematics (VCTM), and multiple institutions of higher learning throughout Virginia collaborated on the V-QUEST project during the years 1992-1996. A portion of the project provided funding for the training of a group of lead teachers for Virginia schools, teachers being trained to become leaders within their own schools focusing on mathematical needs. Pitt (2005) described the project as:

a sustained initiative to develop the concept of Mathematics and Science Lead Teachers, as well as develop our understanding of the training and support that Lead Teachers would need to be effective. This became the Coalition's highest educational priority (p. 2).

By the end of summer 1996, about 960 teachers had been trained through summer professional development workshops designed to increase the teachers' content knowledge through the use of prepared activities that these teachers could use within their own classrooms. In 1997, the Virginia Mathematics and Science Coalition (VMSC)

published a whitepaper on the efforts in Virginia to train lead teachers (Critchfield & Pitt, 1997). This report highlighted the various specific initiatives across the Commonwealth aimed at the training of lead teachers. These lead teachers, in most cases, continued in their regular teaching roles and in addition, were:

expected to provide inservice for their colleagues, manage mathematics and science resources, organize schoolwide and community activities, act as liaisons to the central office, and develop effective teaching methods to ensure success for underrepresented students. (NSF, 1998, p. 81)

This description of the role of a lead teacher illustrated the vision of teacher leaders that existed during the second wave period in the evolution of teacher as leader. It was found that this effort was not very successful. The individual teachers participating in the professional development gained in expertise, but this did not have much impact on other teachers within the schools because these teachers were not given release time to work collaboratively with other teachers, sharing materials and instructional strategies learned.

In 1999 the VMSC published an Executive Summary focusing again on training lead teachers in the areas of mathematics and science. Since the NSF V-QUEST project had ended and funding was no longer available through that initiative, the VMSC's Summary was a call to improve the content knowledge of mathematics teachers especially at the middle school level by increasing the staff development opportunities that were available for them, funding coursework for the teachers through the Virginia budget process, and focusing institutions of higher learning on the training of these teachers. The goal of the VMSC was still on the training of a select group of mathematics and science teachers through coursework and staff development offered

outside of the normal working environment and schedules, in most cases by university faculty.

Since the training of a select group of teachers, who after training returned to their classroom responsibilities, had not been very effective in creating systemic change in the schools, a new initiative began within the Commonwealth of Virginia that resulted in the creation of a certified position of Mathematics Specialist. This new position was expected to include roles and responsibilities for this teacher leader aligned with the vision of the third wave. The concept of a Mathematics Specialist was not a new one. In 1984 Dossey addressed the need for this role in an article entitled “Elementary School Mathematics Specialists: Where Are They?”. His call was for additional support for the teaching of mathematics at the elementary level. He did not propose a specific model or vision for the Specialist position, but he did discuss the need for assistance that existed at this level. The creation of specialists teaching mathematics has been advocated throughout the literature since Dossey’s initial article (National Research Council, 1989; Rowan and Campbell, 1995; National Research Council, 2001; Reys and Fennell, 2003; Nickerson and Moriarty, 2005; Fennell, 2006). In addition, a national call for mathematics specialists at the elementary school level was seen in three national reports: *The Mathematics Education of Teachers*, 2001; *Adding It Up: Helping Children Learn Mathematics*, 2001; and NCTM’s *Principles and Standards of School Mathematics*, 2000.

In or around the year 2000, George Mason University (GMU) and Virginia Commonwealth University (VCU) developed and offered graduate leadership coursework in mathematics education targeted for mathematics lead teachers and

those interested in an anticipated position of mathematics specialist. Several school divisions already had in place teachers called mathematics lead teachers or mathematics specialists, but there was no standard training process, no certification nor licensure process, no standard job description, and no listing of standard job responsibilities for these individuals. However, it was found that “the graduates of these programs at GMU and VCU began impacting the schools in geographic regions adjacent to the universities” (Pitt, 2005, p.3). At the same time ExxonMobile partnered with two school systems in Virginia, Hanover County and Bedford County, to fund additional work towards training mathematics lead teachers. In addition, VMSC working with support from ExxonMobile began hosting meetings of school administrators and higher education faculty from across the Commonwealth focusing discussions around the needs for and the creation of a licensure process for the certification and recognition of the mathematics specialists positions. In the summer of 2002 the University of Virginia (UVa) in partnership with eight school divisions offered its first Mathematics Specialist Leadership Institute. With the growth in numbers of programs available for teachers and the commonwealth-wide discussions that were continuing around the effectiveness of teachers working with schools in the capacity of a mathematics specialist, teachers from additional school divisions sought the training and additional institutions of higher learning began the development of programs to meet these teachers’ needs.

In the Fall of 2002 a task force was formed by the VMSC to explore the feasibility of mathematics specialists at the elementary and middle school levels in Virginia. Included in the task force were mathematics supervisors and coordinators from school

divisions across Virginia, mathematics education and mathematics faculty from both two and four year institutions of higher learning, and leadership representatives from the three state mathematics organizations (VCTM, VCMS, and VMSC). Drawing upon research surrounding the lead-teacher projects, research literature, and collected information and descriptions on existing similar positions already in place across Virginia, the task force prepared a report that was published in the *Journal of Mathematics and Science: Collaborative Explorations* (2005) and presented to the VDOE, the Virginia Board of Education, and other agencies dealing with educational policy. The report advocated for the creation and certification of the position of Mathematics Specialist in Virginia. The task force (VMSC, 2005) also made recommendations concerning the role and responsibilities for this new position:

- Translate mathematics standards and research into classroom practice to support implementation of the Virginia Standards of Learning and the National Council of Teachers of Mathematics Principles and Standards of School Mathematics.
- Plan and facilitate professional development sessions to focus on the needs of staff members in the implementation of a high quality and challenging mathematics program for all students.
- Work collaboratively with building administrators and staff to plan, implement, and evaluate effective mathematics programs that support the improvement of teaching and learning.
- Work collaboratively with teachers to implement a variety of instructional and assessment strategies to meet the needs of a diverse student population.
- Support teachers in identifying, implementing, and refining the use of instructional resources and strategies through coaching, co-teaching, and modeling lessons.
- Work collaboratively with administrators and teachers to analyze student work, to identify students' level of understanding and/or proficiency, to interpret assessment information to inform the instructional program as well as to assist teachers differentiating instruction.
- Facilitate parent workshops in mathematics and share ways to work with their children in mathematics.

- Provide ongoing assistance to new teachers, especially first year teachers and “career switchers” in mathematics content and mathematics pedagogy. (p. 7)

Through this recommendation the Task Force clearly defined the multiple facets of this position. The mathematics specialist position was to work with teachers, administrators, and parents in ways that promote student learning. It is also clear from this listing that the Mathematics Specialist position would differ from that of a Reading Specialist (whose certification and job description has existed for years). In dealing with issues around literacy, speech therapy, special education, remediation, and English language learners, two models of delivery of instruction are called the “pull-out” and “push-in” models. The pull-out model has students removed from the regular education classroom to receive specialized instruction in another setting. Within the push-in model, students receive needed services from a specialist teacher within the regular education classroom setting or indirectly through the classroom teacher. A Reading Specialist often works in a “pull-out” program, pulling individuals or small groups of students out of the classroom to address their reading needs. Through the responsibilities list from the Mathematics Specialist task force it was clear that the vision for this position was not one of a pull-out model, but more a “push-in” model. Responsibilities listed by the task force not only included working directly with students, but also working with all teachers in a school, administrators, and parents to impact the effectiveness of the mathematics instruction throughout the school.

Using information from the task force (even before fully completed), the VDOE created a listing of regulations for endorsement as a Mathematics Specialist. In the

spring of 2003 these regulations were approved by the state Board of Education. As a result of this approval, the VDOE named Mathematics Specialists as one focus of their Mathematics and Science Partnership Competitive Grant Program offerings in the fall of 2003 (VDOE, 2003) which was advertised through a Superintendent's Memo to all school systems in Virginia.

In 2004 VCU and VMSC received two large grants from the NSF. These grants supported a research study on the effectiveness and impact of mathematics specialists on student learning in Virginia; supported Norfolk State University (NSU), UVa, and VCU in their offering of the courses designed to train mathematics specialists; and supported the offering of summer institutes using these courses. Throughout this time period additional institutions of higher learning became partners in this Commonwealth-wide development and offering of courses aimed at the certification of mathematics specialists. For example in 2005, Virginia Tech received funding from the VDOE Teacher Quality Enhancement Grant: Incentive-Based Funding Initiative to develop and implement the mathematics content courses necessary within a program to train mathematics specialists (Wilkins & Lloyd, 2006).

In 2005 the Virginia Legislature, in a joint resolution, instructed the Virginia Board of Education to develop an endorsement process for Mathematics Specialists. As a result of the combined efforts of the task force, VMSC, the VCTM, the Virginia Council of Mathematics Supervisors (VCMS), VDOE, and mathematics educators throughout the Commonwealth, the position and the certification requirements for the Mathematics Specialist was approved in 2007 by the Virginia Board of Education. This process set in motion a renewed emphasis on the Virginia Mathematics Specialist position in school

systems across Virginia. Although neither the Board of Education nor the VDOE established a formal description of the role and responsibilities for the position, the vision for this role was a major piece of the task force recommendations in all of its presentations and its written report to the VMSC. For the scope of this dissertation, the listing of the responsibilities for the Mathematics Specialist as presented in the task force recommendations is used as the Virginia vision for this position (VMSC, 2005).

A Mathematics Specialist Licensure/Endorsement

Using input from the Task Force (VMSC, 2005), the Virginia Department of Education established the requirements for teachers to achieve the licensure as a Mathematics Specialist (VDOE, 2007). A complete description of the requirements are presented in Table 1. In addition, the position of mathematics specialist was designed to include responsibilities to coach and mentor teachers within their classrooms, to serve as a school and teacher resource, to work with parents and community members, to analyze data for instructional uses, to provide focused professional development, to aide teachers in assessing student learning, and to assist teachers and administrators in interpreting the standards (VMSC, 2005). This description of the leadership role of a mathematics specialist illustrates the vision of teacher leadership as it exists within the third wave.

Summary

Even though there is no one agreed upon definition of teacher leadership or even one accepted description of the roles that a teacher leader should take on, it was evident throughout the literature that there is a need for effective teacher leadership in

our schools. Certainly the vision of teacher leadership had evolved over the years as researchers, educators at the universities and school levels, and other stakeholders in our schools search for effective ways to meet the challenge of educating all students. One thing was very certain, teacher leadership was an essential part of any reform and

Table 1

Endorsement requirements

The candidate must have:

1. Completed at least three years of successful classroom teaching experience in which the teaching of mathematics was an important responsibility; and
 2. Graduated from an approved mathematics specialist preparation program (master's level); or completed a master's level program in mathematics, mathematics education, or related education field with 30 semester hours of graduate coursework in the competencies listed below, including at least 21 hours of coursework in undergraduate or graduate-level mathematics.
 - a. Understanding of the knowledge, skills, and processes of the Virginia Mathematics Standards of Learning and how curriculum may be organized to teach these standards to diverse learners;
 - b. Understanding of a core knowledge base of concepts and procedures within the discipline of mathematics, including the following strands: number systems and number theory; geometry and measurement; statistics and probability; and functions and algebra;
 - c. Understanding of the sequential nature of mathematics and the mathematical structures inherent in the content strands;
 - d. Understanding of the connections among mathematical concepts and procedures and their practical applications;
 - e. Understanding of and the ability to use the five processes – becoming mathematical problem solvers, reasoning mathematically, communicating mathematically, making mathematical connections, and using mathematical representations – at different levels of complexity;
 - f. Understanding of the history of mathematics, including the contributions of different individuals and cultures toward the development of mathematics and the role of mathematics in culture and society;
 - g. Understanding of major current curriculum studies and trends in mathematics;
 - h. Understanding of the role of technology and the ability to use graphing utilities and computers in the teaching and learning of mathematics;
 - i. Understanding of and the ability to select, adapt, evaluate and use instructional materials and resources, including professional journals and technology;
 - j. Understanding of and the ability to use strategies for managing, assessing, and monitoring student learning, including diagnosing student errors;
 - k. Understanding of and the ability to use strategies to teach mathematics to diverse learners;
 - l. Understanding of leadership skills needed to improve mathematics programs at the school and division levels, including the needs of high and low-achieving students and of strategies to challenge them at appropriate levels; child psychology, including personality and learning behaviors; educational measurement and evaluation; and effective professional development approaches; and
 - m. Understanding of and proficiency in grammar, usage, and mechanics and their integration in writing.
-

improvement efforts and teachers must be leaders in schools in order to improve student learning (Dozier, 2002). Little (1988) emphasized that “teachers who lead leave their mark on teaching. By their presence and their performance, they change how other teachers think about, plan for, and conduct their work” (p.84). Fessler and Ungaretti (1994) are emphatic in their prediction that “meaningful school reform will not occur until teachers are recognized as full partners in leading, defining, and implementing school improvement efforts”. (p.211) As stated by Sherrill (1999):

Clearly identifying expectations for teacher leadership roles needed now and in the 21st century – and determining how educators will acquire the knowledge and skills needed to assume those roles successfully – are critical steps in the continuous reform efforts to improve public education in this century. (p. 60)

School reform researchers as reported by Middlebrooks (2004) “recognize teacher leadership as a key element of effective reform initiatives and are linking teacher leadership to improved pedagogical practices and the development of professional education leaders” (p.443).

From an investigation in the progression of the development of teacher leadership roles, it would seem appropriate to consider current and future teacher leadership positions as described in the third wave. To be effective, teacher leaders need to be available on a fulltime basis, working with teachers in the normal classroom setting, assisting them in reforming their teaching and assessment strategies, improving content and pedagogy knowledge, all targeted at improving instruction and student learning. Their greatest impact will come from working with all teachers and staff within a building on the common goal to improve student learning. In order for school improvement initiatives to be successful, research indicates the need for the

involvement of effective teacher leaders throughout the process. Within the Commonwealth of Virginia the evolution of teacher as leader has mirrored the three wave process as found in the literature. The current description of the roles involved in the Mathematics Specialist position seem to be situated well within the third wave description – working collaboratively with teachers in the classroom setting, modeling lessons and co-teaching, working with teachers on assessment strategies with their own students, planning and providing professional development opportunities for teachers on relevant concerns, working with new teachers, and focusing the school on issues around mathematics.

The Concept of an Internship/Externship ¹

In the field of education the inclusion of a work-related experience can be found in many settings from the student teaching experience for pre-service teachers to the internship experience in the training of school administrators. In both cases, an internship experience is usually one of the final requirements within the university degree program. This evaluation was focused on an externship as part of the experiences within a graduate program in the preparation of mathematics specialists. Since the role of Mathematics Specialist is relatively new, a review found no literature directly related to Mathematics Specialist programs so the externship for mathematics specialists was modeled after internships that many universities already include within the graduate education program for school principals.

¹ The terms internship and externship are used interchangeably throughout this paper.

McIntyre (1979) gave great importance to the internship experience when he stated, “the internship is by far the most highly recommended program feature especially when practitioners are asked to do the recommending” (p. 32). When reviewing the importance of the internship experience for principals, Sweeny, Huth, and Engel (2001) noted that:

the internship is generally accepted as a vital ingredient in the preservice training of school administrators for it is during this activity that aspirants have the opportunity to acquire hands-on experience and feedback on performance. (p. 151)

Milstein, Bobroff, and Restine (1991) described the need for the internship to be an integral part of the entire program in the preparation of school principals. By including specific requirements, NCATE (National Council for Accreditation of Teacher Education), in its Educational Leadership Program Standards, cited the importance of this internship experience:

The internship provides significant opportunities for candidates to synthesize and apply the knowledge of practice and develop the skills identified in these Standards through substantial, sustained, standards-based work in real settings, planned and guided cooperatively by the institution and school district personnel for graduate credit. (p. 51)

Daresh (1987a, 1987b, 1988) reported on the research from 1971 until 1984 related to the effectiveness of an internship designed for principals. In studying research from dissertations he found over 1100 dealing with internships of which 34 dealt specifically with principal internships. He also reviewed over 350 articles including 50 that were dealing with the training of administrators, but only 6 that he thought could “properly be classified as descriptions of research conducted on the field-based practicum for educational administration” (p. 8). He concluded from this review that “the

field is not currently supplied with an abundance of high quality investigation” (p. 12). He concluded this because, “all these studies employ a descriptive survey design, a single data collection technique (usually a specially designed questionnaire), and a problem-solving, rather than a theory-based, perspective” (p. 1). In this current review of the literature this was still the case. The majority of the studies that have been conducted dealt with the perceptions that principals have about the importance and effectiveness of the internship experience. The research illustrated in general that most principals valued the hands-on experiences that the internship provides, the realistic situations in which to apply the theory and skills previously learned in the classroom. The lack of abundant research studying the impact of an internship using techniques other than exploring principal perceptions may be due to the difficulty in measuring the effectiveness of these experiences in any other way.

However, many authors have written on the general importance of the internship and the experiences that it affords the aspiring principal. Researchers have determined that the internship is an essential part in the development of competency-based leadership (Fry, Bottoms, and O'Neill, 2005; Institute for Educational Leadership, 2000; Mitgang, 2003; Thomas B. Fordham Foundation, 2003). Sweeney, Huth, and Engel (2001) studied responses from principals who were former administrative interns and in this study they found that “there was unanimous agreement that the internship program was valuable. Nearly eighty percent reported that it was very valuable” (p. 152). In addition, it was found that “there was nearly unanimous agreement that the internship made a major contribution to their professional development, enrichment, and advancement in the profession” (p. 153). Cordeiro and Smith-Sloan (1995) found in

their study of 36 principals and interns that all of them cited the importance of the real-world experience that an internship provided. The experience of an internship should be just as valuable for mathematics specialists who are also training to become leaders in the school setting.

The Southern Regional Education Board (SREB) is a consortium of 16 states, including Virginia, which provides resources and assists states in achieving educational improvements. In 2005 the SREB performed a study and created a report on the quality of internships provided to aspiring principals (Fry, Bottoms, & O'Neill, 2005). The study reviewed school leadership literature, research on success factors of principals, school leader preparation programs, and information from the on-going SREB University Leadership Development Network. As a result of this work, the SREB identified 13 critical success factors for effective principals and "eight core components of a quality internship that give aspiring school leaders opportunities to apply and master the skills and knowledge necessary to improving student achievement in today's schools" (p. 7). The eight core components of an effective principal internship were:

- collaboration between the university and school districts that anchors internships in real-world school problems
- specific school-based assignments for application of knowledge, skills, and ways of thinking
- a developmental continuum of practice that continues from observing to participating to leading
- opportunities to work with diverse populations (students, teachers, and parents)
- handbooks that outline expectations, processes
- ongoing supervision by faculty supervisors providing feedback on performance
- veteran principals as mentors/coaches
- rigorous evaluations of interns' performance on leadership standards (p. 8)

In addition to the specific eight core components given above, the SREB cited the need in general for universities to “make field experiences a high priority for their leadership preparation programs and allocate the necessary resources” (p. 9).

During the review of the literature on characteristics of internships, common themes emerged. The following sections discuss the findings on each of the common themes.

The Importance of Collaboration

Most of the core components set forth by the SREB have been addressed by other authors as well. One aspect of an internship that appeared essential was the support that must be provided to the interns throughout the experience. The SREB report stated in its core components the importance of the collaboration between the university and school district that provides supervision and guidance from the university, and of providing direction in the form of mentorship from a veteran principal. Lave and Wenger (1991) discussed the importance of this support during the internship which they called “legitimate peripheral participation” and define as “the mode of engagement of a learner who participates in the actual practice of an expert, but only to a limited degree and with limited responsibility” (p. 14). Cordeiro and Smith-Sloan (1995) also found in their study of 36 principals and interns that they all cited the importance of being able to work closely with someone else during this internship experience. Prestine and LeGrand (1991) discussed the social nature of the work during the internship and its importance in the development of collaborative learning skills. Fry, Bottoms, and O’Neill (2005) placed the importance of the principal mentor under the guidance of the states:

States should standardize the training of mentor principals around adopted leadership standards and assign an appropriate state agency to take the lead in ensuring that a high-quality training program is developed for use by all universities and districts. (p. 9)

In addition, they charged the universities to “provide enough of the right staff with sufficient time and resources to do a good job, and recognize and reward them for doing so” (p. 9). The support for any interns in a leadership preparation program as they work to apply skills and knowledge to real settings must be in place at both the university level for supervision and at the district level in mentoring.

The Importance of Application

Another important feature of a principal internship was the on-the-job, real-world experiences that it provided an aspiring principal. Gruenert and Balch (2004) emphasized the need to make this experience valuable by including in their goals for the internship that participants would be able to get excited about the transition to a new position and “manage complexity amid ambiguity” (p. 11). When discussing the role of an internship in general, Schon (1983) explained that the real importance of the internship or any experiential learning opportunity was in its ability to allow students to comprehend previously learned material in new and different ways. Going beyond the need for providing merely different experiences, Howery (1983) cited the need for internships to provide opportunities that specifically allow students to link theoretical ideas that have been learned in the classroom to the practical concerns of concrete examples. Sweeny, Huth, and Engel (2001) stated that the valuable experiences within an internship will take previous lessons and make them real. Internships can also allow principals to put theoretical concepts into practice and learn from the consequences

(Daresh, 1988; LaPlant 1988; Milsteinet et al. 1991). Fry et al. (2005) described this internship as a “sturdy vessel upon which new practitioners can navigate the swift, unpredictable currents that separate classroom theory and the on-the-job reality” (p. 3). From the review of this literature, it seemed essential that any preparation program for school leaders include an externship experience through which participants can gain real-world applications of skills and knowledge learned in the classroom setting.

The Importance of Expectations

Another major feature of the externship experience seemed to lie in the importance of the actual setting itself – working within the school setting, dealing with multiple issues at once, and experiencing a wide range of job-related requirements as they arise. In describing the internship setting, Schambach and Dirks (2002) stated that:

Such settings are generally more complex than can be simulated in classroom based experiences or case studies. This real-world encounter reinforces conceptual learning, makes it more visible, and emphasizes task importance. (p.2)

Gruenert and Balch (2004) described the learning setting as providing the aspiring administrator with experiences in learning about the need to consider the big picture involved in the school building, the idea of thinking about the entire school, “systems thinking serves as an essential framework for the intern to understand and experience the interconnectedness of organizational components within the school setting” (p.11). An externship experience provides a setting through which an aspiring school leader can experience a focus on an entire building and its needs instead of the individual, small issues one at a time. This setting requires that the intern learn to prioritize needs within an entire building.

Beyond the importance of the setting of the externship, the experiences that the internship provided and the opportunities for enhancing the learning within a program of study were essential components. In discussing the importance of any experiential learning opportunity, Coleman (1976) stated that this type of experience will, “increase motivation of the learner, improve retention of material, and lead to a greater sense of personal accomplishment” (p. 310). The application of those concepts learned within a classroom setting was a valuable component of such a learning experience. Parilla and Hesser (1998), in describing the value of experiential learning in general, stated that, “the internship invites and challenges the students and faculty supervisors to move to deeper levels of understanding as new meanings and synthesis become necessary and possible” (p.312). Thus the internship experience allowed for the application and synthesis of concepts learned in the multiple courses in a program of study. It also forced participants to draw upon everything that was learned at a theoretical level and choose the appropriate specific skills and understanding to apply at the appropriate time within a real-world setting.

The Importance of Reflection

Several specific aspects within the internship experience were essential to its usefulness. Parilla and Hesser (1998) cited the importance of reflection in the internship experience, calling reflection the key to a successful internship. These researchers also discussed that, “the internship experience must continually be brought back to the classroom for analysis and discussion” (p. 314). Theory will impact practice only when time has been set aside for reflecting on the relationship between the two (Kolb, 1984). Gruenert & Balch (2004) stated that interns need to learn to, “appreciat[e]

the art of reflection and its relationship to professional development” (p. 11). Therefore, any internship experience must allow time for the participants to apply and then reflect and discuss these applications in a supportive learning environment. In order to be an effective experience, an environment of reflection and discussion must be structured into any internship learning experience.

The Importance of the Cohort Structure

Another aspect of the internship experience that emerged from the review of literature is the importance of this experience being structured in a cohort. When interviewing principals about their internship experiences, Vick (2004) found that they preferred working in a cohort and that they felt that this led to a more satisfying internship experience. Krueger and Milstein (1995) discussed the importance of the supportive relationships that developed as a result of the cohort structure and that the supportive relationships were among the most highly valued aspects of the internship experiences. Norris and Barnett (1994) stated that the learning that occurs within the cohort tends to be more meaningful and relevant, that the process of integrating the theory and reality is enhanced, and that participants tend to be able to better articulate their personal values and beliefs after working within such a learning structure. Cohorts have been found to increase the academic performance of group members and promote their abilities of reflection (Kraus & Cordeiro, 1995). Milstein and Krueger (1997) expressed a long-term value of the cohort experience as, “cohorts model adult learning in a supportive environment and enhance the probability that students will promote this approach when they become school leaders” (p. 106). Teitel (1997) captured the importance of the cohort experience in saying:

Because one of the most important things preparation programs can do in developing such leadership is to model the development of learning communities and provide opportunities for students to model and explore their own leadership within them, the cohort approach is filled with opportunities and challenges.” (p. 76)

Using a cohort model as the structure for a field experience for mathematics specialists should result in the same benefits both within the program and later in the school setting.

Summary and Framework

Through this literature review it has become evident that an externship experience for aspiring school administrators was an essential part of their preparation program. There were many research findings that described not only the effectiveness of an internship, but also the importance of certain aspects of the experience. Since a graduate program for mathematics specialists would be preparing them for a similar role as a leader within the school setting, it seems appropriate that the findings from this literature could be applied to the development of a similar internship for them. Based on these findings, first and foremost, an internship is essential in the preparation program for mathematics specialists. The internship needs to be a collaborative between a school district and an institution of higher learning, to be structured as a cohort, to include hands-on experiences in realistic school situations, to include time devoted to reflection and discussion, and to provide clear expectations or standards for the overall experience (see Figure 1).

Universities and school districts should collaborate to provide the support network for the interns as they gain on-the-job training. Universities should provide

supervisors who can give feedback on an extern's progress, and the school district should provide a mentor to guide the intern through the experience. A concern that

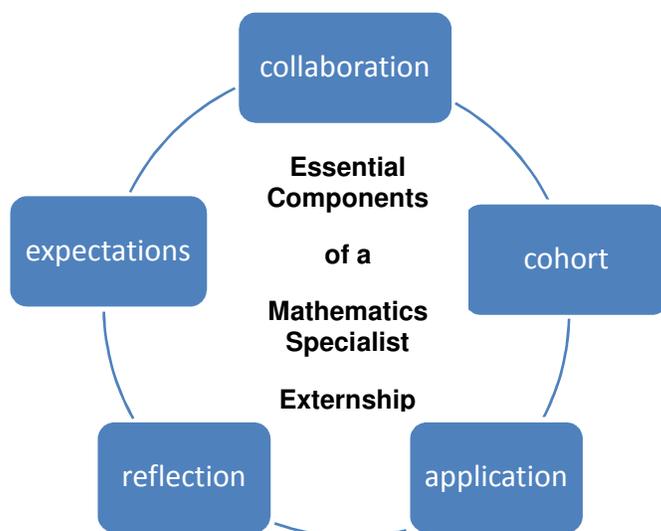


Figure 1. Components of a Mathematics Specialist Externship

arises around this notion of mentor is that there may not be enough practicing mathematics specialists in the field on whom to draw for mentors. However, mathematics supervisors or principals within the school districts may be able to effectively mentor the intern at least within the areas of leadership development.

The literature indicated that it would be beneficial for the internship to be a part of an overall preparation program that is structured in a cohort format. This structure would provide participants with the additional support of the members within the cohort in addition to the university supervisor and a mentor from the school system.

Experiences and requirements within the internship need to engage the mathematics specialists in the application of the skills and knowledge that have been learned through classroom experiences. In applying these skills and knowledge, the

interns should be working in a whole-school setting, dealing with the needs of an entire school with its diverse student and teacher populations. The internship should provide a wide range of experiences allowing the mathematics specialist to at times observe, at times participate, and at other times to lead.

Reflection needs to be a major focus of the externship experience. An emphasis must be placed on individual self-reflection time, and time to discuss and critique situations in working with teachers, students, principals, and other district administration. It is through this reflection that a mathematics specialist will grow in his/her vision of the role and in the ability to effectively apply classroom knowledge.

The internship set-up should also provide the participants with a clear set of standards on which an evaluation of the intern's performance will be based. The requirements of the internship should engage the mathematics specialists in experiences within all aspects of the expected role while providing support from the university and the school district.

If an externship for mathematics specialists is modeled on the essential components found from the literature, then this should produce an effective and valuable experience within their preparation program. Therefore, an externship for mathematics specialists should be built around strong collaboration between a university and a school district to support the teachers as they engage in their new leadership responsibilities. The externship should be structured in a cohort format creating a supportive and learning community of teachers as they go through their experiences together but at their individual school settings. In addition, the externship should engage the teachers in real, school-based experiences allowing them to apply

their previous skills to new situations. A major component of the externship should have the teachers focusing on reflection, taking the time to assess how things are going, what is actually happening, and their reactions to their situations. These reflections may take the form of personal written reflections, but they should also have some component of group reflections with the teachers sharing within their cohort their reactions, concerns, frustrations, and triumphs. Finally, the externship needs to place the teachers in the realistic situations similar to those that they can expect to find in the actual position of mathematics specialist. If the externship is built around this framework, then it should provide the experiences that the teachers need in their preparation to become mathematics specialists.

Evaluation of the Externship

This study was designed as an evaluation of the externship experience for a cohort of teachers in their preparation to become a mathematics specialist. As such it has the characteristics of an evaluation not a research study. The following sections will describe the literature around evaluation, evaluation as it differs from research, and the role of an evaluator as it applies to the current study.

Overview of Evaluation

There are many definitions of evaluation that are used throughout the literature. Tyler in 1950 defined educational evaluation as “the process of determining to what extent the educational objectives are actually being realized” (p. 69). Another definition of evaluation suggests that it provides information upon which decisions can be made (Alkin, 1969; Cronbach, 1963; Stufflebeam et al., 1971). More recently evaluators have

come to agree upon the definition of evaluation as the assessment of value or worth (Eisner, 1977; Glass, 1969; Guba & Lincoln, 1981; House, 1980; Scriven, 1967; Stake, 1967, Stufflebeam, 1974). A joint committee on standards for evaluation added to this definition: evaluation is “the systematic investigation of the worth or merit of some object” (Joint Committee, 1981, p. 12). Scriven (1980) initiated the use of the term “evaluand” to refer to this object or target of an evaluation process.

Evaluations may be used for four distinct purposes: to improve, to determine accountability, to motivate or increase awareness, and to exercise authority. Evaluation can be used to determine the value of almost anything. In 1965, due to the inclusion of evaluation within the Elementary and Secondary Education Act, the focus of educational evaluations shifted from evaluating students to evaluating educational programs, projects, and curriculum materials.

There are several different types of evaluation. Russ-Eft and Preskill (2001) described three different kinds of evaluations as developmental, formative, and summative. Developmental evaluation involves working with a client or stakeholder (term suggested by Guda & Lincoln, 1981) in the designing stages of a product or program. Therefore, the evaluation is a part of the ongoing designing process, informing the design and implementation of a product or program. Formative evaluation has as its intent the improvement of the product or program being evaluated and, therefore, should be used with an emerging program (Scriven, 1967) to determine how well it was implemented and what can be done to improve it. Summative evaluation is designed to determine the worth or value of an evaluand in the process of making a decision on its

future. For this reason, a summative evaluation should be used on a well-established, stable product or program (Scriven, 1967) to determine its merit and its future existence.

Michael Patton (1997) discussed stakeholder or utilization-focused evaluation as another type of evaluation. Utilization-focused evaluation based its design and execution on the needs or goals of the identified stakeholders or users of the product or program. The evaluation was designed to answer questions on the usefulness of the product or program as it was designed. One special type of stakeholder evaluation has been called goal-free. In this type of evaluation, the questions and focus of the evaluation are allowed to emerge from the work with the stakeholders instead of being determined at the beginning of the evaluation process. Weiss (1997) coined the notion of theory-based evaluations. This type of evaluation “makes clear theoretical underpinnings of the product and uses them to help structure the evaluation” (p. 502). Researchers also use the name of program evaluation when referring to research designed to assess the implementation and effects of an educational program. An evaluation of this type can be used to improve the program, determine the value of the program, determine the usefulness of sections within the program, or assess the accountability of the program.

Usually there are general steps that an evaluation process will follow: determine the evaluand, determine the specific questions that need answers concerning the evaluand, determine the means through which data will be collected, collect the data deemed necessary, analyze the collected data, draw conclusions about the data, and create recommendations based on the analysis of the data. Once the evaluand has been determined, data may be gathered using qualitative techniques, quantitative

techniques, or the combination of both types of data. Campbell (1969) argued for using both quantitative and qualitative data, letting the different assessments support each other. There is no one right way to design an evaluation, the design chosen needs to bring the most meaning to the evaluator and stakeholders. Of course this determination of the best way to design an evaluation can only be accomplished through interaction and negotiation between all those participating in the evaluation. Once the data has been collected, it must be analyzed to determine the information that it provides about the questions being used. Finally, conclusions and recommendations based on the data results need to be presented to the client(s) in a previously agreed upon, appropriate format.

The process involved in the evaluation may itself be evaluated using the program evaluation standards created by the Joint Committee on Standards for Educational Evaluation (1994). The 30 standards within this document were arranged into four major categories:

- Utility - The utility standards are intended to ensure that an evaluation will serve the information needs of intended users.
- Feasibility - The feasibility standards are intended to ensure that an evaluation will be realistic, prudent, diplomatic, and frugal.
- Propriety - The propriety standards are intended to ensure that an evaluation will be conducted legally, ethically, and with due regard for the welfare of those involved in the evaluation, as well as those affected by its results.
- Accuracy - The accuracy standards are intended to ensure that an evaluation will reveal and convey technically adequate information about the features that determine the worth or merit of the program being evaluated.

These standards gave an overview of the appropriate implementation of the evaluation process.

Evaluation versus Research

Russ-Eft and Preskill (2001) provided a thorough comparison of the evaluation process and research. Evaluation and research are very similar in the areas of design, techniques of data collection, and methods of data analysis. Both evaluation and research can be naturalistic or experimental in design. However the time frame used in the study must be determined by the client in an evaluation, but may be determined by the researcher's schedule and funding issues in a scientific investigation. Both types of studies can and do use qualitative and quantitative data instruments. In general, evaluation and scientific research both deal with validity and reliability issues. Both research and evaluation also perform the analysis of collected data using the basic techniques of inferential statistics and descriptive statistics.

Evaluation is undertaken with the primary purpose of using the information gathered to make a decision about an evaluand. Research, however, is designed to seek an answer to a specific question, gain new knowledge, or draw a new conclusion, all of which are designed by the researcher. In addition, research must focus on the other components involved in scientific design – issues around matching of control groups and treatment groups, control of identified variables other than those targeted by the study. This is because an outcome desired from most scientific research studies is the generalizability of findings. Evaluation does not have as a primary goal the generalizability of its findings. The goal of an evaluation is to answer key questions for a specific client, a study that is designed for that specific situation only.

Because there is no goal of generalizing results, evaluation does not have to deal with some of the issues around objectivity and other tight scientific methodology

issues that are a major component of research. However, evaluation does have to deal with issues around data quality. To ensure validity or credibility of results, an evaluation may include some random sampling from the participants for data collection purposes and the use of multiple data sources used to answer each of the key questions. To address issues around reliability of the collected data and resulting findings, an evaluation will make its procedures and methods very transparent, use multiple data sources, and use techniques of member-checking or follow-up with the participants from whom the data was collected.

In addition to purpose, evaluation and research also differ in their intended audiences. Research is usually carried out in order to find new conclusions that can be shared with other researchers. Evaluation, however, is conducted at the request of a specific client, someone who needs to determine the value of a product or program. The major difference between these two is probably in the area of focus. Research is designed and carried out to focus on a research question, an hypothesis, a statement of a problem, around which all variables have been defined. The focus of an evaluation is chosen by the stakeholders (clients) who determine the key questions that need to be answered in the decision making process of the evaluation. An evaluation process must be responsive to the interests and requests of the stakeholders throughout the entire process; research has no such constraints since the researcher generally has individual control over design and process.

Another difference between research and evaluation lies in the intended use of the findings. A researcher shares results with other researchers through publications of findings; this sharing often also includes ideas about further research that could be

done. An evaluation is designed to provide information to the client(s) only; the conclusions or results are to be used to inform this client's decision-making process.

Research and evaluation do share pieces of their processes around data collection, data analysis, and design of the study. The two differ in the areas of focus, purpose, audience, and the intended use of the findings. The differences between evaluation and research often seem to be blurred throughout the literature. Patton (1997) discussed the relationship between evaluation and research, finding that program evaluation should not be considered the application of scientific research methods, but rather the systematic collection of information around a problem in order to inform decision-making. However Rossi, Freeman, and Lipsey (1999) felt that program evaluation was actually an application of scientific research methods in assessing the design and implementation of an educational program. The two frameworks do share many similarities, but the purpose of the two and the intended use of results are very different.

The Role of the Evaluator from the American Evaluation Association

The American Evaluation Association [AEA] established and published five guiding principles for evaluators (2004):

- Evaluators conduct systematic, data-based inquiries.
- Evaluators provide competent performance to stakeholders.
- Evaluators display honesty and integrity in their own behavior, and attempt to ensure honesty and integrity of the entire evaluation process.
- Evaluators respect the security, dignity and self-worth of respondents, program participants, clients, and other evaluation stakeholders.
- Evaluators articulate and take into account the diversity of general and public interests and values that may be related to the evaluation. (p.1)

Under the first principle, evaluators need to adhere to high technical standards.

At the beginning of the evaluation process, the evaluator needs to work with the client to determine the strengths and weaknesses in the design of the questions to be studied and the techniques chosen for data collection. In discussing the need for the evaluator to work with the client, Newcomer and Whorley (1989) stated that “prior to an evaluation, the evaluator and program managers should work together to define the ideal final product” (p. 202). The data collection techniques need to be carefully chosen to solicit the necessary information to inform each of the evaluation questions. These techniques include the use of focus groups, conducting interviews, designing and administering surveys, performing observations, and reviewing documents. The evaluator must work with the client to determine which of the collection strategies will be most effective in gathering the types of information needed throughout the evaluation process. This also includes the need for the processes throughout the evaluation to be transparent so methods and techniques can be understood and critiqued.

The second principle deals with the need for the evaluator to be competent in many different senses. First, the evaluator must understand and have the skills necessary to perform the evaluation as designed. In addition to this, the evaluator must have a “cultural competence” (AEA, p. 2). This encompasses issues of working with diverse groups of people. It also specifically addresses the need for the evaluator to remain current in knowledge and skills through participating in professional development opportunities.

The third principle addresses issues of honesty and integrity. The evaluator must remain honest in reporting findings, disclosing any conflict of interest issues, discussing any changes in documents with the stakeholders, communicating any concerns to the

client, and striving against any misuse or misrepresentations of data findings. This principle would also include the need for evaluators to “manage their own biases and preferences” (Russ-Eft & Preskill, 2001, p. 117).

The fourth principle highlights the need for the evaluator to respect all participants and stakeholders. This includes the adherence to the concepts of informed consent and other ethical issues. At the beginning of the evaluation, Brown (1998) stated that the evaluator needs to “foster open and clear communication among stakeholders and surface underlying assumptions and cherished beliefs” (p. 2). It is the evaluator’s job to ensure “inclusion of all stakeholders” (Brown, p. 2) and to understand all the perspectives that may impact the process of the evaluation. This also highlights the need as stated by Patton (1997) for the evaluator to “not use their expertise to intimidate or manipulate intended users” (p. 137). In addition, the principle cites the need at times for an evaluation to report findings that may harm client or stakeholder interests. When such reports are necessary, “evaluators should seek to maximize the benefits and reduce the unnecessary harms that might occur, provided this will not compromise the integrity of the evaluation findings” (AEA, p. 4).

The fifth principle includes the need for the evaluator to report all relevant findings, taking into consideration the perspectives of all the stakeholders. It is the role of the evaluator to strive to meet the client’s needs and communicate with all the interested parties throughout the evaluation process. As such, the evaluator needs to address the differences in perspectives of all the stakeholders in the designing of the questions, the data collection, the data analysis, and the reporting of the findings.

The AEA guiding principles are, “intended to guide the professional practice of evaluators, and to inform evaluation clients and the general public about the principles they can expect to be upheld by professional evaluators” (AEA, p.1). The information within these guidelines gives a broad look at the role of the evaluator in any evaluation process.

The Role of the Evaluator from Literature

Barkdell (1980) gave three roles of an evaluator: a scientist, a consultant, and an auditor. As a scientist, the evaluator must focus on the collection of data and not on other parts of the evaluation process, such as the relationships between participants or the politics of perceived or desired outcomes. As a consultant, the evaluator focuses on the collaboration with the client(s) and joint design decisions that are a major part of the evaluation process. As an auditor, the evaluator works through the analysis process to determine the merit of a product or program, draw conclusions and give recommendations for improvement. The evaluator takes on different roles depending on the evaluation process and these roles have had different names (Greene, 1994) depending on the researcher who used them: expert or “connoisseur” (Eisner, 1991), technical consultant (Clinton, 1975), developmental evaluator (Patton, 1996), negotiator (Guba and Lincoln, 1989), facilitator (Papineau & Kiely, 1996), and social change agent (Greene, 1994; Guba & Lincoln, 1989). The roles that an evaluator may play are also determined by the type of evaluation that is being conducted: a generalizable program study – role of methodological expert; a program’s worth – role of a judge; an accountability evaluation – role of an auditor; a program’s improvement – role of an

advisor; part of a design team – role of a consultant; and a social justice study – role of a change agent (Patton, 1997, pp. 128-129).

Researchers tended to characterize the role of the evaluator by defining different functions that they might do. Shadish and Epstein (1987) divided evaluators into two groups – the academic evaluators and the service evaluators. The academic evaluators emphasize the research purpose of evaluation, deal mainly with summative evaluation, and use their results as contributions to social science theory. The other group discussed is that of service evaluators who may be independent or internal, focus on the role of serving the stakeholders' needs, deal with program improvement, and usually work with qualitative data methods. All of these different categories pointed to Patton's (1997) argument that, "the evaluator's role in any particular study will depend on matching her or his role with the context and purposes of the evaluation as negotiated with primary intended users" (p. 122). Patton even went further in discussing the role of the evaluator to say that this role changes over the course of the evaluation because as the evaluator observes and collects other data, the client receives feedback and the working relationship between the evaluator and client may change throughout the process.

In discussing the role of the evaluator, Patton (1997) discussed evaluators broken into two groups – the internal evaluators and the external evaluators. Historically, evaluators tended to be external, this following from the need for an evaluator to mimic the part of the "true" researcher. This ensured independence of the evaluator, and the assumption of objectivity. One problem that an external evaluator will usually face hinges on the fact that this person is not within the client organization, and

while this may ensure independence, it also creates a problem when the evaluation is over and the evaluator leaves with a lot of historical and scientific knowledge about the organization that will be lost. In addition, data within the organization may not be as readily accessible to an external evaluator.

Patton (1997) in discussing the internal evaluator stated that “the internal evaluator can produce evaluations of high quality that meet rigorous standards of objectivity while still performing useful service” (p. 34). Russ-Eft & Preskill (2001) gave advantages of the internal evaluator that included the fact that the evaluation information and reporting tended to be a better fit to the client’s needs, the evaluator had greater access to the data from within, the results coming from an insider were more likely to be used, and this type of evaluator had greater insight into the design, implementation, and reporting phases of the evaluation. Often these evaluators are not as respected as an external evaluator might be because they are still seen in their old position, and politics can impede evaluation and the use of the results. A major advantage of being an internal evaluator was described by Ross and Cronbach (1976): “The evaluator, instead of running alongside the train making notes through the windows, can board the train and influence the engineer, the conductor, and the passengers” (p. 18).

No matter the specific classification of the role, the evaluator must, “consciously and deliberately act, react, and adapt in order to increase their effectiveness in working with stakeholders” (Patton, 1997, p. 135). The evaluator must work closely with all stakeholders from the very beginning to understand the context of the evaluation and determine the key questions that will be the focus of the evaluation. It is also the

evaluator's role to determine the most appropriate means of obtaining the best data possible to answer these questions. If necessary, the evaluator must design, create, and then apply the data gathering instruments. The data gathered may be quantitative or qualitative in nature, but it must address the key questions of the evaluation. The evaluator must also decide the most appropriate data analysis techniques to apply to the data, and the most efficient and effective means of reporting the findings from this data analysis. Throughout the entire process of the evaluation, the evaluator must be communicating with the client to ensure understanding and a common direction. It is important that throughout this entire process the evaluator abides by the guiding principles set forth by the AEA. The final report of conclusions and recommendations from the evaluation must again be the result of collaborative efforts between the evaluator and the stakeholders. The success of the evaluation process depends on the expertise of the evaluator in communicating with the client to determine the focus and the intended use of the findings.

Summary

The literature described and supported the process of conducting an evaluation that is different in format and design from a research study. The American Evaluation Association set forth principles to guide the behavior of an evaluator and literature gave an overview of the process for conducting an evaluation, determining data sources, analyzing data, and establishing conclusions based on this data analysis.

The Role of This Evaluator

As the evaluator for this study, I bring unique experiences and understandings to the process. At the beginning of this Master's Degree Program I was the Mathematics

Supervisor for the county school system from which the majority of the teachers were drawn. In this capacity I worked closely with teachers in a very supportive way providing support, materials, classroom assistance, and professional development opportunities. Therefore I came to the project with strong, positive relationships already in place with the teachers, the principals, and administrators within the county school system. This certainly enabled my easy access and acceptance into the schools and teachers' classrooms, and my nonthreatening inclusion into teacher discussions and interviews. This trusting and respectful relationship also allowed teachers the freedom to report on their feelings and issues very openly, without monitoring what was said or how they felt.

I also have a very strong, professional working relationship with Dr. Wilkins and was a part of the early discussions and design work on the Master's Program for Mathematics Specialists with the inclusion of the Externship as the capstone experience. Also being a part of the development of the requirements of the Mathematics Specialist in Virginia, I certainly brought this wealth of prior information to bear on the discussions of requirements within the Externship. Dr. Wilkins and I collaboratively determined the requirements that we felt were essential for this program to prepare these teachers for their new roles as mathematics specialists. Being the evaluator for the Externship component of this program requires that I focus on the teachers' perspectives, their vision of this experience, as I analyze and discuss the data that has been gathered from multiple sources. Being an internal evaluator requires careful focus, selection of data sources and analysis of the data, and interpretation of findings. By ensuring a transparency throughout the entire evaluation process I can

ensure the validity of the findings and the conclusions drawn about the value of this Externship experience from the teachers' perspectives.

CHAPTER THREE

METHODOLOGY

This chapter discusses the methods used for the evaluation of the Externship associated with the mathematics specialist program. This program leads to a master's degree in Curriculum and Instruction and the Externship serves as the capstone experience of the program. Included in this chapter are background information with the licensure requirements of the Mathematics Specialist, the purpose for the evaluation, the evaluation key questions to be explored, the significance of the evaluation, and the evaluation design and procedures.

Background

Seventeen teachers formed a cohort and at the time of this study were in their last year of a three year Master's Degree program in Curriculum and Instruction at Virginia Tech working towards certification as K-8 mathematics specialists. Fourteen of the teachers were from a county public school district and three were from a neighboring city public school system. As a part of this program Wilkins and I collaborated to create a full-year externship experience with requirements designed to give these teachers experiences around our understandings of the responsibilities of a mathematics specialist. All of the county teachers were employed fulltime either as teachers or specialists serving classroom teachers (gifted, technology, mathematics). The three teachers from the city system were already serving in the capacity of Mathematics Specialists with that school district.

As per the preliminary state requirements, in order to be involved in this cohort, teachers must have had at least three years of successful teaching at the elementary or

middle school levels and been responsible for teaching mathematics at least part of their day. Since I spent several years working on a Task Force for the Virginia Mathematics and Science Coalition to look at possible job descriptions and the endorsement requirements for this new certification of Mathematics Specialist K-8, I had a firm understanding of Virginia's vision for this new position. The requirements of this Externship were designed to give teachers in the cohort experiences outside of their classroom and "normal" teaching responsibilities, and ones that we thought were needed to broaden the skills of these teachers in working with school administrators, groups of teachers, building-level mathematics goals, and district initiatives. Wilkins and I co-taught all the class components (mathematics content and pedagogy) of this program including this Externship.

A Mathematics Specialist Licensure/Endorsement

In 2007 the Virginia Department of Education established the requirements for teachers to achieve the endorsement of licensure as a Mathematics Specialist (see Table 1 in Chapter Two for the specific listing of these requirements).

As part of the requirements for the Virginia Tech program, teachers were involved in an Externship through which the teachers could gain realistic experiences around the roles involved in being a mathematics specialist. Therefore requirements and assignments were chosen that we felt would give these teachers realistic experiences involved in the roles that they would expect to find as mathematics specialists. The Externship was a full-year experience, spanning the two full semesters of Fall 2007 and Spring 2008. It was determined that having these teachers conduct a mathematical needs assessment and then plan a means of addressing the perceived

need(s), would provide a wide variety of authentic experiences that would mimic those responsibilities of a mathematics specialist. We felt that through this externship process the teachers would become involved in working with stakeholders in the educational process at the school, with professional development planning and implementation, with addressing curriculum issues, and they would be placed in a leadership role throughout the year. The specific requirements of the year-long course reflected the importance of each of these broad areas of responsibilities. For the complete syllabus for the Externship including descriptions see Appendix A.

In general, the fall requirements focused on conducting a mathematical needs assessment within the teacher's school utilizing grade-level teacher meetings, meetings with the principal, whole faculty discussions, and any other strategies that could be used to determine the mathematical needs within that school. The spring semester requirements of the Externship continued working within this needs assessment focusing on researching an appropriate action to meet the needs, planning, and then implementing a school-based project that would address the priorities determined from the needs assessment. This project could take many different forms, for example, a series of professional development sessions for teachers or a tutorial program for students. The project was required to be systemic in nature, involving a series of actions to address the school need. This entire process involved with the mathematical needs assessment and resulting project would be written within a final report and presented to the cohort of participants and mathematics and mathematics education faculty from Virginia Tech as a final evaluation of the teacher in the Externship course.

Purpose of the Evaluation

The purpose of this evaluation was to determine the effectiveness of the Externship as the capstone experience of the Mathematics Specialists program. The evaluation drew from participants in the first cohort of teachers (2005-2008) training to become mathematics specialists at Virginia Tech. The Externship took place during the last year of coursework (SY 2007-2008) for this cohort. The results of this evaluation will be used to determine the inclusion of this type of experience in the master's degree program and to make improvements in the Externship requirements that will be used with future cohorts of teachers in the program. This formative evaluation was naturalistic in design, structured to determine the effectiveness of the Externship from the teachers' perspectives, and utilized both qualitative and quantitative data analysis.

Evaluation Questions

This study was designed to answer the question: *Do teachers feel that the Externship has prepared them for their role as a Mathematics Specialist?* This overarching question was broken into four key questions on which the evaluation will be based:

- Has the Externship prepared the teachers to work effectively with all the stakeholders in their new role as a Mathematics Specialist?
- Has the Externship prepared the teachers to work effectively with issues related to curriculum and instruction?
- Has the Externship prepared the teachers to develop and deliver effective professional development?

- Has the Externship prepared the teachers for their leadership roles as a Mathematics Specialist?

Significance of the Evaluation

This evaluation was designed to provide information that would be used to determine the overall effectiveness of the Externship experience, and to shape and improve the requirements within this experience for teachers training to become mathematics specialists. While other universities and colleges across the Commonwealth of Virginia offer courses and have established master's degree programs for mathematics specialists, the Virginia Tech program is unique in the actual requirements of this Externship experience. It was therefore essential to evaluate the effectiveness of this experience in meeting the needs of the teachers, to determine the value of this requirement. This evaluation would certainly inform the continuous improvement of the Externship within the Virginia Tech program, but could also inform other university programs of the importance of the inclusion of such experiences for teachers.

Evaluation Design

Worthen, Sanders, and Fitzpatrick (1997) stress that participant-oriented evaluations place the emphasis on the human element of the evaluation. Participant-oriented evaluations focus the attention of the evaluator to the actual needs of those participating in the program, those impacted by the program. The strengths of a participant-oriented evaluation include flexibility, the use of multiple data sources, the potential for gaining new insights from a participant perspective, and the ability to gain insights into the nature of the program (Worthen, Sanders, & Fitzpatrick, 1997). Since

this evaluation used the responses from the teachers themselves to answer the key questions, this is a participant-oriented evaluation.

The evaluation was formative in design as described by Patton (1990) to be appropriate for developing and changing a program, especially early in the development of the program. The results from the evaluation will be used to determine strengths and weaknesses of the Externship and inform the requirements for future Externships as part of the overall Master's Degree program.

Merriam (1998) referred to qualitative research as "an umbrella concept covering several forms of inquiry that help us to understand and to explain the meaning of social phenomena" (p. 5). During an evaluation process, the use of qualitative data "can illuminate the people behind the numbers and put faces on the statistics to deepen understanding" (Patton, 2003, p. 2). Qualitative inquiry allowed me to collect and analyze data to better understand the program from the teacher's perspective rather than from a researcher's (Merriam, 1998). Denzin & Lincoln (2005) stated that "qualitative research involves an interpretive, naturalistic approach to the world. . . . attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (p. 3). The process of using qualitative data allowed for concepts and themes to emerge rather than the testing of a theory, and focused on the understanding of the phenomena being studied. Gathering qualitative data from the teacher's reflections, interviews, and writings enriched and brought additional meaning to the quantitative data that resulted from survey results.

Using a mixture of quantitative and qualitative methods for this evaluation provided richer results. Quantitative research informed the construction of the teacher

survey questions to enable statistical analysis of the results, but the open ended explanations requested for each item allowed a qualitative approach to enrich and enhance the meaning of the statistical results. The use of both methods also allowed for multiple data sources to increase the validity of findings and conclusions. The two methods yielded findings that complimented and enhanced each other.

Evaluator's Role

I have been a mathematics teacher at the high school level for 27 years, a supervisor of mathematics K-12 for 9 years, an adjunct with the School of Education at Virginia Tech for 4 years, and am currently a Clinical Instructor within the Department of Teaching and Learning at Virginia Tech. My experiences have therefore given me a broad but realistic perspective on the role of teacher leaders within schools. I have planned and implemented many different types of professional development activities for teachers, including coursework through the university setting, state-wide educational initiatives, and school district level professional development initiatives.

I was involved in the Mathematics Specialist Task Force that studied and presented recommendations to the VDOE on educational needs for training mathematics specialists and their envisioned job responsibilities within schools as specialists. As such I was involved in the initial study and discussions of the need for this position in schools, the current status of teacher leaders and teacher leadership programs throughout the Commonwealth of Virginia, the roles that these specialists should hold in the school setting, and the coursework that should be required of teachers striving to become a specialist.

When the Virginia Tech Mathematics Specialist program was initially being structured, planned, and the search was beginning for funding sources, I was Mathematics Supervisor K-12 and I had served for several years as an adjunct within the Virginia Tech School of Education. I was an integral part of the early discussions, the planning of the program, and the selection of courses and content to be included in the program. My previous grant work with Virginia Tech and Dr. Wilkins enabled us to easily build a new partnership in the development of the Master's Program. As Mathematics Supervisor I had built strong positive working relationships with elementary and middle school teachers throughout my school district. Therefore it seemed a natural progression of our work together to target my school district for possible participants as the first cohort of teachers enrolled in this Mathematics Specialist licensure program.

Although I was involved in the planning and implementation of the Externship at a time when I was the Mathematics Supervisor for the county school system from which the majority of the teachers worked, I never had an evaluation role over these teachers. I was a support person for their professional and classroom needs. Before the Externship course actually occurred, I had retired as Mathematics Supervisor and was teaching within the School of Education at Virginia Tech. My relationship with the teachers allowed for very honest discussions, very honest written reflections, and interviews with them. I also had a strong working relationship within the schools which allowed me access to principals and classrooms that I might not have otherwise enjoyed. My direct involvement with the Externship might pose a limit on my ability to evaluate the Externship if this was designed to be summative in nature. However, the

formative nature of this evaluation, identifying strengths and weaknesses, lends itself to my ability to gain honest and reflective data from the teacher participants.

Critics of the participant-oriented evaluation often cite its subjective nature as a limitation. In this situation I feel that working directly with the participants enabled the collection of multiple data sources over a relatively long time period. The wealth of data, quantitative and qualitative, should give an honest view of the teachers' perceived needs and their feelings of preparation in becoming mathematics specialists. The multiple and varied data sources allowed for the cross referencing of teacher responses and enriching any quantitative data with teacher written and interview responses. As the evaluator I did not extend any conclusions beyond the data gathered from the participants and I was cautious in making interpretations and drawing conclusions. However, I did have a long-term view of their coursework, their discussions, and their activities throughout the entire program.

Procedures

The following sections describe the participant selection, data collection, and data analysis procedures for this evaluation.

Participants

Seventeen teachers, 14 from a county school district and three from a city public school system, as a cohort were in their last year of a three-year Master's Degree program in Curriculum and Instruction working towards certification as Mathematics Specialists. All of the teachers from the county were employed fulltime either as classroom teachers or specialists (gifted, technology, mathematics) serving classroom teachers. The three city school district participants were already serving in the capacity

of Mathematics Specialists with that school system. In order to be involved in this cohort, teachers must have had at least three years of successful teaching at the elementary or middle school levels and been responsible for teaching mathematics at least part of their day. The gender and background teaching experience (position, grade level, years of experience) are summarized in Table 2.

Table 2

Background Characteristics of the Teacher Cohort

Teacher #	GENDER	POSITION	GRADE LEVEL	YRS EXP*
1	F	ELEM	3	13
2	F	ELEM	4, 2	7
3	F	SPECIALTY	PK-5	17
4	F	ELEM	3	4
5	M	ELEM, ADMIN	4, 5	4
6	F	ELEM	5	10
7	F	ELEM	2, 4	6
8	F	ELEM	3, 2	13
9	F	ELEM	3	8
10	F	SPECIALTY	PK-5	11
11	F	ELEM	3	18
12	F	ELEM	3, 4, 5	12
13	F	MATH SP	PK-8	27
14	F	MIDDLE, SPEC	6-8	5
15	F	MATH SP	6-8	taught 7.5, math specialist .5
16	F	MATH SP	PK-5	taught 9, math specialist 1
17	F	MATH SP	PK-5	taught 12, math specialist 1

*Note: YRS EXP = years of teaching experience when entering the master's degree program

Assurance of Confidentiality

Each individual teacher in the evaluation was assured of confidentiality as they entered the cohort. Written permission from all participants was obtained at the beginning of coursework since the courses were being funded through a state grant

program and the county school district, and the need for data was assumed throughout the three year program. Therefore, teachers had already given permission for data collection which could be used for the specific Externship as well. Of course, I could not guarantee 100% anonymity since I was dealing with a limited number of teachers, each with a unique school setting and situation from which data was collected.

Data Collection and Analysis Procedures

The data collected for this evaluation consisted of a teacher survey, writing prompts, an interview, observations, and final project presentations. In the following sections, each of these data sources is discussed. Teacher rankings were analyzed using descriptive statistics and compared across items and with key question categories. Open-ended responses from the teacher survey, interviews, and writing prompts were analyzed using a form of whole text analysis informed by the analytic procedures developed by Glaser and Strauss (1967) and Strauss and Corbin (1998). This process involved analyzing each teacher's responses, grouping responses with like meanings, and coding each using a representative, descriptive phrase or word. Since each of the questions had already been categorized as to its evaluation key question category, these comments were sorted into the evaluation key question categories. This qualitative data was then used to inform and enrich the quantitative data within each of the evaluation key question categories.

Externship Survey

In order to obtain both quantitative and qualitative data on the teachers' experiences late in the Externship experience, a teacher survey was designed which asked for ranking as well as written elaborations. Each teacher completed an

Externship Survey near the end of the year-long externship experience. The survey (Appendix B) was constructed to have specific items from which to gain teacher information for each of the key questions.

The survey was administered by Wilkins during the last class period of the externship in April 2008 to enable teachers to have a designated time for its completion and to have questions answered if any arose. One teacher was absent from this class period, so she completed the survey outside of this structured time.

The Teacher Survey was designed to solicit from teachers a ranking of their agreement with statements concerning their preparation through the Externship experiences to become a mathematics specialist. The instructions for completing the questions stated:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree

Please elaborate on your rating when appropriate by briefly citing one example or activity. Note: You are rating the experience, not the frequency of the activities.

The stem for each of the questions stated: “*The Mathematics Specialist Externship experience has prepared me to be able to*”, followed by an action or activity in which the teacher would have been involved. For example one of the activities was “use classroom student data to plan instruction.” Each teacher was asked to rank a response to this item and elaborate on the ranking through written remarks.

In addition to the ranking items, one question on the survey asked teachers to identify from their perspective the most beneficial aspect of the Externship, one question asking for the least beneficial aspect of the Externship, and one question asking how

the Externship aligned with the teacher's expectations. Also, an additional section on the survey contained a list of 44 job related activities for which each teacher could respond with the frequency of participation in each one. One such activity listed was "working with a new teacher on math curriculum," for which the teacher marked once, at least twice, or left the item blank indicating no participation in this activity. See Appendix A for the complete teacher survey.

Process for Coding Externship Survey Questions

Wilkins and I discussed the types of questions that we wanted to include on the final teacher survey. Independently I created the specific questions, gave these to Wilkins to review for clarity of question wording and overall completeness. After discussing each item, the survey was finalized and administered to all seventeen teachers.

When initially discussing the use of the data from the completed survey questions, Dr. Wilkins and I each individually coded each question, determining under which category (professional development, curriculum and instruction, stakeholders, or leadership) each question would fall. We then met and discussed what we each felt the individual categories meant (i.e., clarified the categories). Table 3 presents the finalized clarifications for each of the four categories associated with the evaluation key questions.

After clarifying and agreeing on the specifics for each category, we individually revisited each question and aligned our codings with our discussions on the meanings of the categories. We then jointly discussed each question's codings. There were only seven items on which we disagreed on our individual coding and in each instance the

Table 3

Description of Key Question Categories

Category	Description
stakeholders	any person involved in the educational process (principals, teachers, parents)
professional development	planning and implementation of training for small groups or whole faculties
curriculum and instruction	dealing with curriculum or instructional issues; included assessment since this informed both instruction and curriculum
leadership	activities that took the teacher beyond the “normal” classroom responsibilities and procedures (e.g., mentoring new teachers in mathematics, dealing with whole school initiatives); those activities into which a mathematics specialist would bring additional information, training, expertise (coaching, model teaching); and those activities in which the teacher took on leadership roles (facilitating grade level discussions).

question could have had multiple codes and we only disagreed on one category. For example, most of the items involved the teachers in working with stakeholders, however, after discussing the codes, we agreed that if an item dealt with curriculum and instruction and stakeholders, it would be coded for curriculum and instruction.

Therefore, the only items coded as working effectively with stakeholders did not have any other interpretations (leadership, professional development, curriculum and instruction). After discussing our reasons for including codes, we reached agreement on the coding to be used for each of the items on the teachers’ final survey. These final question codes were used to assign each survey question to an evaluation key question category in the quantitative and qualitative analysis of the collected data.

The frequency data from the teacher survey consisted of each teacher’s response to 44 activities. Teachers marked each item to indicate participation in the activity once, at least twice, or not at all. When analyzing this data, the teacher

indications of once and at least twice were combined to indicate at least once. So for each activity a teacher's response was coded as at least once or not at all.

Writing Prompts

The writing prompts were used throughout the year-long Externship to inform the on-going discussions and requirements of the Externship. The writing prompts were designed to capture the teachers' reflections on different aspects of the Externship process. Table 4 lists the writing prompts and the dates on which these were due.

Table 4

Writing Prompts

DATE	WRITING PROMPT	KEY QUESTION ADDRESSED
SEPT 2007	What are your expectations of the Externship?	baseline information on expectations for the Externship
OCT 2007	Do you feel prepared for the Mathematics Specialist position? If yes, why? If no, what do you feel you still need to know?	information for all key questions
DEC 2007	Reflect on what you have learned about yourself as a Mathematics Specialist through the Needs Assessment process for your school.	information on leadership issues
FEB 2008	Have you begun the implementation of your project? If yes, describe one thing that you have done as a part of the implementation and briefly discuss strengths/weaknesses, successes/"wish I had done differently". If no, describe what you plan to do first. As you begin the implementation of your project discuss your attitudes toward working with students, teachers, or parents, etc. as a "Mathematics Specialist".	information for all key questions
MAY 2008	Reflecting on your Externship experience this year, list and discuss two aspects of the Externship that you feel have had the greatest impact on your beliefs about your ability to be a successful Mathematics Specialist. Discuss one thing that you feel would have enhanced your Externship experience and ultimately would have better enhanced your potential to be a successful Mathematics Specialist.	information on overall Externship experiences

Process for Coding Writing Prompts

Teachers' written comments were analyzed to identify comments that had similar meanings which were grouped and labeled with a descriptive code representative of this meaning. The codes were then grouped and reported under the associated evaluation key question category. Any themes that emerged from this coding process that did not fall within the four key categories were also reported during the analysis process.

Observations

During the second semester (Spring 2008), each teacher was observed at least once in the school setting while involved in an activity that would fall under the responsibilities of a Mathematics Specialist (outside of the normal teacher activities). Teacher observations were recorded on an Observation Form (see Appendix C), which I constructed to document the type of activity in which the teacher was involved, to collect notes on this observation activity, and to record notes from the post-observation discussion. Every teacher was observed at least once, most teachers twice, either by Wilkins or myself, and was involved in a post-observation discussion.

Process for Analyzing Observations

Teacher observations provided a snapshot of the activities in which the teachers were involved and their success in this setting. The observation forms and notes taken during the observation were sorted according to the evaluation key question under which they fell. Data from the observations were used to inform each of the evaluation key questions.

Interviews

After the completion of the Externship experience, teacher participants were interviewed about the Externship either in late May or in Sept 2008. The questions used in the interviews were designed to specifically ask the teachers about how adequately they felt that the Externship had prepared them for the role of Mathematics Specialist based on the four key questions of the evaluation:

- *Discuss whether you feel that the Externship has adequately prepared you to work effectively with teachers, administrators, and parents as a Mathematics Specialist. Please explain.*
- *Discuss whether you feel that the Externship has adequately prepared you to work effectively in the areas of curriculum and instruction as a Mathematics Specialist. Please explain.*
- *Discuss whether you feel that the Externship has adequately prepared you to develop and deliver effective professional development as a Mathematics Specialist. Please explain.*
- *Discuss whether you feel that the Externship has adequately prepared you for your leadership roles as a Mathematics Specialist. Please explain.*

In addition, the question was asked, *is there anything that you gained from the Externship experience that you feel you had not gotten in any of the other courses in the masters' s degree program?*

Process for Analyzing Interviews

The tapes of teacher interviews were independently transcribed and the transcripts were read and coded in the manner described for the writing prompts. Any themes that emerged from the analysis of the teacher interviews that was outside the four evaluation key questions categories were reported in the data analysis process.

Final Teacher Project Presentations and Analysis

In May 2008 teachers successfully presented their overall final Externship projects to the entire cohort and at least three Virginia Tech Mathematics or

Mathematics Education faculty. These project presentations were summarized along with supporting information about the content of the projects that would be used to inform each of the evaluation key questions. The Virginia Tech mathematics and mathematics education faculty present for the teacher project presentations rated the teacher presentations according to an evaluation form (see Appendix E).

Evaluation Data Analysis

Evaluation Planning Data Matrix

At the beginning of the data analysis process an evaluation planning data matrix was created to ensure that the multiple data sources were aligned with the four evaluation key questions and that each question would be informed from various data sources (see Table 5). The teacher survey items, the writing prompts, the final project presentations, teacher observations, and the teacher interviews were identified as data sources for each category. This feature is a major component in the planning of any evaluation – the aligning of the data sources with the evaluation key questions.

Addressing Quality

No matter the type of research, validity and reliability are concerns that can be addressed through a study's careful design; the methods used for data collection, data analysis, and interpretation; and the presentation of the findings. Lincoln (1985) refers to the trustworthiness of qualitative research that can be addressed through the concepts of credibility, transferability, confirmability, and dependability.

Table 5

EVALUATION PLANNING DATA MATRIX

KEY QUESTION	DATA SOURCES	ANALYZE	COMMUNICATE
1 Has the Externship prepared the teachers to work effectively with all the stakeholders in their new role as a Mathematics Specialist?	Teacher survey – questions: Part I: 8,19 Survey Part II Prompts from Oct, Feb Teacher observations Final Project Presentations Teacher Interviews Survey Part III: 13, 15, 25, 28, 32, 35, 36	Mean for each question using Excel, mean for entire category of questions, mean for subcategories Coding of prompts, observations, project presentations, and teacher interviews for responses correlated to KQ Frequency counts as aligned to KQ	Table of all question means Table of category means, subcategory means Coded data used to support findings of means (support quotes)
2 Has the Externship prepared the teachers to work effectively with issues related to curriculum and instruction?	Teacher survey questions: Part I:1-3, 16-18 23, 26 Survey Part II Prompts from Oct Teacher observations Final Project Presentations Teacher Interviews Survey part III: 4, 8-11, 14, 27-28, 30-31, 33-34, 37, 40,44	Mean for each question using Excel, mean for entire category of questions, mean for subcategories Coding of prompts, observations, project presentations, and teacher interviews for responses correlated to KQ Frequency counts as aligned to KQ	Table of all question means Table of category means, subcategory means Coded data used to support findings of means (support quotes)
3 Has the Externship prepared the teachers to develop and deliver effective professional development?	Teacher survey questions: Part I: 13-15, 27 Survey Part II Prompt from Oct Teacher observations Final Teacher Presentations Teacher Interviews Survey part III: 21-24	Mean for each question using Excel, mean for entire category of questions, mean for subcategories Coding of prompts, observations, project presentations, and teacher interviews for responses correlated to KQ Frequency counts as aligned to KQ	Table of all question means Table of category means, subcategory means Coded data used to support findings of means (support quotes)
4 Has the Externship prepared the teachers for their leadership roles as a Mathematics Specialist?	Teacher survey – questions: Part I: 4-7, 9-12, 20-22, 24-25 Survey Part II Prompt from Oct, Dec Teacher observations Final Teacher Presentations Teacher Interviews Survey part III: 1-3, 5-7, 12, 16-20, 26, 38-39, 41-43	Mean for each question using Excel, mean for entire category of questions, mean for subcategories Coding of prompts, observations, project presentations, and teacher interviews for responses correlated to KQ Frequency counts as aligned to KQ	Table of all question means Table of category means, subcategory means Coded data used to support findings of means (support quotes)

Note: KQ=Key Question

Credibility

For seven years prior to the implementation of a Master's Degree program designed for Mathematics Specialists I had served as the Mathematics Supervisor for grades K-12 in the county school system. In this capacity I developed a strong and very positive working relationship with all the teachers from this county that were participants in the first cohort. These relationships were built on mutual respect and trust, and allowed me the opportunity to interview the teachers and observe their activities without being threatening. Teachers willingly opened their classrooms, professional development sessions, their discussions with small and large groups of the faculty, and answered all requests for data openly and honestly. By collecting data from several sources at various times throughout the Externship experience, I was able to triangulate the data that helped establish credibility to findings. Frequent checks and discussions with Dr. Wilkins also helped to maintain credibility.

Transferability

Throughout the evaluation I provided a thorough description of the features of the Externship. It is important here to note the structure of the cohort that allowed me to have easy and free access to schools, classrooms, teachers, and principals. This information should allow the readers of the evaluation to determine the transferability of the results (Lincoln, 1985). Providing thorough descriptions of context enables one to determine the transferability of results.

Confirmability

Transcripts of interviews and the summaries of the writing prompts, the teacher survey, observation results with notes, and final teacher project presentations used

within the data analysis provided the “audit” trail recommended by Guba and Lincoln (1985). The wealth of data sources, the information provided for the data collection, and the data analysis process should enhance confirmability. Wilkins and I frequently discussed the data being gathered and the teachers’ responses. All themes were allowed to emerge from the data analysis process and reported, whether they fell within the four key categories or not.

Dependability

The close collaboration between myself and Wilkins throughout the development of data sources, the collection of data, the management of data, and the process for data analysis ensure the dependability of the data and findings.

CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of this evaluation was to determine the effectiveness of the Externship as the capstone experience in the mathematics specialist program at Virginia Tech. The effectiveness will be viewed from the teachers' perspectives using multiple data sources collected at various times during the year-long Externship experience. The results from this evaluation will be used to determine the value of the Externship as a requirement and/or to make improvements in the structure and requirements of the Externship. This chapter is structured to report the findings and results from the analysis of multiple data sources as the data informed each of the key questions designed in the evaluation study:

- Has the Externship prepared the teachers to work effectively with all the stakeholders in their new role as a Mathematics Specialist?
- Has the Externship prepared the teachers to work effectively with issues related to curriculum and instruction?
- Has the Externship prepared the teachers to develop and deliver effective professional development?
- Has the Externship prepared the teachers for their leadership roles as a Mathematics Specialist?

These questions were answered using several data sources: writing prompts, teacher observations, a teacher survey, teacher final projects, and teacher interviews. Data sources will be discussed as applicable to the key questions in the following sections.

Analysis of Writing Prompts

Teacher responses to the writing prompts were primarily categorized based on the four evaluation key questions, although additional themes were allowed to emerge.

September Writing Prompt

The first writing prompt given to the teachers in September of their year-long Externship asked teachers to discuss their expectations of the Externship experience: *What do you expect from the Externship?* Each of the teacher responses was analyzed by coding the expectations within partial or whole comments, and the comments with similar meanings were grouped and labeled with a descriptive code representative of the group. The resulting codes were then grouped under the associated key category. Each incidence of a teacher's coded expectation and the percentage of teachers with comments falling under a specific code are presented in Table 6. Since I was also interested in determining if a teacher had any comments within a key category, this is also denoted in Table 6. In addition, any categories outside of the key questions that emerged from teacher comments were also included in this table.

Sixty-five percent of the teachers expected to be involved in activities that would be classified as dealing with curriculum and instruction. Within this category, 11 mentioned working with data analysis, mainly in the form of SOL data, and six expected to be involved with planning and implementing lessons. Forty-seven percent of the teachers expected to be involved with some form of professional development. Five teachers mentioned planning and implementing professional development in general, while three teachers specified that they expected to be working with teachers on uses of manipulatives specifically. Sixty-five percent of the teachers generally discussed their expectations of working with stakeholders in the form of parents (5) and other teachers (4). It is noted here that these were general comments related to working with

Table 6

INCIDENCE OF TEACHER EXPECTATIONS BY CATEGORY

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	% T
CURRICULUM AND INSTRUCTION																		
data analysis		x	x	x	x	x				x	x		x	x		x	x	65
plan/implement lessons						x				x	x			x		x	x	35
evaluate student achievement		x								x								12
Teacher Responded		~	~	~	~	~				~	~		~	~		~	~	65
PROFESSIONAL DEVELOPMENT																		
develop and implement pd				x				x	x					x		x		29
illustrating manipulative applications			x													x	x	18
teaching good instructional strategies										x								6
Teacher Responded			~	~				~	~	~				~		~	~	47
WORKING WITH STAKEHOLDERS																		
working with parents/families									x	x	x	x		x				29
working with teachers		x					x	x					x					24
working with Principal			x		x													12
working with different grade levels								x										6
Teacher Responded		~	~		~		~	~	~	~	~	~	~	~				65
LEADERSHIP																		
coaching/ model teaching				x						x		x				x	x	29
focus whole school on math	x			x					x						x		x	29
learning to be encouraging/ positive										x	x						x	18
observing teachers		x														x	x	18
practical experiences in job related areas of ms	x									x								12
developing communication skills										x							x	12
mentoring new teachers (building and district)	x																x	12
evaluate math instruction										x								6
address concerns at school								x										6
Interviewing		x																6
being a resource for teachers													x					6
Teacher Responded	~	~		~				~	~	~	~	~	~		~	~	~	71
REMIEDIATION																		
					x	x												12
Teacher Responded					~	~												12

Note: x = activity within a category; ~ = at least one response in that category; %T= percent teachers responding

stakeholders that could not be categorized otherwise into a specific category of curriculum and instruction, professional development, or leadership. It seems appropriate to assume that all teachers expected to work with teachers and/or parents during the Externship, but the other teachers' comments were more specific in nature and therefore could be classified within one of the other key question categories. Seventy-one percent of the teachers expected to be involved in some form of leadership activities. Recall that teacher responses were categorized as leadership if the activities in which the teachers were involved had them working outside of what would be considered "normal" classroom teacher activities. Five teachers discussed the need to focus the entire school on a "mathematics need" and five described their expectation of coaching or mentoring teachers while they were involved in the Externship. Only one category of teacher comments fell outside of the four key categories – remediation. Two teachers discussed their expectation to be involved in the actual remediation of students. This may not have been included as an expectation by the majority of teachers because the class had reviewed the Mathematics Specialist Task Force report with appropriate job responsibilities and these teachers as a cohort had developed their own vision of the job responsibilities for a mathematics specialist. Neither of these documents included direct remediation of students. Therefore the possibility of working with the remediation of students may not have been part of the teacher's frame of reference as job responsibilities of a mathematics specialist.

In looking at the overall responses of the teachers on their expectations of the Externship, almost all of the responses fell easily into one of the four key question categories. The largest category of responses dealt with Leadership (71%) which would

seem reasonable since the position of mathematics specialist is asking teachers to become more involved in whole-school issues, step outside of the classroom and work with other teachers and the principal on mathematics needs. So these teachers should be thinking about their changing roles in terms of becoming more of a school leader. It is probably also the area of most concern for a classroom teacher – moving into a new position that requires leadership skills. When looking at the specific teacher responses it can be seen that only five teachers did not mention leadership specifically. Of these five, four mentioned working with the principal and teachers, but did not specify how. Therefore their responses were categorized as merely working with Stakeholders. These four may very well have been referring to new roles with these groups, but they did not make that specific. The one other teacher not mentioning leadership did discuss planning and implementing lessons. Again, this may have meant a new role of working with other teachers to help them plan and implement lessons (which would have fallen under Leadership), but she was not specific enough to classify this as a change in roles. The category containing the smallest number of teacher responses was Professional Development (47%). This may have been lower because these teachers were focused on issues of curriculum and instruction, working with stakeholders, and leadership, all obvious responsibilities of the position of mathematics specialist. Therefore, professional development was not foremost in their responses.

October Writing Prompt

The October Writing Prompt basically asked teachers in what areas they felt prepared and what needed to still be done in their preparation:

Do you feel prepared for the Mathematics Specialist position? If yes, why? If no, what do you feel you still need to know?

This writing prompt was divided into two parts for data analysis and each will be discussed separately.

Each individual teacher's response to this prompt was analyzed to determine each area in which the teacher felt prepared, to label the area using a representative code, and to group these codings by key category. These individual codings are presented, along with the percentage of teachers responding in each area of preparation, in Table 7. Note that four of the teachers' responses were missing from this analysis.

Thirteen of the seventeen teachers within the cohort responded to this writing prompt. In their remarks 100% of the teachers responding to the prompt discussed experiences that would fall under the category of curriculum and instruction. Eleven of the teachers (85%) discussed their increased content knowledge and five also mentioned their gain in pedagogical knowledge. One teacher in discussing her gain in content and pedagogy wrote of her feeling of being "enlightened" through the content courses and her new confidence in being able to "articulate to other teachers about effective teaching of mathematics." Another teacher discussed the content courses stating:

the opportunities we had in class to explore and discover on our own with so many manipulatives and within meaningful contexts. I was finally able to see and understand so many of the things that I was unable to connect when I was in school.

Table 7
AREAS IDENTIFIED IN PREPARATION BY CATEGORY (N=13)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	% T
CURRICULUM AND INSTRUCTION																		
Increased content knowledge	x			x	x	x	x		x	x		x	x	x			x	85
Overall knowledge of elementary curriculum					x	x			x	x		x	x	x				54
Knowledge of the whys behind the math					x	x				x		x		x			x	46
Gained pedagogical knowledge								x	x		x		x	x				38
Learning to assess better				x		x			x		x							31
Learned how students learn math								x		x	x							23
Exploring different manipulatives				x				x		x								23
Remediation issues – know the math behind procedures					x			x										15
Teacher Responded	~			~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
PROFESSIONAL DEVELOPMENT																		
Workshops presented & attended				x														8
Enjoy sharing instructional techniques								x										8
Sharing ideas with other schools										x								8
Teacher Responded				~				~		~								23
WORKING WITH STAKEHOLDERS																		
Working with other teachers	x			x	x			x		x	x	x	x	x				69
Work with families										x	x	x		x				31
Work with principal	x												x	x				23
Working with different students	x							x										15
Utilizing manipulatives improved my ability to teach all children				x														8
Working with bubble students								x										8
Importance of collaboration								x										8
Teacher Responded	~			~	~			~	~	~	~	~	~	~	~	~	~	77
LEADERSHIP																		
Helping other teachers	x			x	x			x	x			x	x	x				62
Confident enough to step in and help other teachers	x			x	x			x	x			x	x	x				62
Ability to coach teachers				x					x		x	x		x				38
Ability to guide school efforts	x			x							x							23
Communicate with teachers								x		x							x	23
Help teachers assess students				x					x			x						23
Support teachers in planning and teaching											x	x						15
Ability to critique workshops				x														8
Prepare families for math expectations											x							8
Offered additional help to grade levels	x																	8
Leadership activities												x						8
Teacher Responded	~			~	~			~	~	~	~	~	~	~	~	~	~	85
EXTERNSHIP EXPERIENCES																		
	x			x								x	x					31
COHORT STRUCTURE																		
	x			x	x			x			x	x	x	x			x	69

Note: x = activity within category; ~ = at least one response in that category; %T = percent teachers responding

A third teacher wrote of the importance of using her gain in understanding to impact students:

In today's society, it is not enough to just "cover" the material. We need students to come out of school with an understanding of the mathematical concepts and a desire to continue math education.

Seven teachers (54%) cited their increased understanding about the overall elementary mathematics curriculum and six (46%) addressed their increased knowledge about the "whys" behind the mathematical content. A teacher wrote of now being able to "decipher when a skill was introduced and how I could take that skill and go back to the building blocks for that skill if a student was having trouble." Another teacher wrote specifically of the importance of the content courses and her gain in understanding of these "whys":

I truly thought that I was really good at math before I started this program but now I feel that I actually understand all of the math that I thought I was really good at but now I realize I didn't really understand any of it.

A second teacher also referred to the importance of students understanding these "whys":

I think if a lot of students knew the "why" behind so many of the problems, they would be able to do better in math. So many times, they are just taught the process, and not the meaning behind the process, and it does not make sense to them.

Only 23% of the teachers (3) mentioned professional development at all in their responses to this writing prompt and even though each thought the experiences with professional development were important, each discussed a different aspect – one mentioned workshops presented and attended, one her enjoyment in sharing of

instructional strategies, and one the sharing of ideas with other schools. The importance of being involved in professional development was highlighted by one teacher:

I have had the opportunity to present two workshops and see that I really have grown and have accumulated a wealth of knowledge over the course of the program.

Ten (77%) of the teachers discussed working with stakeholders in a general way. Nine (69%) mentioned working with other teachers, and four (31%) working with families. One teacher expressed the importance of working with all these groups:

I am able to assess students in a variety of ways, coach teachers in their classrooms, and work with communities to better prepare families for the mathematical expectations in our school and society. I would hope that I could provide not only support for a community and a school, but a mathematical literacy that would help students extend their ideas from the classroom into their own world.

Eighty-five percent of the teachers (11) included remarks that were coded as falling under leadership activities. Eight teachers (62%) discussed helping other teachers and specifically mentioned their increased level of confidence in being able to step in and help other teachers. Five teachers discussed their ability to actually coach other teachers. One teacher's comments around the mathematics content courses occurring earlier in the program, exemplify the sentiment of all of them:

The math content courses have given me more focus and direction in my own teaching and I feel I could help other teachers do the same. I have gained a great deal of experience with different methods of teaching mathematics through these courses and would enjoy sharing them with other teachers.

One major category emerged within the analysis of this writing prompt that could not be coded directly under any of the four key question categories. Nine teachers (69%) specifically mentioned the importance of the structure of the cohort during the program and the Externship experience as providing support for them as they were

entering into the job responsibilities of a mathematics specialist. These teachers cited the ability of bringing questions and discussions to the group and relying on support from the group as they ventured into new experiences. One teacher expressed the value of the cohort:

I feel that the most valuable experience throughout this process is the set up of the cohort. Since our cohort is comprised of various grade levels representing different schools we get a varied perspective at the building level. We all bring different experiences, strengths, and weaknesses to the cohort. From that we are able to support each other and have been able to learn some of the most valuable information for our careers.

In analyzing the overall picture created from the first portion of the second writing prompt, 100% of the teachers responded that they felt most prepared in the area of Curriculum and Instruction, 85% in the area of Leadership, and 77% in the area of working with Stakeholders, and 23% in the area of Professional Development. It was found that ninety-two percent of the teachers included multiple categories in their responses, so their feelings about preparation reached across multiple areas. Table 8 presents the distribution of the teachers' responses across the key question categories.

Table 8

Categorization of Teacher Responses on Areas of Most Preparation

Categories	Percent of Teachers Responses	Number of Teachers Responses
CI & L	85%	11
CI & S	77%	10
S & L	69%	9
CI & S & L	69%	9
CI & S & PD & L	23%	3

Note: CI=Curriculum and Instruction; S=Working Effectively with Stakeholders; PD=Professional Development; L= Leadership

Only one teacher's responses fell into a single category, Curriculum and Instruction. This writing prompt was not structured in a way that solicited the teachers' responses across any specific categories, but was worded in such a way as to be as general as possible allowing the teachers the freedom to respond in whatever form and across whatever activities they desired. Therefore the analysis of the teachers' responses merely captured teachers' thoughts at this specific time. From the teachers' responses to this writing prompt, they seem to feel prepared for most of the areas within which their new roles will fall.

The second section of this prompt solicited from teachers their needs: *What do you feel you still need to know?* The teachers' responses were analyzed to identify each perceived need which was labeled using a descriptive code. These codes were grouped into the associated key category. Each incidence of a teacher's coded need and the percentage of teachers responding in each category are presented in Table 9.

Five teachers (38%) included a response under this part of the writing prompt and their responses did not fall within the same key question category. Three teachers (23%) specifically mentioned their need to have additional content knowledge specific to the mathematics found at the middle school level. These three teachers have experience only at the elementary school level and, therefore, feel the need for additional coursework aimed at the grade levels with whom they have not been involved. One of these teachers explained this need:

I do not feel that I gained enough understanding of all the strands [of mathematics] to enrich children's mathematical understanding beyond the fifth grade level. Even though I may have knowledge about best practices with math, manipulatives, and questioning, I think that the courses students take in the middle school are delivered by teachers that have had much more extensive

math training. This is training I would be lacking if placed in a middle school as a math specialist.

Table 9

Identified Needs by Teacher by Category (N=13)

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	%T
CURRICULUM AND INSTRUCTION																		
More middle school mathematics					x	x	x											23
Teacher Responded					~	~	~											23
PROFESSIONAL DEVELOPMENT																		
Teacher Responded																		
WORKING WITH STAKEHOLDERS																		
Learning to be more collaborative														x				8
Teacher Responded														~				8
LEADERSHIP																		
Working with unwilling teachers					x													8
Teacher Responded					~													8
GENERAL																		
Job interviewing skills					x													8
Being observed by math specialist									x									8
Teacher Responded					~				~									15
Total Responses					~	~	~		~					~				38

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

In other areas, one teacher mentioned a need to learn to be more collaborative, and one teacher wanted to learn more about how to deal with unwilling teachers. Two additional comments fell outside of the key question categories. One of these dealt with the need to be observed by a mathematics specialist while carrying out job related activities:

I felt that as a pre-service teacher student teaching was the piece that tied together all the things we had been learning in our courses over the years. Getting an opportunity to see other teachers at work and to practice my teaching ability in a safe environment was where I made the most personal growth as a

teacher. I was able to spend my day completely focused on student teaching and there was direct feedback, by more than one person, on my strengths and weaknesses to guide my progress. I am missing that observer feedback to help me be a better mathematics specialist.

One teacher also wanted an opportunity to practice job interviewing skills in her preparation, wanting to “feel more knowledgeable about the interviewing process if we were to spend some time practicing for interviews.”

Since 62% of the teachers did not have any responses on this portion of the writing prompt, it would seem that overall the teachers felt prepared for their new job responsibilities as a mathematics specialist at this stage of the Externship.

November Writing Prompt

The November Writing Prompt was designed to capture the teachers’ feelings about the Externship late in the first semester of the year-long experience:

How is the Externship going? Discuss one aspect of the Externship that is going well. Discuss one aspect of the Externship that has been frustrating for you.

The teacher responses to this writing prompt were analyzed by identifying those aspects going well and those with similar meanings were grouped together and labeled with a descriptive code. These codes and the key categories into which they fell are presented in Table 10. In addition, the percentage of teachers responding with each code is also presented. One teacher’s comments were not available for analysis.

Eighty-eight percent of the teachers discussed issues that were going well that would fall into the category of Leadership. Thirteen teachers (81%) included comments on the interviewing of teachers within their schools as going well, and nine (56%)

Table 10

Aspects Going Well by Teacher and Category (N=16)

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	% T	
CURRICULUM AND INSTRUCTION																			
Data analysis										x	x						x	x	25
Middle school solving equations			x																6
Teacher Responded			~							~	~						~	~	31
PROFESSIONAL DEVELOPMENT																			
Pd for teachers		x	x	x				x			x					x	x	x	50
Teacher Responded		~	~	~				~			~					~	~	~	50
WORKING WITH STAKEHOLDERS																			
Working with teachers		x		x				x	x			x			x	x	x	x	56
Working with parents											x				x	x			19
working with tutors								x											6
Teacher Responded		~		~				~	~		~	~			~	~	~	~	63
LEADERSHIP																			
Interviewing teachers	x	x	x	x	x	x	x	x	x	x	x						x	x	81
Interview with principal	x	x	x	x				x		x	x						x	x	56
Interviews with students		x																	6
Serving as resource for teachers				x															6
Observing teachers												x							6
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~					~	~	88

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

discussed the interviewing of the school principal as going well. One teacher interviewed teachers and students during the needs assessment process and felt that these “interviews helped to cultivate a better sense of shared goals.” Another teacher mentioned the interviews and hearing of teacher frustrations:

I have enjoyed meeting with different grade levels and hearing what they have to say about math in our school. It is interesting to hear their frustrations and actually have an idea that could help them with that situation.

Sixty-three percent (10) of the teachers felt that their work with stakeholders was going well, with nine specifically discussing their work with teachers. One teacher wrote of the connections made through the interviewing process:

It has been neat talking with each grade level. I feel I have made some great connections with a couple of teachers who have changed grade levels.

Another teacher mentioned developing relationships with teachers and the principal:

The conversations and relationship between my principal and myself has grown due to this Externship. I have also seen my co-teachers at grade four start to see me as a resource for math because of the outreach I have started because of the Externship.

A third teacher wrote of the changes that she has seen in more veteran teachers, “two old teachers have made a 180° turn around with help from the principal.”

Fifty percent (8) of the teachers discussed professional development as an area that was going well, with all eight referring to their professional development with teachers specifically. Three teachers mentioned having presented the Enhanced Scope and Sequence Plus document with their whole faculties and were planning “workshops one a week for the three following weeks.” Another teacher wrote of her planned use of this document:

I plan to choose an area of weakness [from SOL data] to demonstrate using the ESS+ document for ideas to boost the children’s understanding of these concepts.

Two teachers had “planned and were still working on workshops and classes for all school district teachers.”

Thirty-one percent (5) of the teachers included comments on areas within Curriculum and Instruction as going well, with four (25%) mentioning their work with

data analysis. One of the teachers provided a very comprehensive response about her activities as they related to the area of curriculum and instruction:

We [teacher along with the school faculty and principal] reviewed our SOL data and discussed our needs as a school and how this data correlated with our needs. I am working with pre-school and kindergarten, sharing materials with classroom teachers and resource teachers, and planning a math night to help our parents connect with our curriculum.

Since the Externship required teachers to perform a needs assessment within their schools, these teachers at this point in the Externship were very involved in the collecting of data for this assessment. This collection included interviewing teachers and the school principal along with analyzing multiple data sources (SOL data, school-wide benchmark testing data, individual teacher assessment data, etc). Therefore it seems understandable that the teachers would be focused on the areas of Leadership and working with Stakeholders at this stage of the Externship. Fifty percent of the teachers discussed issues within both of these key question areas within the writing prompt. Forty-four percent of the teachers mentioned both areas of Professional Development and working with Stakeholders, and Professional Development and Leadership as multiple areas that were going well. Sixty-nine percent of the teachers did respond with comments that would be classified into more than one of the key question categories. Five of the teachers responded with information that would fall within a single key question category, four mentioning areas only within Leadership and one in working with Stakeholders. The focus of the teachers' time towards the completion of a needs assessment could also explain why there were only five teachers mentioning issues of Curriculum and Instruction within this writing prompt.

The second part of the November Writing Prompt asked teachers to identify areas of frustration. These areas of frustration were identified with a representative code and grouped into the appropriate key category. The codings for the frustrations are presented in Table 11. One teacher's comments were not available for analysis.

Table 11

Frustrating Aspects by Teacher and Category (N=16)

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	%T
CURRICULUM AND INSTRUCTION																		
PROFESSIONAL DEVELOPMENT																		
WORKING WITH STAKEHOLDERS																		
Reluctant teachers				x														6
Working around others' schedules							x											6
Teacher Responded				~			~											13
LEADERSHIP																		
Focusing on one need out of many								x				x				x	x	25
Asking teachers to work on something else		x								x								13
Needing principal OK to schedule pd			x	x														13
Not seeing me as math specialist yet/not coming with questions					x													6
Time for research for project		x																6
No time to do observations	x																	6
Teacher Responded	~	~	~	~	~			~		~		~				~	~	63
Unclear on structure of final report							x	x	x									19
Lack of time	x		x	x		x			x	x	x	x			x	x	x	69
Total Teachers Responded	~	~	~	~	~	~	~	~	~	~	~	~			~	~	~	94

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

Ninety-four percent (15) of the teachers responded to the writing prompt with some area of frustration. Sixty-three percent of their frustrations would fall under the category of Leadership. Within this area, four teachers mentioned the frustration of trying to focus on only one need when there seemed to be so many at the school level. This may be a result of these teachers looking now at the school information as a whole instead of focusing on an individual classroom or grade level. One teacher wrote of feeling “guilty for asking other teachers to help with the needs assessment process simply because teachers already have so much to do.” Another teacher mentioned how others started seeing her, “as a threat or a burden, they do not want one more thing to do.” The frustrations that can be part of a leadership role were discussed by two teachers: one writing of “depending on others and going to the unknown, not being sure of what should be done to address the needs,” and the second discussing “trying to prioritize teachers’ needs and wants.”

Thirteen percent (2) of the teachers commented on issues that would fall under working with Stakeholders. One teacher discussed her frustration in trying to work with reluctant teachers, and the other teacher mentioned a frustration over trying to work around so many other schedules in order to set meetings.

None of the teachers mentioned any frustrating issues within the areas of Curriculum and Instruction or Professional Development. Two themes emerged from the analysis of this writing prompt that did not fall within any of the four key question categories. Three teachers discussed their frustration in not knowing more specifically the expectations and format for the write-up of the final project. Sixty-nine percent (11) of the teachers cited their frustration over time – not having enough time to do all the

things they needed to do. One teacher wrote of her unique situation of being a specialist in this program:

It seems the last 3 weeks I have been so busy with parent conferences and report cards and filling out gifted surveys and creating gifted portfolios that I haven't done anything.

Another teacher spoke of her limited time:

I can't get to the depth because of meetings, phone calls, copying, and other activities that teachers do during their limited planning period.

This time crunch is certainly a result of being a fulltime classroom teacher, a graduate student, and in addition being asked to step into new roles at the school level.

Overall, in analyzing the November writing prompt, it was found that teachers discussed areas that were going well that fell within all four of the key question categories. The largest number of these dealt with interviewing teachers and principals which were components within the needs assessment process in which all teachers were involved. Teachers did not identify as frustrating any areas within Curriculum and Instruction or Professional Development. The majority of the frustrating aspects fell within the area of Leadership dealing with the need to focus on one school need from many perceived needs through the needs assessment process. Outside of the four key question categories, issues around time seemed to be the most frustrating for these fulltime teachers.

December Writing Prompt

The December writing prompt was the final one during the fall semester in this year-long Externship. The question asked for some personal reflection: *Reflect on what you have learned about yourself as a Mathematics Specialist through the Needs*

Assessment process for your school. Teacher comments were analyzed and the identified areas with similar meaning were grouped together and labeled with a descriptive code. These codes were grouped into key question categories and are presented by teacher in Table 12. Five teachers' comments were not available during the analysis process.

An interesting finding from the analysis of teachers' responses to this writing prompt was that most teachers did not answer the prompt as it was written. They did not specifically discuss what they had learned about themselves, but rather they mentioned things they learned in general. So it does not appear that this particular writing prompt garnered the type of information that was hoped. However, teacher responses were used to inform the key questions in general.

Eighty-three percent (10) of the teachers listed things learned that would fall under the Leadership category. Four teachers discussed the difficulty in prioritizing between so many school mathematical needs, one saying that "the needs in my school are so great even though we have decent SOL scores." Another teacher wrote of the emergence of her role as a school leader:

I am surprised how many resources we really have already in our school. These resources are usually brought to me, and then dispersed later to my staff.

Seventy-five percent (9) of the teachers wrote of activities that could be categorized under the working with Stakeholder category. One teacher described her working relationship with teachers as follows:

I have found that some teachers are very open to new ideas and suggestions, while others seem to be satisfied doing what they are doing. I will need to work on how to make suggestions for alternative ideas so that I don't sound critical.

Table 12

Aspects Learned by Teacher and Category (N=12)

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	%T
CURRICULUM AND INSTRUCTION																		
I know strategies				x	x													17
I learned more about whole math program (spiral)					x													8
Data analysis										x								8
Discussing math education throughout school											x							6
Need for discussion across grade levels													x					8
Teacher Responded				~	~					~	~	~						42
PROFESSIONAL DEVELOPMENT																		
Chose most effective pd that I could provide											x							8
Presenting to staff											x							8
Teacher Responded											~							8
WORKING WITH STAKEHOLDERS																		
Meshing district and school needs																x	x	17
School needs are so great				x			x											17
Different teachers have different strengths							x											8
New teachers/new building-trust is an issue									x									8
Building relationships									x									8
Some teachers open, some satisfied										x								8
Working within a building's atmosphere												x						8
Hard to be viewed outside of current specialty			x															8
Teachers like help and a resource				x														8
Working with principal – not a math coach														x				8
Teacher Responded			~	~			~		~	~		~	~			~	~	75
LEADERSHIP																		
Hard to identify the most important need							x						x			x	x	33
Hope to address needs across grades with meetings	x																	8
I'm able to offer help				x														8
Feel comfortable implementing with teachers				x														8
I have ideas for other grade levels					x													8
I had ideas teachers could use					x													8
Need to be able to make suggestions without sounding critical										x								8
Being a teacher resource											x							8
Conducted grade level meetings												x						8
Dealing with different ideas of need												x						8
Excited teachers are coming for help	x																	8
Teacher Responded	~			~	~		~		~	~	~	~				~	~	83

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

Another teacher discussed a similar concern of working with certain teachers:

I have learned first that there is not a lot of discussion among various grade levels about what's going on. I need to foster some discussions about cross-grade level instruction – where they are coming from, where they are going. I have found that there are so many places of need even where teachers think they are just fine.

One teacher discussed that working with multiple schools has given her insights into the roles administrators play, “the biggest issue that has hit me is the importance of the building atmosphere created by the administration.”

Forty-two percent (5) of the teachers discussed activities falling under Curriculum and Instruction. Several comments dealt with assisting teachers directly with lessons and curriculum, one stating that “some of the teachers are coming to me for ideas and insights into the real mathematics of the lessons.” Another teacher wrote of her developing skills:

I learned that I would be able to offer help for the [school's] needs. I know resources and strategies that could work and would feel comfortable and confident implementing them with teachers.

Another teacher discussed the importance of learning more about the overall elementary curriculum:

I have learned a bit more about the math program itself – seeing how it spirals – not just with the year – but also from year to year. I think that's important because I can be another supporter of asking teachers to follow the program because what happens in the lower grades is a building block for the upper grades.

Only one teacher wrote about professional development in responding to this writing prompt. This teacher chose to address the mathematical needs of her school through the process of Lesson Study, working with teachers to create, teach, reflect,

and re-teach lessons through which to determine what their students are understanding and learning. This process was:

chosen because it seems to be the most effective staff development that I could provide, and seemed to present itself naturally. I have been asked to present and discuss my progress with my staff by my principal. My school has become invested in my work.

It was clear from the analysis of the teachers' responses to this writing prompt that no major themes emerged. Individual teachers answered more from a personal perspective and, therefore, responses were scattered throughout the four key question categories. In general, the teachers did discuss the difficulty involved in identifying the most important need for a school.

February Writing Prompt

The February Writing Prompt was designed to check on each teacher's progress through the needs assessment portion of the Externship and to determine where each teacher was in the planning and/or implementation stages in a project to address the perceived mathematical needs of the school:

Have you begun the implementation of your project? If yes, describe one thing that you have done as a part of the implementation and briefly discuss strengths/weaknesses, successes/"wish I had done differently." If no, describe what you plan to do first. As you begin the implementation of your project discuss your attitudes toward working with students, teachers, or parents, etc. as a "Mathematics Specialist."

Each teacher's response to this prompt was analyzed to determine activities in which the teacher had been involved. Similar activities were grouped and labeled using a representative code, and then reported under the associated key category. The codes for these activities are presented by teacher and category in Table 13. Since this evaluation was designed to determine the teachers' feelings of preparation in each of

Table 13

Activities in Which Teachers Were Engaged by Category

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	% T
CURRICULUM AND INSTRUCTION																		
Data analysis	x	x	x	x	x	x	x	x		x	x	x	x			x	x	88
Computation skills	x		x	x				x		x			x	x		x	x	53
Working with manipulatives					x	x	x		x					x		x	x	41
Development and use of assessment		x			x	x	x	x				x						35
Remediation efforts		x			x	x	x	x										29
Vertical alignment	x		x	x						x			x					29
SOL sorting activity with teachers on computation & estimation	x		x										x					18
Use of technology															x			6
Building number sense											x							6
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
PROFESSIONAL DEVELOPMENT																		
Pd sessions for teachers			x	x				x	x	x	x	x	x	x	x	x	x	71
Pd sessions for parents				x								x		x				18
Pd sessions for volunteers								x										6
Teacher Responded			~	~				~	~	~	~	~	~	~	~	~	~	71
WORKING WITH STAKEHOLDERS																		
Working with teachers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	100
Working with principal	x		x	x	x	x	x				x	x	x	x	x	x	x	76
Working with parents		x		x	x	x	x	x				x		x				47
Tutoring students				x	x	x	x	x										29
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
LEADERSHIP																		
Leading discussions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	100
Co-planning		x			x	x	x	x			x	x				x	x	53
Developing tutoring program		x			x	x	x											24
Teacher observations												x			x	x	x	24
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

the key question areas, this writing prompt was used to determine exactly what teachers were involved in throughout the needs assessment process and their planning stage to meet the need. It is important to note here that each teacher was working within a

specific school setting to determine the school's mathematical needs and then plan a strategy to address the mathematical need. Therefore every teacher was dealing with a unique setting and set of perceived needs. It was not expected that there would be similarities in project designs, but rather that the teachers would be involved in activities that could be generally categorized.

From the analysis of the teachers' responses it was determined that 100% of them were involved in activities in the areas of Curriculum and Instruction, working with Stakeholders, and Leadership. Within the area of working effectively with Stakeholders, all of the teachers had worked with groups of teachers or individual teachers, 76% of the teachers (13) had also worked with principals, 47% (8) also with parents, and 29% (5) with students directly. It is interesting to note here that only 13 of the teachers mentioned their work with principals, but all of them had been involved in interviewing the principal for the needs assessment process. All of the work with students was in the form of remediation efforts either led directly by the teachers or indirectly through the training of tutors. One teacher discussed working with students in both ways:

I have started working with a group of third graders in homework club. The goal is to help them build their math computational fluency. One strength is that I have volunteers to give students one on one focus to help them with building these skills.

The teachers' work with parents was in the form of creating newsletters, holding parent nights focused on alternative algorithms, providing parents with manipulatives and information on their use. One teacher discussed efforts to improve parent night attendance:

During the [parent-teacher] conference night I will field questions and/or demonstrate/teach the how and why of alternative algorithms. This is an

advertisement to drum up interest in a parent workshop that will take place two weeks after conference night.

In the area of Curriculum and Instruction teachers' responses revolved around data analysis (80%), working on computation skills in the schools (53%), and working with manipulative use (41%). The data analysis in which the teachers were engaged included all teachers working with SOL data and in addition, six working with individual classroom assessment strategies for teachers. One teacher discussed her work with grade level teachers to focus on classroom assessment to inform instruction:

We used the assessment record sheet to record the results of a week's worth of snapshot assessment pieces to determine which students needed remediation, extra practice, or enrichment through the discussion and evaluation of exit slips.

In the Leadership category, 100% of the teachers had led discussions with whole faculties and small groups of teachers. Since the requirements of the Externship included a process of needs assessment, all of these teachers had to be involved in discussions with groups of teachers on the mathematical needs of their schools. In addition 53 % (9) of the teachers had been involved in co-planning activities with teachers. This co-planning was either one-on-one, working with small groups of teachers, or working with whole grade levels together. One teacher had begun working with "several teachers to use formative assessment in the form of exit slips and observations." Another teacher wrote of the newness of this practice, "second grade teachers are now planning math together. Prior to implementation, we always planned independently." A third teacher in discussing her work with the Lesson Study process with teachers in her building stated:

We have gone through two lesson study processes and worked with pre-K and third/fourth [grade teachers] to help them look at the mathematical concepts.

Teachers' observations of student thinking build perspectives and new insights when connecting their beliefs to their practices. Teachers are wondering more about how or why they would teach or assess students' thinking/knowledge in certain ways.

Twenty-four percent (4) of the teachers had been involved in some form of teacher observations. It is important to note here however that three of these teachers were acting mathematics specialists and the fourth teacher had just begun as a math specialist. Therefore their job description and expectations included performing teacher observations.

Seventy-one percent (12) of the teachers were also involved in providing Professional Development. Of the twelve teachers discussing professional development activities, all twelve had designed professional development sessions for other teachers within their schools. The professional development sessions ranged from working with teachers on data analysis, sessions on the ESS+ document, sessions on curriculum alignment, and sessions on effective manipulative use. One teacher described her experiences with professional development sessions:

I held a workshop for grades three through five teachers this past Wednesday. I was pleasantly surprised at the number of participants. I think I shared some valuable information and provided activities that would be easy for teachers to implement.

Another teacher wrote of developing professional development sessions for all middle school mathematics teachers on a mathematics software package.

Overall, it was informative to note that by February of the year-long Externship, 71% (12) of the teachers were already engaged in activities that would fall within all four of the key question categories. The teachers were already engaged as mathematics

specialists in their schools and involved in all four categories of responsibilities for which they were being prepared.

Final Reflection

The final teacher writing prompt in May asked teachers to reflect on the Externship experience:

Reflecting on your Externship experience this year, list and discuss two aspects of the Externship that you feel have had the greatest impact on your beliefs about your ability to be a successful Mathematics Specialist. Discuss one thing that you feel would have enhanced your Externship experience and ultimately would have better enhanced your potential to be a successful Mathematics Specialist.

Teacher comments were analyzed to identify aspects listed as having greatest impact, label the aspects with similar meanings using a descriptive code, and group these codes by key question category. These codes are presented by teacher and by category in Table 14. It is important to note that even though the prompt asked for two aspects that had the greatest impact, only six teachers limited their responses to naming two, the rest mentioned more than two aspects.

Seventy-one percent of the teachers mentioned the needs assessment process in their responses. Within the overall process of conducting a needs assessment, all teachers were involved in the activities of analyzing student data around issues of curriculum and instruction; leading discussions with teachers, principals, and/or parents; conducting interviews; and planning and facilitating meetings. Therefore, if a teacher cited the needs assessment as an aspect of the Externship that had an impact, this selection was coded under the categories of Curriculum and Instruction, working effectively with Stakeholders, and Leadership. Other teacher responses were also

Table 14

Aspects Having Most Impact by Teacher and Category

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	% T
CURRICULUM AND INSTRUCTION																		
Needs assessment process	x	x		x	x	x	x			x		x	x	x	x	x		71
Research/literature review on best practices		x		x							x			x			X	29
Increased pedagogical knowledge								x										6
Alignment of curriculum			x															6
Effective manipulative use									x									6
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
PROFESSIONAL DEVELOPMENT																		
Providing professional development sessions		x	x			x		x	x	x	x		x		x	x	X	65
Teacher Responded		~	~			~		~	~	~	~		~		~	~	~	65
WORKING WITH STAKEHOLDERS																		
Needs assessment process	x	x		x	x	x	x			x		x	x	x	x	x		71
Working with teachers/school faculty								x	x	x	x					x	X	35
Focus on struggling students					x													6
Working with principal			x															6
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
LEADERSHIP																		
Needs assessment process	x	x		x	x	x	x			x		x	x	x	x	x		71
Building leadership skills			x					x	x		x						X	6
Teacher Responded	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	100
Cohort	x				x					x		x				x	X	35
Other Aspects																		
Practice job interviewing							x											6
Developing patience											x							6
Reassurance in job															x			6
Teacher Responded							~				~				~			18

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

coded under multiple categories depending on the descriptions given within the response. For example, one teacher discussed the value of presenting professional development opportunities for teachers in her building and specifically discussed the content of this professional development as computational strategies and instructional

strategies to improve students' computational fluency. This aspect of impact was coded as falling with the areas of Curriculum and Instruction and also Professional Development for this teacher.

From an analysis of teachers' responses to this prompt, 100% of the teachers identified an aspect that would fall under the category of Curriculum and Instruction and twelve (71%) of the teachers referenced the needs assessment process as being the most beneficial aspect of the Externship. One teacher summarized the benefits of the needs assessment process:

I don't think I realized how much we were learning about our schools and the role of the math specialist until this project was complete. By interviewing the teachers I learned a great deal about how they feel about the math program we use and where they feel there are strengths and weaknesses in the program. Also by interviewing the principal I learned a great deal about where she stood with regards to our current program. I also gained insight into areas of concern she had for the math instruction in our building. Reviewing our school data to find areas of concern gave me added practice in looking at data and identifying areas of concern. I had looked at data before for our grade level but I had not really looked at it as a school as a whole.

Twenty-nine percent (5) of the teachers referenced the research and literature review component of the project design process as beneficial. One teacher stated:

Learning how to find research was instrumental to changing how I presented information. Instead of talking about alternative algorithms as something I believe in or I see work, I had research to back why we should use them. By making it "research based" and factual instead of emotional, I think the project had more impact. This way there was more of a buy in to the concepts than if I had stood there and just said, "trust me it works."

One hundred percent of the teachers wrote about the opportunities for working with Stakeholders as being a beneficial aspect of the Externship. Thirty-five percent went beyond the discussion of the needs assessment process to include additional

comments on the value of working with teachers. One teacher described the development of her skills in working with teachers:

In the beginning I started out working with just one teacher. Even though we had completely different personalities, I really did enjoy the type of work I was doing with her. Being able to meet with that teacher and offer sound advice and suggestions made me feel that I could be successful as a mathematics specialist. Eventually, by the nature of my project, I was forced to work with all teachers throughout the building. The work that I did with the other teachers was more impersonal. However, I did enjoy being able to talk with all the grade levels about mathematics instruction.

Another teacher wrote of the insights she gained working with teachers:

The Externship experience also gave me an insight into the reality of working with all staff members. My school is very supportive of my work and I am proud to be able to work in such an encouraging environment. I still had obstacles at times and I was surprised when other staff members did not have the same priorities that I have.

Only one teacher wrote of the benefits of working with the school principal directly:

Conversations with the principal had the greatest impact on my beliefs about my ability to be a successful mathematics specialist. There are three specific conversations with the principal in which I feel my opinion was sought and respected. The first conversation involved his interest in my opinion about timed tests on basic facts. The second conversation was about the position of a math remediation teacher. This discussion allowed me to discuss big ideas such as pull-out versus going-in the classroom and the idea of drill and practice versus changing instructional strategies. The third conversation was a discussion of the use of supplies during math lessons and teacher training. Again the principal showed an interest and respect for my thoughts.

One hundred percent of the teachers referenced opportunities around Leadership as being a most beneficial aspect of the Externship. Teachers either referenced the needs assessment process specifically or they mentioned the opportunities they had to learn and develop leadership skills in general. One teacher discussed the development of leadership skills in working with different groups of people:

I have found that I work very well with a variety of different people and they looked to me for guidance in the area of mathematics. By taking more of a leadership role in many of the activities and programs in my project my confidence level has grown tremendously. Throughout my project I was forced to make decisions and look at the bigger picture to see how we could best help improve students' computational fluency. I had to be a teacher leader and develop a staff development workshop that could be beneficial to teachers from K to grade five. I worked out in the community and found my expertise was also needed beyond the walls of my school.

Another teacher wrote of the variety of leadership opportunities in which she had to engage:

Throughout this process I have continued to share effective strategies, model lessons for teachers, aid in data analysis, create division-wide benchmarks and simulations, and ensure coordination of the district's math initiatives. We are of course seeking to improve student achievement, but also to model to the teachers that communication is an important aspect of improving the quality of mathematics instruction. The Externship has helped me to improve my communication skills.

Sixty-five percent (11) of the teachers discussed the importance of being involved in presenting professional development opportunities as being a beneficial aspect of the Externship. One teacher wrote of the overall importance of professional development opportunities in general:

I truly believe that teachers need to be provided with time to share ideas, instructional strategies, and have professional development on current mathematics topics. Teachers need staff development that keeps them informed on the latest techniques and strategies to help them provide the best instruction they can to meet the needs of all students for mathematics instruction.

Another teacher wrote specifically about the importance of the planning process :

The whole experience of figuring out what to do, finding resources to support why we were doing it and getting it all together was the most valuable part of the process. The experience of presenting the staff development was important too, but the planning is what I gained the most from.

A third teacher addressed the importance of being in a safe, familiar setting in providing

staff development opportunities:

The feedback I have received from teachers this year about the fraction workshop and the faculty presentations has helped me to feel more comfortable in terms of doing presentations and staff development activities. I am not nearly as experienced in this area as many of my colleagues, but knowing I was “among friends” made it better. While I still get nervous about these types of situations, the experience has been tremendously helpful.

Another teacher wrote of the change in focus of the professional development

because of the needs assessment process and findings:

Typically when teachers come to workshops they expect to leave with an activity, game, etc. that can be easily implemented the next day in their classrooms. However, the sessions I was planning were focused more on reflections and discussion. The sessions would consider instructional strategies being practiced in the mathematics classroom and then compare these practices among the classrooms across a grade level as well as from one grade level to another grade level. Having teachers think about this is more of an “internal” staff development because it requires a lot of sincere reflection and analysis of what’s actually happening in mathematics instruction. It would also require understanding how mathematics instruction in just one classroom can impact students mathematical learning in sequential grade levels.

In analyzing the teachers’ responses to this final writing prompt, one theme emerged outside of the four evaluation key question categories. Thirty-five percent (6) of the teachers discussed the cohort structure of the Mathematics Specialist Program and the Externship as one of the aspects that had a major impact on their ability to become a mathematics specialist. Each cited the nature of working within a cohort of supporting teachers as aiding in their development of skills towards becoming a mathematics specialist. One teacher wrote of the benefits of this structure:

It was enlightening to hear others share their progress, successes, and challenges. Together we learned that providing professional development is different than teaching children. We have learned that sometimes adults respond to our plans better than children do, and sometimes they don’t! We have learned to continue on and keep trying either way. Without the support from the cohort for

the past three years, I know my experiences would have been far less meaningful. We challenge, as well as support, each other.

Another teacher discussed the future value of this network:

The opportunities to share also made me realize how much we learned from each other. I know that after this year, if there are situations with which I need assistance or help finding material, I have a group of people with whom I can reach out to and consult. I feel that we have truly established a very unique network that will continue after we've finished this program.

This final writing prompt also asked teachers to identify anything that might have enhanced their experiences in this Externship. The teacher responses were analyzed to identify any areas of enhancement, group those of similar meaning and label them using a representative code, and group these codes under the appropriate key category. The codings for the identified enhancements are presented in Table 15.

Fifty-three percent (9) of the teachers' responses could be categorized as falling within one of the four key question categories. Forty-one percent (7) of the teachers wrote of enhancements that would fall outside of the four evaluation key question categories. In addition, one teacher did not identify any enhancement that was needed for this Externship experience.

Twenty-four percent (4) of the teachers dealt with the area of Professional Development, either having additional general instruction on preparing and delivering effective professional development (1 teacher), or suggesting the removal of a requirement to do professional development at all (1 teacher) and the district-focused sessions on the Enhanced Scope and Sequence document in particular (3 teachers). One teacher mentioned a need for additional instruction on professional development

Table 15

Identified Enhancements by Teacher and Category

Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	%T
CURRICULUM AND INSTRUCTION																		
Research class	x																x	12
Assessment of benchmarks																x		6
Teacher Responded	~															~	~	18
PROFESSIONAL DEVELOPMENT																		
Remove requirement for district level initiative/pd				x								x	x					18
More how to information									x									6
Teacher Responded			~					~				~	~					24
WORKING WITH STAKEHOLDERS																		
Time in other settings											x							6
Not dealing with teachers first												x						6
Teacher Responded											~	~						12
LEADERSHIP																		
Others																		
More time/being a math specialist								x		x					x			18
More collaboration with cohort/instructors		x			x													12
Shadow math specialist						x												6
Not dealing with multiple schools			x															6
Teacher Responded		~	~		~	~		~		~					~			41

Note: x = need within category; ~ = at least one response in that category; %T = percent teachers responding

saying, “I did gain experience by actually giving presentations, but I felt I needed more in how to actually prepare effective professional development.” Another teacher discussed the district wide initiative:

We are all so new still and just trying to get a handle on how to work with a building, that district wide may be too ambitious and ineffective. The first interaction we had with schools and teachers should not have been something that they had not expressed interest in.

One teacher in discussing the requirement within the Externship experience that

professional development within the school setting not be a one-shot-deal explained

her view:

I can understand how it might seem like only completing one staff development is not much, but what we did was HUGE in my opinion. I felt like I could have been more effective with the experience we were planning for the teachers if I did not have to also focus on what we might be able to do next.

Three (18%) of the teachers cited additional work in the area of Curriculum and Instruction. Two (12%) of the teachers discussed their need for additional instruction in the area of research, one saying:

I really do not like the thoughts of having to take a research class, but I do not feel that I was truly prepared to do the research piece of the project. Not just the finding of resources, but being able to take those resources to back up my ideas.

Another teacher suggested a way to address this need for additional work with research:

I would have liked to have had more opportunities in previous classes to relearn and construct a better understanding of “how” to write research papers. Would there be a way to conduct “mini” research projects and “mini” projects within each of the [mathematics] strand classes.

Two (12%) of the teachers wrote about working with Stakeholders. One teacher wanted “more time spent exploring a school setting outside of the teachers’ comfort zone during the Externship program to ensure success”. This indicated that this teacher felt that elementary teachers should have experiences working with middle school teachers, and vice versa. Another teacher wrote of realistic expectations on working with teachers that a mathematics specialist would first encounter:

In our current data-driven setting, specialists are placed or moved to work with schools that are not being successful as measured by test scores. It is highly likely that the teachers will be under considerable pressure to alleviate the

situation. A new specialist will not likely have the option of working with the willing teachers first.

Seven (41%) of the teachers responded with ideas of enhancement to the Externship experience that would not fall within any of the four evaluation key question categories. When analyzing their responses two themes emerged both of which dealt with time –the need for additional time to spend in the role of a mathematics specialist and additional class instructional time. Three (18%) of the teachers discussed the need for time to actually spend being a mathematics specialist. One teacher mentioned the possibility of spending “the day with a math specialist from another county to actually see what their days are like and the things they encounter throughout each day.” Two teachers felt the need to be “given time away from the classroom to work on the different aspects of this project,” and “arranged for some kind of opportunity where we could have really focused on the math specialist role for a short time.” Twelve percent (2) of the teachers specifically mentioned their need for additional contact time with the instructors and the cohort members. One described this as taking the form of conferences with the instructors:

Conferences should have been scheduled each semester, but at least once a year in order to allow for re-direction, goal setting, and even for some encouragement along the way.

Another teacher discussed additional time with cohort members:

It would have been nice to be able to get together and bounce ideas off each other. We all have different strengths to offer, and I think our projects could have been even better if we could have had more time to collaborate together.

Summarizing the findings of the analysis of this final writing prompt, teachers identified the most beneficial aspects of the Externship. These aspects fell across all

four key question categories: Curriculum and Instruction (100%), working effectively with Stakeholders (100%), Leadership (100%), and Professional Development (65%). Conducting a needs assessment was specifically identified by 71% of the teachers as a very beneficial aspect of the Externship experience because it engaged them in roles of leadership, working with stakeholders, working with issues of curriculum and instruction, and (depending on the chosen project) professional development. In addition, the requirement of providing professional development, a new role for many, was identified as having a positive impact on the teachers' preparation process. The importance of the structure of the cohort as a supportive learning community emerged as an important feature in the teachers' preparation to become mathematics specialists. Teacher comments helped to clarify and support their selections of beneficial aspects. Teachers' responses also identified enhancements for the Externship experience. No Leadership aspects were identified, and the majority of the teachers responded with an aspect outside of the key question categories, mainly dealing with the need for additional time.

Analysis of Teacher Observations

Fourteen of the teachers, those from the local school district, were observed at least once by Wilkins or Kreye. The three teachers, all acting mathematics specialists, from the city school system were observed during their job related activities by the Mathematics Supervisor within that system and their data was not requested for this evaluation. The goal of recording observations of these teachers was to describe and present their experiences and categorize these experiences into the four evaluation key categories. For the teachers observed, the activities in which they were engaged were

coded under the key question category into which the activity fell. These codings are presented in Table 16 by teacher and by category.

Table 16

Teacher Observations by Teacher and by Category (N=14)

TEACHER	OBSERVATION 1	CATEGORY	OBSERVATION 2	CATEGORY
1	Faculty Meeting	S,CI,L	Grade level meetings	S,CI,L
2	Lesson Study Group	S,CI,L	Lesson Study Group	S,CI,L
3			Two- school pd	S,CI,PD,L
4	Faculty Meeting	S,CI,L	Faculty Meeting	S,CI,L
5	Faculty Meeting	S,CI,L	Student Tutorial	S,CI,L
6	Faculty Meeting	S,CI,L	Student Tutorial	S,CI,L
7	Faculty Meeting	S,CI,L	Student Tutorial	S,CI,L
8	Faculty Meeting	S,CI,L	Faculty Meeting	S,CI,L
9	Faculty Meeting	S,CI,L	Faculty Meeting	S,CI,L
10	Faculty Meeting	S,CI,L	Faculty Meeting	S,CI,L
11	Lesson Study Group	S,CI,L	Lesson Study Group	S,CI,L
12	Working with a Teacher	S,CI,L	Working with a Teacher	S,CI,L
13			Two-school pd	S,CI,PD,L
14	Working with a Teacher	S,CI,L	Working with a Teacher	S,CI,L

All of the observations recorded successful engagement of each of the teachers in roles and activities that would be within the responsibilities of a mathematics specialist within a school building. Although not all of the teachers were fully at-ease during their observations, each teacher did a commendable job within the setting of the observation. All observations involved the teachers acting in a leadership capacity: leading a grade-level discussion, presenting information to a full faculty, providing a professional development session for two school faculties, leading a grade level group of teachers as they are engaged in a lesson study process, or working with students not merely from their own classroom. The lesson study process involved the teachers planning a lesson together, presenting it to students at that grade level, meeting to

discuss the teachers' observations of the students during the lesson, revamping the lesson, presenting it to another of that grade-level classrooms, and engaging in a final reflection of the lesson and its effectiveness with students. All teachers were also involved with working with stakeholders during the observations – teachers, principals, and/or students. All observations recorded the teachers dealing with issues of curriculum and instruction either in the form of presenting data analysis information, alignment of curriculum issues, working with specific content in lesson planning, or working with students on specific curriculum concepts. Only two teachers were observed as they presented a planned professional development session. This observation actually captured their work with the faculties from two different elementary schools (a preK-grade 2 school and a grade 3-5 school) as they focused on curriculum alignment and computation strategies between grades and schools. Therefore all teachers were observed successfully engaging other stakeholders in activities of curriculum and instruction and leadership.

Analysis of Final Teacher Projects

Through the Externship the teachers were required to perform a needs assessment to determine the highest priority mathematical need within their individual schools. Once the need was identified, the teachers used a review of literature process to determine a project through which to address this mathematical need. The choice of a final project was the sole responsibility of each individual teacher. Therefore there were no set expectations for the format or direction of any of these projects. Table 17 provides the titles and brief descriptions of the final projects chosen by the teachers and the key question categories into which the projects fell. These projects and the teachers'

presentations of their work were evaluated by University faculty. All teachers successfully completed the requirements of the project and its presentation.

Table 17

Teacher Final Projects by Teacher and by Category

T	PROJECT TITLE AND DESCRIPTION	CATEGORY			
		S	CI	PD	L
1	Vertical Alignment Through Communication -designing, initiating, and facilitating cross-grade level meetings to discuss SOL requirements, instructional strategies, manipulatives used, and math concepts taught	X	X	X	X
2	Using Assessment to Plan Instruction -facilitating collaboration between all grade 2 teachers to implement use of exit slips, anecdotal teacher comments, and other assessment strategies to determine placement of all grade 2 students into groups (remediation, extra practice, and enrichment), using parent volunteers and literacy volunteers to focus students on the created activities designed to meet the needs of each of these groups	X	X		X
3	Measuring the Alignment of Instructional Delivery in Computation -designed and facilitated a meeting involving all the faculty across two schools (a primary school that feeds into an elementary school) to focus discussions between all grade level teachers on instructional strategies, vocabulary, algorithms, and manipulatives that currently are being used to teach computation	X	X	X	X
4	Parent Nights -designed and implemented parent nights to teach parents the alternative algorithms of partial sums, partial products, and lattice multiplication	X	X	X	X
5	Leap into Learning -used data to select small group of students (upper elementary) to attend 18 before school remediation sessions scheduled over 18 weeks -designed curriculum materials and taught the sessions -focused on vocabulary around operations	X	X		X

Table Con't

Teacher Final Projects by Teacher and by Category (continued)

T	PROJECT TITLE AND DESCRIPTION	CATEGORY			
		S	CI	PD	L
6	Leap into Learning -same procedure as teacher #5 (at the same school) working with a different set of students -focused on vocabulary	X	X		X
7	Leap into Learning -same procedure as teacher #5 (at the same school) working with a different set of students -focused on manipulative use	X	X		X
8	Building Computational Fluency -created and presented a whole-faculty staff development workshop on computational mastery -planned and facilitated Math Mondays, a tutoring sessions for struggling students using VA TECH tutors and math games -focused Learning Lunches on math issues, presented workshop for parent volunteers -coordinated efforts of retired teachers acting as tutors at local trailer parks (created binders of math materials and presented staff development for the tutors)	X	X	X	X
9	Manipulative Project -surveyed teachers and presented mini-professional development sessions on the topics of fractions, operations, and number sense -designed and presented whole school staff development on manipulative use -compiled a school-wide listing of all manipulatives	X	X	X	X
10	Building Computation and Estimation Skills Using Games, Manipulatives, and Songs -assisted SOL remediation tutor to identify students using SOL data -designed and led whole-faculty meeting on SOL data results for school to identify areas of concern -planned and facilitated workshop "Fun with Fractions" -facilitated whole school implementation of the use of multiplication fact songs	X	X	X	X
11	Building a Mathematical Community One Lesson Study at a Time -facilitated grade level discussions on areas of concern -created, administered, and analyzed faculty survey on areas of concern -used results to choose topic to use for Lesson Study format within two different grade levels (plan lesson, teach, reflect)	X	X	X	X

Table Con't

Teacher Final Projects by Teacher and by Category (continued)

T	PROJECT TITLE AND DESCRIPTION	CATEGORY			
		S	CI	PD	L
12	From Summative to Formative Data -worked with school math teachers to interpret state assessments -facilitated discussions with faculty on the use of formative assessment strategies -assisted teachers in implementing formative assessments (exit slips, observation check lists, reflections, student self-evaluations, student interviews)	X	X	X	X
13	Measuring the Alignment of Instructional Delivery in Computation -designed and facilitated a meeting involving all the faculty across two schools (a primary school that feeds into an elementary school) to focus discussions between all grade level teachers on instructional strategies, vocabulary, algorithms, and manipulatives that currently are being used to teach computation	X	X	X	X
14	The Math Toolbox Program -applied and received grant and using these funds purchased manipulatives (cuissenaire rods, rulers, base-ten blocks, and Everyday Math card decks) to create parent kits -designed and presented 5 parent night sessions (games, cuisenaire rods, base-ten blocks, time and money, Achievement Record process) and gave all participating parents a math toolkit	X	X	X	X
15	Understanding Math Plus (district-wide software package) - designed evaluation process of the software package and use based on funding costs	X	X	X	X
16	Teachers + Fractions + Manipulatives = Understanding -designed and facilitated 3 sessions of professional development for district-wide faculty -created binder for presentation and to give to participating teachers -observed participating teachers for manipulative use as follow-up to sessions	X	X	X	X
17	Teachers + Fractions + Manipulatives = Understanding -designed and facilitated 3 sessions of professional development for district-wide faculty -created binder for presentation and to give to participating teachers -observed participating teachers for manipulative use as follow-up to sessions	X	X	X	X
Percent of Teachers		100	100	76	100

Note: S = Work effectively with Stakeholders; CI = Curriculum and Instruction; PD = Professional Development; L = Leadership

It can be seen that 100% of the projects created and implemented by the teachers incorporated aspects from the categories of Curriculum and Instruction, working with Stakeholders, and Leadership. In addition, 76% (13) of the projects included aspects from all four key questions categories. The category of Professional Development was not a piece of only 4 projects, and three of these dealt with a focus on working directly with students (not necessarily the teacher's own) within a tutorial program. Since the choice of projects was totally within the responsibility of the teacher the analysis of key question categories addressed within the projects should indicate that the teachers have chosen activities in which they felt confident. This does not necessarily mean that the teachers felt totally comfortable carrying out all the activities, but they would probably not have chosen to be involved in activities for which they do not feel somewhat competent and confident. Therefore the choices of projects indicate a level of preparation on the teachers' parts.

Analysis of Teacher Survey

Teachers were asked to rate their agreement with statements concerning their preparation through the Externship experiences to become a mathematics specialist using the following prompt:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale: 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree. The Mathematics Specialist Externship has prepared me to be able to...

These statements along with descriptive statistics are presented in Table 18 and grouped by the evaluation key question categories as described in Chapter Three using

Table 18

Mean and Standard Deviation for Each Ranking Item by Categories

	\bar{X}	<i>SD</i>
Working Effectively with Stakeholders		
work with a group of teachers on a common mathematical goal	3.35	.85
work with parents on issues involving mathematics	2.41	.73
Overall	2.88	
Curriculum and Instruction		
interpret school-level assessment data	3.53	.95
apply my mathematical content knowledge working with teachers.	3.47	.53
collaborate with individual teachers on classroom instruction.	3.41	.62
facilitate discussions with a group of teachers around best instructional strategies	3.41	.70
implement and align curriculum with local, state, and national Standards	3.21	.80
use classroom student data to plan instruction.	3.18	.95
facilitate teachers' application of differentiation strategies in the classroom setting	3.00	.90
facilitate teachers' application of assessment strategies in the classroom setting	2.74	.72
Overall	3.24	
Professional Development		
coordinate, plan, and present an effective professional development opportunity with school faculty.	3.59	.87
provide a targeted professional development opportunity to address an identified need.	3.44	.92
coordinate, plan, and present an effective professional development opportunity outside of your school setting	3.00	.71
plan and present sessions at local and/or state professional mathematical meetings or conferences.	2.94	.87
Overall	3.24	
Leadership		
serve as a building-level resource person for mathematics	3.65	.86
work with teachers to identify a school mathematical need.	3.65	.71
collaborate with principals to identify a school-based mathematical need.	3.53	.80
use research in determining a plan of action to meet a diagnosed mathematical need.	3.53	.93
work with the Principal to meet a school mathematical need	3.41	.62
mentor experienced/veteran teachers in mathematical content	3.29	.94
mentor new teachers in mathematical content.	3.18	.87
observe teachers classroom practices	3.18	.87
engage a classroom teacher in professional conferencing around effective instructional strategies	3.09	.95
mentor experienced teachers in mathematical pedagogy.	3.00	.77
mentor new teachers in mathematical pedagogy.	3.00	.95
work with District personnel to identify a district-level need and implement a district plan.	2.85	.51
build school community around a focus on mathematics.	2.82	.69
Overall	3.24	

the descriptions in Table 3. These 27 items will be analyzed overall and then by category.

Overall Analysis

Given that the rankings were based on a 1-4 scale, I used $\bar{X} = 2.5$ as the lowest agree ranking, indicating that on average the teachers agreed with the given statement. Therefore, an \bar{X} within the range 2.5-3.4 indicated agree, 3.5-4.0 indicated strongly agree. Analyzing the overall teachers' rankings for the survey questions, it was found that the five questions with lowest rankings fell below 3.00, and the six questions with the highest ranking means fell above 3.50, strongly agree. The highest ranked and lowest ranked items, along with their means, are given in Table 19. Note that although listed as the lowest ranked questions, the mean for all but one of the questions is above 2.5, indicating a "low agree" ranking. The only question mean falling below 2.5 deals with working with parents. The Externship experiences did not require that all teachers work directly with parents and not all teachers chose to design their projects to have a component of working with parents. Forty-seven percent of the teachers ranked this item 2 or below, with three teachers ranking this at a 1. Of these eight teachers, none of them chose to include a parent component in their project. Therefore their rankings could have reflected their lack of opportunity to work directly with parents, and these teachers may have benefited from additional work with parents. Three of the four lowest ranking questions dealt with working with parents, community, and district level personnel, groups that teachers may not have worked with as part of their final projects. In the elaborations accompanying the rankings, two of the teachers wrote of the issues

Table 19

Highest and Lowest Ranked Items by Category

The Mathematics Specialist Externship experience has prepared me to be able to:		\bar{x}
Highest Ranking Items	serve as a building-level resource person for mathematics (L)	3.65
	work with teachers to identify a school mathematical need. (L)	3.65
	coordinate, plan, and present an effective professional development opportunity with school faculty. (PD)	3.59
	collaborate with principals to identify a school-based mathematical need. (L)	3.53
	use research in determining a plan of action to meet a diagnosed mathematical need. (L)	3.53
	interpret school-level assessment data (CI)	3.53
Lowest Ranking Items	plan and present sessions at local and/or state professional mathematical meetings or conferences. (PD)	2.94
	work with District personnel to identify a district-level need and implement a district plan. (L)	2.85
	build school community around a focus on mathematics. (L)	2.82
	facilitate teachers' application of assessment strategies in the classroom setting (CI)	2.74
	work with parents on issues involving mathematics (S)	2.41

Note: S = Working Effectively with Stakeholders; CI = Curriculum and Instruction; PD = Professional Development; L = Leadership

around focusing a building on mathematics, one saying that “the principal was more focused on reading and writing than mathematics” and a second teacher commenting that “teachers are not interested in building a math community.” Therefore the teachers’ rankings reflected the opportunities that they had within their individual situations. One of these questions dealt with the use of assessment working with teachers. One teacher elaborated upon the ranking that she “needed more experience with this to feel comfortable and prepared.” Another teacher stated that “it was not that I didn’t feel prepared to do so, just didn’t have the opportunity to apply it.” Therefore these rankings

certainly depended on the teachers' actual engagement in the activities being ranked, not necessarily reflecting their feelings of being prepared.

Interpreting the teachers' responses that ranked the highest, there are questions that could be placed in each of the categories of Curriculum and Instruction, Professional Development, and Leadership. Within the top six ranking items, there were no teacher rankings of 1, and three teachers ranked one or more of the questions with a ranking of 2. However, of the three teachers ranking the items with a 2, all were in unique school situations. At the beginning of the Externship one of the teachers had just left the classroom for an administrative position, one was a specialist in the school district without a classroom of her own, and the third teacher had just accepted a position in a different school building. All three of these situations could have affected the opportunities easily available for these teachers to engage closely with a school faculty in the needs assessment process and in the implementation of their follow-up project. The structure of the teachers' school and job situations certainly impacted their opportunities and experiences throughout the Externship.

When analyzing the ranking items by categories, it was found that on average the three areas of Curriculum and Instruction, Professional Development, and Leadership received the same ranking ($\bar{X} = 3.24$), within the upper values of the agree range. Working effectively with Stakeholders was somewhat lower ($\bar{X} = 2.88$), but still within the agree range. Within the Stakeholder category, the lowest ranked single item of working with parents ($\bar{X} = 2.41$) was found, certainly lowering the overall category mean.

Analysis of Curriculum and Instruction Ranking Items

Considering the items associated with the category of Curriculum and Instruction (see Table 18) the overall mean ($\bar{X} = 3.24$) indicates that teachers, on average, felt prepared for activities within this category. Considering individual items, the means for all questions were greater than 2.7, which indicates that on average the teachers agree that they were prepared to work effectively with issues related to curriculum and instruction. The lowest ranking item dealt with facilitating teachers' application of assessment strategies in the classroom. The Externship required that teachers become involved in a needs assessment process, which would have included using assessment data. However, the majority of these teachers were not involved directly with assisting teachers in using assessment within the classroom setting unless a teacher chose specifically to implement a project that incorporated the use of classroom data and working with other teachers in assessment strategies.

Each of the ranking items also asked the teachers for elaborations of their rankings. One hundred percent of the teachers offered an elaboration to one or more of the items under Curriculum and Instruction. When analyzing these elaborations it was found that 94% of the teachers described ways in which they used SOL and classroom data to inform instruction when working with teachers during the Externship. Sixty-five percent of the teachers included comments on working with teachers on best instructional strategies for classroom use. Thirty-five percent had been involved in assisting teachers in the area of content knowledge and curriculum pacing. Some representative teacher comments supporting their feelings of being prepared to work in various ways within the area of Curriculum and Instruction follow:

We are constantly assessing and planning instruction according to data.

Several teachers have come to me after grade level meetings to ask questions about classroom instruction.

Discussions of student understandings observed in lesson study brought our conversations to differentiation strategies.

Teachers' application of differentiation strategies in the classroom setting is one of the main goals in our planning; we model differentiation strategies and hope they [other teachers] will follow through into their classrooms.

Aligning curriculum with local, state, and national standards was the foundation for the instruction we presented to teachers so that it would be meaningful to them.

Several teacher elaborations included comments expressing the teachers' needs for additional support in the area of Curriculum and instruction:

I would have liked more experiences with how to collaborate with individual teachers on classroom instruction issues.

I need more experience with facilitating teachers' applications of assessment strategies to feel comfortable and fully prepared.

More experience with using classroom data to plan instruction would have helped me feel more comfortable with this.

It is interesting to note that the teachers' comments on what additional experiences they feel they need all center around their need to feel comfortable using the strategies. This may be an issue of having to become involved in the actions in order to feel comfortable.

Analysis of Working Effectively with Stakeholders Ranking Items

Considering the items associated with Working Effectively with Stakeholders (see Table 18) the overall mean ($\bar{X} = 2.88$) indicates a low agree that on average the teachers felt somewhat prepared for this area of job responsibilities as a mathematics specialist.

It is important to recall here that the two questions used for this category were selected because they dealt mainly with stakeholders as the primary focus, working with parents or teachers, on a general mathematical need. The question dealing with working with parents was the lowest ranking item ($\bar{X} = 2.41$) from all the items as has been discussed in the previous section. A strong agree ranking was given to the question dealing with working with teachers in general. In analyzing the teachers' responses to these items, there were only a total of 11 responses between the two questions that gave a ranking of 1 or 2. Seven of the eleven rankings came from teachers who did not have their own classrooms at the time of the Externship. This lack of classroom contact within a school building could certainly impact a teacher's opportunities of working with parents and even groups of teachers. Since all teachers were required to complete the needs assessment process which included discussions with teachers on needs of the school, this item should have received a high ranking.

Teacher elaborations were included on the items and upon analyzing these it was found that four of the teachers did not elaborate on any question, and the ratings for the item on working with parents by two of these four teachers were the lowest, either a 1 or 2. The opportunities that a teacher would have for working with parents during the Externship were solely determined by the selection of a project by each individual teacher. These teachers chose projects that did not have a parent component, and these teachers may therefore have desired additional experiences with this. It is also interesting to note that the item on working with groups of teachers, which should have come during the needs assessment process for all teachers, received a 2 from one of these teachers. This teacher had just come from a classroom teaching

position to one of administration which would have limited opportunities for working with a school faculty. Of the thirteen teachers responding with elaborations, 100% of them discussed working with teachers, 62% worked with parents, and 31% worked directly with students. In addition, one teacher discussed her work involved in training tutors for a student remediation program. The following quotes from the teachers' elaborations illustrate their work with stakeholders:

Parent volunteers were recruited and worked with as part of my needs assessment project.

Newsletters were created and sent home to keep parents informed of the remediation program.

I worked with parent volunteers as part of the remediation program.

I worked with teachers from the entire district in professional development.

There were no elaborations that provided insights into additional aspects of the Externship that might have enhanced the teachers' preparation in working effectively with Stakeholders.

Analysis of Professional Development Ranking Items

Considering the items associated with activities within the category of Professional Development (see Table 18) an overall mean ($\bar{X} = 3.24$) indicates that teachers on average agree that they felt prepared within this area. Analyzing individual items found that all items received an agree rating or higher, the lowest being $\bar{X} = 2.94$ indicating that on average the teachers felt least prepared for planning and presenting at professional mathematics meetings and conferences. Within the Externship experience, teachers were expected to present district-level professional development

on the Enhanced Scope and Sequence Plus document from the VDOE. It would seem from the teachers' responses to these items that some of them did not feel as prepared as they had hoped in doing this. It was found that only one teacher ranked any of these items the strongly disagree ranking. One teacher ranked all four items at the disagree ranking level. This teacher had changed jobs from a classroom teacher to administrator at the beginning of the Externship and this job shift certainly could have impacted opportunities for developing in the area of providing professional development for school faculty. The lowest ranking item within this category dealt with the teachers providing professional development at local or state mathematical meetings. While most of the teachers worked with their own faculties, it would appear that teachers would have benefited from additional preparation at providing professional development for larger audiences (local and state meetings).

The teachers were asked to elaborate on each of the ranking items on the Teacher Survey. Analyzing these elaborations within the category of Professional Development, it was found that one teacher did not include elaborations on any of these questions and ranked each of them at the disagree level, disagreeing that the Externship prepared the teacher for planning and presenting effective professional development within a school, outside the school, or at mathematical meetings. Without anything specific within the elaborations, it cannot be determined what additional support this teacher felt the Externship should have offered. Of the remaining 16 teachers, all mentioned their professional development offerings for their own teachers, 19% for other schools, 19% for entire district. The topics included in the teachers' discussions of their professional development offerings included: curriculum alignment

(vertical and horizontal), manipulative use in the classroom, the Enhanced Scope and Sequence Plus document from the VDOE, and work with fractions. The following quotes from the teachers illustrate their feelings of preparation offered through the Externship experiences:

The project and building of confidence through [cohort] discussions in class helped to build a validation and shared experiences to draw upon.

I feel we have worked on this by becoming more knowledgeable in all our classes and in how to relate to teacher learners in this Externship class.

The professional development we offered as a result of our needs assessment was with every staff member in our district.

The following quotes from the teachers' elaborations indicate areas in which this preparation during the Externship could have been improved:

I feel that I could have used more training in how to set up a one-time workshop.

I'm still a little uncomfortable with [grades] 6-8 math, but K-5 I feel comfortable with providing a targeted professional development opportunity.

Analysis of Leadership Ranking Items

Considering the items associated with the evaluation key question of Leadership (see Table 18) an overall mean ($\bar{X} = 3.24$) indicates that on average the teachers felt prepared for their roles of leadership. It is important to recall here that an item was deemed to focus on leadership if it took the teacher out of the "normal" role of a classroom teacher and asked them to work more as a leader of other teachers within a school setting. All of the teachers' responses ranked the items above 2.5, indicating an "agree" ranking for preparation within this category of Leadership. The two lowest ranking items dealt with leadership beyond the individual school setting: an overall

school community (more than the teaching faculty members within a building) and a district-wide initiative. Most of the Externship experiences focused the teachers on the needs assessment within their buildings and working within that setting to address the perceived need. Therefore, teachers were not required and may not have had opportunities to work beyond the confines of their individual school. The highest ranking items dealt with working with school faculty in the needs assessment process and serving as a resource person for the school. There were no rankings of strongly disagree for either of these items, and only one ranking of disagree for the item of working to identify a school mathematical need, and two rankings of disagree for the item on serving as a building-level resource person for math. One teacher ranked both items at the disagree level and this individual was the one that moved into an administrative role, out of the classroom, at the beginning of the Externship. The other teacher ranking this item with a disagree, was also not a classroom teacher, but a specialist who worked with multiple buildings. Therefore the job situations for these two teachers definitely impacted their opportunities to engage in the specific leadership activities mentioned in these two items.

All seventeen teachers included elaborations on all or part of the items listed within the category of Leadership. Eighty-two percent of the teachers discussed their leadership work with teachers and 41% referenced their specific work with new teachers in their schools. These leadership roles included leading meetings for grade levels, whole faculties, and small groups of faculty members. These teachers also were sought for advice on planning mathematics lessons, interpreting assessment data (SOL, benchmark, and classroom), co-teaching in classrooms, and for observing in

classrooms and offering suggestions for improvement. Thirty-five percent of the teachers discussed their new leadership role as it impacted working with students in developing, implementing, administering remediation efforts; in interpreting data for a school tutoring aide to use to meet student needs; and in training tutors to work directly with students. Eighteen percent (3) of the teachers mentioned their involvement in doing research to support their needs assessment project and their willingness to share this research with classroom teachers individually or in groups. The following teacher quotes are examples of the preparation for leadership roles provided by the Externship:

Research has changed the way I view teaching math and I am well prepared to share this information with other teachers .

We meet regularly to discuss math in our school and what we need.

Teachers have sought me out to ask math related questions.

I have planned with the principal to give teachers the support for our math needs.

The following teacher quotes included some suggestions of ways in which the Externship experiences could have been improved so as to enhance their preparation for their leadership roles:

I feel prepared as a K-5 teacher, but less prepared for [grades] 6-8.

My lack of presence in a single school meant I didn't get opportunities to apply understandings and work with groups of teachers.

I need more on how to discuss results of [classroom] observations with the teachers.

I could use a class just in how to do research to support teachers' questions.

Teacher Frequency Data

Teachers were also presented with 44 activities to which they were asked to indicate those in which they had participated at least once during the Externship experience. These activities were grouped into the four evaluation key question categories, as described in Chapter Three using descriptions given in Table 3, and analyzed both overall and as individual categories.

Overall Analysis

The teachers' responses indicated an activity in which they had participated or not. These activities are presented by individual teachers and grouped by key categories in Table 20. Also within this table are the total number of activities in which each teacher participated by category and as a grand total.

It was found that 100% of the teachers engaged in activities across all four of the key question categories and the average number of activities that the teachers participated in was 27 of the 44 total activities. Only one teacher participated in fewer than 12 activities and this was the teacher who became an administrator at the beginning of the Externship experience. New job responsibilities certainly limited access to many of the listed activities throughout the Externship experience and those listed on the teacher survey. The remaining teachers engaged in at least 12 activities, with 76% (13 teachers) participating in at least 22 (half) of the 44 activities. As has been discussed before, these activities were scattered throughout the four evaluation key question categories, so every teacher participated in at least one activity in each of the

Table 20
Frequency of Activities by Teacher and Category

Activity	Teacher																	% T
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Working Effectively with Stakeholders																		
discussing school data with a principal	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	88
assisting teachers in finding math manipulatives	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X	88
working with parents on a math issue		X		X	X		X	X				X		X	X	X	X	53
teaching a small group of students math (not my own)	X	X			X	X	X	X				X			X	X		53
tutoring students in math (not my own)	X				X	X	X	X				X			X	X		47
assisting a teacher with a class management issue	X				X				X			X			X	X	X	41
working with a new teacher on class management	X							X				X			X	X	X	35
Total # activities	6	4	1	3	6	4	5	6	3	2	2	7	2	1	7	7	5	
Curriculum and Instruction																		
answering a math content question	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	100
answering a math pedagogy question	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	88
discussing school data with a teacher	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	88
assisting a teacher with a math curriculum issue	X	X			X	X	X	X	X	X	X	X	X		X	X	X	82
assisting a teacher with the use of a math manipulative	X			X	X	X	X		X	X	X	X	X		X	X	X	76
co-planning a math lesson with a teacher	X	X	X	X		X		X		X	X	X			X	X	X	71
assisting a teacher with math instructional strategies	X	X		X	X		X		X	X	X	X			X	X	X	71
discussing classroom data with a teacher	X	X		X	X		X	X			X	X	X		X	X	X	71
discussing classroom data with a principal		X		X	X	X	X	X			X	X	X		X	X	X	71
assisting a teacher with a remediation issue in math		X			X	X	X		X	X	X	X	X		X	X	X	71
working with a teacher on math differentiation strategies		X			X		X	X	X	X	X	X			X	X	X	65
assisting a teacher with a math assessment issue		X			X	X	X			X	X	X	X		X	X	X	65
working with a new teacher on math curriculum	X							X	X		X	X	X		X	X	X	53
working with a new teacher on math content	X							X	X		X	X			X	X	X	47
working with a new teacher on math instructional	X			X				X		X		X			X	X	X	47
Total # activities	11	11	3	9	11	8	11	11	9	11	14	15	9	3	15	15	15	

Table Continued

Frequency of Activities by Teacher and Category (continued)

Activity	Teacher																	% T
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Professional Development																		
planning and delivering math whole-faculty p d	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	88
planning and delivering small group p d (in school)		X			X	X		X	X	X	X	X	X	X	X	X	X	76
planning and presenting math p d (in the district)			X	X				X	X		X	X			X	X		47
planning and presenting math p d outside the district			X	X											X	X		24
Total # activities	1	2	3	3	2	2	1	3	3	2	3	3	2	1	4	4	2	
Leadership																		
coaching or mentoring a teacher in math	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	88
facilitating a discussion on math with the whole faculty	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	88
facilitating a discussion on math with grade levels	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	88
answering a teacher's question on data		X		X	X		X	X		X	X	X	X	X	X	X	X	76
conferencing with a teacher on math	X	X		X			X	X	X		X	X	X		X	X	X	71
attending grade-level meetings about math on my own		X	X	X	X		X			X	X	X			X	X	X	65
answering a principal's question regarding a math issue	X		X	X					X	X	X	X	X		X	X	X	65
model teaching a math lesson	X				X	X		X		X		X			X	X	X	53
researching a math question for a teacher				X	X			X			X	X	X		X	X	X	53
working with other specialty teachers on a math issue		X					X			X	X	X	X		X	X	X	53
assisting a grade-level with a math remediation issue		X				X	X	X			X	X			X	X	X	53
assisting the school with a math remediation issue					X	X	X	X		X	X	X			X	X		53
co-teaching a math lesson		X		X		X						X	X		X	X	X	47
observing a teacher's math lesson on my own		X							X			X	X		X	X	X	41
attending grade-level meetings as requested by teachers		X									X	X			X	X	X	35
observing a teacher's math lesson at principal's request									X		X	X			X	X	X	35
observing a math lesson at the teacher's request											X	X			X	X	X	29
attending grade-level meetings as requested by the Principal											X				X	X	X	24
Total # activities	6	11	5	9	8	5	9	9	6	9	15	17	10	1	18	18	17	
Grand Total # activities	24	28	12	24	27	19	26	29	21	24	34	42	23	6	44	44	39	

four key categories. From the teachers' responses it is evident that all teachers became involved in multiple activities in each of the categories.

The analysis of this frequency data found that all of the teachers had worked with a classroom teacher answering a math content question. Eighty-eight percent (16) of the teachers had also participated in the following activities: discussing school data with the principal and a teacher, assisting a teacher with manipulatives, answering a math pedagogy question, planning and delivering math professional development for school faculty, coaching a teacher, and facilitating discussions with whole faculty groups and grade levels. Five of these activities were direct results of the needs assessment process in which these teachers had been engaged. In addition, these teachers were actively involved in roles of an acting mathematics specialists – coaching and assisting teachers and answering their pedagogy questions.

Working Effectively with Stakeholders

Considering the activities that were characterized as Working Effectively with Stakeholders (see Table 20), 88% (15) of the teachers met with principals in discussing school data and assisted a teacher in finding math manipulatives. The requirements of the Externship included, within the needs assessment process, a meeting with the school principal. Therefore, it would seem that two of the teachers, although they had met with the principal on data, failed to denote in their responses that this had happened. Therefore, 100% of the teachers should have denoted this meeting. Only one teacher included identifying manipulatives available within the school as part of a final project. The fact that 88% of these teachers were asked to find manipulatives for use in the classroom indicates that within the school buildings these teachers were

being seen as mathematics specialists and an available resource for the teachers. Fifty-three percent (9) of the teachers had worked with parents and small groups of students during the Externship. The classroom teachers who were involved in these activities did so because these were aspects of their designed projects to address their school's mathematical needs. The three acting mathematics specialists also indicated working with parents and students, but these activities would be within their job responsibilities (not their choice of projects). Forty-one percent (7) of the teachers assisted a teacher with classroom management and 35% (6) worked with a new teacher on management. Since none of the teachers' projects dealt with issues around management, this again is an indicator that these teachers were being accepted as specialists within their schools and called upon to assist teachers (even outside of mathematics).

Overall the teachers averaged participating in four of the seven activities that would fall within this category and all teachers participated at least once in one of the listed activities. Two teachers reported being involved in only one of the listed activities and both were not classroom teachers; they had job responsibilities on an administrative level or as a specialist within multiple school buildings. Both jobs would limit a teacher's access to a building's faculty and general student body and therefore would limit participation in some of these activities. Three teachers participated in all seven of the listed activities, two were acting mathematics specialists and the third was another specialty teacher. Their job responsibilities and schedules would allow opportunities for engaging more often in these types of activities.

Curriculum and Instruction

Considering the 44 different activities, fifteen would fall within the category of Curriculum and Instruction (see Table 20). The activities in which the largest numbers of teachers were involved included: answering a math content question (100%), answering a pedagogy question (88%), discussing school data with a teacher (88%), and assisting a teacher with a math curriculum issue (82%). The needs assessment process during the Externship required that the teachers work with faculty in their buildings in analyzing student needs and many of these activities could have fallen within that needs assessment process. However, all of these activities dealt with working with the classroom teacher in some manner, and this is a major job responsibility envisioned for a mathematics specialist. Seventy-one percent (12) of the teachers were also engaged in working with classroom teachers in the areas of co-planning, best instructional strategies, and remediation issues. Only two teachers' projects included aspects of co-planning with teachers, only six projects involved working with teachers on instructional strategies, and only one project included an aspect of remediation within the classroom setting. Therefore, these activities in which the teachers were engaged demonstrated their involvement with teachers beyond the required aspects of the Externship.

Overall the teachers participated in an average of 11 different activities in the category of Curriculum and Instruction. Only two teachers participated in the least number of activities (3), with the remaining teachers participating in at least 9 activities. Both of the teachers who engaged in only three activities were not classroom teachers, they had job responsibilities falling in multiple school settings which would have limited

their opportunities within this category of activities. Four teachers were engaged in all fifteen activities in the Curriculum and Instruction category, three were acting mathematics specialists, and the fourth teacher was a specialty teacher out of the classroom setting. This freedom from classroom responsibilities and schedules certainly impacted these teachers' ability to engage in more of the Curriculum and Instruction activities.

Professional Development

Considering the 44 individual activities, four of these would fall within the category of Professional Development (see Table 20). Eighty-eight percent (15) of the teachers participated in planning and delivering whole-faculty professional development. It was determined that the only teacher who did not participate in this activity was not in a classroom, but had moved to an administrative position at the beginning of the Externship. Therefore, this teacher did not have access to a building's faculty with whom to work, and this limited the opportunities for providing such professional development. However, this teacher did plan and deliver professional development for a small group. Since the Externship did not require teachers to plan and present professional development outside of the teacher's own school setting, it was totally a choice of each individual teacher as to whether professional development was an aspect of the final project. This area of providing professional development was more closely linked to each individual teacher's choice of project and activities supporting that project.

Overall the teachers participated in an average of two of the four activities within the category of Professional Development. Three teachers participated in only one

activity, one of whom was the teacher who became an administrator and moved from the classroom setting. One of the teachers who did not indicate planning and delivering small group professional development was actually observed facilitating a cross-grade level meeting on curriculum alignment, which would have qualified as this type of activity. Two teachers participated in all four of the Professional Development activities and both were already acting mathematics specialists which certainly gave them opportunities for and experiences with these types of activities. It is also a comfort issue with teachers feeling ready to provide professional development sessions beyond their school setting.

Leadership

Considering the 44 activities, eighteen fell within the category of Leadership (see Table 20). For the highest frequency activities, 88% (15) of the teachers participated in coaching or mentoring, working with a whole faculty, and working with grade levels of faculty. Only one teacher had not participated in any of these three activities, probably because this teacher was no longer within a school as a classroom teacher, but had become an administrator at the beginning of the Externship experience. This shift outside of a school community certainly impacted opportunities for participating in these types of activities. The other teacher not participating in a coaching situation was in the unique position of being in a new school for the first time at the beginning of the Externship. Not having established working and trusting relationships within a school could certainly limit the opportunities for working in this way with other faculty members.

When analyzing the teachers' responses it was found that the activities in which they participated the least were: attending a grade-level meeting as requested by the

principal (24%), observing a teacher as requested by the teacher (29%) and also by the principal (35%), and attending grade-level meetings requested by the teachers (35%). Those teachers that attended grade-level meetings requested by the principal included four teachers who were already acting as mathematics specialists and two classroom teachers. Both of the classroom teachers were very involved with activities across the grade levels in their buildings as part of their projects. The five teachers who observed a math lesson as requested by the teacher included the four mathematics specialists and one classroom teacher whose project was designed around lesson study which involved observing lessons. Participation in these types of activities seemed to mainly involve teachers already outside of the classroom with the opportunities for visiting other classrooms.

Overall teachers participated in an average of 10 of the 18 activities categorized as dealing with Leadership. Only one teacher reported being involved in only one activity, and this was the teacher who became an administrator at the beginning of the Externship experience. Without being involved in an individual school with its community of faculty and having other job related responsibilities, opportunities for such leadership activities as those listed in this category would be limited. The remaining teachers reported being involved in five or more of the activities within this category. Two teachers participated in all 18 activities, but these were acting mathematics specialists with increased opportunities for these experiences.

Analysis of Teacher Identified Most Beneficial Aspects

Teachers were also asked to identify the most beneficial aspect of the Externship experience. The teachers' written responses were analyzed to identify these aspects

and using the teachers' own words as the descriptors, these were sorted into the associated key categories. Table 21 presents and summarizes the individual teacher's choices of the most beneficial aspect and the codings for their responses into the four evaluation key question categories.

Table 21

Most Beneficial Aspects of Externship by Teacher and by Category

T	Beneficial Aspects	S	CI	PD	L
1	class discussions		x		
	learning from cohort members				
2	identifying, targeting our school needs	x	x		x
	accountability for requirements				
	working with teachers	x			
3	applying research/literature review to support plan to meet need		x		x
	planning professional development			x	
	lesson study information	x	x		x
4	literature review		x		
	use of research to back our plans		x		
	the needs assessment process	x	x		x
	having to do what the school wants and needs	x			x
5	looking at our schools' needs	x	x		x
	helping our school to improve	x			x
6	the needs assessment and finding concerns of staff and administration	x	x		x
	constructing instruction to address school's needs		x		
7	needs assessment and interviews	x	x		x
	data analysis		x		
	presentations to new faculty			x	
	requiring reflections				
8	the needs assessment	x	x		x
	working with teachers to set up programs to meet needs	x			
	ability to use skills and experiences learned from classes				
	learning to be a facilitator and teacher/student resource	x			x
9	sharing struggles and successes with everyone in class				

Table Continued

Most Beneficial Aspects of Externship by Teacher and by Category (Continued)

T	Beneficial Aspects	S	CI	PD	L
10	building relationships with colleagues in discussing school needs	x			
	discussing strategies to meet student needs		x		
	provide teachers with new ideas and strategies	x	x	x	X
11	lesson study information	x	x		x
	connecting experiences to research and student thinking	x	x		
	a high quality experience that taught me how questions and inquiry based opportunities are rich for students and teachers	x	x		
12	actual experiences with real math specialist "stuff"				
13	determining needs and trying to meet them	x	x		x
	meeting with all teachers	x			
	taking info from teachers and planning an action to meet needs	x			x
14	making me follow through with my plan				x
	documenting and presenting project		x		
15	to actually "be" in the job				
16	address a concern by a large number of teachers across the district	x	x		x
	offering professional development			x	
17	exciting to provide staff development across a district			x	
	good communication opportunity to build and foster the math community (district wide)	x	x		x
	increased my confidence in working with teachers	x			
	% Teachers	71	8 2	29	76

Note: S = Works effectively with Stakeholders; CI = Curriculum and Instruction; PD = Professional Development; L = Leadership

Twenty-nine percent (5) of the teachers responded with aspects that could be categorized into all four of the key question categories: working effectively with Stakeholders, Curriculum and Instruction, Professional Development, and Leadership. Seventy-one percent (12) of the teachers included beneficial aspects that could be sorted into at least three of the key question categories. Eighty-two percent (14) of the

teachers discussed a beneficial aspect of the Externship that would fall under the Curriculum and Instruction key question category, 76% (13) under Leadership, 71% (12) under Working Effectively with Stakeholders, and 29% (5) under Professional Development. It was interesting to find that only five teachers mentioned aspects under professional development that they cited as being beneficial even though 88% (15) of the teachers had been engaged in activities of providing professional development for school faculty. This may be an indication of the teachers' lack of confidence in planning and presenting professional development sessions.

One theme that emerged from the analysis of teachers' responses was the importance the teachers placed on the needs assessment process and planning a way to address these needs. Fifty-nine percent (10) of the teachers referred to this process as being a most beneficial aspect of the Externship experience.

Seven of the teachers' comments were so general that they could not be coded into any of the four evaluation key question categories. Two of these comments identified the cohort structure of the Externship as being beneficial for these teachers. In addition, three of them dealt with the value of the opportunities provided during the Externship for applying the skills and knowledge learned. One teacher cited the importance of having to complete reflections throughout the Externship experience. Except for the four teachers whose comments were very general, 100% of the remaining teachers listed beneficial aspects that would fall within the categories of Curriculum and Instruction and Leadership.

Analysis of Teacher Identified Least Beneficial Aspects

Teachers were asked to identify the least beneficial aspect of the Externship.

The teachers' written comments were analyzed to identify least beneficial aspects and using the teachers' own words as descriptors, these were sorted into the associated key categories. Table 22 presents and summarizes the teachers' responses of least beneficial aspects of the Externship. Only four (24%) of the teachers' comments were

Table 22

Least Beneficial Aspects of Externship by Teacher by Category

T	Least Beneficial Aspects	S	CI	PD	L
1	Needed more contact with our group on needs assessment – what others were doing and how				
2	Nothing				
3	The scheduling of Saturday classes				
4	Work with the ESS+ was not well received by teachers			x	
5	Unclear about needs assessment write-up and Infrequent class meetings				
6	Overwhelming feeling completing class assignments and my teaching responsibilities				
7	Schedule did not mesh well with district schedules				
8	Nothing				
9	Like to have spent a class in lab working on projects & presentations/research with instructors available for questions		x		
10	Stress of trying to coordinate what I needed to do for my job with what I needed to do for class				
11	The ESS+ was nice but not necessary for me			x	
12	Nothing				
13	Nothing				
14	The ESS+ presentations seemed artificial, more of an exercise than an authentic experience			x	
15	Difference between being a teacher doing an Externship and a math specialist doing the Externship				
16	Hard to narrow focus based on my position in multiple schools				
17	Not being able to minimize my focus, a logistic of my district not the Externship				
	% Teachers	0	6	18	0

Note : S = Working effectively with Stakeholders; CI = Curriculum and Instruction; PD = Professional Development; L = Leadership

specific enough to be coded into a key question category. Three of these specifically referred to the professional development session on the Enhanced Scope and Sequence Plus document that was required during the Externship as a district initiative. These three teachers did not see a value in this presentation because the session was not well received by teachers or did not seem relevant to the teachers. One other teacher indicated a need for additional information of the process of finding research to inform and support projects to meet the identified needs of schools. This comment was coded in the category of Curriculum and Instruction since the research would be around instructional strategies that could best address a school's mathematical needs. Twenty-four percent (4) of the teachers specifically said that "nothing" was least beneficial. Thirty-five percent (6) of the teachers mentioned aspects of working within their jobs and trying to also incorporate aspects of the mathematics specialist position – working around teaching responsibilities or working with multiple schools and district responsibilities. Two teachers referenced their need for additional guidance and support on working with the needs assessment write-up, project selection, and reports. During the class meetings of the Externship, share time was built into each daily schedule, but these teachers' comments seem to indicate their need for additional support with their specific project choices and reports.

Alignment of Externship with Teacher Expectations

The teachers were also asked to rank how well the Externship aligned with their expectations (see Appendix B). This question used a 5-point ranking scale:

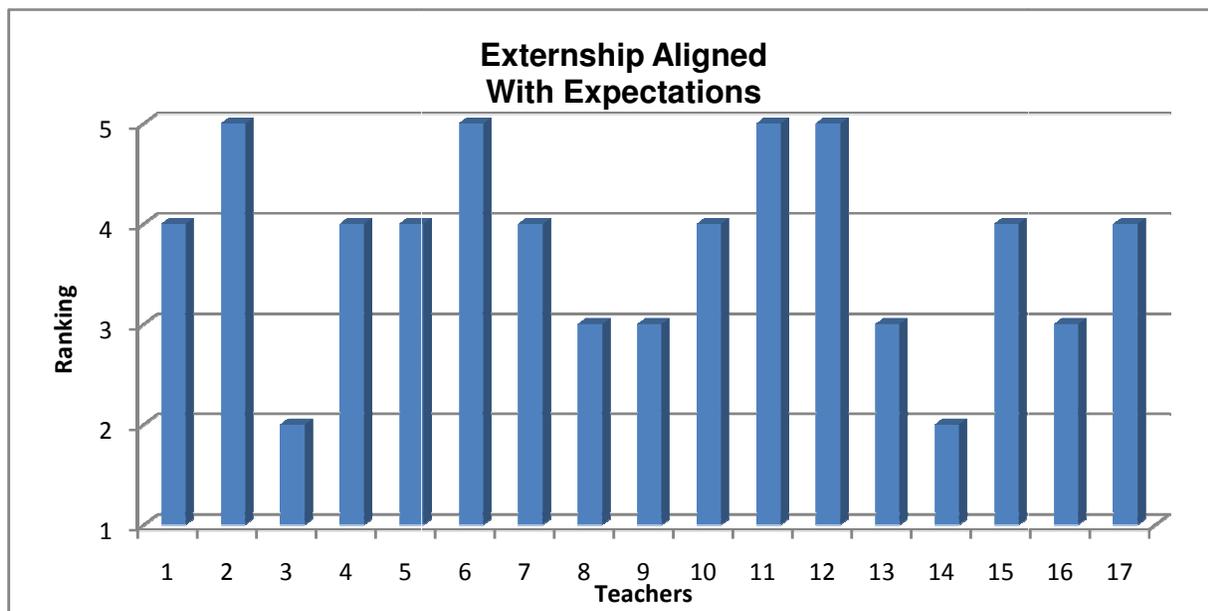
- 1 *the Externship did not align with any of my expectations*
- 2 *I learned some useful things, but I had hoped for lots more*
- 3 *the Externship met my expectations*
- 4 *the Externship exceeded my expectations*

5 *the Externship far exceeded my expectations (I learned some things that I didn't even realize I needed to know)*

Figure 2 presents the rankings by teacher for each of the seventeen teachers in the Externship.

Figure 2

Alignment with Expectations



Overall participants indicated that the Externship met their expectations (Mean = 3.76, $SD= 0.97$). In looking at individual teacher responses, four teachers ranked the alignment of the Externship with their expectations as a 5, indicating that they felt they had learned some things they didn't even know they needed. Three of these teachers were classroom teachers and the fourth had just changed from the classroom to a specialty teacher. Eleven of the teachers ranked this alignment at either

a 4 or 5, indicating that 65% of the participants felt that they had gained more than they had expected from the Externship experience. When combining these rankings with those in the 3 range, 88% (15) of the teachers felt that the Externship either met or exceeded their expectations. Only two teachers ranked this alignment at the 2 level indicating some learning but wanting more from the externship. It was interesting to note that both of these teachers were not classroom teachers, one was the recent administrator and the other was a specialty teacher with multiple schools. Both of these job situations would certainly impact the number of opportunities and the quality of those opportunities which they could engage at a building level. In addition, four of the six teachers who scored the alignment of the Externship with their expectations at the lowest ranking (a ranking of 2 or 3) were not classroom teachers, they had roles at other levels within the school districts – they were not assigned to a single school nor did they have a classroom of their own.

Analysis of Teacher Interviews

In the initial design of this evaluation of the Externship experience, I had planned to interview all participants during the months of May and June directly following the completion of the Externship. Six of the teachers were interviewed during this time frame. However, when trying to schedule the interviews several of the teachers had major conflicts due to SOL testing windows and their responsibilities during the final days of a school year. Therefore, the remaining teachers were interviewed in late August or early September. Comparing the transcripts from all teachers, this time difference did not seem to impact the quality or specificity of teachers' responses. Table

23 presents the teacher interview protocol. The teachers' responses to each of these individual questions was analyzed looking for emergent themes and will be discussed separately.

Table 23

Teacher Interview Protocol

Part I.

Discuss whether you feel that the Externship has adequately prepared you to work effectively with teachers, administrators, and parents as a Mathematics Specialist. Please explain.

Discuss whether you feel that the Externship has adequately prepared you to develop and deliver effective professional development as a Mathematics Specialist. Please explain.

Discuss whether you feel that the Externship has adequately prepared you to work effectively in the areas of curriculum and instruction as a Mathematics Specialist. Please explain.

Discuss whether you feel that the Externship has adequately prepared you for your leadership roles as a Mathematics Specialist. Please explain.

Part II.

Is there anything that you gained from the Externship experience that you feel you had not gotten in any of the other courses in the masters' degree program?

Working Effectively with Stakeholders

Considering the analysis of teachers' responses to this question, it is important to note first that 100% of the teachers indicated affirmatively that the Externship had adequately prepared them to work effectively with stakeholders and then followed this with specific comments of support. The themes that emerged during the analysis in this category involved the teachers working with administration on whole-school goals, working with parents, and working with new groups of teachers.

Seven teachers discussed the importance of having to work with school level and district administration during the Externship. One teacher talked about the new role that this experience provided:

I was more intimidated by working with the administration, because I had not worn that hat in my school before, I thought that was probably more important for me to go through.

Another teacher discussed how this experience broadened her perspective because it “gave me a lot bigger picture cause we actually had to look at all grades and teachers and discuss with the principal.” A third teacher spoke of discussions with many levels of administration:

We started with one of our supervisors and then went to our principal and then to site administrators and talked about what they thought their greatest need was as far as instruction with their teachers. That was good, not just using the data, their opinions mattered and I think that was a good aspect that I hadn't really tied together before.

Six of the teachers discussed working with parents and the importance of being able to do so effectively. One teacher who was planning to provide parent nights as part of the final project talked of reluctance to do so, but what changed that opinion:

I thought, oh no one is going to come and that is usually how things go here and I am not going to put all that time into it and then it not work. Because of the feedback I got the first night, I set up a welcome back to school day and parents came and filled out surveys for me about when [to offer sessions], the same faces were there plus new ones. So I think it definitely made me more comfortable about doing that.

Another teacher talked of opportunities to work with parents:

I would say that the project piece was key, because people had flexibility to choose the stakeholders that they were working with, so for me it proved to be parents and it worked great.

All of the teachers talked of the new experiences they had in working with different groups of teachers. One teacher spoke of the importance of working with groups of teachers across different grade levels:

I think I had only looked at the grade level I worked in. This gave me a bigger picture because we actually had to get out and look at grades above us and below us, and look across the whole scope and sequence and see if there was something the kids were lacking from the beginning.

Another teacher spoke of the importance of being required to deal with new teachers, because “it did push me to communicate with new people in my building and that is not something that I was really willing to push myself to do.” A teacher also talked about the difficult teacher to reach:

With my grade level they were very comfortable asking me questions. But there are some people that will not let their guard down to say, I don’t know how to do this. When I look at it and think that person could probably use a little bit more, but I don’t have that right yet.

Overall, teachers felt that the Externship had adequately prepared them for their new roles in working effectively with stakeholders. The Externship placed these teachers in new roles during the needs assessment process. They worked with administrators on whole-school efforts, focused on whole-school data, and worked with groups of teachers with whom they had not worked before (different grade levels and entire faculties). These opportunities seemed to allow teachers to become more comfortable working with all the stakeholders in the school community.

Curriculum and Instruction

Eighty-eight percent (15) of the teachers indicated affirmatively that they felt that the Externship had adequately prepared them for issues around Curriculum and

Instruction. Both of the teachers who did not respond affirmatively to this question cited work in other courses, especially the content courses in the Mathematics Specialist program, as being more important in their preparation process than the Externship. However, one of these two teachers did state that the Externship “was more about learning to work with people with issues of Curriculum and Instruction.” Within this category of Curriculum and Instruction, teachers discussed the importance of looking at the entire curriculum (not merely one grade level), and looking at classroom instructional practices and needs.

Five teachers discussed the importance of looking at the overall curriculum and the spiraling nature of the curriculum. One spoke about how looking at this spiral enhanced personal understandings:

I definitely had to look at the curriculum and how it goes grade to grade and I think it helped me get a deeper understanding of how the algorithms develop and feed into each other.

Another discussed the impact that this look at the big picture of curriculum had:

Looking at pacing guides and seeing what concepts or content needs to be taught first, are they in the right order? Knowing the sequence of what kids learned and what needs to go first helps you to adjust all your instruction by looking at your assessments, etc.

Looking at curriculum was “crucial” for this teacher because:

Looking at SOL data, I was looking specifically at what areas of the curriculum that we were having struggles with and figuring out ways to enhance those areas in the curriculum and in the instruction so we could pull those scores up.

Teachers also discussed the importance of looking at classroom instructional practices throughout the Externship experiences. As one teacher put this:

In the Externship having to sit down and plan those staff development sessions, we had to sit and focus on what we were going to do, what teachers needed in

their classrooms. It helped us and forced us to think about those things and help teachers in their classroom instruction.

Since one teacher chose to use a Lesson Study format for the final project, curriculum was very important: “the lesson study experience was hugely grounded in curriculum and instruction that was going on in the school.” Another teacher also discussed the importance of meeting teachers’ instructional needs:

We spent so much time going back and forth trying to figure out how exactly we were going to get our information out to the teachers and that really did have us spend a lot of time in the curriculum and instruction side and trying to meet those needs.

In discussing issues around curriculum and instruction, two teachers mentioned their need for additional work in this area. One was an elementary teacher who wanted more experiences with middle school curriculum: “I think it did prepare me for elementary and some middle school, but I felt like I walked away lacking a little something in the middle school area.”

The other teacher to mention the struggles with different school levels was a middle school teacher who had just become a specialist. Included in this teacher’s responses was a view of the elementary curriculum:

Through analyzing test data I learned a lot about exactly what was included in each [elementary] grade level. My elementary background was the weakest part, but I had to actually look at exactly what is being tested in third grade and help work with third grade teachers about what exactly needed to be covered and how in depth it needed to go.

From the teachers’ comments it is apparent that the Externship had adequately prepared them to work within the area of Curriculum and Instruction. This preparation came in the form of having to look at the school math curriculum as a whole and all instructional practices within a school. Opportunities to work in these areas were a

direct result of the needs assessment process and the planning of the final project to address the greatest mathematical need within a school.

Professional Development

From analyzing the teachers' responses, it was found that all of the teachers responded affirmatively that the Externship had adequately prepared them to develop and deliver effective professional development. When elaborating on their responses, the teachers discussed the importance of having to work with whole faculties and small groups of teachers, having to plan and deliver effective workshop sessions, and being put into a new position of providing professional development.

Ten teachers mentioned that merely the fact that professional development was a major part of the Externship experience was valuable for them. One teacher commented, "you know you have to do it, it's not a choice, you have to do it." Another teacher discussed its importance:

I think that presenting to my faculty was unnerving and I didn't think it would be, because I felt so comfortable talking to my faculty. But again wearing that new hat was kind of different and it was new and to go through that you have to go through it once, then reflect.

A teacher spoke of the importance of the overall Externship requirements:

We had deadlines with the Externship. It wasn't just plan a workshop and give them the information. It was diagnose what their needs are, find out what they need, find out what you want them to know. Looking at data and test scores and just seeing where the weak links were and looking at what parts of those weak links needed to be focused on. By doing this it helped us really focus on what specific teachers wanted and were asking for, instead of here is a workshop we are offering and I hope you come.

Five teachers also talked about the fact that having to plan and present professional development sessions pushed them out of their comfort zones into a new

role in their preparation to become mathematics specialists. One teacher discussed the fact that having to plan and deliver professional development for a group of parents coming to learn about alternative algorithms was a different type of presentation:

I had to totally step out of my comfort zone. I have to teach all these so I have to learn it. They don't really like this and that is why they are coming. So I have to win them over. So it made me have to feel ready to take on their questions. So yeah, now I feel like I can handle staff development.

Another teacher described this as a personal weak area: "I don't like to get up in front of people. But it did prepare me to do some type of staff development. I do feel much better prepared than I would have before".

One teacher also discussed the importance of this requirement:

Not an area I am comfortable with, so the more that is required of me in that department, that gave me practice doing that, the better off I was. I got to do a little bit with the whole faculty and a little bit with smaller portions of the faculty, and then presenting it to my peer groups was huge. I had never done anything that elaborate before so, yes, it was very worthwhile.

Two teachers talked about the importance of the planning process in providing professional development. One teacher spoke of the difficulty in the planning process:

I know what good staff development is and I know my faculty and know what they need. Trying to combine the two and stay realistic is a struggle but I think that because I had to do it, it has helped me if I have to do it again.

Another teacher reflected on the planning process involved in having two faculties discuss vertical alignment of curriculum and instructional strategies around computation:

I don't think the professional development session came across as real positive to the members of the two faculties that we worked with. But yes, the time that we spent developing the professional development opportunity for the two faculties, all that time we spent working cooperatively to prepare the in-service, has been invaluable.

Looking at professional development a very different way, one of the teachers who was an acting mathematics specialist discussed a different approach to professional development:

Any time I have contact with a teacher in my position is considered professional development. So when we are discussing lessons, actually working with them [teachers] in the classroom to find appropriate lessons, all of these are different professional development tasks. So these occurred with each teacher that I know.

All teachers responded that the Externship had adequately prepared them to plan and deliver effective professional development. The requirements of planning and delivering professional development to large and small faculty groups to address a need that was identified through the needs assessment process, placed some teachers in this very new role. Overall, teachers' comments express the benefits from these opportunities.

Leadership

In considering teachers' responses to this question, 100% of the teachers responded affirmatively indicating that the Externship had adequately prepared them for their leadership roles as a mathematics specialist. Within this Leadership category, teachers identified new roles of leadership – a teacher resource and a school leader working with all grade level teachers.

Eleven teachers discussed their development into new roles within their schools. A teacher discussing the Externship experiences around leadership noted that these opportunities simply “allowed me to understand it is OK to sometimes be a leader.” One teacher spoke of the change in the way she was perceived by other teachers:

I was kind of seen as the math person. Now people come to me and say, this is what is going on, can you help? Just having those conversations with teachers about needs has really put me in that position.

Another teacher talked about the confidence that the Externship experiences gave her in becoming a school leader: “I feel comfortable stepping in now when I hear people talking – I heard you say... I have some things that might help, do you mind if I give you some advice?”

Five teachers also talked specifically about the experiences in the Externship forcing them out of their comfort zones and into new roles. One teacher referred to the needs assessment process and the discussions she had:

We had to get out and work with other grade level teachers and this was kind of hard because there were lots of teachers that had lots more experience than I did. But you had to get out and discuss with grade levels where they felt the strengths of the program were and the weaknesses. I was real uncomfortable at first but this gave me a lot of good experience.

Another teacher spoke of being pushed by Externship experiences:

For me personally, this was the part that is the hardest. I am not an extrovert or natural leader, so it has kind of pushed me out of my comfort zone and made me do some leadership things that I would not naturally do. I think this has really helped me.

One teacher discussed the experiences she had been involved in and the fact that now “I am a lot more comfortable with that leadership piece than I would have ever imagined being.”

All teachers felt that the Externship had adequately prepared them for the leadership roles that they would encounter as a mathematics specialist. The Externship experiences around facilitating the needs assessment process and working with all teachers and administrators, forced some of the teachers into new roles as school

leaders. Overall the teachers' comments suggest that they benefited from these experiences.

Benefits Unique to the Externship

The final question within the interview protocol asked teachers:

Do you think there is anything you gained from the Externship experience that you would not have gotten through the other course work with the master's degree program? Is there anything unique to the Externship?

All seventeen teachers discussed benefits that they considered unique to the Externship experience. However, few of the teachers discussed items specific enough to even classify under the four evaluation key questions: working effectively with Stakeholders (4), Curriculum and Instruction (2), Professional Development (0), and Leadership (3). The teachers' remarks tended to be much more broad and dealt with the Externship as a whole. As the teachers' comments were analyzed, several themes did emerge. Teachers valued the time that the Externship provided for applying their skills and knowledge, and they liked the long-term aspect of the needs assessment and final project.

Twelve of the teachers mentioned the value of being able to apply what they had learned throughout the program during this Externship experience. The following are some of the quotes that capture the teachers' feelings about the importance of having a time set aside in which to apply skills and concepts learned:

The externship is a must. I think if we didn't have that, you almost deprive teachers of the experiences. I think for me the light bulb may not have really come on about what this really is until I was really engaged in it.

You don't get that experience out working in the school until you are there. You can talk about it in the classroom all you want, but I don't think you actually understand it until you get out there and work and experience it, like we had to.

We actually had to be a math specialist and do those jobs. I think that is when you learn the most.

To integrate it all into realistic classroom settings in the school itself and to work with the teachers and the kids made it more meaningful and made it more realistic and more integrated. It made that wholeness to it and that was what I was hoping for, putting all the pieces together.

It is one thing to talk about and learn about it in your own class, it is another to have to put yourself out to your grade level or to a department or whatever, and another level to do something for a whole school situation. I really think that the externship has got to be a critical component of the program.

There is no way that you can get that kind of experience inside a classroom no matter how good your instructors are. That hands-on experience is so much more valuable than just being told how to go out and do it.

You can read about stuff, but if you don't do it, you don't really learn it. I learned that I knew more than I thought I did which has helped, but I also learned that everyone doesn't know as much as I assumed they do. That was a bigger eye-opener and stuff you cannot learn in a book.

It is the hands-on experience, you can tell me but until I get out there and do it myself, I am not going to know exactly how it works or exactly what it is supposed to look like. You can't just sit and listen about it.

I almost felt like I was actually doing the job that I would have been doing had I been in this building as a math specialist. I would have worn all those hats, and I would have been involved in all parts of the school and community outreach, evaluating SOL data. So I think in a lot of ways, I actually got quite an education.

Three of the teachers discussed specifically the importance of the long-term project around the school mathematical needs assessment and the value of having one full year in which to be engaged in this activity. One of these teachers discussed a benefit of the Externship in allowing the teachers to "create a focus, to have this long term kind of a goal or project." Another teacher discussed the overall nature of the project:

For the Externship there was a specific task and it did create a focus for you to have this long term kind of goal or project on board. I had to do needs

assessment, I had to do follow-up, I had to do analysis and research, and I had to plan something to meet those needs.

Another teacher in discussing the value of the project being spread across the year, stated:

What I gained was being able to think more on my own. It was an open-ended kind of project so what it gave me was the liberty to choose what direction I wanted to go. I had to think more, be creative, and actually do it. So it was the doing part rather than being told what to do that was important and I had time to think and work with teachers.

In addition, when asked to identify anything gained from the Externship that was unique, two somewhat unexpected broad themes emerged: the value of the safety provided by working within a home school, and the value of working within a cohort structure.

Two themes emerged when analyzing the teachers' responses during the interview as a whole, across the specific questions that they were asked. One dealt with the feeling of safety that teachers had in working within their own schools during the Externship. One teacher spoke of this feeling:

I think with my having been at the same school all my years of teaching helped me in the fact that I already had a reputation of being a "math person". It helped when asking teachers to get together. I felt like the teachers and the principal were very supportive of what I was doing and would like to see this continue.

Another teacher also reflected on the support from the school staff:

I just felt like I had the school behind me. It made me feel supported so that I wasn't just out there doing something by myself. Everyone was very supportive of me.

One teacher discussed the pros and cons of being at their own school for the Externship experiences:

I think having been in a school where I had been established is a lot like a double edged sword. Good in the fact that no matter what I asked people to do, they were willing to do it for me because they know me personally, they knew me as a colleague. So if I needed to take a leadership role, they were willing to let me. On the other hand, they also still looked at me as a colleague. So at times it was harder for me to establish myself as the professional or leader in a specific position.

Another teacher talked about the comfort gained being in a familiar school:

I feel like I was really fortunate that I could do that here at the school where I already feel so supported. I think the Externship required me to go to a different setting it might have been a lot more uncomfortable for me, here I feel a lot more comfortable.

One teacher, who was not a classroom teacher but a specialist in multiple buildings during this Externship experience, also spoke of the issue from a different perspective:

I think that had I been at one school and able to give my energy to that school, principal, teachers, and community, I think I would have been more effective. Until teachers see you more often in the building they won't come and ask for things, because they see you in different places and don't want to add to your job.

Another theme that emerged across the interviews is the value that the teachers placed on the cohort structure. Seven teachers referenced this cohort structure somewhere in their interview responses. One teacher discussed the support that this group gave:

I liked having those meetings where we had the opportunity to touch base with the other folks[teachers]. I did a lot of e-mailing and talking with others to see what was going on with them and what resources they had and what suggestions they had. Having that opportunity with a good group of people to give me feedback, I think that was so helpful to me as opposed to if I had just been out there on my own.

Another teacher spoke of the cohort and the value of sharing experiences:

The cohort nature of the Externship was an essential piece and so important. That working with a group of teachers over a long period of time and getting to know their different buildings and different needs, and being able to brainstorm

with teachers in other buildings about the kinds of things they were doing along the way was so important to my growth as a leader and as a person.

One teacher who was not a classroom teacher talked about the cohort discussions as providing additional opportunities:

I would say that the collaboration pieces of meeting with the cohort on an ongoing basis and talking about where their projects were and the different phases they were in, gave me a lot of examples and insight into how to learn to work more effectively with teachers and administrators.

Another teacher in describing the Externship in general also referenced the nature of the cohort:

It [Externship] was just the whole package from the beginning to the end. I did like that it was spread out with timelines. We could talk about how things were going and it was great that we were able to talk to each other, some people were a little bit ahead, so the parameters kind of made me comfortable in that I was not too far behind.

Summary

In studying teacher responses during the interview process, all teachers indicated that they felt that the Externship had adequately prepared them to work effectively with stakeholders, to work in areas of Curriculum and Instruction, to plan and provide professional development, and to take on the leadership roles of a mathematics specialist. In each one of these categories, teachers were able to support their feeling of preparation with explanations and descriptions. When discussing their preparation through the experiences within the Externship, teachers emphasized the importance of learning to work with all teachers and administrators on a whole-school project. All of these were aspects of the needs assessment process within the school – learning to work with all stakeholders on a focused school need, to work with the entire curriculum

and on instructional strategies across the grade levels, and to provide leadership through created professional development opportunities.

CHAPTER FIVE

OVERVIEW, CONCLUSIONS, AND RECOMMENDATIONS,

This chapter includes an overview of the theoretical framework in which this study was grounded and conclusions of the evaluation of the Externship as the capstone experiences in a master's degree program for mathematics specialists. Recommendations for program improvement are given, along with final remarks on this study.

Overview

This evaluation was grounded in the theoretical framework of the essential components within any successful externship experience: a cohort structure, application, expectations, collaboration, and reflection (see Figure 1). Under this framework, a successful externship provides a cohort structure that gives support for the participants. The experiences within the externship provide participants with real-life situations through which to apply their skills and prior learning, as well as placing the participants in realistic situations that mimic the expectations for the job for which they are preparing. For additional support of the participants an externship includes a strong component of collaboration between university and school personnel. A successful externship also includes a component of reflection time to assess how things are going, to interpret what is going on, and to determine reactions to situations. In working with prospective mathematics specialists, the opportunities for these teachers to develop as leaders should be based on the view consistent with the third wave (Silva, Gimbert, & Nolen, 2000). That is, in order to support real change within the school setting, teachers

should be learning to lead from outside of their own classrooms, applying their skills and understandings to support and work with other teachers focused on improving instruction for all students.

The purpose of this evaluation was to determine the effectiveness from the teachers' perspectives of the Externship as the capstone experience in the education of mathematics specialists. The results of this evaluation will be used to make improvements in the Externship requirements for future cohorts of teachers in the program. This formative evaluation was naturalistic in design blending qualitative and quantitative data analysis gathered from the teachers' responses to writing prompts, a teacher survey, teachers' final projects, teacher observations, and teacher interviews. Triangulation of data was accomplished through the use of multiple data sources and types of data: ranking data, frequency data, written responses, observation data, teacher presentations, and interviews.

Seventeen teachers, 14 from a rural, public school system and three from a city public school system, as a cohort were in their last year of a three year Master's Degree program in Curriculum and Instruction working towards state certification as Mathematics Specialists. As a part of this program Dr. Jay Wilkins and I collaborated to create a full-year externship experience with requirements designed to give these teachers experiences around our understandings of the responsibilities of a mathematics specialist. All of the teachers from the county school system were employed fulltime either as teachers or specialists serving classroom teachers (i.e., gifted, technology, mathematics). The three city school participants were already serving in the capacity of Mathematics Specialists with their school system. In order to

be involved in this cohort, teachers must have had at least three years of successful teaching at the elementary or middle school levels and been responsible for teaching mathematics at least part of their day.

Conclusions are grounded in the theoretical framework in response to the four evaluation key questions. This study was designed to answer the question: Do the teachers feel that the requirements of this Masters' Degree Externship have prepared them for their role as a Mathematics Specialist?

- Has the Externship prepared the teachers to work effectively with all the stakeholders in their new role as a Mathematics Specialist?
- Has the Externship prepared the teachers to work effectively with issues related to curriculum and instruction?
- Has the Externship prepared the teachers to develop and deliver effective professional development?
- Has the Externship prepared the teachers for their leadership roles as a Mathematics Specialist?

Conclusions

Overall Conclusions

One conclusion of this evaluation is that overall the success and effectiveness of the Externship as the capstone experience in the preparation for mathematics specialists was tied directly to the design of the teachers chosen experiences. The entire process of conducting the needs assessment involved teachers in all five of the essential components of the externship framework – application, collaboration, reflection, expectations, and the cohort structure. In addition, placing the teachers in the various aspects of the needs assessment process engaged the teachers in leadership roles consistent with the view of the third wave in the development of teachers as leaders. These teachers worked collaboratively with administration to focus on a school

mathematical need, looking at all grade levels and all instructional practices. They mentored and coached teachers, they modeled lessons, they worked with other teachers on assessment and differentiation strategies for the classroom, they determined the project that would address the school's need, they worked with content and pedagogy, and they became a resource for other teachers. Although during the Externship these teachers were still involved in their own classrooms and with their own students, they did begin taking on the roles of an effective teacher leader and more specifically as a mathematics specialist. As a result, other teachers began to accept them in this new role and to call upon them as the mathematics specialists within their schools.

While some adjustments in the Externship experiences may make it more effective in the preparation of mathematics specialists, another overall conclusion is that the Externship adequately prepared teachers for the roles they will face as mathematics specialists. Throughout the Externship teachers were involved in discussions, reflections, observations, project presentations, and interviews. Overall 88% (15) of the teachers felt that the Externship met or exceeded their expectations. Therefore, based on teacher expectations, the year-long Externship experience has prepared these teachers for their role as a mathematics specialist.

Conclusions Based on Key Questions

Teachers felt that the experiences within the Externship prepared them to work effectively with stakeholders. These teachers discussed the value of learning to work effectively with all stakeholders – administrators, teachers, parents, and students. The Externship provided the teachers with opportunities in which to work with these different

groups during the needs assessment process, to collaborate with all stakeholders in determining the school's mathematical need and a plan to address this need. In this process teachers worked with principals on school data, and with teachers determining their needs. They also worked with teachers in finding math manipulatives and on classroom management issues. Depending on the chosen project, the teachers worked with parents and students from across the school. It is important to note here that every activity in which these teachers were engaged involved working with stakeholders in the educational process.

The teachers felt the Externship had prepared them to work effectively in the area of Curriculum and Instruction. Teachers cited the importance of data analysis as part of the needs assessment process in the Externship. By having to look across grade levels at all the school data, they saw the value of looking at the entire curriculum and instructional strategies throughout all the different grade levels. These opportunities allowed the teachers to apply their understanding of curriculum and pedagogy in working to answer content or instructional questions from across grades. Teachers were also involved in co-planning with others, and assisting in strategies around differentiation, assessment, and manipulative use.

Teachers felt the Externship had prepared them to develop and deliver effective professional development. Their comments on professional development focused on the importance of merely having to do it, the fact that the Externship had this as an aspect of the needs assessment process. The teachers planned and presented their findings from the needs assessment process to whole faculty groups or to smaller groups at grade levels. They also worked with entire faculties on a targeted professional

development designed to enhance classroom instruction on mathematical content determined through the needs assessment process. Even though many teachers still felt somewhat uncomfortable presenting, they did benefit from planning and presenting appropriate sessions when addressing the school's mathematical need.

The teachers felt the Externship had prepared them for their leadership roles as a mathematics specialist. As a result of the needs assessment process, they discussed their changing roles from classroom teacher to school leader – working with school personnel on determining the school's most pressing mathematical need, determining the most appropriate project through which to address this need, and working to implement the chosen project. They coached, mentored, and conferenced with other teachers; they initiated and facilitated discussions with all grade levels on school needs; they interpreted and discussed school data with principals and teachers; and they modeled lessons for other teachers.

General Conclusions

In addition to the four evaluation key questions, several aspects of the Externship emerged as important components that further aligned with the theoretical framework. The cohort nature and structure of the Externship was an important feature and valuable in the support of these teachers. Throughout the teachers' comments, the cohort was seen as supportive of the teachers' activities, teachers felt comfortable bringing issues to the cohort for discussion and suggestions. They also found support from teachers experiencing similar situations in different schools. This cohort of teachers certainly felt comfortable enough to extend classroom discussions and push each other to try different things. The nature of a cohort provided a community of

learners in which to share thoughts and activities, and the cohort was seen as a valuable network of teachers to whom future questions or needs could be brought for assistance.

The requirement of the needs assessment was an important and essential feature of the Externship experience in the preparation of mathematics specialists. It was through this process that the teachers had to apply their skills and previous knowledge. The requirement of conducting the needs assessment, prioritizing the school's needs, determining an appropriate project to address this need, and implementing the project gave the teachers opportunities through which to apply what they had learned. The analysis of teachers' comments showed that this process impacted the teachers' growth in all evaluation key question categories and beyond. Not only did the teachers have to apply content and pedagogical knowledge in answering classroom questions and assisting other teachers with instructional strategies, but they also had to apply their understanding about how students learn, how the curriculum builds across grade levels, and how to interpret school and classroom data. Not only was the needs assessment important because it placed the teachers into experiences in which they had to apply their skills, it was also important because it placed the teachers in a setting where they had to prioritize needs and projects. Teachers were forced to deal with multiple issues at the same time, to draw on everything learned, and deal with issues within a realistic setting very similar to what they expect to find as a mathematics specialist.

The collaboration between university and school personnel was an important component of the Externship in the support it provided the participants during these new

experiences. The Externship in the Virginia Tech program certainly benefitted from the inclusion of a university faculty member who had such a positive prior working relationship with the teachers before the Externship experiences. As the former mathematics supervisor working with all the county teachers, I was able to provide support for the teachers, observe their activities, and discuss very openly any issues throughout the Externship experiences. As an internal evaluator, I was working closely with all the teachers and Wilkins to ensure support for and connections with each teacher. I feel that the trusting, open, professional relationships allowed me to be a part of all discussions – how things were going, frustrations, and triumphs.

The inclusion of opportunities for reflection was another important component of this Externship. This reflection took two forms – the explicit reflection that resulted from the targeted writing prompts and the implicit, on-going reflections that took place during the entire needs assessment process. Through this needs assessment process the teachers were conducting interviews with the principal and with groups of teachers on which they needed to reflect to determine the mathematical needs within a school and from that listing to determine a top need. Teachers then had to reflect on their knowledge to determine the ways in which they could address this need. Following a literature review around the perceived need, the teachers had to reflect on their individual school's situation and community in order to choose the best strategy to use to address their specific need. The Externship provided opportunities for explicit reflection and also continuous reflection throughout the year.

Another component of the Externship that emerged as important was that the mathematics specialists were being trained within the third wave view of teachers as

leaders (Silva, Gimbert, & Nolen, 2000). Teachers discussed the types of activities they were engaged in as they applied their skills and knowledge in their emerging leadership roles. These teachers were involved in school-wide data analysis, discussing data from all students and all classrooms with large and small groups of faculty and administrators. They worked with parents and students within the larger school community rather than just their own classroom. More importantly, the teachers were involved in the instruction that was going on in all classes - they answered content and pedagogy questions from fellow teachers, they coached teachers and modeled lessons within other classrooms, they conferenced with other teachers around classroom needs, they co-planned with teachers, they worked with individual teachers on instructional, assessment, and differentiation strategies, they researched a teacher's question to provide support, and they planned and presented effective professional development opportunities focused on the school's perceived need. These activities resulted from each teacher's reflection from the needs assessment process; they were not chosen nor directed by someone outside of that school community. These teacher leaders were emphasizing best instructional strategies and were leading from outside of their classrooms, working cooperatively with fellow teachers and the school as a whole to improve student success. These teachers were able to integrate leadership and teaching skills in their work with others.

Recommendations for Externship Improvements

Throughout the year-long Externship experience, the teachers reflected on both the aspects that were going well and offered suggestions for enhancements to the opportunities provided by the Externship. These enhancements tended not to emerge

from a large number of teachers nor from a single data source, but rather were noticed when looking at the teacher responses as a whole.

Teachers commented that they needed additional content instruction in middle school mathematics. Within this cohort, the majority of these teachers (14) were trained as elementary teachers and therefore several of them reported a need for expanding their mathematical content background. The Master's Degree program at Virginia Tech is designed to prepare teachers as K-8 mathematics specialists and middle school mathematics concepts were included throughout the math content courses. However, in order to be secure working with middle school teachers, some teachers felt that they needed additional mathematical content at this level. Therefore, a recommendation of this evaluation would be to differentiate more clearly between the mathematical content at the elementary and middle school levels, and to include some experience in the Externship at the middle school level. This may take the form of pairing an elementary teacher with one middle school teacher for some specific activities, or working with the middle school that serves the students from the teacher's elementary school. However, it may not be realistic to ask teachers during the Externship experience to work outside of their home schools.

Teachers discussed their feelings of preparation to plan and deliver effective professional development opportunities. In citing those aspects of the Externship that were most beneficial, only five teachers (29%) listed any aspects associated with Professional Development, suggesting that the teachers did not see this component as important in their preparation as the other three categories (Curriculum and Instruction, Working with Stakeholders, and Leadership). In addition, when identifying least

beneficial aspects of the Externship, three of the four teachers who cited aspects that fell within any of the key question categories mentioned the elimination of the Enhanced Scope and Sequence Plus professional development specifically. Based on teacher information, a recommendation of this evaluation would be to eliminate any requirement that identifies the focus of professional development that the teachers must conduct. Rather the professional development should be a natural outgrowth of the needs assessment process for each individual school. In addition, teachers should receive additional support in the planning stage and the implementation of the professional development. This may take the form of teachers working together in the planning stages and university faculty assisting in this planning as well as observing the professional development sessions and reflecting with teachers on its effectiveness.

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Appendix A

EDCI 5764: Externship in Education

CRN: 96479

Fall Semester, 2008

Jay Wilkins
300-C War Memorial Hall
(540) 231-8326
wilkins@vt.edu

Betti Kreye
322 War Memorial Hall
(540) 231-8348
bkreye@vt.edu

General Aims

The Externship will provide practical experience associated with being a school-based mathematics specialist. The Externship will take place within your school building or other appropriate educational organization (e.g., school district). The general goal of the Externship is to conduct a 'needs assessment' of mathematics teaching and learning for your school through interviews, discussions, and observations. This needs assessment will provide the ground work and frame for the implementation of a school-based initiative in the spring externship (or late fall) and your final masters project to be presented during the Spring semester. Several course activities have been designed to help guide you through this experience although the nature of your investigation will depend on the structure and needs of your school and may extend beyond these activities. It is important to also recognize that individual experiences will differ based on school culture and expectations. In addition there will be a district-wide initiative directed by the cohort that will culminate in a professional development experience for the district (Enhanced Scope and Sequence Plus).

Meeting Rooms and Time

We are scheduled to formally meet on four Saturdays throughout the semester (September 8, October 6, November 3, and December 1). These meetings will be held in 118 WMH on the Virginia Tech campus. However, other meeting times (either as a whole group or small groups) may be scheduled as needed depending on your particular situation or organizational or activity-based needs.

Office Hours

By appointment.

Religious Observances

Should a class meeting or assignment conflict with a student's religious observances, please contact me to discuss alternatives.

Accommodations Based on Disabilities (Services for Students with Disabilities Office [SSD])

If you need adaptations or accommodations because of a disability (learning disability, attention deficit disorder, psychological, physical, etc.), if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office location is 300C War Memorial Hall; please contact me to set up an appointment.

Virginia Tech Honor Code

We will adhere to the Virginia Tech Honor Code in this course.

General Structure and Requirements

1. Needs assessment.
2. Grade-level meeting
3. Principal meeting.
4. Lead a faculty or department meeting related to mathematics.
5. Contribute to the implementation of a district-wide initiative.
6. Thought papers/Reflections.
7. Activity Log/Time Log.

1. Needs Assessment: This report should outline the mathematical teaching and learning needs of your school and how they relate to the project that you would like to conduct for the Spring Externship. Your report should include a 3-5 page review of pertinent literature related to your proposed project. A discussion of what you plan to do, how you plan to do it, and the expected outcomes from the project (both personal as well as school-based).

2. Grade level meetings: As part of conducting the school-based needs assessment, you will meet with each grade level to discuss their hopes and needs for mathematics.

3. Principal meeting: As part of conducting the school-based needs assessment, you will meet with your principal to discuss hopes and needs for mathematics (e.g., ideas for school-based initiatives; ways of working with teachers; participation in faculty meeting).

4. Faculty/Department meeting: As part of conducting the school-based needs assessment, you will take on a leadership role in a faculty meeting based on your discussion with your principal.

5. District-wide initiative: This semester the cohort will development a professional development experience for teachers in the district related to the Enhanced Scope and Sequence Plus.

6. Thought papers/Reflections: Throughout the semester we will ask that you reflect on different aspects of your experience. First reflection will be due on September 8. The prompt will be mailed out over e-mail.

7. Activity Log/Time Log: This log should list the types of activities related to “being” a mathematics specialist that you were involved in this semester and the amount of time associated with the activity.

8. Attendance and Participation: Active participation is essential for learning. The frequency and quality of questions and contributions to class discussion and projects are an important sign of active involvement and, thus, an important element to consider in assessment.

Final Evaluation

Final evaluation will be based on the professional judgement of the instructor. Expectations for projects and assignments will be provided through assessment rubrics. The externship is graded Pass/Fail.

Pass—Successful completion of course requirements including participation in planned externship activities.

EDCI 5764: Externship in Education

CRN: 16453

Spring Semester, 2008

Jay Wilkins
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wilkins@vt.edu

Betti Kreye
322 War Memorial Hall
(540) 231-8348
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General Aims

The Spring Externship will provide practical experience associated with being a school-based mathematics specialist. The Externship will take place within your school building or other appropriate educational organization (e.g., school district). Based on your school-based 'needs assessment' of mathematics teaching and learning conducted in the fall you will implement a school-based initiative as described and outlined in the needs assessment. This initiative should represent a systemic program in that it is more than a 'one-shot' initiative. It should consist of series of meetings, workshops, or instructional sessions, etc. that is documented and evaluated over the course of the externship. This project will culminate in a final report of the project and a presentation of the project that will constitute your final masters' defense.

Meeting Rooms and Time

We are scheduled to formally meet on three Saturdays, 9:00-12:00, throughout the semester (January 26, February 23, and March 29). These meetings will be held in 118 WMH on the Virginia Tech campus. However, other meeting times (either as a whole group or small groups) may be scheduled as needed depending on your particular situation or organizational or activity-based needs.

Office Hours

By appointment.

Religious Observances

Should a class meeting or assignment conflict with a student's religious observances, please contact me to discuss alternatives.

Accommodations Based on Disabilities (Services for Students with Disabilities Office [SSD])

If you need adaptations or accommodations because of a disability (learning disability, attention deficit disorder, psychological, physical, etc.), if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office location is 300C War Memorial Hall; please contact me to set up an appointment.

Virginia Tech Honor Code

We will adhere to the Virginia Tech Honor Code in this course.

Externship Requirements

1. Final Project.
2. Report of Final Project.
3. Presentation of Final Project.
4. Class Participation
5. Activity Log/Time Log.

1. Final Project: Based on your needs assessment you will conduct a final school-based project. This project is intended to address a mathematics need of your school. This initiative should represent a systemic program in that it is more than a 'one-shot' initiative. It should consist of a series of meetings, workshops, or instructional sessions, etc. that is documented and evaluated over the course of the externship. Examples of projects include, but are not limited to, a series of professional development activities for the teachers in your building, an after/before school tutorial for students, lesson study, school-based curriculum study with teachers, SOL related work.

2. Report of Final Project: This report should be at least 15 pages, not including references or appendices (double-spaced, 12 point, Times, 1" margins). The report should discuss the background literature for your project, rationale for the project, needs assessment, implementation plan, anticipated outcomes or research questions, methodologies/procedures, findings/outcomes, an overall discussion of project, its impact, and its implications, and a list of references (see attached rubric for more detail). Parts of this report can be modified from your needs assessment report.

3. Presentation of Final Project: You will do a 20-minute presentation of your project. This presentation should briefly address the background literature, needs assessment, and rationale for your project. Your presentation should discuss what you did and the results from the project, the evaluation of project and the implications for the findings of the project (see attached rubric). Presentations will take place on April 3, 10, and 17, 4:00-7:15 at Christiansburg Middle School.

4. Class Participation: Participation in class discussion is a vital part of the externship. This is an opportunity for you to get feedback on your project plans and offer feedback to other members of the cohort. In addition it is important to support cohort members during their presentations.

5. Activity Log/Time Log: This log should list the types of activities related to "being" a mathematics specialist that you were involved in this semester and the amount of time associated with the activity.

Final Evaluation

Final evaluation will be based on the professional judgment of the instructor. Expectations for projects and assignments will be provided through assessment rubrics. The externship is graded Pass/Fail.

Pass—Successful completion of course requirements.

Mathematics Specialist (K-8) Project Rubric

Name: _____

Title of Project: _____

The final write up of your mathematics specialist project will be assessed using the following rubric and scoring guide:

Unsatisfactory	0
Basic	1
Proficient	2
Distinguished	3

	Unsatisfactory (0)	Basic (1)	Proficient (2)	Distinguished (3)
A. Literature Review - a synthesis of the literature on the topic of approximately 4-6 pages with at least 5 pertinent references.				
B. Rationale - discussion of the rationale for addressing this topic in the specific school context.				
C. Needs Assessment – discussion of data collected for the needs assessment, how they were collected, how the data were analyzed, and the results in terms of needs for this topic to be addressed in the school.				
D. Plan for Implementation of the Project - discussion of the project, the research questions/anticipated outcomes, how the project worked, and how it was implemented in the school.				
E. Methodology/Procedures – includes: (1) a description of the context of the school, (2) the participants from whom the data were collected, (3) procedures used and timeline followed, (4) tools used in collecting data (such as interview questions, survey questions, field notes to be collected, test scores gathered), and (5) a discussion of how each of the data sources were analyzed.				
F. Results - the findings from data collection including a description of outcomes and what was learned as a result of data analysis and artifacts related to the project.				
G. Discussion – includes: (1) discussion of outcomes and/or answers to each research question based upon the data, (2) overall discussion of the project and its impact, (3) recommendations for implementing a project of this kind in other schools, and (4) suggestions for future directions with this project in the school context (at least 3 pages).				
H. References - reference list (preferred in APA style, but most important that it is consistent).				

Total Score: _____

Mathematics Specialist (K-8) Presentation Rubric

Name: _____

Title of Project: _____

Directions for Reviewers:

Please review the mathematics specialist presentation critically using the attached rubric. In the spaces provided below, please indicate your assessment using the following scoring guide:

Unsatisfactory	0
Basic	1
Proficient	2
Distinguished	3

	Unsatisfactory (0)	Basic (1)	Proficient (2)	Distinguished (3)
A. Related Literature - a brief discussion of literature related to the project.				
B. Rationale - discussion of the rationale for addressing this topic in the specific school context.				
C. Needs Assessment – brief discussion of data collected for the needs assessment, how they were collected, how the data were analyzed, and the results in terms of needs for this topic to be addressed in the school.				
D. Plan for Implementation of the Project - discussion of the project, the research questions/anticipated outcomes, how the project worked, and how it was implemented in the school.				
E. Methodology/Procedures – briefly discuss: (1) the context of the school, (2) the participants from whom the data were collected, (3) the procedures used and timeline followed, (4) tools used in collecting data (such as interview questions, survey questions, field notes to be collected, test scores gathered), and (5) a discussion of how each of the data sources were analyzed.				
F. Results - the findings from data collection including a description of outcomes and what was learned as a result of data analysis and artifacts related to the project.				
G. Discussion – includes: (1) discussion of the overall project, (2) discussion of outcomes and/or answers to each research question based upon the data, (3) discussion of the impact of the project, (4) recommendations for implementing a project of this kind in other schools, and (5) suggestions for future directions with this project in the school context.				

General comments and reasons for ratings can be noted on the reverse side of the rubric.

Overall Grade: PASS FAIL

Signature of Reviewer: _____

Date of Review: _____

Appendix B

MATHEMATICS SPECIALIST EXTERNSHIP SURVEY Name: _____

The Externship is comprised of two semesters, Fall 2007 and Spring 2008, for 6 total credit hours.

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree

Please elaborate on your rating when appropriate by briefly citing one example or activity. Note: You are rating the experience, not the frequency of the activities.

Part I.

The Mathematics Specialist Externship experience has prepared me to be able to:

1) use classroom data to plan instruction. 1 2 3 4

Please elaborate:

2) interpret school-level assessment data 1 2 3 4

Please elaborate:

3) collaborate with individual teachers on classroom instruction. 1 2 3 4

Please elaborate:

4) collaborate with principals to **identify** a school-based mathematical need. 1 2 3 4

Please elaborate:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree

The Mathematics Specialist Externship experience has prepared me to be able to:

5) work with the Principal to **meet** a school mathematical need 1 2 3 4
Please elaborate:

6) work with teachers to identify a school mathematical need. 1 2 3 4
Please elaborate:

7) build school community around a focus on mathematics. 1 2 3 4
Please elaborate:

8) work with parents on issues involving mathematics. 1 2 3 4
Please elaborate:

9) mentor new teachers in mathematical content. 1 2 3 4
Please elaborate:

10) mentor new teachers in mathematical pedagogy. 1 2 3 4
Please elaborate:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree

The Mathematics Specialist Externship experience has prepared me to be able to:

11) mentor experienced/veteran teachers in mathematical content 1 2 3 4

Please elaborate:

12) mentor experienced teachers in mathematical pedagogy. 1 2 3 4

Please elaborate:

13) coordinate, plan, and present an effective professional development opportunity with school faculty. 1 2 3 4

Please elaborate:

14) coordinate, plan, and present an effective professional development opportunity outside of your school setting. 1 2 3 4

Please elaborate:

15) plan and present sessions at local and/or state professional mathematical meetings or conferences. 1 2 3 4

Please elaborate:

16) apply my mathematical content knowledge working with teachers. 1 2 3 4

Please elaborate:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree

The Mathematics Specialist Externship experience has prepared me to be able to:

17) facilitate teachers' application of assessment strategies in the classroom setting. 1 2 3 4

Please elaborate:

18) facilitate teachers' application of differentiation strategies in the classroom setting. 1 2 3 4

Please elaborate:

19) work with a group of teachers on a common mathematical goal. 1 2 3 4

Please elaborate:

20) use research in determining a plan of action to meet a diagnosed mathematical need. 1 2 3 4

Please elaborate:

21) work with District personnel to identify a district-level need and implement a district plan. 1 2 3 4

Please elaborate:

Based on your Externship experience, please rate your agreement with each of the following statements by circling the appropriate number using the following rating scale:

1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree

The Mathematics Specialist Externship experience has prepared me to be able to:

22) serve as a building-level resource person for mathematics. 1 2 3 4
Please elaborate:

23) facilitate discussions with a group of teachers around best instructional strategies. 1 2 3 4
Please elaborate:

24) observe teachers classroom practices. 1 2 3 4
Please elaborate:

25) engage a classroom teacher in professional conferencing around effective instructional strategies. 1 2 3 4
Please elaborate:

26) implement and align curriculum with local, state, and national standards. 1 2 3 4
Please elaborate:

27) provide a targeted professional development opportunity to address an identified need. 1 2 3 4
Please elaborate:

Part II.

28) In your opinion what was the most beneficial aspect of the Externship?

29) In your opinion what was the least beneficial aspect of the Externship?

30) How well did the Externship align with your expectations? 1 2 3 4 5

5 – The Externship far exceeded my expectations (I learned some things that I didn't even realize I needed to know).

4 – The Externship exceeded my expectations.

3 – The Externship met my expectations.

2 – I learned some useful things, but I had hoped for lots more.

1 – The Externship did not align with any of my expectations.

Please explain your response as clearly as possible.

Part III. Using the following list, please check the appropriate box to indicate any activity related to mathematics in which you participated **once** or **at least twice** during the Externship experience.

Once	At least twice		once	At least twice		once	At least twice	
		coaching or mentoring a teacher in math			co-teaching a math lesson			model teaching a math lesson
		co-planning a math lesson with a teacher			observing a math lesson at the teacher's request			observing a teacher's math lesson at the Principal's request
		observing a teacher's math lesson on my own			answering a math content question			answering a math pedagogy question
		discussing school data with a teacher			discussing classroom data with a teacher			answering a teacher's question on data
		discussing school data with the Principal			discussing classroom data with the Principal			working with parents on a math issue
		facilitating a discussion on math with the whole faculty			facilitating a discussion on math with grade levels			attending grade-level meetings about math on my own
		attending grade-level meetings about math as requested by teachers			attending grade-level meetings about math as requested by the Principal			planning and delivering math whole-faculty professional development

Using the following list, please check the appropriate box to indicate any activity related to mathematics in which you participated **once** or **at least twice** during the Externship experience.

Once	At least twice		once	At least twice		once	At least twice	
		planning and delivering small group professional development on math (in school)			Planning and presenting math professional development at another school (in the district)			planning and presenting math professional development outside the district
		assisting teachers in finding math manipulatives			researching a math question for a teacher			assisting a teacher with a math assessment issue
		assisting a teacher with a math curriculum issue			assisting a teacher with a class management issue			assisting a teacher with math instructional strategies
		working with a new teacher on math content			working with a new teacher on class management			working with a new teacher on math instructional strategies
		working with a new teacher on math curriculum			teaching a small group of students math (not my own)			tutoring students in math (not my own)
		working with a teacher on math differentiation strategies			answering a principal's question regarding a math issue			working with other specialty teachers on a math issue
		assisting a teacher with a remediation issue in math			assisting a grade-level with a math remediation issue			assisting the school with a math remediation issue
		conferencing with a teacher on math			assisting a teacher with the use of a math manipulative			ANY OTHER???

Appendix C

MATHEMATICS SPECIALIST EXTERNSHIP OBSERVATION FORM

TEACHER _____ DATE _____

ACTIVITY

TEACHING	FACILITATING GRADE LEVEL MEETING	PRESENTING AT FACULTY MEETING
PLANNING	PRESENTING AT GRADE LEVEL MEETING	MEETING WITH PRINCIPAL
MODELING LESSON	MEETING WITH GROUP OF TEACHERS	MENTORING A TEACHER
PRESENTING SITE-BASED STAFF DEVELOPMENT	OTHER	

OBSERVATION NOTES

ACTIONS	NOTES/COMMENTS

FINAL COMMENTS/SUMMARY:

POST-OBSERVATION DISCUSSION:

Appendix D

Teacher Interview Protocol

Part I. The following questions will be asked of each teacher.

1. Discuss whether you feel that the Externship has adequately prepared you to work effectively with teachers, administrators, and parents as a Mathematics Specialist. Please explain.
2. Discuss whether you feel that the Externship has adequately prepared you to work effectively in the areas of curriculum and instruction as a Mathematics Specialist. Please explain.
3. Discuss whether you feel that the Externship has adequately prepared you to develop and deliver effective professional development as a Mathematics Specialist. Please explain.
4. Discuss whether you feel that the Externship has adequately prepared you for your leadership roles as a Mathematics Specialist. Please explain.

Part II.

5. Is there anything that you gained from the Externship experience that you feel you had not gotten in any of the other courses in the masters' degree program?

Appendix E



Office of Research Compliance
 Institutional Review Board
 2000 Kraft Drive, Suite 2000 (0-497)
 Blacksburg, Virginia 24061
 540/231-4991 Fax 540/231-0959
 e-mail moored@vt.edu
 www.irb.vt.edu

FWAC0000572 (expires 1/20/2010)
 IRB # is IRB00010657

DATE: March 25, 2008

MEMORANDUM

TO: Jesse L. Wilkins
 Gwendolyn M. Lloyd
 Bertibel Kreye

FROM: David M. Moore 

Approval date: 7/27/2007
 Continuing Review Due Date: 7/12/2008
 Expiration Date: 7/26/2008

SUBJECT: **IRB Amendment 1 Approval:** "Mathematics Specialists in Southwest Virginia",
 OSP #415096, IRB # 05-461

This memo is regarding the above referenced protocol which was previously granted approval by the IRB on July 27, 2007. You subsequently requested permission to amend your IRB application. Since the requested amendment is nonsubstantive in nature, I, as Chair of the Virginia Tech Institutional Review Board, have granted approval for requested protocol amendment effective as of March 25, 2008. The anniversary date will remain the same as the original approval date.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtain re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

cc: File
 Department Reviewer: Mary Alice Barksdale

Invent the Future