Teacher Quality Partnership

Novice Teacher Studies

Technical Report NTS 10-01

Research Brief

2007-2009

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September, 2010

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Please cite *Novice Teacher Study Technical Report NTS 09-01: Research Brief 2007-2009* as:

Kinnucan-Welsch, K., Franco, S., & Hendricks, M. (2010). Teacher quality partnership novice teacher study, Technical Report NTS 09-01: Research Brief, 2007-2009. Cincinnati, OH: Teacher Quality Partnership.

Research conducted by the Teacher Quality Partnership is supported in part by the Proctor & Gamble Fund, Carnegie Corp. of New York, The Joyce Foundation, the U.S. Department of Education (FIPSE), the Ohio Department of Education, the Ohio Board of Regents, the George Gund Foundation, the Martha Holden Jennings Foundation, The Ohio State University, the

University of Dayton, the University of Cincinnati, Mount Vernon Nazarene University, Bank One, the Student Loan Fund, and the American Association of Colleges for Teacher Education.

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INTRODUCTION

The purpose of this technical report is to summarize the research methodology and report selected findings of the Novice Teacher Study (NTS) and the Large Scale Study (LSS) strands of the Teacher Quality Partnership (TQP) research for 2007-09, at which point the project was completed This document includes background information presented in *Novice teacher study technical report NTS 07-01*: *Research brief 2004–2008*, as well as background information on the LSS strand. We have combined these two study strands for data analysis, interpretation, and reports of findings. Both LSS and NTS focus on novice teachers, their preparation, and their performance in the classroom. Some data sets for the studies overlap, so that in some cases data from both studies are analyzed as a single group of first year teachers. The NTS field researchers collected in-depth quantitative and qualitative data about teachers in their first, second, and third years of teaching. The LSS field researchers collected similar, but selected, quantitative data about novice teachers in their first year of teaching. This report is divided into four sections: a brief description of TQP; a description of our theoretical framework, the research design and methodology for NTS and LSS, and selected findings. In preparing this technical report, we drew from artifacts documenting the research processes; from regional and national presentations; and from materials distributed to external audiences.[1]

THE TEACHER QUALITY PARTNERSHIP RESEARCH

The Teacher Quality Partnership (TQP) collaborated from 2004 - 2009 with all 50 Ohio higher education institutions that prepare teachers, the Ohio Department of Education, the Ohio Board of Regents, teacher organizations, and school districts in Ohio to examine the relationships among teacher preparation, teacher characteristics, and growth in student achievement. TQP was initially designed as five research strands located at multiple research universities, each studying

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[1] The Novice Teacher Study evolved with the large Scale, Longitudinal Study to form the Novice Teacher Studies (NTS). Key personnel contributing to the NTS include Dr. Kathryn Kinnucan-Welsch, principal

investigator of the Novice Teacher Study, Dr. Suzanne Franco, co-principal investigator of Large Scale Study, Dr. Martha Hendricks, TQP associate director, and Dr. Robert Yinger, TQP research director.

a particular facet of the broader research questions. TQP was successful in collecting substantial amounts of longitudinal data, including data on candidate characteristics, perceptions, and performance; institutional and program characteristics; and novice teacher characteristics and performance.

While TQP experienced successes in addressing research questions, the project also encountered challenges. Institution Review Board approvals across multiple institutions sometimes resulted in restricted access to data across the study strands. Policies and structures of the state assessment data system prevented access to the teacher-level value-added ratings, the primary dependent variable. Consequently, TQP evolved and refocused as did the NTS and LSS to meet those challenges.

The TQP research questions as stated in the original research design are below. Note that the questions relate teacher variables to student achievement, and we are unable to report findings related to student achievement because as reported earlier we did not have access to teacher value-added ratings.

1. How do variables of teacher background, initial preparation, and ongoing professional learning relate to teacher practices, student learning, and achievement?

2. How do specific elements of teacher preparation and aspects of school contexts impact novice teachers' development during their first 3 years of teaching?

3. Do high value-adding teachers have characteristics, instructional practices, and understandings that differ from those of other teachers along the value-added continuum?

4. What specific school contexts are associated with high value-added novice and experienced teachers?

CONCEPTUAL FRAMEWORK

Our theoretical framework is graphically represented by spheres of knowledge incorporating system elements of the teaching profession. This representation can contribute to a rich understanding of the characteristics, preparation, practices and professional learning contexts of teachers in relationship to teaching practice and student performance. At the core is the conception of the teaching profession from Darling-Hammond and Bransford's *Teachers For a Changing World: What Teachers Should Know and Be Able To Do* (2005). We selected this framework for a number of reasons. The framework is predicated on the work of the National Research Council *How People Learn: Brain, Mind, Experience, and School* (Bransford, Brown, & Cocking, 1999). The assumption is that learning to teach is based on the same principles as all human learning. The model is grounded in seminal research over the last few decades. The model is simple, yet able to support an understanding of the complexity of teaching. Although all of us were familiar with the model, our formal adoption of the model for this research arose from the analyses and organization of our data related to novice teachers.

While Darling-Hammond and Bransford (2005, p. 11) use the graphic to describe teacher education (see Figure 1), we use it to characterize the professional learning, the specific bodies of knowledge, and the teaching contexts of novice teachers.

For our purposes, the large encompassing circle represents the broader contexts that have influenced the novice teacher and his or her practice. These contexts include the teacher preparation program and institution of higher education and the school context in which the novice teacher teaches, including student demographics, professional development opportunities, building leadership and culture, and other factors. Bodies of knowledge that contribute to teaching effectiveness include Knowledge of Teaching, Knowledge of Learners, and Knowledge of Subject Matter. The findings reported in this research extend our understanding of novice teacher characteristics and teaching contexts within this framework.

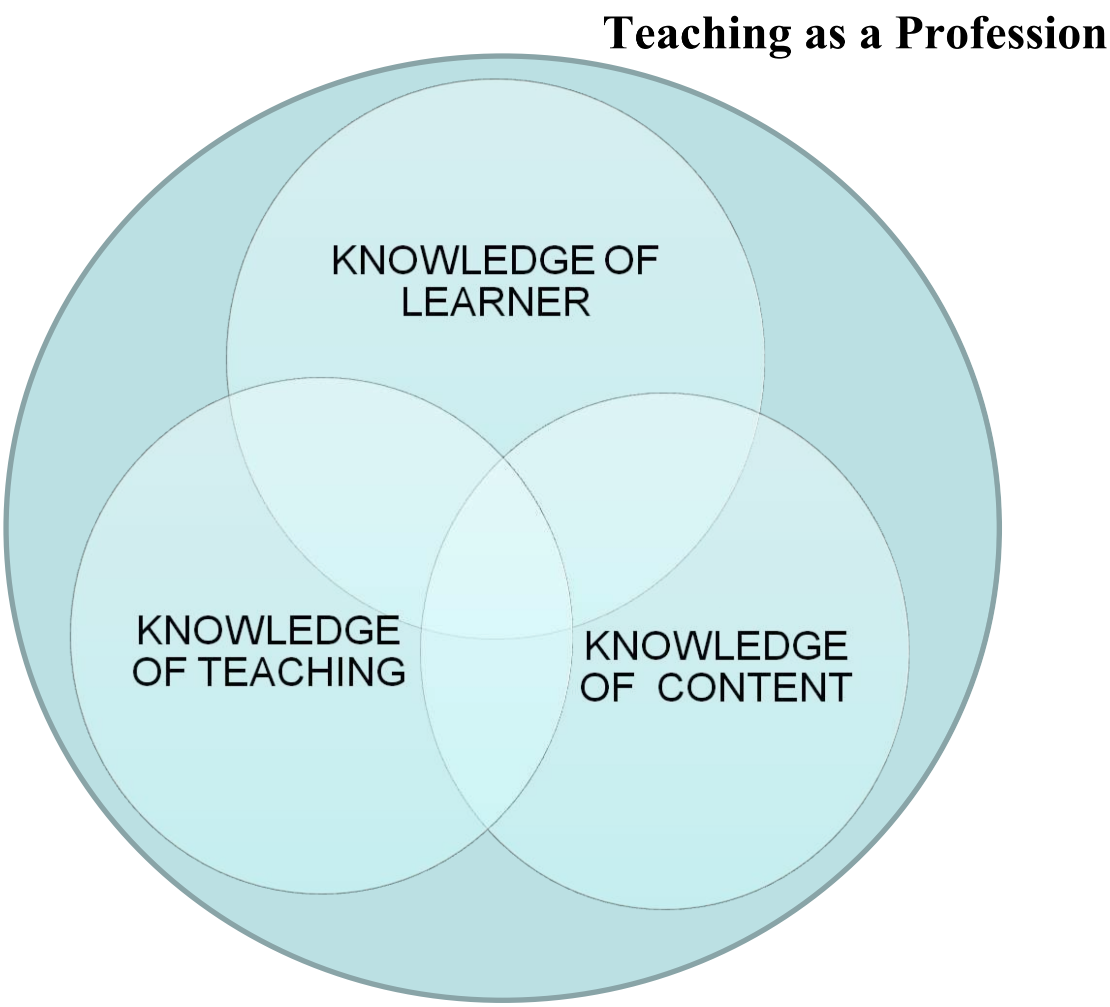


Figure 1. Conceptual Framework of Teaching as a Profession (Darling-Hammond & Bransford, 2005, p. 11, Reprinted with permission of John Wiley & Sons, Inc.)

METHODOLOGY

Large Scale Study Description

According to an initial document describing the aims of TQP, "The purpose of the Large Scale Study (LSS) is to examine the interaction between and among identified variables in order to better predict models of teacher development through P-12 contexts over time by analyzing changes from program entry through the first three years of teaching" (Yinger, 2005). The study strand intended to offer recommendations for ways in which teacher preparation programs might be more successful in preparing teachers to help their students achieve in various classroom, school, and community contexts. Descriptive data were collected on the 50 partner teacher education programs and institutions of higher education through state data systems, the PEDS data system administered by AACTE, and institutional reports. The original design of the study strand called for data to be collected on 1,200 beginning teachers (two cohorts of 600) sampled from a minimum representative distribution of 400 schools in 135 districts, an ambitious design that was not realized due to study strand personnel changes and the difficulty of recruiting large numbers of novice teachers.

The research questions guiding this study strand were as follows:

1. Are there elements of teacher preparation programs—specifically in the areas of content preparation, pedagogical understandings, pedagogical content knowledge (content knowledge specific to how students learn the content), and field experiences—that result in candidates being better able to positively affect their K-12 students' achievement from the very start of their work as new teachers?

2. Are there elements of teacher preparation that result in new teachers being better prepared to learn and develop their teaching expertise during their first three years of teaching, thereby becoming more effective in improving their K-12 students' achievement more quickly (e.g., they get better, faster, partly because of the foundation they received in their preparation program)?

3. In addition to the direct effects of the teacher education program on candidates who are prepared there, are there ways in which teacher education programs partner with and thus influence schools and/or districts in which new teachers are placed, with the result that the K-12 environment is better able to support and foster new teacher success?

LSS Participants

In order to be eligible for participation in the study, individuals must have graduated recently from an approved teacher education program in Ohio, be in their first year of teaching, and be teaching math and/or reading in grades 4 through 8. The subject matter and grade level restrictions were the result of the implementation of the state of Ohio district and school accountability plan, which tests student achievement in reading and math near the end of the school year in grades three through eight. From these achievement tests, value-added ratings are calculated for grades 4 through 8.

In the 2007-08 academic year, first-year teachers were identified by their enrollment in the state-funded Entry Year Program. The principals in the building in which the first-year teachers taught were contacted by email and were asked permission for researchers to contact the teachers. If the principal granted permission, the first-year teachers were contacted by email. If the teacher agreed to participate, he or she was given informed consent information outlining the study and measures to ensure confidentiality and human subjects' protection. Before data collection began, teachers were asked to sign two consent forms, one for the LSS (Appendix A) and one from NTS (Appendix B). Eighty first year teachers participated in the LSS strand.

Novice Teacher Study (NTS) Description

The purpose of the NTS strand of the TQP research was to examine the characteristics, instructional practices, and school contexts of novice teachers on the value-added continuum. A second purpose was to examine the professional learning experiences that contributed to a teacher identified as high value adding. The research design of the NTS supported an in-depth, case study analysis of novice teachers, which differentiated this strand from the LSS. The research questions were as follows:

1. Do teachers who prove to be high value-adding teachers (HVATs) have characteristics different from those of other teachers along the value-added continuum (e.g., identity as teacher, dispositions, vision of teaching)?

2. Do HVATs have instructional practices that differ significantly from those of other teachers along the value-added continuum?

3. Do HVATs have different understandings regarding the following:

   a. Curriculum?

   b. Subject matter content?

   c. Assessment?

   d. Student diversity?

   e. Instructional contexts?

   f. Differentiation?

4. Do HVATs have a different orientation to teacher-student relationships (e.g., classroom climate, emotional support)?

5. What specific dispositions and conceptual tools are associated with the professional learning of HVATs?

6. What specific forms of professional development are associated with high value-added teaching?

7. What particular school contexts tend to be associated with the professional learning of HVATs?

Novice Teacher Study Participants

In Year 1(2006–07), twenty-one novice teachers were recruited to participate in the study for three years. In November of Year 2 (2007–08), twenty-three teachers were recruited, fifteen of whom were continuing in the study from Year 1. The original research plan called for fifty novice teachers every year, but due to budget constraints, the entire number was not recruited. In Year 3 (2008-2009), fourteen Year 2 NTS teachers and 4 LSS teachers were recruited for a modified and limited continuation of the research design, specifically focused on teacher interviews related to teacher preparation and professional development.

Once a potential participant was identified, he or she was contacted by the NTS project office with an invitation to participate. NTS field researchers followed up with a building visit, and if the teacher agreed to participate, he or she was given informed consent information outlining the study and measures to ensure confidentiality and human subjects' protection. Before data collection began, teachers were asked to sign two consent forms, one for the LSS (Appendix A) and one for the NTS (Appendix B), inasmuch as data from both studies would be combined for certain analyses..

Data Collection and Analysis for LSS and NTS

As has been discussed before, some data were collected common to LSS and NTS, and some data were collected for NTS only. Data common to both strands are described in this section, and data collected for NTS strand only are described in the next section. Each variable and the associated data source is described below. Demographic data about the teachers, characteristics of teacher preparation programs and institutions, and teacher perceptions about their preparation were collected through Teacher Profile, Institution and Unit Data, Program Survey and Inservice Teacher Surveys.

Teacher Profile

The teacher profile instrument collected the following data on every participant: gender, state of Ohio teaching license granted, highest degree earned, degree-granting institution, and information about teaching assignment (school and district name, category of school and district according to state of Ohio typology, grade level[s], and subject[s]). Teacher profile data were analyzed by calculating frequencies in each category for each variable. Typology of state of Ohio School Districts can be found in Appendix C.

Institution and Unit Data

Data describing the 50 institutions of higher education with teacher preparation programs in Ohio were collected primarily through two sources. Teacher education programs in Ohio annually submit data to the state as required for Title II. These data include program requirements, student diversity, faculty diversity, and workloads. The second source was the ranking by *U.S. News and World Report* of America's best colleges. These data included such constructs as size, selectivity, faculty productivity, and financial aid. Institution and unit data were analyzed by calculating frequencies for each category for each variable.

Program Survey

A web-based survey about licensure program characteristics for Adolescence/Young Adult mathematics (grades 7 through 12) and Middle Childhood Mathematics and English Language Arts (grades 4 through 9) was conducted during September through November 2007. Forty-three institutions responded. The survey collected data about program structure, content requirements, and field experiences. Program survey data were analyzed through descriptives and a factor analysis of program components.

School Context Survey

The School Context Survey was adapted, with permission, from the Organizational Climate Index (Hoy, Smith & Sweetland, 2002). The purpose of the survey was to capture healthy dimensions of school climate, by focusing on faculty trust in colleagues, principals, and students. Data were analyzed by calculating frequencies and descriptives for each subscale and correlation coefficients with values associated with teaching performance and perceptions of characteristics of school context.

Principal Survey

The principal survey, as is indicated by the name, was completed by the novice teacher's building principal. The survey identified the professional development, mentoring, and induction activities the novice teacher experienced throughout the academic year and rated the principals' perception of utility of the activity. Data were analyzed by calculating frequencies and descriptives for each subscale and correlation coefficients.

Data were collected that provided information about classroom instruction, specifically the interactions between teacher and students.

Classroom Assessment Scoring System (CLASS)

Teachers were observed and assessed using Classroom Assessment Scoring System (CLASS), an instrument developed by Pianta and his colleagues at the University of Virginia (Pianta, La Paro, & Hamre, 2008), designed to assess teacher-student interaction in four domains. The first domain is Emotional Support and focuses on positive classroom climate, teacher sensitivity, and regard for student perspective. The domain Classroom Organization focuses on behavior management, productivity, and instructional learning formats. The domain Instructional Support focuses on procedures and skills, content understanding, analysis and problem solving, and quality of feedback. The domain Student Outcomes focuses on student engagement. The CLASS instrument has two protocols, one for use in elementary classrooms (grades 4 through 6 in reading and grades 4 and 5 in math) and one for use in middle school classrooms (grades 6 through 8 in math). Researchers received training using the CLASS instrument and received a score of 80% or better on a reliability protocol.

During a CLASS observation, the researcher observes twenty-minute segments of a lesson, making note of evidence related to each dimension. The next 10 minutes are spent assigning a score of 1 to 7 to each dimension. A low rating is indicated by a score of 1 or 2; a mid rating is indicated by a score of 3, 4, or 5; and a high rating is indicated by a score of 6 or 7. The researcher repeats this 20/10 cycle 3 to 4 times in one visit. At the end of a research year, twelve to sixteen scores for each dimension for each teacher participating in the NTS strand were obtained. The eighty teachers participating in the LSS strand were observed on a single occasion resulting in 3 scores for each dimension. The twenty-one participants in NTS 2006-07 and the twenty-three participants in NTS 2007-08 were observed and assessed using CLASS 4 times during the academic year. Fourteen NTS participants and 4 LSS participants were observed once in the 2008-2009 academic year.

Data from CLASS observations were analyzed both by calculating descriptives, correlation coefficients among CLASS domains, among CLASS and Content Knowledge for Teaching Mathematics, and other variables associated with teacher characteristics and school contexts.

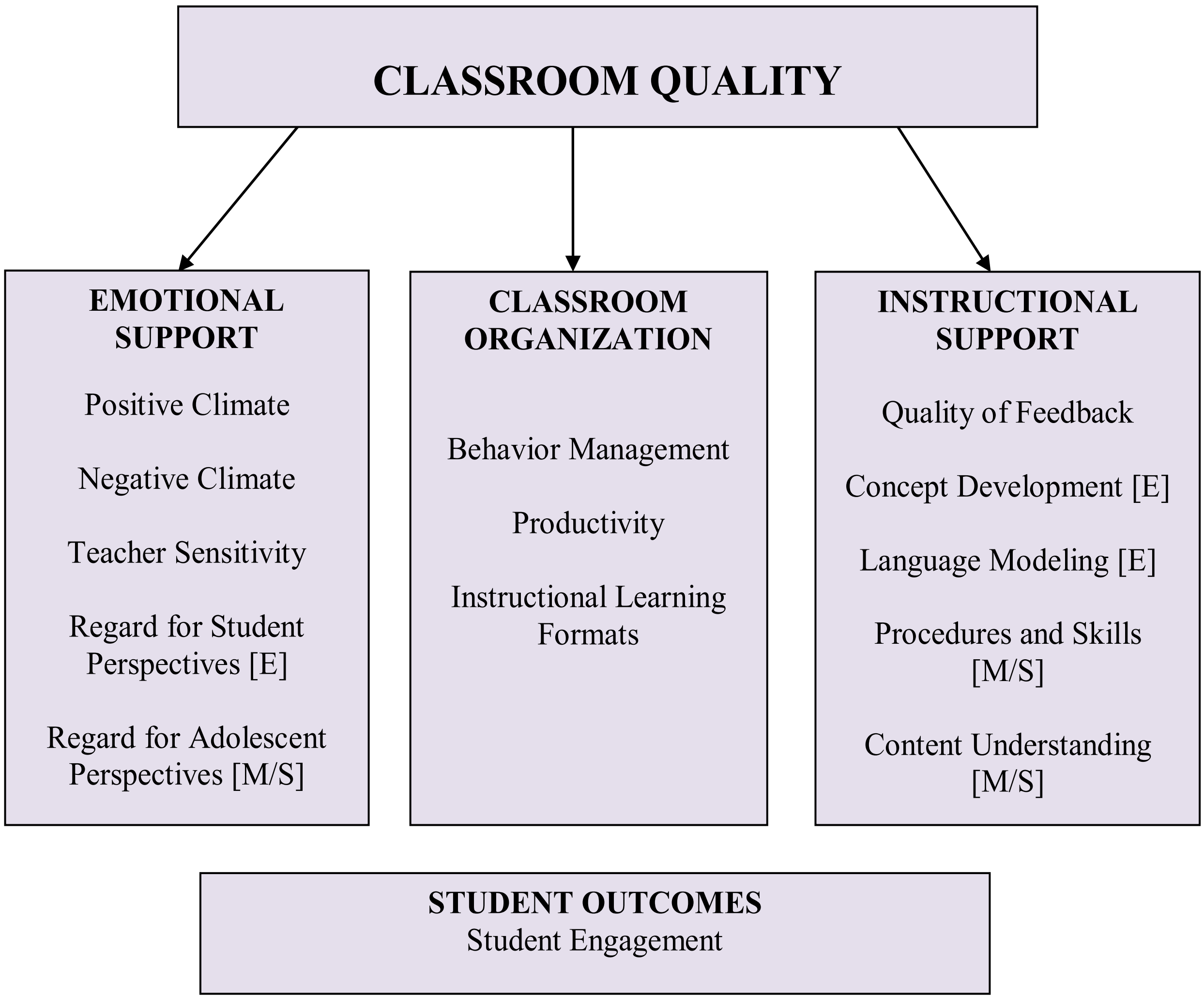


Figure 2: CLASS Domains and Dimensions (Adapted from Robert C. Pianta (2005) *CLASS Manual*, University of Virginia)

Data collected for NTS participants

In addition to the data collected for all LSS and NTS participants, some data were collected specific to the NTS strand. These data sources and related analyses are described below.

Content Knowledge for Mathematics Teaching Survey

The *Content Knowledge for Mathematics Teaching Survey*, used by permission from the School of Education, University of Michigan, comprised items developed by the UM Study for Instructional Improvement, Learning Mathematics for Teaching (LMT), and the Consortium for Policy Research in Education (Hill, Rowan, & Ball, 2005). LMT staff provided training for the use of their instruments. Two TQP mathematics teacher educators compiled the survey instrument (Appendix D). To meet the needs of the project, the instrument developers chose not to use the full LMT instruments made available by the University of Michigan group and instead chose to compile an instrument to meet specifically the needs of the TQP studies.

The TQP instrument was designed based on the following considerations: 1) sensitivity to teacher time constraints, both in terms of their roles as classroom teachers and as participants in our study; and 2) the inclusion of mathematics content aligned with State of Ohio mathematics content standards grades four through eight. The resulting instrument measured content knowledge for teaching in the areas of number and number sense, algebra, geometry, measurement, data analysis and probability. Items did not simply measure mathematical knowledge, but included problems that addressed student understandings and student errors.

Twenty-five NTS teachers took the survey as first year teachers. Thirteen participants retook the survey during their second year of teaching. Data for the *Content Knowledge for Mathematics Teaching Survey* were analyzed by calculating descriptives and correlation coefficients among multiple variables related to teacher characteristics and practice.

Post-CLASS Observation Interview (Years 1 and 2)

The post-observation interview (Appendix E) was conducted with NTS participants after *CLASS* observations. The interview was a semi-structured recorded interview that prompted the teacher to consider a lesson taught during a *CLASS* observation segment. Specifically, the teacher was asked about his or her thoughts on the lesson; the student response(s) to the lesson; preparation for the lesson; and decisions made during the lesson, including use of resources. The questions were consistent across all interviews, but the researcher often followed a participant response with secondary questions and probes, seeking elaboration when necessary.

Post-CLASS Observation Interview (Year 3)

The interview protocol used in Year III (Appendix F) specifically queried teachers about their understanding of their students and the content in the observed lessons. The interview guide also inquired about the effectiveness of the teacher preparation program and about effective professional development experiences

The post-observation interview data were transcribed and analyzed using widely accepted qualitative data analysis techniques, such as identifying codes, marking segments of texts with codes, and organizing coded data to determine themes or patterns at more abstract levels of interpretation (Miles & Huberman, 1994; Ryan & Bernard, 2000). Researchers agreed that the text segments to be coded were a complete turn, that is, the entire text of a question posed by the field researcher and the corresponding teacher participant response. By coding an entire turn, researchers preserved prompts, contextual data, and other information that would help with interpretation. Each turn could have multiple codes. Codes were post-defined (not specified before or during data collection), a method recommended by many scholars (Anfara, Brown, & Mangione, 2002; Patton, 1990). It should be noted, however, that the research purpose and theories guiding the development of the project, including the interview questions, helped to determine some of the coding categories used before the open coding of transcribed interviews began.

Initial analysis of two years of post-observation interviews resulted in the identification of fourteen codes: Administration, Classroom Context, Content/Subject Matter, Curriculum, Instruction, Parents, Planning, Professional Learning, Resources, School Context, Standardized Testing, Student Characteristics, Student Response, and Teacher Characteristics. Researchers then examined four codes that contained much of the data: Student Characteristics and Student Response, Instruction, and Content/Subject Matter. Within the codes Student Characteristics and Student Response, three "child codes" (an NVivo software term) were identified: Learner Background, Learner Independence, and Learner Interdependence. Within the code Instruction, three "child codes" were identified: Instructional Goals, Differentiation and Assessment for Instruction. This configuration of codes prompted researchers to return to the work of Darling-Hammond & Bransford (2005), who identify the three realms of teacher knowledge: teaching, learners, and content. Our initial codes Student Characteristics and Student Response aligned with Knowledge of Learners. Our initial code Instruction aligned with Knowledge of Teaching. The initial codes Content/Subject Matter and Curriculum aligned with Knowledge of Subject.

Data Collection Schedule

Data were collected about the NTS teachers during the entire academic year during Year 2 (and also Year 1 as reported in Kinnucan-Welsch, Hendricks, Erchick, Smith, Stroot, Shervey, & Currell, 2007). The research year was divided into 6 cycles, or visits. Cycle 1 occurred at the beginning of the school year. During Cycle 1 field researchers introduced the study, established rapport with the teacher participant, and completed Physical Environment Survey. Cycles 2 through 5 were scheduled from early October to April. During these visits, the field researcher observed the teacher according to CLASS protocol and recorded a post-observation interview using the Year 1 and 2 interview guide. The Content Knowledge for Mathematics Teaching Survey was completed by teachers licensed in and teaching mathematics content. Cycle 6 occurred sometime in the last two weeks school was in session. Cycle 6 did not include an observation, but the field researcher conducted an unrecorded exit interview. Year 3 NTS participants were observed using the CLASS protocol one time and were interviewed using the Year 3 interview guide.

The majority of LSS data were collected during January through April of the 2007-08 academic year.

SELECTED FINDINGS AND DISCUSSION

Results are reported for all first year teacher participants in the LSS and NTS strands for years 2006 – 2007 (n=21) and 2007 – 2008 (n=107). Results from the NTS strand first year teachers (n=29) for 2006 – 2007 and 2007 – 2008 are also reported. Results for teachers who participated in a second or third year of the study are not included in this report.

Demographics of NTS and LSS Participants

Demographic profile data for NTS and LSS participants are displayed in Table 1. These data are also compared to the state of Ohio data. The typology of districts in which the participants were teaching is displayed in Table 2.

Table 1. Participant Demographics

Descriptive Demographics	NTS n=29	LSS n=78	First Year Teachers n=109
Number of schools	20	66	86
Number of districts	17	76	93
Gender	66% female	85% female	79% female
Number of IHE represented	13	24	26

Table 2. Grade Levels and Subjects Taught

Grade Levels and Subjects Taught	NTS N=29	LSS N=78	First Year Teachers N=107
Grade			
4	2	15	17
5	3	20	23
6	12	14	26
5,6	2		2
7	3	14	17
6,7	1		1
8	4	14	18
7,8	1	1	2
6,8	1		1
Subject			
Math	21	46	67

Reading	4	28	32
Math & Reading	4	4	8

Tables 3, 4, and 5 summarize the characteristics of the districts in which the participants taught.

Table 3. Percent Districts in ODE Districts by ODE Typology For First Year Teachers

District Type	NTS n=29	LSS n=78	First Year Teachers n=107
1	3%	5%	5%
2	10%	7%	7%
3	28%	11%	12%
4	32%	34%	36%
5	10%	3%	6%
6	10%	19%	16%
7	7%	21%	18%

See Appendix C for definition of typology

Table 4. District Typology by Setting for First Year Teachers

Setting of District	NTS n=29	LSS n = 78	First Year Teachers n=107
Suburban	41%	37%	36%
Urban	17%	41%	42%
Rural	42%	22%	22%

Source: Ohio Department of Education (ODE), based on 2000 census data, updated in 2004

Table 5. District Typology by Poverty Level for All First Year Teachers 06-08

Poverty Level of District	NTS n=29	LSS n=78	First Year Teachers n=107
Low Poverty	42%	50%	48%
Medium Poverty	34%	11%	17%
High Poverty	24%	39%	35%

Source: ODE, based on 2000 census data, updated in 2004

Teacher Education Program Characteristics

Forty-three Ohio IHEs responded to the online survey about Adolescent/Young Adult Mathematics and Middle Childhood Education Reading/Mathematics programs. Data were analyzed in order to determine differences across teacher education programs. Factor analysis with the 55 program data factors yielded six clearly defined components:

1. Placement/Diversity
2. Entry Requirements for Math
3. Exit Requirements for Math
4. Entry Requirements for ELA
5. Exit Requirements for ELA
6. Other Program characteristics (cohort, induction support, semester/quarter, etc.)

SPSS varimax rotation explained 67% of the variance in the dataset. Each component explained between 14% and 9% of the variation, indicating that none of the components were particularly indicative of the variation among preparation programs. The fact that no major components represented a substantially higher portion of the variability indicates that Ohio teacher preparation programs are relatively homogeneous. We believe NCATE requirements and other legislative requirements have guided this homogeneity. The majority of institutions locate content course work in Arts & Sciences Colleges; clinical assessments are standardized. The length of the program did not load on any of the significant components; in other words, there was not enough variability in the program length across the dataset to be significant.

CLASS Data

CLASS data were analyzed through descriptives, linear regression, and correlations with other data sets, including district setting, district poverty level. For each Domain within the sample, overall average Domain scores for the sample of 109 participants are as follows.

Table 6. Mean and Standard Deviation for CLASS Domains

Domain	NTS n=29	LSS n=78	First Year Teachers n=107
Emotional Support	5.19 (.49)	5.5 (.97)	5.42(.88)
Classroom Organization	5.12 (.70)	5.45 (1.08)	5.36(1.0)
Instructional Support	4.00 (.75)	4.23 (1.28)	4.17(1.17)
Student Engagement	4.80 (.56)	5.36 (1.00)	5.30(1.07)

We wanted to know whether or not district setting made a difference in CLASS scores and resultant Domain means. Using ANOVA in SPSS, significant differences were identified for Instructional Support when comparing CLASS scores between the three settings of rural, urban and suburban. ($F(2,104) = 3.057$, $p = 0.05$)

Likewise, we wanted to know whether of not poverty level made a difference in CLASS scores and Domain ratings. Using a one way between subjects ANOVA in SPSS, significant differences were identified for Instructional Support when comparing CLASS scores between the three settings of high poverty, medium poverty and low poverty ($F(2,104) = 3.90$, $p = 0.056$)

Table 7 contains the average Domain scores both by setting and poverty. Following that table is a discussion of the post hoc analysis completed after the ANOVAs demonstrated significant difference between settings and between poverty levels.

Table 7. Mean Domain Scores by Setting and Poverty

	Setting			Poverty		
	Rural	Urban	Suburban	High	Medium	Low
Emotional Support	5.28 (.79)	5.52 (.92)	5.39 (.89)	5.39 (.89)	5.18 (.72)	5.53 (.92)
Classroom Organization	5.08 (.75)	5.49 (1.12)	5.39 (.98)	5.39 (.98)	5.05 (.61)	5.46 (1.12)
Instructional Support	3.86 (1.13)	4.03 (1.18)	4.52 (1.11)	4.52 (1.11)	3.87 (1.02)	4.00 (1.21)
Student Engagement	5.06 (1.01)	5.43 (1.06)	5.31 (1.11)	5.31 (1.11)	4.90 (.82)	5.45 (1.09)

A one way between subjects ANOVA was conducted to compare the effect of low medium and high poverty on CLASS scores; the analyses was also conducted comparing the effect of urban, rural and suburban settings on CLASS scores The following is a summary by CLASS domain.

Emotional Support: There are no significant differences among first year teachers' mean scores for Emotional Support with regard to poverty or setting; hence the first year teachers in high poverty schools and/or urban schools were rated similarly to first year teachers in low and medium poverty schools or rural and suburban schools.

Classroom Organization: There are no significant differences among first year teachers' mean scores for Classroom Organization with regard to poverty or setting; hence the first year teachers in high poverty schools and/or urban schools were rated similarly to first year teachers in low and medium poverty schools or rural and suburban schools.

Instructional Support: Instructional Support scores were significantly different by poverty levels ($F(2,104) = 3.90$, $p = 0.056$). Using Post Hoc analyses (Games-Howell and Tukey PostHoc), specific differences among CLASS scores by poverty levels and by settings were determined at the $p = .10$ level and are explained below:

Regarding poverty levels of low medium and high, the mean Instructional Support score is significantly higher in low poverty schools (M = 4.00) when compared to medium poverty schools (M = 3.87), with p=0.082 . The mean Instructional Support score is significantly higher in high poverty schools (M =4.52) than in medium poverty schools (M =3.87), with p=0.10. It is interesting to note that the mean score in the high poverty settings (M = 4.52) is higher than the mean score in the medium poverty setting (M = 3.87). Missing is any significant difference between Instructional Support scores in high poverty and low poverty schools. This finding seems counter intuitive to much of the literature that documents the instructional challenges first year teachers face in high poverty schools.

Regarding the settings of urban rural and suburban, Instructional Support scores were also significantly different (F(2,104) = 3.057, p = 0.05). The mean Instructional Support score is significantly higher in suburban settings (M = 4.52) than in rural settings (M = 3.86) with p = 0.07. There were no significant differences determined between urban Instructional Support scores and either rural or suburban Instructional support scores.

Student Engagement: For Student Engagement, the first year teachers' mean scores were significantly different in low poverty schools than in medium poverty schools. The first year teachers in high poverty schools were rated similarly to first year teachers in low and medium poverty schools. There was no difference based on setting.

Table 8 contains a correlational table demonstrating the correlations among the four Domain scores for the sample of all first year teachers from 2006-08. All correlations are significant.

Table 8. Correlations among Domains for First Year Teachers (N = 107)

Domain	Emotional Support	Classroom Organization	Instructional Support	Student Engagement
Emotional Support	1.00			
Classroom Organization	.778*	1.00		
Instructional Support	.700*	.618*	1.00	
Student Engagement	.692*	.758*	.516*	1.00

*Significant at α = .01 (2-tailed)

Table 9 contains a correlational table demonstrating the correlations among the four Domain scores for the NTS sample of first year teachers from 2006-08. All correlations are significant.

Table 9. Correlations among Domain for NTS First Year Teachers (N = 29)

Domain	Emotional Support	Classroom Organization	Instructional Support	Student Engagement
Emotional Support	1.00			
Classroom Organization	.730*	1.00		
Instructional Support	.835*	.633*	1.00	
Student Engagement	.517*	.861*	.371*	1.00

*Significant at α = .05 (2-tailed)

The high correlation among the Domains is supported in Pianta's work (Pianta et al, 2008).

Further analyses using linear regression on the Domains demonstrated that the predictive value among the Domains was not constant. Table 10 contains the model for Emotional Support; Table 11 for Classroom Organization, Table 12 for Instructional Support, and Table 13 for Student Engagement.

Table 10. Emotional Support N = 107

Hypothesis	*B*	*SE B*	*p* > |*t*|
Constant	1.538	.270	.000**
Classroom Organization	.375	.081	.000**
Instructional Support	.240	.053	.000**
Student Engagement	.164	.069	.019**

Note. Model Significance: $F(3, 103) = 77.24$, $p = .000$, $R^2 = .692$

** Significant at $\alpha = .05$

Three Domains are significant in the predictive model for Emotional Support. Emotional support is the one Domain that embodies the other three in a predictive model with N = 107.

Table 11. Classroom Organization N = 107

Hypothesis	*B*	*SE B*	*p* > |*t*|
Constant	.361	.342	.294
Student Engagement	.379	.069	.000**
Emotional Support	.461	.099	.000**
Instructional Support	.118	.063	.138

Note. Model Significance: $F(3, 103) = 83.49$, $p = .000$, $R^2 = .709$

** Significant at $\alpha = .05$

Student Engagement and Emotional Support are the only two Domains that are predictive of Classroom Organization.

Table 12. Instructional Support   N = 107

Hypothesis	*B*	*SE B*	*p* > |*t*|
Constant	-.981	.513	.059**
Classroom Organization	.274	.147	.066
Student Engagement	-.002	.120	.985
Emotional Support	.682	.152	.000**

Note. Model Significance: $F(3, 103) = 34.89$, $p = .000$, $R^2 = .504$

** Significant at $\alpha = .05$

Besides the constant, Emotional Support is the only Domain that is predictive of Instructional Support.

Table 13. Student Engagement   N = 107

Hypothesis	*B*	*SE B*	*p* > |*t*|
Constant	.427	.427	.319
Emotional Support	.315	.133	.02**
Instructional Support	-.002	.081	.985
Classroom Organization	.592	.108	.000**

Note. Model Significance: $F(3, 103) = 51.40$, $p = .000$, $R^2 = .600$

** Significant at $\alpha = .05$

The clear finding from these analyses is the key role that Emotional Support plays in determining the ratings in all other Domains. If a novice teacher does not demonstrate Emotional Support, he or she will be poorly rated in all other Domains. This finding supports much of the literature that suggests relationships between teacher and students and between students and students are critical to academic success.

Content Knowledge for Mathematics Teaching Survey

Participants in the Novice Teacher Study strand completed a Content Knowledge for Mathematics Teaching Survey (MCK) during each year of participation. Table 15 contains the MCK scores from the 2006-07 NTS study participants. The scores are represented as percentiles.

Table 14. Math Content Knowledge (MCK) Percentage Scores for NTS first year teachers

Descriptives	Percentage Scores N = 25
Mean	74.36
Median	72.73
Standard Deviation	13.89
Range	54.54
Minimum	40.91
Maximum	95.45

Table 15. Percent Correct Responses in Math Content Areas

Mathematics Content and Process Standards	Number of Items on MCK Survey	Percent With Correct Answers
Number and Number sense	13	77.53%
Algebra	10	73.2%
Geometry	9	53.3%
Measurement	1	60%

Data Analysis and Probability	2	88%

From an item analysis of the Content Knowledge for Mathematics Teaching Survey in Table 15, it appears that novice teachers have the most difficulty with Geometry. Because of the scant numbers of items focusing on measurement and data analysis and probability, no further conclusions can be drawn. We analyzed CLASS data and MCK data for first year teachers in 2006-2008 (n = 25) who had taken the MCK survey and found no significant correlations among CLASS Domains and MCK scores (Table 16).

Table 16. Correlations Between CLASS and Math Content Scores

Domain	Emotional Support	Classroom Organization	Instructional Support	Student Engagement	MCK
Emotional Support					
Classroom Organization	0.73*				
Instructional Support	0.83*	0.63*			
Student Engagement	0.52*	0.82*	0.35		
Math Content Knowledge	0.07	0.06	0.06	0.01	

*Significant at α = .05 (2-tailed)

Qualitative Findings and Discussion

The interview data from ten first-year teachers comprise these findings. The ten teachers were classified as either "high scoring" or "low scoring," according to quartile rankings of CLASS domain means. To be identified as "high scoring," teachers had to be in the highest quartiles in Emotional Support, Instructional Support, and in at least one other domain and be "medium scoring" in the remaining domain (n= 5). To be identified as "low scoring," teachers had to be in the lowest quartiles in Emotional Support, Instructional Support, and in at least one other domain, and be "medium scoring" in the remaining domain (n=5). Findings are reported at the secondary coding level, which categorizes selected data into in the areas of Knowledge for Teaching, Knowledge of Learners, and Knowledge of Content, in accordance with our theoretical framework.

Knowledge of Teaching

In the American Education Research Association report on research and teacher education, Grossman (2005), editor of the chapter on pedagogical approaches in teacher education, identifies two broad areas in the literature: classroom instruction and interaction and tasks and assignments. Classroom instruction and interaction include the relational aspects of teaching and learning and particular strategies, such as case studies, simulations, and role playing (p. 426). Tasks and assignments, she argues, "represent crucial ingredients in the pedagogy of teacher education as they focus students' attention on particular problems . . . and introduce them to ways of reasoning or performing" (p. 426). Although Grossman is referring to pedagogical approaches in teacher education, we find her distinctions useful for our research, because we chose to observe classroom instruction using CLASS, an instrument to assess the quality of interaction and the nature of instruction, rather than using means, such as participant observation or video-taping, to describe instruction and instructor-student interaction. Our interview protocol focuses on specific aspects of the observed lesson in order to prompt novice teachers to articulate their practice. While we strongly believe that all nature of relationships in the classroom are critical to student achievement, the structure of our research questions and the types of data we collected focus more on tasks and assignments, which can be seen and talked about more concretely than relationships.

Our analyses of the data contained in the initial code Instruction resulted in the identification of the "child" codes Clarity of Instructional Goals, Assessment for Instruction, and Differentiation, all of which we later classified as Knowledge of Teaching

Clarity of Instructional Goals. The "child" code Clarity of Instructional Goals was identified as we found marked differences in the ways novice teachers talked about their instructional goals for the observed lessons. After the identification of the child code, we connected Clarity of Instructional Goals to the fact that the state of Ohio, in which all participating teachers attended teacher education programs, has adopted the PRAXIS III assessment as the means for determining whether a novice teacher is worthy to move from a provisional license to a professional license. One of the criteria of the PRAXIS III assessment is "the articulation of clear learning goals." Inasmuch as Title II in Ohio requires the reporting of PRAXIS III pass rates of graduates for each institution of higher education, we are confident that "the articulation of clear learning goals" is a component of all teacher preparation programs and of common assessments across the state. Therefore, it was somewhat surprising that we found such differences in the clarity of novice teachers' instructional goals.

The high scoring Teacher 31 specifically identifies what mathematical insights he wants his students to realize as a result of the instructional activities:

> Yesterday they had ten designs that they had to find the area and perimeter. So today it had to deal with what they did yesterday. I had them look at [design G], one of the first activities where it was 11 square units, and they had to keep the 11 square units, but think of different designs or different perimeters that would result in different designs, so they can see, "Oh, I still have 11 square units, but I can get 12 as my perimeter or I can get 15 as my perimeter."

Contrast low scoring Teacher 27's description of the instructional aims of her observed lesson:

> I think [the lesson] went really well, the focus was just to make sure they understood the parts that are going to be on that test on Tuesday. And asking each other questions that I gave them and getting them quick, too. It's not just about being able to figure it out, it's doing it multiple times and understanding, going quicker and quicker, knowing the answers rather than discussing them.

Her goals for student outcomes are so vague that many reading her response will not be able to guess the content she taught. Most readers guess mathematics when, in fact, she was teaching a reading lesson.

Research in the writing, and hence conceptualizing, of instructional goals and objectives has moved from the behaviorist dictum of prescribing student outcomes in terms of observable student behaviors performed under identified conditions that meet specified criteria (Mager, 1975) to more cognitive objectives that address high levels of learning and identify sample behaviors as evidence of student attainment of the objectives (Gronlund, 2004). Popham (2005), a former proponent of precise behavioral objectives, now advises teachers to create learning goals that are "truly salient, broad, yet measurable" (p. 104). High scoring teachers in our study were very clear and intentional about the concepts and processes they wanted students to learn. Our high scoring teachers articulate clear educational outcomes for their students.

Assessment for Instruction. Countless professional development workshops are occurring across the country to promote teacher learning in the difference between assessment of learning and assessment <u>for</u> learning. Current research suggests that effective teachers engage in formative assessment, that is, continuous assessment during the instructional process to improve student learning and teaching (Stiggins, 2008). Our interview protocol specifically asked teachers whether or not students had achieved the instructional goals set for the observed lesson. A follow-up question asked the novice teachers how they knew whether or not students were learning what was intended. Invariably, low scoring teachers would respond, when asked how they could tell if their students were achieving the instructional goals, as Teacher 11 did, "Well, obviously their facial expressions." Relying solely on body language to gauge the nature of student understanding is risky at best. While common sense tells us that the expressions on students' faces do communicate, our high scoring novice teachers looked for additional evidence, as is revealed in the response of Teacher 28 when asked, "What led you to understand that they were having problems?":

> With that group, usually if there's three or four hands, you can get a feel. Mostly the type of questions I was getting from the type of kid they were coming from. A lot of those kids in there are very . . . very good at picking up new math skills. So, just based on the writing question, some of the kids in the classroom weren't picking up on it but they won't ask questions either because they are shy or they are not paying attention. Usually the ones that are right on task and on point were having a lot of struggle so that is why I kept following it and reteaching it. Presenting it a little bit of a different way. There are only so many ways you can improve on that. But, just basically the questioning and the looks of confusion and the types of question.

Teacher 28 does use facial expressions as indications of student learning, but he also considers the types of questions students ask as additional evidence.

Some of our high scoring teachers purposefully designed lessons so that the mechanisms of formative assessment were transparent to both the students and to the teachers themselves. Teacher 01's response illustrates how she used the instructional activities to make the degrees of student understanding visible. She has planned, as evidence of their comprehension, for students to be able to demonstrate the mathematical concept of the lesson in three different ways.

> I had them work with partners and work with manipulatives, interlocking cubes, and they had to show me two different ways that they could show me the answer of how they could come up with how many applesauce jars would go on each shelf and then they also had to include a picture. So they can use the hands-on, they can draw the visual and they use the actual algorithm. A lot of students were using it as, even though it's more of a

> division problem, they were doing it - approaching it as a multiplication problem and working kind of backwards to get to their answer.

By providing students with a variety of ways to solve the problem and demonstrate their understanding, Teacher 01 ensures that she will know if students with different abilities and learning styles are successful. Her ability to design multiple instructional activities and to recognize and interpret student strategies in problem solving also attest to the depth of her content knowledge.

Differentiation. Differentiated instruction is an acknowledgement that it is no longer possible to teach the fourth grade—one must teach the students who are in fourth grade whose developmental levels, academic abilities and background knowledge, and diversity range widely. While increasingly curriculum is leveled to meet the needs of below-grade, at-grade, and above-grade level students, effective teachers continue to create, share, and "steal" materials to promote the learning of all students, as indicated in high scoring Teacher 03's comment on the materials she used in her observed lesson:

> The resources I used with the [book] and [book] group came from, actually, our gifted group coordinator. She makes sets of higher-order thinking questions to go along with each story and other activities that you can do. That is what I used for those two groups and also with the [book] and [book] group, I used the cards, the discussion cards, that I saw the presenter use at a conference I went to on Tuesday. So I got that idea and stole that and used that because they like to pull a card. If the discussion's not going well, they're having trouble talking about something, that is a good thing to do. I thought it went pretty well.

Teacher 03 ensures that her above-grade level students are challenged by seeking assistance from the gifted coordinator, and she scaffolds her below-grade level learners with the use of question cards.

Contrast her efforts with those of Teacher 30. The field researcher asked Teacher 30 what his thinking was when he had his math students take notes.

> It's not my favorite thing, but there's such a wide range of students in my classes, especially the first class I have and the last class I have....same class....not....there is a little narrower of a range...In the last class you just observed, there's kids who right now struggle with the concept of what multiplication is and then I've got kids whose parents have already taught them to solve linear functions and solve for x and y, and whose older brothers and sisters told them those things. So I've got kids who are like "Oh my gosh, this is so easy" and get it immediately, and I've got kids that the word fraction...they are not even completely positive of what it means. So its hard to do...I know you are supposed to do all of the constructivist

> activities that you know you are always told you are supposed to do...it's the best way to learn, it's been proven over and over it's the best way to learn. But I don't always have time to A, put those together, B have all the resources to do those things. My resources are really, really limited.

Teacher 30 knows that his students' mathematical knowledge diverges wildly, from students who have not yet master multiplication to students who know how to solve linear functions. Apparently his solution to even the playing field and to increase the knowledge of his struggling students is to have all students take notes about the mathematical concepts in the lesson. Teacher 30 admits the futility of his strategy. He clearly has been taught that the development of mathematical understanding is a constructivist endeavor, but he is overwhelmed and cannot design and implement the differentiated curriculum that a constructivist approach requires. Teacher 30 accurately accesses his situation—as a first year teacher, he does not have the time to develop materials he needs to scaffold the below-grade level students and to challenge the above-grade level students. Apparently, unlike Teacher 03, Teacher 30 does not have the human and physical resources he needs adequately support student learning in his classroom.

Knowledge of Learners

One of the central tenets of constructivist theory is that learning is the active and personal construction of knowledge (de Kock, Sleegers, & Voeten, 2004). Two of our initial codes, Student Characteristics and Student Response, which were included in our secondary coding level as Knowledge of Learners, describe the instances in which student background knowledge and characteristics of the students as learners were discussed by the teachers. The secondary code Knowledge of Learners was then re-analyzed and three distinct areas emerged: Student Background Knowledge, Learner Independence, and Learner Interdependence.

Student Background Knowledge. Critical to cognitive and constructivist theories of learning is the background knowledge—prior knowledge is the foundation for the construction of new knowledge. High scoring novice teachers elicit their students' background knowledge and recognize the role it plays in anchoring new knowledge, as is evidenced in high scoring Teacher 01's comments about her students' performance:

> So, one big thing we're trying to work on is to try to interlink the multiplication and the division which is great because even though it was a division problem they were still approaching it as a multiplication problem. So, they know multiplication, they're getting to a

> point where they know it pretty well. So, it's good that there is this connection so they can build on it from there.

Contract Teacher 01's appreciation of her students' efforts with low scoring Teacher 11's assessment of her students, who do not yet know their multiplication tables:

> They won't get that motivation [to learn their multiplication tables] until I make it consequences for them and I haven't made that yet just because I know that they'd be having consequences all year. So, hopefully, I can come up with something or we can come up with something as a staff to make it worthwhile to them understand multiplication tables. Cause they certainly aren't getting that at home. I mean, when I grew up, I had to know it and everything. You know, if they don't get it here, they're not gonna get it at home.

Teacher 11 is aware that her students lack the background knowledge necessary to learn additional mathematics, as do her teacher colleagues. However, the strategy she uses appears to be one of "blame and shame." Teacher 11 does not want to begin punishing her students for their lack of knowledge, because she believes she will have to punish them for the entire school year.

Learner Independence. According to Windschilt (2002), meaningful learning occurs when teachers provide students with the informational and physical resources necessary to mediate learning. High scoring Teacher 01, when asked what resources she did not use during the lesson, but wished that she had, responded with the following:

> I think grid paper might have helped. Looking back, grid paper might have helped because when they draw the shapes--sometimes drawing the shapes helps rather than having the physical shape in front of them. I noticed some of them drawing the shapes because the trapezoid they had in their [collection of shapes] is not always what a trapezoid looks like. Drawing on [plain] paper is difficult, so if they had grid paper they could have charted it out a little better.

By carefully observing her students at work, Teacher 01 has realized that the representations provided (manipulative geometric shapes) have not supplied the information required, and students were generating their own representations (by drawing a more familiar trapezoid). Her future intention is to further support students in generating the information they need to solve the problem by providing appropriate resources, in this case, graph paper.

Low scoring Teacher 07 actively discourages her students from their desire for independent learning, as indicated by their request to read ahead of the class.

> They like it. I think it's going well. They like not bringing their book to class. But, in general, I think they like the book. Like a lot of them have asked me if they can read ahead and stuff like that. I'm trying to hold them back a little so that they're not bored in class. I think they do like it. It's not a terribly long book and so I think that's helpful that we're not jumping into a three hundred page novel, or something. And, they had experience in the past doing novels. Like in fifth grade they read a book together as a class. So, I think they were excited about it because it was a change of pace (emphasis is ours).

Learner Interdependence. The "child" code Learner Interdependence focuses on social nature of learning. Creating a learning community in one's classroom means creating the belief that the needs of all members of the community will be met through the commitment to work together (Bransford, Goldman, & Cocking, 1999). High scoring Teacher 01 alternates between having her students work individually and collaboratively. She recognizes the benefits and trade-offs of each strategy and plans accordingly:

> They did it a little bit individually, like I said before, they get a little bit more done sometimes if they work individually but when they struggle, I like for them to work with each other. That frees me up to walk around so they can use me as a resource as well then. I also offer to have a classroom set of books and I said if anybody wants to use the books as a resource to maybe look up the definition if you don't really know what a rhombus is you can use the book to look it up and figure out what it is and then you can apply that to what you're doing in the class.

She promotes learner independence through having resources available and learner interdependence, having students help each other and freeing her expertise to used where it is needed most. According to Shepard, Hammerness, Darling-Hammond, and Rust, (2005), the realities of today's classrooms prevent teachers having time for one-on-one tutoring and shepherding individual students through the learning process. To respond to this reality, Teacher 01 creates a learning community in which students help each other learn.

High scoring Teacher 28 acknowledges that sometimes students can best teach each other and formally encourages them to do so:

> Sometimes it's the way they word it or the way they actually show or, I think, if the learner actually sees another student doing it, they can watch exactly what they are doing. They think when I am putting something on the board, it's how the teacher does it or it's the perfect way to do it. You can show them multiple approaches of multiple different students and they are watching that, I think they can suck that information up a little better. I think that it definitely helps to have them present it. That is something I try to do once a week or once every other week. It's pretty much how I teach social studies. It's a lot of group presentations, a lot of one student explaining something, you know, maybe they look at it differently.

The high scoring teachers purposefully create learning communities, while the low scoring Teacher 32 "does" groups and group work. She does not articulate an academic or social reason for having student work together, but rather appears to mix individual and group activities in order to prevent boredom. When asked how the observed lesson went, she responds:

> It was alright. I think I've been doing a lot of group work lately, and I think it's been too much because they usually - they do really well with group work…and overall, for the most part… And Monday and Tuesday we did something with groups, and then I can't even remember last week…kind of we did…and then before Thanksgiving we were doing a lot, so I think they're getting a little bit of overkill on group work, so they were a little more antsy than I was hoping for. So, it was ok, but it could have been better.

Knowledge of Content/Subject Matter

Numerous studies attest that teachers should have deep knowledge of the content they teach (Grossman, Schoenfeld, & Lee, 2005). For example, a majority of studies show a positive correlation between secondary school teachers' study of mathematics and student achievement in mathematics and the number of science courses teachers take in college and their students' achievement (Floden & Meniketti, 2005). Our high scoring teachers exhibited their Knowledge of Subject Matter in their articulation of content in great detail and in their understanding of the structure of the discipline.

Structure of the Discipline. Bruner (1966) developed a teaching model, based on what he called the "structure of knowledge," which is designed to sequence learning so that knowledge is most accessible. Bruner's vision was for students to grasp, transform and transfer, which pedagogically requires new concepts to be taught first enactively (that is, hands-on activities with manipulatives), iconically (using pictographs or other visuals to represent concept), and finally symbolically (using formulas or other abstract notation). Teaching using Bruner's model requires teachers to have in-depth, detailed understanding of mathematical concepts. High scoring teacher 28 uses his knowledge of mathematics to help students learn conceptually and not just memorize formulas:

> What we did to construct and just to practice to get the general idea that volume means cubed we actually use centimeter cubes and we constructed four or five guided shapes where I told them what to make and we talked about width and height, and I also had them just kind of mess around make shapes however they could construct them with the volume of 24 cm. So the whole idea behind that is to them to realize why we use cubed to label volume, and also to understand that knowing the formula is important enough, to not have to use little shapes. Then we used a worksheet and the over head to talk about how to find the volume of prisms, rectangular prisms, cubes and also to find rectangular pyramids. So we went through those. We talked about the two formulas involved with those. I was hoping to tie together the construction of the shapes to the formulas. . . . I think that probably the majority of the whole class with the exception of maybe one or two could calculate volume of every shape now that we've covered today.

Low scoring Teacher 27 squanders opportunities to enhance student learning, even when student performance suggests they are ready for further learning:

> We read the story Tuesday after going over the vocabulary on Monday. I was just trying to get them through it because it's not like the most important story ever. But, just getting them to know the vocabulary words is really important, so I was amazed at how well they understood the story having only read it once in class.

Intersection of Knowledge of Teaching, Knowledge of Learners, and Knowledge of Subject Matter

As our theoretical framework suggests and the findings from our qualitative analyses confirm, for novice teachers to be successful they must have sound Knowledge of Teaching, Knowledge of Learners, and Knowledge of Subject Matter. It is our contention that the highest scoring novice teachers have integrated these bodies of knowledge so that when they discuss classroom interaction it is difficult to label one event as Knowledge of Learners or Knowledge of Teacher. Reconsider Teacher 01 lesson in problem solving:

> I had them work with partners and work with manipulatives, interlocking cubes, and they had to show me two different ways that they could show me the answer of how they could come up with how many applesauce jars would go on each shelf and then they also had to include a picture. So they can use the hands-on, they can draw the visual and they use the actual algorithm. A lot of students were using it as, even though it's more of a division problem, they were doing it - approaching it as a multiplication problem and working kind of backwards to get to their answer.

Although we used this passage to highlight how Teacher 01 makes her formative assessments transparent, we equally could emphasized the mathematical knowledge required for her to have her students working on so many different representations of a single problem. We also could have inferred Knowledge of Learners as she is providing for the needs of many different learners—hands-on learners, visual learners, learners with more advanced levels of mathematics than other students, that is, those who use an algorithm to solve the problem or those who recognize the problem as division.

High scoring Teacher 28 also integrates his knowledge of teaching, learners, and subject matter. He is highly aware of the various developmental levels across his classes and how these influence his pedagogical strategies. It is a rich knowledge of learners—" knowing their backgrounds, knowing their scores in language arts, knowing their scores in social studies and science, like talking to their teachers every day, I know that that group is just, they're ready for whatever you can give them." He analyzes student work so he has a very detailed knowledge of their mathematical knowledge—"like I showed you with those scores, it showed me very specifically what they are lacking. His knowledge of mathematics and the mathematics required for certain activities enable him to design work at his students' zone of proximal development as is indicated in the passage below:

> They were confused on the order of operation. They were not understanding that if....this is with the pyramids, not the prisms...I actually found no errors in the prisms because they are very solid at figuring out perimeter and area. They have that good foundation. The problem was they were dividing by three rather than finding what all of the dimensions multiplied together divided by three were. They were dividing the last number by three. That was the only mistake I actually saw. Typically with that class, there will be no mistakes or once in a while I'll find I have omitted something and I can go back and figure out what that is. Like I showed you with those scores, it showed me very specifically what they are lacking and like you have seen with that class, that's not much. What I try to do is pick on the little areas where they can get better. Overall, usually with that class, it's a lot of....I'll model something or I'll have them figure it out on their own. It's one or the other and a lot of the time we will do very quick little group projects. Today wasn't extremely structured but to build the bigger shapes the groups are really fast. I had them put their blocks together. I tried to get them to learn on their own sometimes as well because it's a big step with intellect is from when you go from just being hand fed everything to when you can start to self-discover and you can look things up on your own and you can tie together ideas. And I think that group of kids is, they're ready for that. I wouldn't say that all sixth graders are ready for that. But I would say that based on being around those kids and knowing their backgrounds, knowing their scores in language arts, knowing their scores in social studies and science, like talking to their teachers every day, I know that that group is just, they're ready for whatever you can give them. They can always do more and so we do a lot of extra stuff. I think I am going to do a scale model of the solar system with them. We have decided we want to do that. And we get to scale factor in the next two weeks I think I am going to start fiddling with that idea. And that is something we won't be able to do with the other classes. It's a lot of individual work. It's a lot of....one group will make a planet to scale....then you make the distances to scale. It's a lot of work and I have found a project like that I want to do. We'll see if it works.

Conclusions and Directions for Future Research

As noted in the introduction to this report, we are not able to suggest conclusions about differences in characteristics, instructional practices, and understandings among first year teachers based on a value-added continuum. However, we are able to offer conclusions based on our findings that do further our understanding of first year teachers, their classroom practice, and the context in which they teach. We also suggest directions for future research.

Teacher Preparation

The findings related to 55 teacher preparation program characteristics indicated that none of the six identified components (diversity in field placements, entry and exit requirements for mathematics, entry and exit requirements for English/Language Arts, and a combination of factors), were not particularly indicative of variation across programs. Based on this finding, we concluded that program characteristics in teacher preparation in the State of Ohio, as defined in this research, do not vary across institutions. This finding was not surprising to us given that institutions must offer programs that comply with explicit program standards and legislated requirements. Other research, however, is not consistent with our finding. Zientek's (2007) research examining quality across traditional, post baccalaureate, and alternative preparation routes detected differences among teachers within the traditional certification route, suggesting differences within components. Furthermore, the scant research on effects of coursework in the Arts and Sciences on teacher knowledge does not shed much light on the contributions of those components (Floden & Meniketti, 2005). If the structural and programmatic characteristics of teacher preparation are similar across programs, then it might be useful to look for differences beyond the structural characteristics. Darling-Hammond (2006, 2010) pointed to conclusions from recent research indicating that some teacher education programs produce graduates who have more positive effects on student achievement than others. The descriptions of these programs include what the pre-service teachers do as part of these programs that likely contribute to their effectiveness. Examples include frequent critical analysis of teaching, including action research; structured and guided clinical experiences, and immersion into multicultural experiences and the opportunity to see and apply in action how exemplary teachers reach all students.

Classroom Quality and Instructional Practice

Given that value-added data were not available, we have not identified differences among teachers on classroom quality and instructional practice along the value-added continuum. We did find some interesting differences in classroom quality based on setting, as well as differences in how high scoring and low scoring teachers (based on CLASS domain mean ratings) talk about their practice.

Some caveats are worth noting at the outset. We are reporting findings of classroom quality based on the CLASS observation measures from classrooms in grades four through eight. Pianta and colleagues have published research that focuses on early childhood and early elementary settings (Hamre & Pianta, 2007), while our research occurred in the upper grades. Observational classroom research in upper elementary and secondary classrooms is scarce, so it is difficult to interpret our findings in the context of other studies. Furthermore, our research was based on early versions of CLASS, and the authors have made some changes to the framework (Hamre & Pianta, 2007).

Our findings indicate that all CLASS domains are related, and that emotional support is predictive of all other domains. Emotional support was rated more highly among all first year teachers than other domains, specifically instructional support. The importance of emotional and instructional support in the classroom to student achievement and child development has been well-documented (Pianta, Belsky, Vandergrinft, Houts, & Morrison, 2008; Hamre & Pianta, 2007) and has strong theoretical grounding as well.

The findings related to CLASS domains among first year teachers in different district settings (rural, urban, suburban) and district poverty levels were more perplexing. In rural settings, emotional support and instructional support was significantly lower than in suburban settings. Interestingly, in high poverty settings there were no detected differences in emotional support; however, instructional support was stronger. We interpret these data with caution, particularly given the small sample sizes for both rural and medium poverty groups. Given that caveat, we suggest that the increased focus on preparing teachers to teach in urban, high poverty settings may account for the relative strength of this group of first year teachers in terms of instructional support scores. Furthermore, urban districts may have well established mentoring programs that provide targeted assistance in supporting new teachers to be successful in urban settings. We also suggest that the challenges faced by teachers in rural school districts may be overlooked, and warrants additional attention both in teacher preparation programs and in mentoring support for first year teachers.

When we analyzed the interview data by high and low scoring teachers on CLASS domains, differences in how teachers articulated knowledge of content, knowledge of teaching, and knowledge of students became clear. High scoring teachers were intentional about goals for instruction and drew upon their knowledge of the content in designing and enacting instruction. Their descriptions suggested they were adept at using formative assessments to drive instructional decisions, both in the moment and in the future. They also used assessment data for differentiating instruction. They incorporated knowledge of their learners into instructional plans and for building classroom community. These high scoring teachers integrated these dimensions, knowledge of content, learners, and teaching, throughout their responses to the interview questions. Low scoring teachers were not as clear in articulating knowledge of content, nor were they able to describe a clear and intentional plan for their teaching. This analysis is preliminary, based on a subset of teachers, but it suggests that the *How People Learn* framework posited by Darling Hammond and Bransford (2005) is useful in interpreting the characteristics and practices of first year teachers.

One finding that surprised us was that there was no detected relationship between Content Knowledge for Mathematics Teaching and any of the CLASS domains, most specifically instructional support. This could be due to the fact that the CKMT specifically focuses on the relationship between content knowledge and instruction. The dimensions in Instructional Support Domain do include Content Understanding, but CLASS observers, all qualified observers through training, were not required to be experts in mathematics content.

Suggestions for Future Research

The Teacher Quality Partnership research was designed to examine the effects of teacher preparation on teacher quality. The homogeneity of program characteristics in the state of Ohio suggest that structural features of programs will not shed much light on teacher quality. We might be better served by refining a research agenda that focuses on what happens inside of teacher preparation. How do the specific tasks embedded within teacher preparation programs differ? What do teacher educators do to prepare successful first year teachers? In other words, what are the student-teacher interactions among teacher educators and preservice teachers? Is it possible to look beyond programs to the interactions that contribute to high quality first year teachers?

This brings us to the question of teacher quality. Considerable attention, in terms of legislation, funded initiatives (federal and private), and research, is directed to the question of teacher quality (Bush Foundation, 2009; Gates Foundation, 2009, U.S. Department of Education, 2009). Others, suggesting that teacher preparation is only the beginning of teacher development, focus on the importance of high quality mentoring and induction to support new teachers in developing competence that will promote in student learning (Moir, 2010). The question of teacher quality is complex, and although teacher preparation programs should be accountable for preparing graduates who can perform competently as first year teachers, the variables of context, mentoring, and building leadership also contribute to teacher quality in the first year of teaching. Research on teacher effectiveness of first year teachers should account for the complexity of the constellation of variables that account for teacher quality. We are in the beginning stages of teacher quality research, and building robust theoretical and research frameworks is essential to move this work in directions that will inform all contributing factors to teacher effectiveness.

References

Anfara, V. A., Brown, K. M., & Mangione, T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researche*, *31*, 28-38.

Bush Foundation Teacher Effectiveness Initiative. Retrieved from http://www.bushfoundation.org/education/teinitiative.asp.

Darling-Hammond, L. (2010). Teacher education and the American future. *Journal of Teacher Education, 61*, 35-47.

Darling-Hammond, L. & Bransford, J. (2005). *Preparing teachers for the 21st century: What teachers should learn and be able to do*. San Francisco, CA: John Wiley and Sons.

Darling-Hammond, L., & Bransford, J. (In collaboration with P. LePage, K. Hammerness, & H. Duffy). (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do*. San Francisco, CA: Jossey-Bass.

Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher preparation: How well do different pathways prepare teachers to teach? *Journal of Teacher Education*, *53*. 286-302.

Darling-Hammond, L. (with Fickel, L., Macdonald, M., Merseth, K., Miller, L., Ruscoe, G., Silkvernail, D., Snyder, J., Whitford, B. L., & Zeichner, K.). (2006). *Powerful teacher education: Lessons from exemplary programs*. San Francisco, CA: Jossey-Bass.

Floden, R. E., & Meniketti, M. (2005). Research on the effects of coursework in the arts and sciences and in the foundations of education. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education*, 261–308. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., Publishers and Washington, DC: American Educational Research Association.

Hamre, B. K., & Pianta, R. C. (2007). Learning opportunities in preschool and early elementary classrooms. In R. Pianra, M. Cox, and K. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability*, 49-84. Baltimore, MD: Brookes.

Hill, H., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42,* 371-406.

Hoy, W. K., Smith, P. A., & Sweetland, S. R. (Dec. 2002/Jan. 2003). The development of the organizational climate index for high schools: Its measure and relationship to faculty trust. *High School Journal 88*(2)*,* 38-50.

Intensive partnerships for effective teaching. Retrieved Januray, 2010, from www.gatesfoundation.org/united-states/Pages/effective-teaching-fact-sheet.aspx

Kinnucan-Welsch, K., Hendricks, M. S., Erchick, D. B., Smith, S., Stroot, S., Shervey, B., Currell, C., & Franco, S. (2007, November). *Novice teacher study technical report NTS 07-01*: *Research brief 2004–2008*. Cincinnati, OH: Teacher Quality Partnership. ERIC # ED507971

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd Ed.). Thousand Oaks, CA: Sage Publications.

Moir, E. (2010). Defining, measuring, and articulating the impact of teacher induction. *Reflections, 12*(1), 1-3.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

NICHD Early Child Care Research Care Network (200). The relation of first grade classroom environment to structural classroom features, teacher, and student behaviors. *The Elementary School Journal, 102,* 367–387.

Patton, M. (1990). *Qualitative evaluation and research methods* (2nd Ed.). Newbury Park,CA: Sage Publications.

Pianta, R. C. (2004). *Classroom assessment scoring system [CLASS]*. Charlottesville, VA: University of Virginia.

Pianta, R. C., Belsky, J., Vandergrift, N., Houts, R., & Morrison, F. J. (2008). Classroom effects on children's achievement trajsctories in elementary school. *American Educational Research Journal, 45*, 365–397.

Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2006a). Classroom assessment scoring system manual: K–3 version. Charlottesville, VA: Center for Advanced Study of Teaching and Learning.

Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2006b). Classroom assessment scoringsystem manual: Middle/secondary version. Charlottesville, VA: Center for Advanced Study of Teaching and Learning.

Ryan, G. W. & Bernard, H. R. (2000). Data management and analysis methods. In N. K.Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd Ed.), 769–802. Thousand Oaks, CA: Sage Publications.

The recovery and reinvestment act of 2009: Saving and creating jobs and reforming education. Retrieved from January, 2010, from http://www2.ed.gov/policy/gen/leg/recovery/implementation.html

Theroux, K. (2007) A timeless university trains teachers for a new era. Retrieved January, 2010, from http://carnegie.org/publications/carnegie-reporter/single/view/article/item/177/

Yinger, R. (2005). *Teacher quality partnership: General proposal narrative*. Unpublished manuscript, University of Cincinnati.

Zientek, L. R. (2007). Preparing high-quality teachers: Views from the classroom. *AmericanEducational Research Journal, 44*, 959-101.

Appendix A

Consent Form for LSS

CONSENT TO PARTICIPATE IN A RESEARCH STUDY – NOVICE TEACHERS

Wright State University

College of Education / Department of Educational Leadership

Suzanne Franco, Ed.D.

937-775-3673 (Suzanne.franco@wright.edu)

Title of Study: Teacher Quality Partnership (TQP) Large-scale Longitudinal Study of Novice Teachers

Purpose of Study: To better understand the aspects of teacher preparation and early career support that help new teachers be successful in teaching math and/or reading to elementary and middle school children.

Participants: Any new teacher of 4th, 5th, 6th, 7th, or 8th grade mathematics in an Ohio school who has just graduated from an Ohio teacher preparation program (not an alternative license program).

Any new teacher of 4th, 5th, or 6th grade reading in an Ohio school who has just graduated from an Ohio teacher preparation program (not an alternative license program).

By signing below, I am agreeing to participate in the Teacher Quality Partnership "Large-scale Longitudinal Study" of new teacher preparation and support in Ohio. I have read and understand the ***Research Information Sheet – Teachers*** provided by Dr. Suzanne Franco, the leader of the study.

I understand that everything that I do with this study will be kept strictly confidential, that all surveys and information about me will be coded to avoid identification, and that all records (including this consent form) will be stored in locked cabinets and facilities at Wright State University throughout the period of the study, and for two years afterward. There will be no audio taping of video taping involved.

I understand that I am not obligated to the study in any way, and may leave the study at any time, with or without giving a reason.

I understand that if I have any questions about study-related activities, I can call Dr. Suzanne Franco, Ed.D. 937-775-3673 or email her at **Suzanne.franco@wright.edu**. If I have questions about my rights as a research participant, I know that I can call the Wright State University Institutional Review Board at 937-775-4462.

I understand that my participation in this research study will be for three years ***(unless I should stop teaching in Ohio), and that I will be asked to complete a survey and to confirm my students in each of those three years. These activities will only take me about an hour total each year. I will be compensated $100 for each year of participation. There are no alternative activities; if I cannot complete the regular study activities, I can opt to leave the study.***

Finally, **I understand that there are no expected risks or benefits to me personally** from participating in this study. If I am interested in finding out about the study progress, I know that I can check the study website at www.tqpohio.org for regular reports.

____

Study Participant / DATE

Appendix B

Consent form for NTS

Teacher Quality Partnership:

Novice Teacher Study

Novice Teacher Consent Form 2007-2008

Dear teacher participant:

Thank you for agreeing to participate in the Novice Teacher Study. The purpose of this study is to understand the practice of beginning teachers, and the factors influencing that practice. We recognize the challenges facing entry-year teachers, and we have structured data collection to minimize intrusion as much as possible. A complete list of the data collection cycles is attached to this consent form. If you agree to participate, please read the information below, sign, and return to your field researcher. Thank you for contributing to the profession of teaching.

Name: School:

TQP Agreement:

1. Maintain complete confidentiality. All reports will be summary data only. At no time will any teacher or school be identified.
2. Arrange the interviews and observation at a time and days that are convenient to the teacher.
3. Pay teacher participants $300 (year 1), $500 (year 2), $700 (year 3) when the agreement has been completed.

Teacher Agreement:

_______ I commit to collect data for the Novice Teacher Study. I understand that I:

- Must participate in 6 data collection cycles between September, 2007 and June, 2008. These cycles include observations of teaching with the CLASS observation protocol and post-observation interviews following the observations.
- Complete all surveys that have been approved for use in the study, including the TQP Inservice Teacher Survey.
- I recognize that the data collected in the Novice Teacher Study will be used for the purposes of the research only. When the analyses of the data are conducted, the identity of the participants will remain confidential to the Principal Investigators and field researchers, and will not be revealed in any reports of research or to anyone outside of the study.
- Participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which I am otherwise entitled, and I may discontinue participation at any time without penalty or loss of benefits to which I am otherwise entitled.
- I should contact the Principal Investigator, Dr. Kathryn Kinnucan-Welsch, at Katie.Kinnucan-Welsch@notes.udayton.edu for answers to questions about the research.
- I should contact for questions about my rights as a subject or in the event of a research-related injury to the subject, Mr. Jon Nieberding, University of Dayton Institutional Review Board Chair, at (937) 229-4053.

I, _________________________________, agree to participate in the Novice Teacher Study.

(Print Name)

____ ___________________

Teacher's Signature Date

Appendix C

Typology

The following data is from the Ohio Department of Education website (http://education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=3&ContentID=12833&Content=78585)

A total of nine district group types were identified. Seven of these groups characterize the K-12 public school districts. Another, Group 0, consists of districts that are extremely small and either geographically isolated (islands) or have special circumstances (College Corner). The final group, Group 8, consists of all Joint Vocational School Districts.

The following list provides a brief description of each group.

0	**Kelly's Island LSD, North Bass Island LSD, Middle Bass Island LSD, Put-in-Bay Island LSD, College Corner LSD**
1	**Rural/agricultural – high poverty, low median income** These districts are rural agricultural districts and tend to be located in the Appalachian area of Ohio. As a group they have higher-than-average poverty, the lowest average median income level, and the lowest percent of population with college degree or higher compared to all of the groups. N=96, Approximate total ADM=160,000.
2	**Rural/agricultural – small student population, low poverty, low to moderate median income** These tend to be small, very rural districts outside of Appalachia. They have an adult population that is similar to districts in Group 1 in terms of education level, but their median income level is higher and their poverty rates are much lower. N=161, Approximate total ADM=220,000.
3	**Rural/Small Town – moderate to high median income** These districts tend to be small towns located in rural areas of the state outside of Appalachia. The districts tend to have median income levels similar to Group 6 suburban districts but with lower rates of both college attendance and managerial/professional occupations among adults. Their poverty percentage is also below average. N=81, Approximate total ADM=130,000.
4	**Urban – low median income, high poverty** This category includes urban (i.e. high population density) districts that encompass small or medium size towns and cities. They are characterized by low median incomes and very high

	poverty rates. N=102, Approximate total ADM=290,000.
5	**Major Urban – very high poverty** This group of districts includes all of the six largest core cities and other urban districts that encompass major cities. Population densities are very high. The districts all have very high poverty rates and typically have a very high percentage of minority students. N=15, Approximate total ADM=360,000.
6	**Urban/Suburban – high median income** These districts typically surround major urban centers. While their poverty levels range from low to above average, they are more generally characterized as communities with high median incomes and high percentages of college completers and professional/administrative workforce. N=107, Approximate total ADM=420,000.
7	**Urban/Suburban – very high median income, very low poverty** These districts also surround major urban centers. They are distinguished by very high income levels and almost no poverty. A very high percentage of the adult population has a college degree, and a similarly high percentage works in professional/administrative occupations. N=46, Approximate total ADM=240,000.
8	**Joint Vocational School Districts**

Variables used in Creating District Clusters (FY2004)

- % Workforce – Admin/Professional (2000 census)
- Median income for district TY2002 (Dept of Taxation)
- % of adult population with college or more (2002 census)
- Population density (Population 2000 census per square mile)
- Total ADM FY2004 (EMIS)
- Percent poverty (FY2004 data used for DPIA calculations)
- Agriculture assessed valuation as percentage of residential + Agriculture (FY2004
- Minority ADM as % of total ADM (FY2004 EMIS)

Appendix D

Math Content Test

Teacher Quality Partnership

Novice and Experienced Teacher Field Study Research

Content Knowledge for Mathematics Teaching Survey

Researcher is to affix label with date survey was taken and coded ID of teacher here

learning mathematics for teaching project

Learning Mathematics for Teaching
University of Michigan
School of Education
610 E. University #1600
Ann Arbor, MI 48109-1259

INSTRUCTIONS

- **In completing this questionnaire, you should not spend more than <u>1-2 minutes on any question</u>. Imagine you are responding to real classroom situations, and select the answer that most closely matches what you would do, say, or answer at that moment.**
- Your responses are voluntary and confidential. If you come to a question you do not wish to answer, simply skip it. We hope that you will answer as many questions as possible.
- Answer questions by circling your choice, e.g.

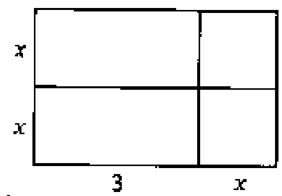
1. During a unit on functions, Ms. Lopez asks her students to write journal entries on exponential growth. Which of the following journal entries illustrate exponential growth? (For each item below, circle EXPONENTIAL, NOT EXPONENTIAL or I'M NOT SURE.)

	Exponential	Not exponential	I'm not sure
a) An example of exponential growth would be if you got a 1% raise each year.	(1)	2	3
b) An example of exponential growth would be if a car increases in speed by 10 miles per hour every second.	1	(2)	3
c) Exponential growth is when the y-axis increases faster than the x-axis. For example, if each time the x-coordinate goes up by 2, the y-coordinate goes up by 3.	(1)	2	3

1. Teachers often offer students "rules of thumb" to help them remember particular mathematical ideas or procedures. Sometimes, however, these handy memory devices are not actually true, or they are not true for all numbers. For each of the following, decide whether it is true all of the time or not. (Mark TRUE FOR ALL NUMBERS, NOT ALWAYS TRUE, or I'M NOT SURE.)

	True for all numbers	Not always true	I'm not sure
a) If the first of two numbers is smaller than a second, and you add the same number to both, then the first sum is smaller than the second.	1	2	3
b) Multiplying a number makes it larger.	1	2	3
c) A negative number plus another negative number equals a negative number.	1	2	3
d) To multiply any number by 10, add a zero to the right of the number.	1	2	3

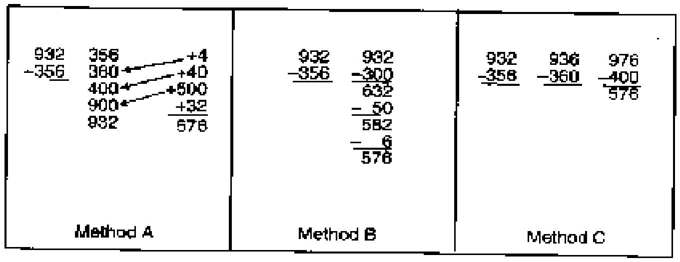
2. Ms. Byrd asked her students to write an expression to represent the area of the figure below.



Many of her students wrote $2x^2 - 6x$. She asked them to write another expression that would more directly express the area as length times width. Which of the following represents the area as length times width? (For each item below, circle REPRESENTS, DOES NOT REPRESENT, or I'M NOT SURE.)

	Represents	Does not represent	I'm not sure
a) $(x+x)(3+x)$	1	2	3
b) $2x(3-x)$	1	2	3
c) $2(3+x)x$	1	2	3
d) $(3x)(x+x)$	1	2	3

3. Imagine that you are working with your class on subtracting large numbers. Among your students' papers, you notice that some have displayed their work in the following ways:



Which of these students is using a method that could be used to subtract any two whole numbers? (Mark ONE answer.)

a) A only
b) B only
c) A and B
d) B and C
e) A, B, and C
f) I'm not sure.

4. Nathaniel suggested the following idea for doing the problem:

0.23
X 95

First I ignore the decimal point and do the multiplication, which gives me 2185. Then I use estimation to place the decimal point. I know that 0.23 is about 1/4 and 95 is about 100 and 1/4 of 100 is 25, so my answer would be 21.85.

Which of the following is most appropriate to say about Nathaniel's approach? (Mark ONE answer.)

a) It happens to work in this case, but will not work for most problems.

b) It only works if one of the numbers is a whole number.

c) It works for any numbers, but some examples are harder to estimate.

d) It works equally well for all problems.

e) I'm not sure.

5. Ms. Starr is preparing to teach a lesson on quadrilaterals. She sees that her textbook uses a different definition of trapezoid from the one that was in her college math methods book.

> Her teacher's edition defines a trapezoid as a quadrilateral with <u>exactly</u> one pair of parallel sides. (Definition I)
>
> Her college math methods book defines a trapezoid as a quadrilateral with <u>at least</u> one pair of parallel sides. (Definition II)

Ms. Starr thinks the choice of definition might affect how one classifies shapes. Which of the following is true? (Mark ONE answer.)

a) A rectangle is a trapezoid according to Definition II but not according to Definition I.

b) A rectangle is a trapezoid according to Definition I but not according to Definition II.

c) A rectangle is a trapezoid by both definitions.

d) All quadrilaterals are trapezoids according to Definition II.

e) The definitions are really the same.

f) I'm not sure.

6. Mr. Nager writes the following statement on the board:

> The length and width of a rectangular swimming pool are each doubled, while the depth remains the same.

He asks his students to make mathematical statements about this pool. Which of the following student claims is true? (Mark ONE answer.)

a) It takes twice as much paint to paint the bottom.

b) It takes twice as much paint to paint the four walls.

c) It takes twice as much water to fill the pool.

d) All of the above.

e) None of the above.

f) I'm not sure.

7. Mr. Siegel and Mrs. Valencia were scoring their students' work on the practice state mathematics exam. One open-ended question on the exam asked:

Write the number that is halfway between 1.1 and 1.11.

a) 1.05

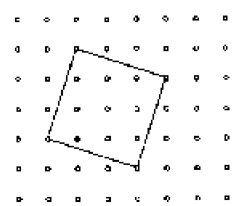
b) 1.055

c) 1.105

d) 1.115

e) I'm not sure.

8. Ms. Lewis' class has been working with geoboards (a square grid of pegs at one unit intervals) to find areas and perimeters of polygons. One of the students, Emilio, creates the following example of a square:



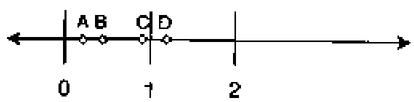
Ms. Lewis asks her class to generate strategies for calculating the area of Emilio's example.

Which of the following are mathematically acceptable? (For each strategy mark YES, NO or I'M NOT SURE.)

	Yes	No	I'm not sure
a) Use the Pythagorean theorem to find the length of one edge, and then square this number.	1	2	3
b) Count the number of points inside the square.	1	2	3
c) Draw a larger square of side length 4 around the square and subtract the areas of the four right triangles with legs of lengths 1 and 3 from the area of the larger square.	1	2	3
d) This square is a 3.5 by 3.5 that has been rotated, so the area is 3.5 squared.	1	2	3

9. Mr. Stone is looking through some mathematics materials for some problems relating fractions to number lines. He comes across the following problem:

Which point is closest to $\frac{7}{16} \times \frac{1}{2}$?



He has not used number lines for this kind of problem before and he wants to make sure he is using it correctly. What is the intended answer to this problem? (Mark ONE answer.)

a) A

b) B

c) C

d) D

e) I'm not sure.

10. Ms. Lawrence is making up word problems for her students. She wants to write a word problem for $3 \div \frac{1}{2}$. Which word problem(s) can she include? (Mark YES, NO, or I'M NOT SURE for each problem.)

	Yes	No	I'm not sure
a) Dan has 3 cups of chocolate chips. He wants to bake cookies, and each batch requires $\frac{1}{2}$ cup of chocolate chips. How many batches of cookies can Dan make if he uses all of the chocolate chips?	1	2	3
b) Jacquie has collected three cans of pennies for her fund-raiser. If she is halfway to her goal, how many cans of pennies had she set as the goal?	1	2	3

11. Ms. Bourlin's new textbook has the following challenge problem:

Look at the repeating pattern below. What shape would be 83^{rd} in the sequence?

The new textbook does not include an answer to this problem, and Ms. Bourlin wants to make sure she knows it before she begins working on it with her class. What shape would be the 83^{rd} in this sequence? (Mark ONE answer.)

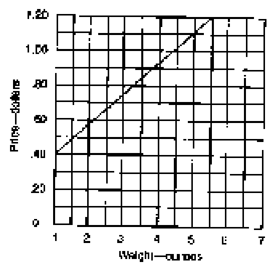
a) triangle

b) square

c) hexagon

d) pentagon

12. Mr. Santiago tells his class that you can buy candy by the ounce at the movie theater. He shows them the graph below involving weight and price and asks them to interpret it:



The students work in small groups on what this graph represents. As Mr. Santiago walks around the room listening to students talking and working, he hears students making interesting conclusions from the graph. Which of the following are correct conclusions from the graph? (Mark YES, NO, or I'M NOT SURE.)

	Yes	No	I'm not sure
For any price there is at most one weight.	1	2	3

Thank you for completing this survey!

Appendix E

Post Observation Interview for Year 1 and Year 2

Post-observation Interview

Background Notes to Field Researcher

The purpose of this interview is to gain insight into the teacher's professional practice by inviting him or her to reflect on a teaching episode he or she has just completed and you have just observed. Specifically, we are interested in understanding ***teacher practice*** in the post-teaching context. The interview should produce expanded account field notes that provide deep insight into the above.

- Please audiotape the interview. Save the audio file using the audio file save procedures. Submit the Word document from your own transcription of this interview according to the electronic data submission procedures. Check to make sure you have **adequate battery power** and **good sound levels** on your recorder before beginning the interview. Periodically check the recorder to make sure you are still recording. Also be sure you are recording in a digital file that has **adequate space** to record the interview.
- As the teacher's responses unfold, whenever possible, probe as to **where he or she learned how to do the things he or she is describing**.
- IMPORTANT: This is a semi-structured interview protocol. As you listen to the subject's responses, be prepared to use secondary prompts like the ones listed below to elicit additional explication of the phenomenon of interest.
- You will focus on one lesson for your interview. Give your teacher the opportunity to suggest which lesson he/she would like to talk about. If there is no preference, be prepared to select one and state your reason why in your field notes.

Possible Field Researcher introduction:

I would like to begin with the reminder that the purpose of this interview is not to evaluate you, but instead to simply try to better understand teacher practice and where you learned about your practice with regard to the observed lesson. Any details you can share regarding your role in the lesson and the performance of the students would be most helpful.

- ❖ Ask the teacher if there is a lesson he/she would like to talk about.
- ❖ If not, identify a lesson you would like to talk about.

Question #1:

Think about the focus of this lesson (specify which lesson) I observed.

Talk a little bit about what you did.

Question #2:

How do you think it went?

Question #3:

How did the students respond to this lesson?

Prompts:

Did the students learn what you were trying to teach them?

If they respond "yes," "no," or "some of them learned," probe: How could you tell? What makes you think so? Tell me more about that.

If they respond "I don't know," probe again: What makes you unsure? Tell me more about what you are thinking here. . .

Question #4

What decisions did you make during the course of the lesson?

Prompts:

What prompted this (these) decisions?

Probe for specifics here, there may have been multiple decisions and different reasons for each of the decisions made during the lesson.

Were there any surprises in this lesson? Things you did not anticipate?

Did you do anything you didn't plan?

Question #5

Talk a little bit about the materials and classroom resources you used in this lesson.

Prompt:

Is there anything you did not have that you wish you would have had?

Question #6

Where did you learn the most about how to teach this lesson(s)?

Prompt:

Probe to see how the teacher learned about the content that was taught and the strategies used to teach the lesson.

Question #7 (If teacher identified the lesson for interview, then ask this question.)

Now that we have talked about this lesson, tell me why you selected it.

General prompts that can be used at any time during the interview process:

- Tell me a little bit more about that . . .

- What do you mean by that . . . ?

- Can you give me an example of what you mean here . . . ?

- Can you expand on what you mean by that comment . . . ?

Reminder: We want to utilize the interview to better understand the participants' views on the various topics. We want to learn from them. The researcher's job is to probe without leading the response of the participant.

When you transcribe the interview, add a final section of your own field notes. Answer these questions:

1. Provide the details about the lesson on which the interview is based, including subject, time of day, segment number(s), and any other contextual information that would shed light on understanding the teacher's responses.

2. If you selected the lesson rather than the teacher, why did you select the specific lesson as a focus for the interview?

Thank you and interview concluded.

Appendix F

Post Observation Interview Form for Year 3

TQP

Post Observation Interview Questions

11.25.08

What lesson would you like to discuss?

What were the learning goals and objectives?

Was there anything about the content of this lesson that you thought might be difficult for the students?

Describe the teaching methods you used. Why did you select these methods? How effective do you think those methods were for this group of students in meeting the learning goals and objectives?

What do you know about your students that you considered in planning and delivering this lesson?

Prompts: Give me a specific example or two.

Did the students learn what you were trying to teach them? How do you know?

What aspect of the lesson did student response indicate worked for them?

During your time as a teacher, what professional development activity or activities have had the greatest impact on your teaching? (Explore)

What feedback would you have for your college professors about how well prepared you were in the following areas? What programmatic changes, if any, would you suggest?