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Editors

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Articles

A Message from the Editors...

The Spring 2011 issue of The Ohio Journal of Teacher Education has an open theme. The articles cover a range of topics of interest to teacher educators such as differentiated best-practice, teacher candidate perceptions, models of co-teaching and preparation of teacher candidates.

The first article by Dani, Klein, and Gut describes a program targeting teams of science, mathematics, and special education teachers' ability to analyze and improve student learning in mathematics and science by locating and creating differentiated best-practice, inquiry-based resources. The MaSCoT professional development model was designed to improving student performance and providing ongoing professional development support for grade 7-10 teachers.

The second article examines preservice survey responses that were obtained from 4,650 Ohio middle and high school teacher candidates seeking licensure in Mathematics or Reading/Language Arts. With a focus on teacher candidates' perceptions of their preparatory program, the major goals of this article were to (a) describe teachers' perceptions of their program's coherence and the degree to which their program prepared them with the necessary professional knowledge and skills and (b) evaluate whether subject area and license level might produce differential perceptions. Descriptive analyses revealed that teachers reported being well prepared in student assessment but less prepared to teach diverse students, including students with special education needs. The article concludes with how teacher education program personnel and educational policy makers might utilize these results for program improvement.

The next article by Michael and Miller reviews a statewide survey that was completed by all teacher education programs regarding models of co-teaching and how they are integrated into higher teacher education programs in Ohio. With the lack of research about the knowledge, practice, and intention levels of teacher-educators regarding co-teaching, the co-authors decided to gauge those levels across the state of Ohio using a survey. Questions were designed to elicit attitudes regarding knowledge and practice of co-teaching at the higher education level in teacher education programs, as well as intentional behaviors.

Finally, Stauffer discusses current political trends, aimed at holding teacher education accountable for the quality of the teachers that graduate from their programs, have created a growing need for pre-service education programs to examine how well they are preparing their teacher candidates to be effective teachers.

We hope you enjoy this issue of the journal, and we hope you find these articles and book review to be informative and helpful in your various roles preparing teacher educators.

Virginia McCormack
Sarah Cecire
Gayle Trollinger
Spring, 2011

An Integrative Professional Development Model in Mathematics, Science, and Differentiated Instruction

Danielle Dani, Ed. D. *Robert Klein, Ph.D.* *Dianne M. Gut, Ph.D.*

Introduction

Recent calls for educational reform stress the need for a prepared 21st century workforce that is technologically, scientifically, and mathematically literate (Bybee & Fuchs, 2006). The State of Ohio's response includes the adoption of (a) the National Common Core Standards for School Mathematics, (b) the revisions to the Ohio Academic Content Standards in Science, (c) the Ohio Core curriculum, and (d) the Ohio Operating Standards for the Education of Students with Disabilities. The Ohio Core curriculum legislates enhanced mathematics and science education requirements. The legislation stipulates that graduation requirements for each student in public or chartered nonpublic high schools include twenty units designed to prepare students to be college or career ready (Ohio Core, 2007). A unit is equivalent to 120 hours of course instruction, except in the case of a laboratory course, where "one unit" is defined as a minimum of one hundred fifty hours of course instruction. The required 20 units include:

- Four units of mathematics, including one unit of algebra II or its equivalent;
- Three units of science with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information. The three units should include the following, or their equivalent:
    - One unit of physical sciences;
    - One unit of life sciences;
    - One unit of advanced study in one or more of the following sciences:
        - Chemistry, physics, or other physical science;
        - Advanced biology or other life science;
        - Astronomy, physical geology, or other earth or space science.

Consistent with requirements put forth by the Individuals with Disabilities Education Improvement Act of 2004, and the goals of No Child Left Behind Act of 2001, the Ohio Operating Standards for the Education of Students with Disabilities (2008) require that "each school district shall ensure that to the maximum extent appropriate, children with disabilities, including children in public or nonpublic institutions or other care facilities, are educated with children who are nondisabled" (p. 163). As a result, the number of students with disabilities being educated in the general education classroom has increased.

Unfortunately, school report card data for underachieving Appalachian Ohio Districts indicate that less than 75% of students (the lowest limit of the acceptable range) are currently scoring at or above state-mandated minimum proficiency levels in mathematics and science (ODE, n.d.). This means the majority of students, including students with disabilities, are earning low passing rates on the mathematics and science portions of the Ohio Graduation Test (OGT). District report card data indicate that 4.5 - 7.9% of students are not taught by highly qualified teachers, when according to the No Child Left Behind legislation, all teachers are required to be highly qualified or appropriately licensed in all core academic subjects they teach.

In response to the need for highly qualified teachers and at the encouragement of the Ohio Department of Education, school districts are adopting a two-pronged approach that emphasizes differentiated instruction and co-teaching as a way to provide children with disabilities access to the general education curriculum alongside their typically developing peers. The first prong, differentiated instruction, is based on the belief that instructional approaches should be adapted to meet the unique needs of diverse students in classrooms (Tomlinson, 2001). The Council for Exceptional Children defines co-teaching, the second prong of Ohio's response, as an instructional model where:

> …two or more professionals with equivalent licensure or status are co-teachers, one who is a general educator and one who is a special educator or specialist. Both professionals participate fully, although differently, in the instructional process. General educators maintain primary responsibility for the content of the instruction; special educators hold primary responsibility for facilitating the learning process. Instruction employs evidence -based practices and accountable differentiation. (Friend & Hurley-Chamberlain, n.d.)

The data on student achievement and teacher preparation raise concerns about the ability of Appalachian Ohio schools and their teachers to provide differentiated mathematics and science experiences that prepare students meaningfully for their futures. The Mathematics and Science Coordination Teams (MaSCoT) project leadership deemed a focus on the preparation of high quality mathematics and science teacher through inquiry and differentiation as a particularly appropriate means of addressing this concern. Consistent with Loucks-Horsley, Hewson, Love, and Stiles (2009), the authors designed MaSCoT to be a professional development program that (a) immerses teachers in learning the content knowledge through inquiry while simultaneously, (b) modeling inquiry practices, (c) modeling co-taught, differentiated instruction, and (d) addressing teacher beliefs as they construct a knowledge base for teaching mathematics and science through inquiry approaches. Project leadership included university faculty members in science education, mathematics education, and special education who delivered a week-long face-to-face experience followed by sustained online professional development. Details of the approach, as well as discussion of its effectiveness follow.

Characteristics of High Quality Professional Development

Disciplinary societies such as the National Research Council (NRC), the National Science Teachers Association (NSTA) and the National Council for Teachers of Mathematics (NCTM) recommend that teacher professional development programs, among other things:

- Unify, coordinate, and connect courses in science, mathematics, and technology with methods courses and field experiences; and
- Teach content through the perspectives and methods of inquiry and problem solving, as well as illustrate and model in content courses, methods courses, and school-based field experiences, a wide variety of effective teaching and assessment strategies that are consistent with the national standards for the discipline.

The Ohio Department of Education (ODE), the National Board of Professional Teaching Standards (NBPTS), NSTA, NCTM, the Council for Exceptional Children (CEC) and many researchers are in remarkable agreement about what constitutes effective teacher professional development (Abdal-Haq, 1995; Fullan, 1991; Little, 1993; Loucks-Horsely et al., 1998; ODE, 2005; ODE, 2007; Sparks & Loucks-Horsely, 1990; Supovitz & Turner, 2000). They propose that professional development is of high quality if it includes six key features. Namely, it (a) immerses participants in inquiry, questioning, and experimentation and therefore models inquiry forms of teaching, (b) is intensive, sustained, and collaborative, (c) engages teachers in concrete teaching tasks and is based on teachers' experiences with students, (d) focuses on subject-matter knowledge and deepening teachers' content skills, (e) is grounded in a common set of professional development standards and shows teachers how to connect their work to standards of student performance, and (f) is connected to other aspects of school change. These principlesformed the basis for the development of the MaSCoT high quality professional development program.

MaSCoT Purpose and Goals

The MaSCoT professional development model was designed to make a significant impact on mathematics, science, and special education teachers' knowledge and practice. MaSCoT goals consisted of improving student performance and providing ongoing professional development support for grade 7-10 teachers by

- Immersing teachers in learning science and mathematics content through inquiry;
- Modeling collaboration and differentiated planning, teaching, and assessment; and
- Promoting instructional technology as integral to student learning.

MaSCoT is characterized by two key features. The first consists of school-based teacher teams consisting of at least one mathematics teacher, science teacher, and an intervention specialist trio creating and participating in a community of practice (Lave & Wenger, 1991). The community of practice provides teacher participants with a sense of joint enterprise and identity, allowing them to learn much more than the knowledge or skill associated with undertaking the task of teaching mathematics and/or science. MaSCoT's second key feature consists of its commitment to engaging participating teams in sustained professional development rooted in an analysis of their school achievement data and student learning needs in mathematics and science, paying particular attention to differentiating instruction (Tomlinson et al., 2003) to meet the needs of all learners.

Curriculum

The MaSCoT curriculum consists of (a) peer-validated resource lessons from the Ohio Resource Center (ORC) aligned with the Ohio Academic Content Standards, (b) content modules on energy, climate change, and probability, (c) strategies for integrating digital technologies such as probeware and computational technology into mathematics and science teaching, and (d) strategies for differentiating instruction, inquiry, and identifying and addressing alternative conceptions. The primary focus of the MaSCoT curriculum was on the benchmarks that form the basis of the Ohio Graduation Test and district-identified areas of low student achievement.

Specific curriculum topics were selected by a curriculum development team consisting of science and mathematics educators from the College of Education, science and mathematics content area specialists from the College of Arts and Science, and science and mathematics teachers from participating school districts. Using the school-based teams' reporting of school needs and areas of low student performance, the themes of (a) energy, (b) climate change, (c) diversity of life, (d) measurement, and (e) data analysis and probability were chosen for the foci of activities in the face-to-face professional development sessions. MaSCoT project leaders examined research literature on these areas of low student performance and identified on-line best practice and promising practice resources from the Ohio Resource Center (ORC) to improve instruction and learning for the selected topics. A special education expert guided the adaptation of lessons using differentiated instruction frameworks to meet the needs of all students. These adapted ORC resources were used as content and pedagogy development activities for teachers, while each school-based team's selection from the ORC was made an explicit part of teacher resource development.

ORC resource lessons were selected for the curriculum because of their significant potential for improving classroom practice of Ohio teachers, their freedom of access, and their direct link to existing state and national standards in a searchable online database (Center for Assessment and Evaluation, 2004). The ORC is a freely available collection of instructional resources for mathematics, science, and language arts with resources that have been peer-reviewed and determined to be of high quality and utility. Teachers can freely locate, select, and save resources to customizable accounts stored on the ORC servers. Over the course of the face-to-face workshop, teachers grew facile with the use of the ORC to support quality instruction.

HOBO data loggers were used to model strategies for integrating digital technologies into inquiry-based mathematics and science teaching. HOBO data loggers are examples of digital probeware with the capability to support authentic, inquiry-based learning experiences in both field-based settings and the classroom. Probeware are educational software tools consisting of hardware devices (probes) and software that allow for the collection, organization, and analysis of data (Mokros &Tinker, 1987). Their real-time data collection and representation features help learners acquire the ability to interpret graphs and learn scientific and mathematical concepts using

authentic data. HOBO data loggers are battery-powered devices used to measure a wide variety of parameters including temperature, relative humidity, and light intensity.

The involvement of higher education faculty in the development of the curriculum guaranteed its rigor. The involvement of the classroom teachers from the districts assured the curriculum was tailored to meet the needs of participants. The rationale for including science teachers, mathematics teachers, and intervention specialists for mathematics and science professional development was based on the nature of the disciplines and the reality of the school settings in which the teachers worked. The disciplines of mathematics and science share many similar concepts, including collecting and analyzing data, and looking for patterns.

Instructional Model

The MaSCoT Instructional Model consists of an extensive, yearlong professional development experience presented in two phases. Phase one consists of approximately 40 contact hours (3 semester hours of graduate credit) through a weeklong summer institute. Phase two is completed over the academic year following the summer session and allows teacher participants to earn up to 4 semester hours of graduate credit.

Phase I

Phase one of MaSCoT is delivered face-to-face. Teams of mathematics teachers, science teachers, and intervention specialists are formed from participating school districts. During this phase, teacher teams act as learners, curriculum planners, and peer-tutors as they participate in emerging communities of practice (Lave & Wenger, 1991). Phase I is facilitated by a faculty team consisting of a mathematics educator, a science educator, and a special educator, district teachers, and scientists and mathematicians.

Learners. Teams participate as learners of mathematics and science content, pedagogical strategies such as differentiated instruction and assessment, and technology integration strategies to promote inquiry teaching and learning. Faculty members from the Department of Arts and Sciences facilitate instruction of the mathematics and science content modules targeting, energy, climate change, probability, and data analysis. Teacher educators from the Department of Mathematics and the Department of

Planners. Curriculum planning begins with teacher teams identifying areas of low student performance by examining OGT or other test results. Teams search for ORC resources that address students' difficulties and select one resource for modification to support peer learning using inquiry. Next, teams develop a Teacher Work Sample (TWS, Renaissance Partnership for Improving Teacher Quality) consisting of instructional materials forming a teaching module/unit that augments the ORC resources, and is differentiated for students at all learning levels. ORC resources benefit by the invention of "wrap-around" supplemental materials that make the use of the resource easier, deeper, or more likely to impact teacher practice and student achievement. The TWS additionally requires the construction of quality assessments that attend to inquiry approaches and differentiated instruction practices. The teachers share their work, "field test" the modules, analyze, and reflect on their impact on student learning during Phase II of the MaSCoT program.

Peer-tutors. In the final steps of phase I, members of each school-based team become peer-tutors. They facilitate the learning of their peers using a team-selected inquiry-based lesson and guide their peers' reflection using the "Pulling it Together" process following the lesson. Phase I concludes with the development of a team plan specific to their school, for sustaining the community of practice created in Phase I. The plan lists collaborative strategies and a timeline for activities, meetings, and recruitment of additional teachers to the team. The plan stipulates how the teams continue the mission of MaSCoT in their buildings and classrooms.

Phase II

Phase II of MaSCoT strengthens the community of practice developed during phase I. Structures are put in place to allow for the generation and appropriating of a shared repertoire of ideas, commitments, and experiences. Phase II is online and consists of two semester-long courses completed over the course of the academic year following the summer session. Teachers use the *iDiscovery* web platform to participate at virtual seminar tables. *iDiscovery* began in 2002 as a collaborative effort of *OSI-Discovery* and *Project Dragonfly*. This web-based initiative was originally designed to support *OSI-Discovery*'s face-to-face teacher workshops by providing follow-up support for *OSI-Discovery*-

trained professionals as they strive to design and implement inquiry-based lessons.

Each semester-long *iDiscovery* course consists of approximately 10 lessons. During the course, teachers continue to read and discuss data and articles centered on inquiry-based instruction. Teachers implement the inquiry-based lesson plans developed in the summer institute in their classroom and participate in discussions designed to share and resolve implementation concerns and needs. These discussions allow teachers to engage in individual reflection as well as benefit from peer professional support.

Effectiveness of the MaSCoT Program

The MaSCoT program was offered in two consecutive years. The majority of participants consisted of teams from high need partnering school districts. Additional teams were selected for participation based on the reported high need status of their school or district. Other individuals and teams were selected when space was available. Year one served a total of 45 participants from 12 high-needs school districts. Year one participants consisted of 10 intervention specialists, 19 math teachers, 16 science teachers, and one teacher who taught both math and science. Year two supported a total of 34 participants from 16 high-needs school districts. Year two participants consisted of 10 special education teachers, 13 math teachers, and 11 science teachers.

Independent evaluators were contracted to assess the effectiveness of the MaSCoT professional development intervention according to the previously stated goals of improving student performance and providing high quality on-going professional development support for teachers (Woodruff, Sutton, & Kao, 2009, Woodruff, Sutton, & Kao, 2010). Evaluation design involved a pre- (before phase 1) and delayed-post-questionnaire (following phase 2) comprised of subscales related to teachers' approaches to classroom teaching. The three subscales, "Teaching Practices," "Communication and Collaboration," and "Self-Efficacy and Beliefs," were measured using five-point Likert continua ("almost never" to "very often" or "strongly disagree" to "strongly agree"). Cronbach's Coefficient alpha scores ranged from 0.85 - 0.87 suggesting relatively high internal consistency among the items on each subscale. The delayed post-questionnaire included additional items used to evaluate the summer institutes' impact on teachers. Other data sources included an electronic teacher interview protocol, and Phase I daily evaluation forms.

Year one. While all participants completed the pre-questionnaire, only the 18 individuals who participated in phase 2 (*iDiscovery)* completed the delayed post-questionnaire and were included in the analysis. Items reaching statistical significance are delineated here. Teachers reported they were better able to plan/develop and implement differentiated lessons and/or modules ($p = 0.011$), and they were able to identify and use strategies that meet the needs of all learners ($p = 0.026$). Teachers also reported their awareness and use of on-line instructional resources increased following MaSCoT. They also reported their instructional practice became more inquiry-oriented as a result of participation in MaSCoT project activities.

Additionally, participants reported collaborating more frequently with other math, science, and intervention specialists than before participating in MaSCoT. Specifically, science teachers reported collaborating more often with other science and mathematics teachers and intervention specialists. Mathematics teachers reported collaborating more frequently with other math teachers and intervention specialists. Interestingly, intervention specialists reported no change in the frequency of collaborating with other intervention specialists, but their frequency of collaborating with science teachers increased after participating in the project.

Data from Electronic Teacher Interviews ($n = 11$) served to triangulate and support data available from the pre-post and delayed-post surveys. Teachers reported using the ORC online resources. One teacher reported, "…I find them very useful. The students become actively involved in the learning process. It is also great that they correlate to Ohio standards. I plan to continue using this wonderful resource and telling other teachers about it" (Woodruff et al., 2009, p. 31). Another reported, "Once you get comfortable with the site, it's an excellent resource to go to" (p. 31).

Clearly, the opportunity to work in collaborative teams had a positive impact on the participants as evidenced in the following comments. "The summer workshop…allowed me to see things from different perspectives. I was able to take some of their ideas and adapt them and implement them in my own classroom" (Woodruff et al., 2009, p. 31), and "It has brought me closer to the math teachers in my own dis-

trict on my team, which can result in more collaboration" (p. 31).

Unfortunately, most teachers (5 of 9) reported that their administration did not facilitate their participation in MaSCoT and/or support changes resulting from their participation in MaSCoT. Representative comments include, "I don't think they're even aware that we were in the MaSCoT program" (Woodruff et al., 2009, p. 31), and "They have not done anything to support classroom changes" (p. 31). A notable exception, one participant reported, "Our administration embraces hands-on activities that challenge students, and collaboration among staff. Administration has made positive comments and provided some money for materials" (p. 31).

Year two. While all 34 participants completed the pre-questionnaire for year two, only 10 completed the delayed-post-questionnaire with only nine valid, as not all participants elected to participate in phase 2 of the professional development. Wilcoxon Singed-Rank tests and ANOVAs on rank data were used due to the relatively small sample size (n = 9). Other data sources included an electronic teacher interview protocol, as well as daily evaluation forms administered during the institute. Data from Electronic Teacher Interviews (n = 6 or 7, depending on the question) again serves to triangulate and support data available from the pre-post and delayed-post surveys.

Analysis of the survey data from the external evaluation suggests the strongest finding was an improvement of teachers' self-efficacy and beliefs regarding academic content standards, use of inquiry-based teaching, use of technology, and teaching strategies. ANOVA results are shown in Table 1 (Woodruff et al., 2010). Interview data confirm teachers felt a greater sense of self-efficacy using inquiry approaches and tools, marked by quotations such as, "I use [the Ohio Resource Center] regularly for lesson ideas and planning. I have also used it to look at future indicators for the math curriculum" (Woodruff et al., 2010, p. 25). Also, "I'm more prepared to teach my students and I'm more knowledgeable of the content standards" (p. 26), and "I'm more willing to do hands-on activities since I have more to use" (p. 26).

Table1

ANOVA on Rank Data Representing Changes in Self-Efficacy and Beliefs

Subscale	**Instrument**	*n*	*M*	*SD*	*F*	*Df*	*p*
Self-Efficacy and Beliefs	Pre	9	4.04	.32	8.67	2, 16	.003**
	Post	9	4.39	.30			
	Delayed-Post	9	4.16	.32			

$p < .05$, ** $p < .01$

As in year one, teachers reported collaborating with other math, science, and special education teachers more following their participation in MaSCoT ($p = .02$ using Wilcoxon Signed-Rank Test by Subscale). This increased collaboration among teachers was also highlighted by responses to the interview questions such as, "We work more together in implementation of coordinating [state-level] indicators" (Woodruff et al., 2010, p. 25), and "It has helped me better assist the regular education teachers in their classroom. More hands-on learning" (p. 25). However, teacher reactions were again mixed regarding school and district administration support of changes resulting from MaSCoT. Three teachers responded that administration was supportive while four indicated non-support.

Interestingly, teachers reported "more often ha [ving] students use evidence to justify responses, discuss subject-specific ideas among themselves, and share experiments, problems, and/or readings with others to confirm results or interpretations" (p. 31) as a result of MaSCoT even though the broader subscale of effects on teaching practices showed no significant difference ($p = .57$). The non-significant findings result from a simple comparison of frequency of teachers who reported "often or very often" on these items on the pre-test and the delayed-post-test. The fact that only 10 participants completed the delayed-post-questionnaire may hint at selection bias. These teachers further commented on changes in observed students' behaviors, citing "students have improved from 65% to 75% on the practice [state grade-8 assessment] that I gave them" (Woodruff et al., 2010, p. 26), and

"My students are more engaged and I have more time to prepare labs" (p. 26).

Conclusion and Recommendations

Evaluation data from years one and two indicate that the Mathematics and Science Coordination Teams (MaSCoT), provides an effective model of integrated professional development for mathematics, science, and differentiated instruction. Participants reported statistically significant positive changes in MaSCoT's stated goals of improving student performance and providing high quality on-going professional development support for teachers.

Several characteristics contributed to the success of the MaSCoT professional development program, including the strengths of a multidisciplinary instructional team and sustainable approaches to instructional change. The instructional team was able to introduce teachers to a wealth of easily accessible, online resources, and model their use in an inquiry-based, collaborative environment. Teachers reported the benefits of working collaboratively in school-based multi-disciplinary teams to prepare an integrated unit of instruction and established a supportive collaboration that continued into the following school year.

As is the case in most secondary settings, university faculty have limited opportunities to collaborate in the classroom and even fewer opportunities to co-teach. MaSCoT created a situation that allowed faculty members from two different colleges (Education and Arts and Sciences) to not only co-plan, but co-facilitate lessons. By year two, the three primary instructors were very comfortable sharing instruction, ideas, and modeling co-taught instruction for the teams. Instructors reported increases in content knowledge (outside their own area of expertise) following the summer sessions. Having three instructors present at all times also allowed for more one-on-one assistance for the participants, thereby enhancing their experience.

Sustainable change in teacher practice was supported by grounding the face-to-face workshop in the use of the Ohio Resource Center (ORC) to locate quality resources based on measured needs of each team's school (as judged according to state standardized test scores), and to adapt those resources using differentiated instruction techniques.

Sustainable change in teacher practice was also achieved by engaging a 'critical mass' of teachers from a single school building in a community of practice working toward common goals. When teachers from different schools were combined into a team, collaboration was effective during the weeklong summer session, but nearly impossible when it came to laying out an implementation and collaboration plan for the coming year. Interestingly, even these multi-building teams were effective members of the MaSCoT community of practice, as one of them suggested they would continue to use each other as resources, even though they were from different school districts.

Finally, the use of the web-based *iDiscovery* professional development platform, led by teacher leaders that took part in the workshop, allowed the conversation and professional development to continue up to a full year after the face-to-face workshop. As such, MaSCoT was able to provide a sustained, job-embedded program tailored to meet the needs of Ohio teachers as they work to more broadly integrate into their practice, mandated changes to state educational legislation, standards, and 21st century skills.

Danielle Dani holds a B.S. in Biology and a M.S. in Biology. She received her Ed.D. in Curriculum and Instruction from the University of Cincinnati. Dr. Dani teaches graduate and undergraduate courses in science education and teacher education. Her major research interests include the beliefs and practices of teachers engaged in teaching science through the methods and perspectives of inquiry and problem solving.

Robert (Bob) Klein received his Ph.D. in mathematics education at The Ohio State University. He teaches mathematics content and teacher education courses at Ohio University. His major research interests include rural issues in mathematics (and, more broadly, STEM) education and technology. He has worked with pre-service and in-service teachers around the country on making mathematics instruction relevant by connecting it to local communities and places.

Dianne Gut holds a B.S. in education and a M.Ed. in special education. She received her Ph.D. in special education and learning disabilities from the University of North Carolina at Chapel Hill. Dr. Gut teaches graduate and undergraduate courses in special education and teacher education. Her major research interests include social and academic interventions for

students with disabilities in low resource schools; transition planning; mentoring for preservice and induction teachers, collaborative teacher training, and integrating 21st century skills in the content areas.

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How Prepared to Teach are Ohio's Preservice Teachers? A Five-Year Analysis of Secondary Teacher Candidate Perceptions of Being Prepared

Raeal Moore, Ph.D. *Kevin G. Kula, M.A.* *William E. Loadman, Ph.D.*

Introduction

Prepared teachers are required in order for student achievement to occur (Cochran-Smith, 2005), yet many teachers entering the classroom report being unprepared to deal with the functions necessary to make the largest impact on their students (Levin, 2006; U.S. Department of Education, 2002). Therefore, teacher education programs need to evaluate the effectiveness of their work in preparing the future of our teacher workforce. To accomplish this task, surveys have been an effective and efficient means of gathering information on preservice and inservice teachers' perceptions of their teacher education preparation and the data have been used to make programmatic changes. The focus of this study therefore is to ascertain Ohio pre-teachers' perceptions of their level of preparedness by their teacher education program, including how teachers rate the coherence of their program and the knowledge and skills these programs provide them. To better contribute to the literature, this research also assesses whether these perceptions might differ by subject area and licensure level. Previous research has only begun to address whether middle childhood and high school licensure levels might influence preparation perceptions while subject matter differences between language arts and mathematics, in regard to these preparation perception, appear to be void in the literature.

Teacher Preparation & Quality Teaching

According to *Educating School Teachers* by Arthur Levine (2006), the former president and professor of education at Teachers College, Columbia University, three out of five teachers report being ill prepared to cope with the current classroom realities. This finding is consistent with other nationally delivered teacher education evaluations ascertaining teachers' perceived preparation (e.g., U.S. Department of Education, 2002; National Center for Educational Statistics [NCES], 1999). Prepared teachers are needed however to promote effective schools and create competitive student outcomes (Cochran-Smith, 2005; Darling-Hammond, 1999; Darling-Hammond, Chung, & Frelow, 2002), and to address the quality teacher requirements specified in the NCLB legislation. Mounting research shows that quality teachers are the single, most important predictor in student learning more so than student demographics and environmental constraints (Darling-Hammond, 1999; Wright, Horn, & Sanders, 1997). Further, teacher effects are cumulative (Darling-Hammond, 1999). K-12 students who are exposed to ineffective teachers for multiple years earn significantly lower achievement scores and are less likely to experience achievement gains relative to those students who are exposed to effective teachers across academic years (Sanders & Rivers, 1996). Teacher impacts are significant across content areas, including mathematics and literacy (Lyon & Weiser, 2005).

The importance of teacher quality has resulted in national attention regarding the knowledge and skills teachers bring to the classroom. Onchawari (2010) reports that although teachers tend to enter the classroom with a variety of pedagogical theories, they lack practical knowledge to effectively apply content and age

appropriate teaching strategies for maximum student learning. Further, and often more problematic, is that teachers of mathematics (Ma, 1999) and reading (Cunningham, Zubulsky, Stanovch, & Stanovich, 2009; Lyon & Weiser, 2005) often lack the breadth and depth of content knowledge in their licensed field. Teachers' limited content knowledge makes it difficult to effectively apply, and with appropriate frequency, teaching tools and curriculum aides shown to help students acquire the necessary reading and mathematics skills to be productive citizens (Castro, 2006; Cunningham et al., 2009). Teachers are also challenged with determining how to apply both formative and summative classroom assessments (Karp & Woods, 2008) and implement differentiating instruction to meet the needs of a diverse student population (Hollins & Guzman, 2005), including students with special needs (Pugach 2005). These challenges exist despite national teacher standards speaking to the necessity for educators to possess these skills (e.g., International Reading Association [IRA], 2010; Interstate New Teacher Assessment and Support Consortium [INTASC], 2001; National Board for Professional Teaching Standards [NBPTS], 2002; National Council for Accreditation of Teacher Education [NCATE], 2007; National Council of Teachers of Mathematics [NCTM], 2000).

Given the increased concern over quality teachers in U.S. schools, today's educational institutions are especially interested in the level of preparedness of their teacher candidates (Williams & Alawiye, 2001) recognizing that without high quality teachers, the goal of improved achievement for our nation's K-12 students will fail to come to fruition (Darling-Hammond, 1999; Dean, Lauer, & Urquhart, 2005). Quality teachers, therefore, need to be well prepared and teacher education programs need to know how effective they are in this preparation (Darling-Hammond, 2006; Darling-Hammond, et al., 2002; Thomas & Loadman, 2001).

Surveying Teachers' Perceptions of Preparedness

Survey studies of candidates and graduates of teacher preparation programs are an efficient method for gathering the much needed data on program efficacy (Darling-Hammond, et al., 2002; Delaney, 1995; Thomas & Loadman, 2001; Williams & Alawiye, 2001). Often the most utilized and cost-effective methods for collecting evaluative information about teacher training experiences, surveys aim to identify respondents' views of their teacher education program. Data are gathered on how well the program reportedly prepared them for teaching, the coherence between theory and practice, the attention to classroom management issues, and perceptions of whether their program provided them the necessary knowledge and instructional strategies (Loadman, Brookhart, Freeman, Rahman, & McCague, 1999).

Surveys provide an opportunity for teacher education programs to gather information on the successes and program improvements on key program dimensions aligned with teacher quality indicators (Darling-Hammond, et al., 2002; Thomas & Loadman, 2001). Interpreting the results such that higher scores represent program strengths while lower scores provide areas for improvement is one suggested method for assessing program quality (Delaney, 1995). Loadman et al. (1999) also suggest that large scale surveys can be used to construct national and/or state norms. Specific target standards can be established to represent indicators of program quality. Program components that score lower than the norm and/or target standard might be areas where program improvement is needed. NCATE (2007) currently requires not only the solicitation of teacher perceptions of their teacher education program but also the use of these data for program improvement, increasing the necessity to ascertain teachers' preparation perceptions.

Positive Perceptions of being Prepared

Various research studies at the national (Loadman et al., 1999), state (Capa, 2005; Darling Hammond et al., 2002), program (Darling-Hammond, 2006), and course (Williams & Alawiye, 2001) level have been implemented to solicit teacher candidate and novice teaches' perceptions of their teacher education program. Such studies inquire about the quality of the characteristics of the program (e.g., coursework, student-cooperating teacher relationship) and/or quality of the knowledge and skills provided in the program (e.g., maintain order in the classroom, use appropriate assessments to gauge student learning). With respect to the former research agenda, results show that teachers perceived their programs to be of high quality. Capa (2005) assessed 617 Ohio, novice teachers' perceptions and found that first year teachers perceived their teacher education program to be above average quality in coursework, teacher education faculty and field experience. Similar results were found by Thomas and Loadman (2001). In addition to the aforemen-

tioned program characteristics, Thomas and Loadman's sample also reported their teacher education program provided quality instructional resources, informative cooperating and supervisory teacher feedback and counseling from their faculty advisor.

Program coherence, the ability of a program to effectively integrate its program components, is a central teacher education characteristic that defines graduates' positive perceptions of being prepared (Capa, 2005; Levin, 2006; Loadman et al., 1999) and their likelihood to practice these skills in the classroom (Darling-Hammond, 2006). The coherence between knowledge and skills presented by teacher education faculty and the students' field experiences and student teaching curriculum is viewed as most beneficial (Levin, 2006; Loadman et al., 1999). The novice sees this as a venue to apply and provide concrete application to the often perceived theoretical material presented in the classroom by textbooks (Levine, 2006). Further, Levine (2006) reported that the longer a beginning teacher was required to be out in the field the more she felt prepared. Interestingly, Brouwer & Korthagen (2005) found that when student teaching and college course work alternate throughout the year beginning teachers felt most prepared to effectively apply what they had learned in their program to their k -12 classroom context.

Research shows teacher education programs develop in their teacher candidates some knowledge and skills necessary for effective teaching but lag behind in other areas. Darling-Hammond (2006), in evaluating the recently restructured Stanford Teacher Education Program (STEP), a 12- month postgraduate program in secondary education, found the most favorable results. Preservice and inservice teachers in both survey results and interview feedback reported feeling well prepared to plan and organize curriculum, use the most appropriate teaching strategies, and employ assessments to meet students' needs. In addition, these graduates were reported by employers to be the most prepared and effective teachers in the classroom, relative to teachers not prepared by the STEP program. Darling-Hammond & Youngs (2002), in their response to the U.S. Department of Education's (2002) less favorable study on U.S teacher education programs, re-analyzed the DOE data to include only those teachers who graduated from traditional education programs and found similar positive results as was found in the STEP program. In addition, the 2002 study found that teachers also felt prepared to implement performance standards into their curriculum.

Assessing the preparation of literacy teaching, Bainbridge and Macy (2008) in a qualitative study found that student teachers felt well prepared to be literacy teachers, crediting their preparation to their course work and practicum experiences. Although the student teachers felt over-whelmed with the thought of being the classroom leader, they believed that their teacher education programs provided them with the literacy knowledge and teaching skills to make positive gains in their students' learning. Louden and Rohl (2005) surveyed 1300 beginning teachers and conducted focus group interviews with a sub-set of these people to ascertain their perceived preparation in a number of literacy skills. Teachers reported feeling confident about their literacy content knowledge in reading, writing and listening, their conceptual understanding of literacy and their understanding of literacy curriculum. Weiss and Colleagues (2001) conducted a study to gauge teachers' perceptions of the preparedness in mathematics using the 2000 National Survey of Science and Mathematics Education Teachers (Weiss, Banilower, McMahon, & Smith, 2001). They found that teacher's felt "very well" prepared to teach some content areas including pre-algebra, computation, estimation and measurement. When asked about their level of preparedness to teach mathematics related strategies the vast majority of respondents indicated they felt most prepared to take students' prior understanding into account when planning curriculum and instruction (86%), develop students' conceptual understanding of mathematics (88%), and listen/ask questions as students work in order to gauge their understanding (93%).

Perceptions of being Unprepared

Levine (2006), in surveying over 15,000 graduates of teacher education programs, found the most discerning results of teachers' perceptions of preparedness. Alumni believed they were ill prepared in eight of the eleven skills assessed. Only sixty percent of respondents reported being at least "moderately well" prepared to implement state or district curriculum and performance standards and address the needs of students with disabilities, with slightly more teachers (67%) reported being able to use student performance assessment techniques. Maintaining order and discipline in the classroom, integrate technology in the classroom, and address needs of students from diverse cultural backgrounds included 50% or less of respond-

ents feeling "moderately well" prepared. Teachers felt least prepared (<40%) integrating technology into the grade level or subject taught and addressing the needs of students with limited English proficiency.

Although some of these results contradict other studies (e.g., Darling-Hammond, 2006; Loadman et al., 1999), teachers consistently report that their teacher education programs were less successful in preparing them to work with diverse learners (Hollins & Guzman, 2005; Scales 1993) particularly those students with learning disabilities (Darling-Hammond & Youngs, 2002; Loadman et al., 1999; Pugach, 2005) and students whose primary language is not English (Darling-Hammond, 2006). These more negative results were found even in the most successful teacher education programs (i.e., Darling-Hammond, 2006). Similar results emerge when evaluating program specific content areas like literacy (Bainbridge & Macy, 2008; Louden & Rohl, 2006); less is known on how well mathematics teacher education programs integrate these skills. Teacher education programs that integrate alternative instructional strategies (e.g., direct instruction, cognitive strategy instruction, inductive instruction and cooperative learning) aligned with the student developmental theory that supports these strategies produce teachers who felt more successful in their teaching and more prepared to manage their classroom of mixed-ability students (Pugach, 2005). Further, when student teachers are taught how to have "regular" students work collaboratively with their special education peers, learn to avoid labeling and making assumptions about students with disabilities, and learn how to make accommodations and modifications in teaching styles for differently-abled students, they report being more prepared (Louden & Rohl, 2006).

The ability to effectively integrate technology (Darling-Hammond & Youngs, 2002; Darling-Hammond, 2006) and effectively utilized assessment to gauge student learning (Loadman et al., 1999; Thomas & Loadman, 2001) were additional areas in which teacher education programs were less able to effectively prepare their teacher candidates. Bainbridge and Macy's (2008) English teacher candidates indicated they would have been more prepared in assessment had they been exposed to a larger repertoire of techniques applicable in the language arts setting and across different language learners. Obtaining sufficient procedural knowledge and direction in using results to inform student placement and teaching strategies were also lacking, an issue Pugach (2005) found was most helpful to novice teachers when these topics were prominent. Avoiding a teacher education program that creates competition with or duplications in assessment and special education coursework with content specific courses is perceived by teacher graduates as most beneficial (Levin, 2006).

Licensure Levels Differences in Preparation Perceptions

Research shows that licensure level is an important predictor of perceived preparation. Elementary teachers report being more prepared in content knowledge and pedagogical knowledge relative to their secondary counterparts (Capa, 2005; Loadman et al., 1999; Louden & Rohl, 2006; Thomas and Loadman, 2001; Weiss, et al., 2001). Louden and Rohl's (2006) four-phased national study on language arts teaching found that although elementary and secondary trained beginning teachers reported being similarly prepared in the conceptual understandings of literacy on reading, writing, speaking and listening they reported being differently prepared in understanding grammar, phonics and spelling. Secondary teachers also reported being significantly less prepared to teach language arts and use language arts curriculum documents. The fact that secondary teachers reported that their teacher education curriculum was less practical and more theoretical, particularly in comparison to their mathematics curriculum, was a probable explanation for the less favorable perceptions. Further, secondary teachers, relative to those trained as elementary teachers, reported less extensive coursework in language arts strategies and subsequently believed they were ill prepared to teach meta-cognitive strategies, less qualified to employ strategies that link reading and writing, and less familiar with integrating computer based, literacy activities into daily lessons. The respondents called for a teacher education program that integrated more practical ideas and strategies, focused less on theory, provided more basic literacy skills and explicitly illustrated the relevance of the knowledge developed during their teacher education coursework.

When Horizon Research compared middle and high school teacher's perceived knowledge in various mathematics content domains, high school teachers reported having more content knowledge in calculus, statistics, measurement, (pre) algebra, geometry, probability, and estimation. Only in computation were there more middle school prepared teachers reported

to have more knowledge relative to those trained at the high school level. Both groups, however, were more prepared to teach computation, estimation, measurement, and pre-algebra relative to other content areas. In eight strategies assessed, four strategies (e.g., make connections between mathematics and other disciplines, lead a class of students using investigative strategies, have students work in cooperative learning groups, and manage a class of students engaged in hands-on/project-based work) showed fewer high school teachers reporting being prepared relative to both middle and elementary school teachers.

We cannot overstate the importance of ascertaining teachers' perceptions of being prepared. Few studies, however, have sought to publish teachers' perceptions of preparedness, data imperative to improving teacher education (Thomas & Loadman, 2001). When such assessments are provided, studies either collapse preservice and inservice teachers' perceptions (e.g., Darling-Hammond, et al., 2002) or focus exclusively on inservice teachers (e.g., Loadman et al., 1999; Louden & Rohl, 2005; Thomas & Loadman, 2001). Although we recognize the utility of ascertaining inservice teachers' perceptions of being prepared (Thomas & Loadman, 2001) this method has its limitations (Brouwer, 2005). Numerous authors (e.g., Brouwer & Korthagen, 2005; Darling-Hammond et al., 2002; Pugach 2005) have pointed out that obtaining inservice teacher's retroactive perceptions of their teacher education have the potential to cloud contextual teaching experiences outside a teacher education programs control. Therefore, we focus our analyses on preservice teachers' perceptions of preparedness in an attempt to avoid this pitfall. Further, we address how licensure level and subject area might differently influence preservice preparedness perceptions. Previous research has shown the importance of licensure level on these perceptions however little research has been conducted on how middle school and high school prepared teachers differ in perceived preparedness. Finally, there are no known studies that address how subject area might be an important factor in understanding how well preservice teachers perceive being prepared. This research seeks to narrow this gap in the research.

Background of the Study

The Teacher Quality Partnership (TQP) of Ohio began as a response to the federal mandate for annual reporting of indicators on teacher education programs in late 2001. At that time, the State University Education Deans (SUED) developed a concept paper with the underlying intent to provide information that better reflected the status of teacher education in Ohio and went well beyond the indicators specified in the original federal mandate of reported indicators. The Ohio Association of Private Colleges of Teacher Education (OAPCTE) coalesced with the SUED group to form the initial partnership of all 50 institutions (both public and private) of higher education in Ohio that prepare teachers to join together to study teacher education in Ohio. There were significant behind the scenes efforts in order to make this partnership a reality.

Initial funding for the effort was obtained with a planning grant from Proctor and Gamble that was soon parlayed into joint support from The Ohio Department of Education (ODE) and the Ohio Board of Regents (OBR). The leadership of this effort quickly engaged all major stakeholders in teacher education in Ohio including representatives from ODE, OBR, the school administrator association, the two prominent teacher unions in the state (OFT and OEA), the Governor's office, and key school superintendents by forming a project advisory board designed to communicate with these various entities as well as seek their advice and input to help steer the initiative through turbulent and uncharted waters. The leadership also obtained the support and endorsement from the provost's from the three lead universities (University of Cincinnati, University of Dayton and The Ohio State University). Politically the initiative was far ahead of the embryonic develop of the newly forming research initiative to study teacher education. With the endorsement of the initiative by the key constituent groups, the leadership moved forward in two important directions.

First educational researchers from participating institutions around Ohio were recruited to begin the task of developing a multi-phase research agenda. This recruitment resulted in coalescing groups of researchers from 11 of the institutions and these individuals eventually formed into five thematic strands. These thematic strands were: 1. Alternative Teacher Education; 2. Novice Teachers; 3. Experienced Teachers; 4. Graduate Surveys; and 5. Longitudinal Study. The ultimate goal was to study teacher education and determine what aspects of teacher education programs were related to program strength and ultimately K-12 student achievement in the form of a value-added metric.

Second, the leadership went about the business of securing large scale financial support to under-gird the research. The research strands began to develop at different rates and with considerable unevenness. Over the next five years, substantial extramural dollars were obtained from ODE, OBR, private foundations, the federal government and private companies in the forms of grants, contracts and gifts. Some of the dollars raised were awarded on an on-going annual basis, others were one time amounts and still others had specified award lives such as two to five year life of the initiative. Altogether more than four million dollars was raised in support of the research goals.

The graduate survey strand was one of the first strands to mature and resulted in the development of the preservice instrument. The instrument was drafted and piloted in 2003 and was used for actual data collection starting in the spring of 2004. In this strand, five cohorts of data were collected through the 2008 year with approximately 5,000 responses per year. Data were obtained from preservice graduates from all of the 50 institutions. The instrument was designed to collect perception data from students graduating from all teacher education programs across the state of Ohio. In a given academic year, there were approximately 7,000 graduates from all teacher preparation programs across the state. The spring of 2004 was also used to develop and pilot test the inservice instrument, designed to be a companion document to the preservice instrument. The inservice instrument captures some of the same information as the preservice instrument, but was responded to by newly hired teacher education graduates after one year of teaching. The instrument was also designed to obtain additional information about the experiences of the new teacher. Because of the development and early data collection and analyses, the graduate survey strand results were used to make visible the potential of the partnership research agenda. The results were also used to provide state norms and standards for each of the participating partner institutions. The data used in this study come from the graduate survey strand of TQP.

Method

Participants

The current study utilized Ohio, TQP, Preservice surveys between the 2004-05 (Cohort II) and 2007-08 (Cohort V) academic years, obtaining survey data on 4,650 middle and high school teacher candidates licensed in either mathematics or reading. Of these respondents, 2,502 were seeking middle childhood (grades 4-9) licensure: 1,228 in Mathematics and 1,274 in Reading and Language Arts. The remaining 2,148 respondents were seeking an Adolescence to Young Adult (AYA, grades 7-12) licensure: 915 in Mathematics and 1,233 in Integrated Language Arts. The 4,650 responses represent candidates from all of Ohio's fifty teacher preparation institutions.

Instrumentation

The TQP Graduate Preservice Survey, comprised of ten sections, ascertain information about preservice teachers' beliefs about teaching, perceptions of the quality of their teacher preparation program, and their teaching concerns in addition to contextual demographic data. Although the entire survey includes twenty subscales, in the current study we focus on six of these scales which measure teacher preparation program perceptions and perceived professional knowledge and skills obtained from their teacher education program. The survey items were guided by theory and constructed from previously created survey instruments including the Beginning Teacher Preparation Survey by Valli, Raths, & Rennert- Ariev (2001) and Loadman, Brockhart, & Freeeman's (1999) National Survey of Teacher Education Graduates. We explain first the six subscales used in this study followed our central demographic measure.

Coherence within program. Comprised of five items, on a 5-point Likert scale ('Strongly Disagree'=1 to 'Strongly Agree'=5), this subscale measures the preservice teachers perceptions of their overall teacher education program. An example item includes: *My teacher education instructors were knowledgeable about the standards and expectations of my teacher education program as a whole.* (Crombach's α=0.85; RMSEA=0.058).

The remaining five subscales represent the quality of professional knowledge and skills the preservice teacher reports receiving from his or her teacher education program. Each scale is measured on a 5-point Likert scale ('Not at All' =1 to 'Very Well'=5). A five-factor, correlated model was estimated to determine construct validity; this construct is valid (RMSEA = 0.063) and reliable (Crombach's α = 0. 90).

Special Education preparation (5 items). The scale asked respondents to rate to what extent

their teacher education experiences prepared them for teaching students with special education needs. (Crombach's α = .0.80). An example item includes: *How well did your teacher education program prepare you to refer students for special assistance when appropriate (e.g., speaking, reading)?*

Diversity preparation (9 items). The scale asked respondents to rate to what extent their teacher education experiences prepared them for teaching in an environment with diversity (Crombach's α = 0.93). An example items includes: *How well did your teacher education program prepare you to address the needs of students from diverse cultural backgrounds?*

Preparation to teach reading and writing (13 items). The scale asked respondents to rate to what extent their teacher education experiences prepared them to teach reading and writing (Cronbach's α = 0.95). An example item includes: *How well did your teacher education program prepare you to teach reading vocabulary (emphasizing word meaning)?*

Preparation to teach mathematics (10 items). The scale asked respondents to rate to what extent their teacher education experiences prepared them to teach mathematics (Crombach's α = 0.96). An example item includes: *How well did your teacher education program prepare you to use of mathematical problem solving processes in teaching?*

Preparation for student assessment (10 items). The scale asked respondents to report how well their teacher education experiences prepared them for assessing students (Crombach's α = 0.98). An example item includes: *How well did your teacher education program prepare you to use standardized assessments to guide your decisions about what skills, concepts, and processes to teach*.

Licensure level and subject area (1 item). Respondents were also asked to: *Select the categories that most closely match the areas in which you are pursuing to be licensed to teach*. Eleven options were available that integrated subject area (e.g., Mathematics, Reading and Language Arts, History, Science) and grade level (e.g., Elementary, Middle Childhood, AYA, Intervention Specialist). Only participants who indicated they were seeking a license in Mathematics or Reading and Language Arts in middle and high school were used in this study. Therefore, the original item was split into two independent variables for the study: licensure level (Middle Childhood=0, AYA =1) and subject area (Mathematics=0, Reading and Language Arts =1).

Procedure

Survey instruments were administered to graduating teacher candidates at each of the 50 Ohio teacher education institutions during the end of student teaching and/or the final semester of one's teacher education program by a TQP higher education representative. Respondents were able to complete the survey either in hard-copy or online. Surveys were filled out anonymously to encourage candid responses.

Research Plan

The objectives of this research were formed to provide insight into how institutions of higher education can use data to adjust and design their teacher education programs to be responsive to perceived weaknesses and shortcomings while building on perceived program strengths. This investigation provides an overview of relationships across characteristics and perceptions for Preservice teacher candidates in the State of Ohio. The research questions guiding the investigation include:

- What are the 2004-2008, Ohio, Preservice teacher candidate perceptions of their preparation program when considering subject area (Mathematics or Reading and Language Arts) and level of licensure (Middle Childhood or AYA) using descriptive statistics?
- Do these preservice teacher candidates' perceptions of being prepared, as measured by the six preparation subscales, differ statistically by subject area and/or licensure level using Multivariate Analysis of Variance (MANOVA)?

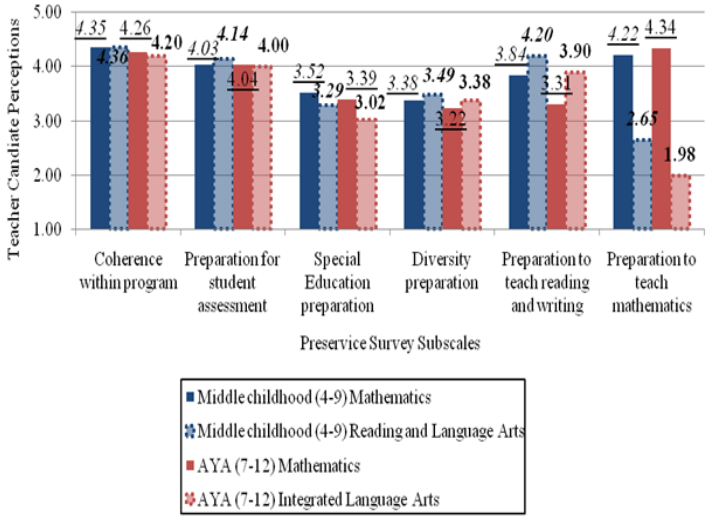
Results

Analysis of variance analyses (ANOVA) were conducted to ensure that mean subscale scores were not statistically or practically different on additional key variables including whether the teacher candidate graduated from a public or private institution (i.e., private/public status) and the year in which the participants graduated from his or her teacher education program (i.e., cohort). Survey responses reflected cross-year and private/public institution status similarities. For this reason, data were aggregated across cohort

and public/private status to answer our research questions.

RQ1 –Descriptive Profile

Figure 1 presents the mean perception of being prepared on the six preparation subscales disaggregated by licensure level and subject area; Table 1 presents these same means and their associated standard deviations. Overall, all teacher candidate subgroups



* Each subscale rating ranges from 1=Strongly Disagree to 5=Strongly Agree.

Figure 1. Ohio teacher candidate program perceptions, by level of licensure and subject area, among the six Preservice subscales of interest reported favorable perceptions on the *Coherence within program* and *Preparation for student assessment* subscales. On a 5-point scale, the four subgroups were above the 4.00 mean score benchmark used for statewide reporting . Mean perceptions for program coherence ranged between 4.36 and 4.20 while preparation for student assessment mean scores ranged between 4.14 and 4.00. Further, consistencies are apparent across licensure level and subject area. For this reason, we conclude that, from the descriptive analysis, license level and subject area do not appear to influence teacher candidate perceptions on the coherence within program and preparation for student assessment subscales and on average each group reports relatively positive ratings.

Teacher candidates diverged in their responses to *Special Education preparation* and *Diversity preparation*. Overall, teacher candidates report lower levels of preparation on these two scales, across license level and subject area, as mean scores fall at or below 3.52, noticeably lower than the 4.00 statewide standard score. Mathematics candidates, regardless of licensure level, reported a slightly higher perceived preparation in special education (Middle *M*=3.52, *SD*=0.80; AYA *M*=3.39, *SD*=.078) relative to Reading and Language Arts candidates (Middle *M*=3.29, *SD*=0.83; AYA *M*=3.02, *SD*=0.82). Conversely, Reading and Language Arts candidates reported being slightly more prepared to address diversity issues (Middle *M* =3.49, *SD*=0.80; AYA *M*=3.38, *SD*=0.84) relative to those seeking Mathematics licensure (Middle *M*=3.38, *SD*=0.76; AYA *M*=3.22, SD=0.78). Collectively, these scales show moderate between-group variability and are below the 4.0 standard.

Not surprisingly, both Mathematics and Reading and Language Arts teacher candidates report a lower level of perceived preparation outside their respective subject area. Middle Childhood (*M*=3.84, *SD*=0.73) and AYA (*M*=3.31, *SD*=0.83) mathematics reported low program perceptions on the *Preparation to teach reading and writing* subscale. Middle Childhood Reading and Language Arts (*M*=2.65, *SD*=1.03) and AYA Integrated Language Arts (*M*=1.98, *SD*=0.97) candidates held unfavorable program perceptions on *Preparation to teach mathematics*, while candidates seeking Mathematics licensure felt well prepared (Middle *M*= 4.22, *SD*=0.79; AYA *M*=4.34, *SD*=0.84). AYA Reading and Language Arts were below a mean of 4.00 for the state benchmark (M = 3.90, SD =0.78) in the content area they were seeking licensure. Duly alarming, is these same candidates have remarkably low levels of perceived preparation in mathematics and these perceptions are lower than Mathematics candidates' perceptions of being prepared in Reading and Language Arts. There is considerable variability between groups, with both subject area and license level influencing preparation perceptions in these two areas.

RQ2 –Multivariate Analysis of Variance

Extending this analysis, a 2x2 multivariate analysis of variance (MANOVA) was conducted to evaluate the statistical influence of subject area and licensure level (independent variables) on the six teacher education preparation subscales – coherence within program, preparation for student assessment, special education preparation, diversity preparation, preparation to teach reading and writing, and preparation to teach mathematics (dependent variables). The independence, normality and homogeneity of variance and covariance assumptions were met, and the alpha level was set to 0.05.

Table 1

Descriptive Statistics by Subject Area and License Level and Inferential Summary.

	Subject Area	Middle Childhood (4-9)		AYA (7-12)		Total		Inferential Analyses Summary		
		Mean	SD	Mean	SD	Mean	SD	Subject Area	License Level	Interaction
	Mathematics	4.35	0.63	4.26	0.69	4.31	0.66			
Coherence within program	Reading and Language Arts	4.36	0.67	4.20	0.76	4.28	0.72	--	L	--
	Total	4.36	0.65	4.23	0.73	4.30	0.69			
	Mathematics	3.38	0.76	3.22	0.78	3.31	0.77			
Diversity preparation	Reading and Language Arts	3.49	0.80	3.38	0.84	3.43	0.82	S	L	--
	Total	3.43	0.78	3.31	0.82	3.38	0.80			
	Mathematics	3.52	0.80	3.39	0.78	3.46	0.79			
Special Education preparation	Reading and Language Arts	3.29	0.83	3.02	0.82	3.16	0.84	S	L	I (*Ordinal)*
	Total	3.40	0.82	3.18	0.83	3.30	0.83			
	Mathematics	3.84	0.73	3.31	0.83	3.61	0.82			
Preparation to teach reading and writing	Reading and Language Arts	4.20	0.67	3.90	0.78	4.05	0.74	S	L	I (*Ordinal)*
	Total	4.02	0.72	3.65	0.86	3.85	0.81			
	Mathematics	4.22	0.79	4.34	0.84	4.27	0.81			
Preparation to teach mathematics	Reading and Language Arts	2.65	1.03	1.98	0.97	2.32	1.05	S	L	I *(Disordinal)*
	Total	3.43	1.21	3.00	1.49	3.23	1.36			
	Mathematics	4.03	0.66	4.04	0.69	4.04	0.67			
Preparation for student assessment	Reading and Language Arts	4.14	0.69	4.00	0.77	4.07	0.73	--	L	I *(Disordinal)*
	Total 4.09	0.68	4.02	0.73	4.06	0.71				

Each subscale rating ranges from 1=Strongly Disagree to 5=Strongly Agree.

** There were 4,650 total respondents in the dataset.

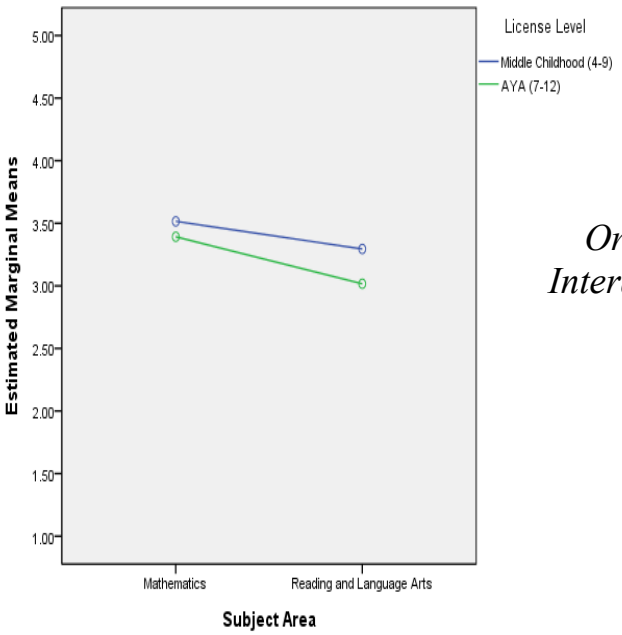
Note: S, L, and I represent significant subject area main effect, license level main effect, and interactions between subject area and license level, respectively. – indicates no statistically significant results were present.

Overall MANOVA. The multivariate test for the subject area main effect is significant, Pillai's Trace = 0.628, $F(6, 4499) = 1265.706$, $p<.01$). Pillai's Trace for the license level multivariate test is also significant, Pillai's Trace = 0.102, $F(6, 4499) = 85.492$, $p<.01$); as is the subject area by licensure level interaction, Pillai's Trace = 0.071, $F(6, 4499) = 57.013$, $p<.01$). The six separate univariate analyses of variance results varied by the subscale under investigation. Therefore, the results herein are organized by subscale according to the complexity of the results.

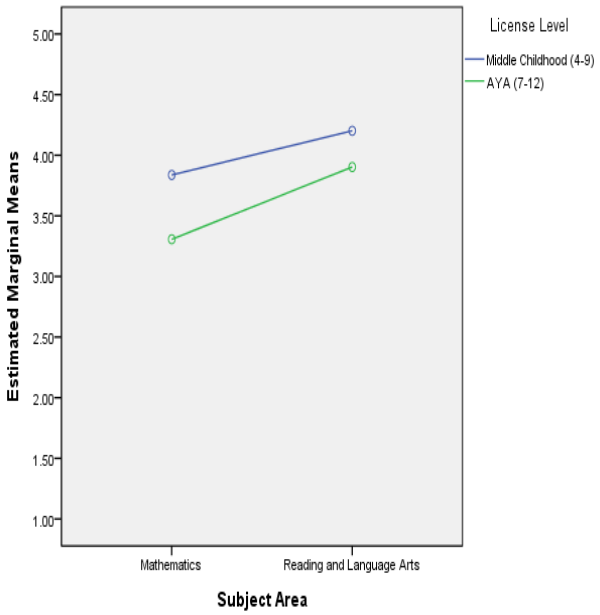
Coherence within program & diversity preparation. The *Coherence within program and Diversity preparation* analysis of variance results showed no significant interaction. There was however a license level main effect for both scales (Coherence $F(1, 4504) =36.721$, $p<.05$, $\eta^2=.008$; Diversity $F(1, 4504)= 31.586$, $p<.05$, $\eta^2=.007$), with Middle Childhood candidates (Coherence M=4.36, SD=0.65; Diversity M = 3.43, SD= 0.78) reporting greater perceived preparation than AYA candidates (Coherence M=4.23, SD=0.73; Diversity M = 3.31, SD= 0.82). In addition, there was a subject area main effect for *Diversity preparation*, $F(1, 4504) = 28.870$, $p<.05$, $\eta^2=.006$, with Reading and Language Arts candidates (M = 3.43, SD= 0.82) reporting being more prepared in diversity relative to their Mathematics trained peers (M = 3.31, SD= 0.77). Effect sizes for these significant main effects were small, and thus interpretation of meaningful differences should be taken with caution.

Special education preparation & preparation to teach reading and writing. Ordinal interactions were observed on the *Special Education preparation,* $F(1, 4504) = 10.174$, $p<.05$, $\eta^2=.002$ and *Preparation to teach reading and writing,* $F(1, 4504) = 26.515$, $p<.05$, $\eta^2=.006$ subscales. Therefore differences between subject areas on perceived preparation depend on the teacher candidates' licensure level. Figure 2(a) and 2(b) illustrate these relationships. Mathematics teacher candidates (Middle M= 3.52, SD=0.80; AYA M=3.39, SD=0.78) report being slightly more prepared in special education than their Reading and Language Arts peers (Middle M= 3.29, SD=0.83; AYA M=3.02, SD=0.82); however, this latter group differed in their preparation perceptions by licensure level more so than did the mathematic candidates. Middle Childhood Reading and Language Arts respondents felt more prepared relative to AYA participants. Main effects for both licensure level, $F(1,4504)=65.553$, $p<.05$, $\eta^2=.015$, and subject area $F(1,4504)=151.026$, $p<.05$, $\eta^2=.032$, were also present and interpretable given the ordinal interaction. Here, Mathematics teacher candidates (M= 3.46, SD=0.79) reported being more prepared to deal with special education issues relative to those seeking licensure in Reading and Language Arts (M=3.16, SD=0.84). Similarly, those seeking a Middle Childhood license (M=3.40, SD=0.82) report being more prepared in special education relative to those who were seeking an AYA licensure (M=3.18, SD=0.83). When considering teacher candidates' perceptions in *Preparation to teach reading and writing,* Reading and Language Arts candidates consistently had a greater perceived preparation when compared with Mathematics candidates. However, the latter group showed a greater divide by licensure area with AYA Mathematics candidates reported being less prepared, (M=3.31, SD=0.83), than those in Middle Childhood Mathematics (M=3.84, SD=0.73). Statistically significant main effects for licensure level, $F(1,4504)=340.057$, $p<.05$, $\eta^2=.070$, and subject area $F(1,4504)=456.207$, $p<.05$, $\eta^2=.092$, were also present. Similar to perceptions of special education preparation, Middle Childhood candidates (M=4.02, SD=0.72) reported being more prepared to teach reading and writing relative to the AYA candidates (M=3.65, SD=0.86). Unlike the special education results, Reading and Language Arts content specialists (M=4.05, SD=0.74) reported being more prepared to teach reading and writing relative to the Mathematics candidates (M=3.61, SD=0.82).

Preparation to teach mathematics & preparation for student assessment. Also referred to as 'crossover' interactions, the final two analysis of variance models showed significant disordinal interactions (see Figure 2(c) and 2(d)). These two interactions were found when respondents addressed their *Preparation to teach mathematics*, $F(1, 4504) = 202.346$, $p<.05$, $\eta^2=.043$, and *Preparation for student assessment,* $F(1, 4504) = 12.452$, $p<.05$, $\eta^2=.003$. Mathematics teacher candidates held similar program perceptions across Middle Childhood (M=4.22, SD= 0.79) and AYA (M=4.34, SD= 0.84) license levels when asked about their level of preparedness in teaching mathematics. However, AYA Language Arts candidates reported being less prepared (M= 2.65, SD=1.03) than their Middle Childhood peers (M=1.98,

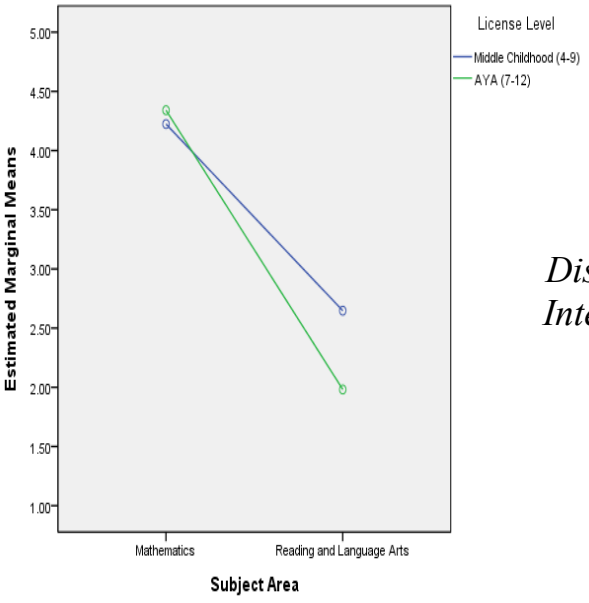


Ordinal Interaction

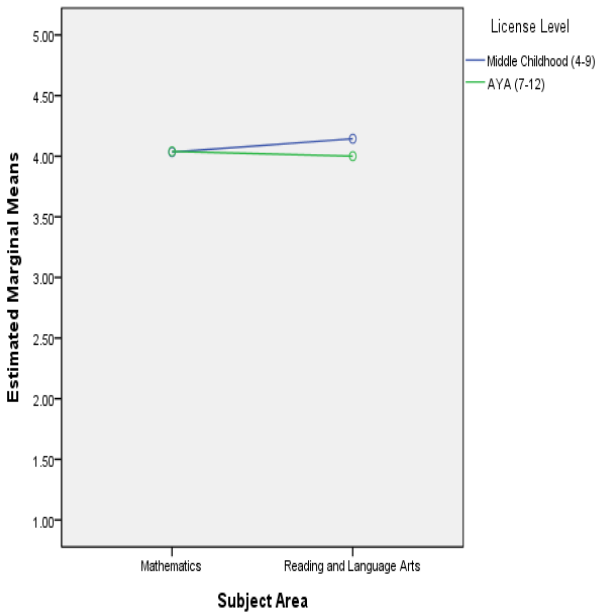


Special Education preparation

Preparation to teach reading and writing



Disordinal Interaction



Preparation to teach mathematics

Preparation for student assessment

*Each subscale rating ranges from 1=Strongly Disagree to 5=Strongly Agree.

Figure 2. Estimated marginal means for Middle Childhood and AYA preservice teacher candidates by Subject Area for results with significant interactions.

SD=0.97). A similar interaction pattern emerged on student teachers' perceptions of their *Preparation for student assessment*. Likewise, Mathematics student teachers across licensure level reported similar preparation perceptions (Middle *M*=4.03, *SD*=0.66; AYA *M*=4.03, *SD*=0.69). Differences across licensure level for Reading and Language Arts candidates were present (Middle *M*=4.14, *SD*=0.69; AYA *M*=4.00, *SD*=0.77) but not as distinct as they were when asked about their preparation to teach mathematics.

Discussion

The current study sought to obtain Ohio preservice teachers' perceptions of their teacher education program using data collected from the Teacher Quality Partnership project from the 2005 through 2008 academic years. The descriptive data on teachers' perceptions were particularly important because they determined whether prospective teachers believed they were prepared to be effective teachers and whether the acquisition of these skills could be attributed to their teacher education program. The results, compared to a state normed mean and comparable across program quality domains, showed that the level of perceived preparation varied by the knowledge and skill being assessed.

Preservice teachers in Ohio reported their teacher education program was less successful in preparing them to teach in an environment with diversity, including teaching students with special education needs. Ohio preservice teachers' limited preparation perceptions are consistent with previous research (e.g., Darling Hammond & Young 2002; Levin, 2006; Loadman, et al., 1999; Hollins & Guzman, 2005; Pugach, 2005; Scales, 1993), including language arts preparation programs (Bainbridge & Macy, 2008; Louden & Rohl, 2006). Research has shown that teacher education programs can improve preparation by effectively integrating diverse teaching strategies rooted in student developmental theory (Pugach, 2005). In addition, since collaboration between the special education and general education classroom teachers has been an effective method to improve preparation (Louden & Rohl, 2006), it might be beneficial for this strategy to be applied in the preservice context. Special education and general education faculty might collaborate in curriculum development with the intentions of providing preservice teachers with teaching tools applicable across the student ability continuum. We do entertain the idea that the need for improved special education preparation could be a product of aggregating perceptions across special and general education prepared students. Intervention specialist trained preservice teachers might have reported being more prepared than their general education counterparts. Although we suggest future research disaggregate these perceptions, differentiated instructional strategies in Ohio's teacher education programs overall appear to be lacking but needed.

The fact that Ohio preservice teachers reported an average scaled score of 4 out of a possible 5 when asked whether their program was coherent and when asked how well their teacher education program prepared them to assess students indicates that Ohio's teacher education programs possess elements of success. The perceived program coherence results found here mirror other Ohio studies (e.g., Capa, 2005; Thomas & Loadman, 2001) and elsewhere (e.g., Darling-Hammond, 2006). Prior research has emphasized the utility of aligning clinical experience and college course work to best maximize the utility of teachers applying concepts in the K-12 classroom. This study supports these results and further demonstrates Ohio programs employ instructors knowledgeable about standards and teacher education expectations as well as structuring programs so that criteria used to evaluate student teachers are consistent with methods course content.

What appears most surprising is the more positive reporting of Ohio's programs to prepare preservice teachers for student assessment. Teacher education has a long standing challenge to effectively prepare teachers to use assessments to inform teacher instruction and student learning (Karp, 2008; Levin, 2006). Perhaps Ohio teacher education programs have exposed their student teachers to a repertoire of assessment techniques applicable to diverse student populations (Bainbridge & Macy, 2008) and detailed directions in using results to inform teaching and learning (Pugach, 2005). Further, national, state and local attention focusing on using data to inform instructional decisions has probably sharpened teachers' attention and awareness of the need for sound assessment of student achievement. This increased attention has undoubtedly filtered into the various teacher education programs across the state. The data also suggest that Ohio preservice teachers varied in their perception of preparation to teach reading/writing and mathematics. It is not surprising that preservice teachers in their respective programs reported being prepared to teach in

their licensure area. These findings concur with Bainbridge and Macy (2008) who assessed language arts preparation perceptions and Weiss et al. (2001) who assessed preparation in mathematics. The lack of perceived preparation across subject matter content might be due to the survey items being pedagogically and content specific. Regardless, it is alarming to see reading/language arts preservice teachers report being so ill prepared to teach mathematics related content, especially since student teachers in mathematics reported being at least moderately prepared to teach reading and language arts. The discrepancy might be due to the state emphasis for all teacher candidates seeking licensure to successfully complete at least two reading courses in their teacher education preparation program. It is also important to point out that language arts, preservice teachers do not feel as prepared to teach in their own subject matter relative to mathematics trained preservice teachers. Research shows language arts preservice teacher's experience a theory and practice disconnect, concerns less often reported by mathematics preservice teachers (Louden & Rohl, 2006).

The use of inferential analyses to determine licensure level and subject matter differences in perceived preparation were especially pertinent given the limited focus by previous research. The MANOVA for the six measures of program efficacy by licensure level and subject area indicated many statistically ($p < .05$) different measures, with both licensure level and subject area as respondent characteristics that generated differential responses. The univariate follow-up analyses, effect sizes, and mean differences indicated Ohio teacher candidates in reading/language arts and mathematics across middle childhood and AYA licensure levels were more similar than different when assessing perceptions about program coherence, preparation in special education and diversity and preparation for student assessment. Although inferential analyses showed licensure level and subject area statistical differences, with such a large sample size we thought it was important to evaluate the practical significance using a .5 mean difference between groups (e.g., middle childhood, AYA, language arts, and mathematics) and at least a .10 effect size. With mean differences no larger than .2 and effect sizes between .001 and .03 we concluded that although some differences were statistically significant, the differences were probably not meaningful to our constituency.

Finally, when assessing inferential differences in perceived preparation to teach reading/writing and mathematics both licensure level and subject area were respondent characteristics that generated differential responses. Ohio preservice teachers differed statistically by licensure level in their preparation perceptions to teach reading/writing and mathematics. AYA preservice teachers relative to their middle childhood licensed counterparts reported being more prepared to teach mathematics with opposite results emerging when asked about preparation to teach reading and writing. The licensure differences in mathematics mirrors previous results (Weis, et al., 2001) and no previous studies assessing middle childhood and AYA perceptual differences were found in the language arts literature. We caution the interpretive value of these statistical differences. Although effect sizes in these analyses were larger than results in program coherence, diversity, special education and student assessment, the licensure differences in preparation to teach reading/writing and mathematics are relatively small (e.g., .07 and .02).

Subject matter perceived preparation differences in teaching reading/writing and mathematics mirror the descriptive results presented earlier. That is, preservice teachers trained in their respective content area reported being more prepared than those not seeking a license in the content area under investigation (e.g., reading/language arts, mathematics). Of both statistical and practical significance are the subject area differences in preparation to teach mathematics. With mean differences over two points and an effect size of .531, it is a concern that language arts preservice teachers report being ill prepared to address mathematically directed teaching strategies. In an era of emphasized inter-disciplinary work and the need for teachers to connect concepts across the content areas, it appears that preservice language arts teachers need to be more informed in how mathematics can be integrated into their teaching. The more positive preparation perceptions by mathematics preservice teachers in language arts/reading might be due to the emphasis in Ohio's teacher education programs to view reading as integral to mathematical comprehension.

Overall, Ohio teacher education program personnel found these results particularly informative because they had a state-normed sample of evidence as well as a state standard upon which to view their own data. Teacher education program administrators were quick to recognize and use the results of the studies to inform their internal and external program review and

accreditation reports, e.g., NCATE. In addition, areas of strength and areas of concern for the state as a whole are readily apparent from these data. Representatives from each institution can readily identify areas of strength and concern for their institution as well. These data help provide them with a road map for change in their teacher education programs. Significant program changes were made by individual institutions and programs within those institutions by identifying areas of strengths and areas of limitations on the surveys identified by their own students. By making public the state normative data while keeping the individual institutional and program level data confidential, it continued to provide the researchers with annual data from each institution while allowing individual institutional administrators the opportunity to adjust and revise their programs in a collaborative environment. The honoring of the promise not to make a public reporting of individual institutional results, nor providing a ranking of the institutions not only continued to build on the trust among the participants, a trust that continues to reap dividends today in strengthening the teacher education programs across the state of Ohio.

Implications

The future of our educational system continues to be a statewide, and national, concern. The presence of highly qualified teachers in the classroom is essential in helping students reach high levels of achievement. Specifically, a thorough evaluation of teacher education programs – especially with respect to teacher candidate preparation perceptions – may serve as the root of determining the success of preparation programs (Delaney, 1995).

This large –scale initiative would not have been possible without the exceptional cooperation and support of many individuals and organizations. Strong leadership was evident from the deans and directors of all 50 teacher education institutions in Ohio. There was particularly strong leadership exhibited by the three lead institutions at the University of Cincinnati, the University of Dayton and The Ohio State University, including their provost's, Education Deans and researchers from many of the partner institutions. There was support from the Ohio Department of Education, the Ohio Board of Regents and the Governors office. There was support from both major teacher unions. There was support from several major school district superintendents. There was significant financial support provided by federal and state agencies, private foundations and private corporations. The research reported here was strongly supported by a local institutional liaison at each institution. There was strong support provided by the research team which undertook this substantial investigation. Collectively these efforts were stunning in magnitude and accomplishment. Without this cooperation and collaboration this work would not have been accomplished; the scale and degree of cooperation exhibited in this undertaking are unprecedented in Ohio, not just in teacher education, but across all academic disciplines in the state. This initiative can serve as a model for other states and other discipline areas in Ohio.

On the downside, one of the original foundational blocks of the research investigation was to obtain and tie many variables together to see what in the preservice program would be related to subsequent P-12 student achievement. This was to be in the metric of a value added score for each practicing classroom teacher in the data base of the study. Despite the ongoing and tenacious efforts of the research team to obtain de-identified but coded data on the value-added metric, we were never able to secure the data to make this connection. The ability to make this important linkage continues as a hope for the future, particularly with the continuing efforts to create state-wide databases. However, at this time, it is not a reality.

This investigation demonstrated how unforced collaboration can successfully drive change in teacher education. There are significant lessons learned from the research, e.g., developing and maintaining a research partnership; using data to drive individual program change; building and sustaining trust across public and private institutional boundaries; and sustaining relationships among these entities. Learning where there is collective strength and collective weaknesses across the state and at individual institutions allows policy makers to develop strategic plans to address these situations; it also provides significant peer pressure for institutions to address programmatic limitations without being overly exposed prior to remediation.

Benchmark data were derived by using both relative and absolute performance standards to allow individual institutions to assess their own positions on the various subscale indicators that are directly related to program quality. What we discovered is that individual institutions differed substantially across the various measures; each institution had a unique profile and there wasn't a single institution that was consist-

ently high or consistently low across all of the indicators. By reporting publicly in the aggregate, while maintaining the confidentiality of individual institutions allowed for substantial progress, maintaining the continued flow of quality data across years, building strong trust among the members while providing useful and important data back to each institution. We learned that by providing the individual institutions with their own data as well as the state norms and quality standards that these institutions made serious attempts to build upon their strengths while simultaneously addressing their perceived limitations using the self-correcting mechanism.

Developing and sustaining this effective partnership of all fifty public and private institutions of higher education in Ohio that offer teacher education programs was a major accomplishment. The collective will of these institutions was significant in achieving study success. In the larger picture the trust engendered among the partnership members has allowed for continuing development and success in moving teacher education forward in the state of Ohio. In addition, evidence-based research, through the longitudinal and cross-sectional design of the study, was used to drive program changes at each institution.

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Co-teaching in Ohio's Teacher Education Programs

Martha G. Michael, Ph.D.
Kimberly K. Miller, Ph.D.

Introduction

Since the 2001 passage of *No Child Left Behind Act* and the reauthorization of federal special education legislation (IDEA 2004), pre-service teachers are expected to know about and demonstrate the capacity to collaborate at the K-12 level when they enter the teaching force. Therefore, there is need to introduce skills and knowledge about reciprocal collaboration at the higher education level (Villa, Thousand, Nevin, & Malgeri, 1996; Villa, Thousand, & Nevin, 2004; Stang & Lyons, 2008). Successful collaboration between general and special educators in relation to student achievement will depend on the educational setting, and how new teachers see this collaboration embodied (Kluth, & Straut, 2003). Even before new teachers enter the classroom, they need to witness effective collaborative relationships between teachers. Kluth and Straut (2003) found that teacher educators were most likely to use collaborative models in their own practice if they experienced them in the university classroom.

As is evident in the shifting ground of education, the profession requires a fresh look at how we do business in classrooms with increasing diversity and inclusion. NCLB (2001) and IDEA (2004) have raised the stakes for educators. Students with disabilities and other exceptionalities are expected to achieve the same success as their general education peers, and therefore an increased emphasis on universally designed general education settings in the least restrictive environments is growing. Among the many ideas and options for meeting these diverse challenges and one that is receiving widespread attention, is co-teaching (Kroeger, S., Miller, K, & Michael, M., & Laine, C. , 2009; Brownwell, Ross, Colon & McCallum, 2005).

Co-teaching occurs when two or more educators share instructional responsibility for a group of students in a single classroom for teaching specific content objectives. With this mutual ownership the expectation is that resources are pooled and there is joint accountability (Friend & Cook, 2003). In K-12 settings, co-teaching is more likely to demonstrate the general education curriculum and support the development of critical thinking skills, than is instruction in self-contained or resource rooms (Walsh & Jones, 2004).

While the current research regarding the effect of co-teaching on student learning is limited, as it is difficult to tease out from other factors, positive improvement in ability for 1) co-designing differentiated content delivery using universal design principles and 2) reflective practice between colleagues as a means of professional development, has been reported. The research that has occurred regarding student outcomes is limited. In one longitudinal study completed recently, there were significant statistical improvements in reading and math proficiency over a 4 year period in co-taught classes compared with classes that were not co-taught (Bacharach, Heck & Dahlberg, 2010). Another study in Arkansas compared grades of students in co-taught classes with those who were not in co-taught classes through a longitudinal lens. (L. Dieker & C. Pearl, personal conversation, November 6, 2010). Furthermore, proficiency scores from one high school in Marietta where co-teaching was the norm, showed significantly differ-

ent scores than those of similar schools of the surrounding region where co-teaching was not used. (B. Bauer, personal conversation, Spring, 2005).
In another study of over 600 educators, collaboration was the only variable predicting positive attitudes toward inclusion among general and special educators (Villa, Thousand, Meyers, & Nevin, 1996). In co-taught, collaborative classrooms, it can be argued that classroom practices are established such that all children (and adults) believe they are members of a community, not just visitors or persons to be simply tolerated. This emphasizes the inclusive nature of the practice of co-teaching and why it is promoted as a method to help increase Least Restrictive Environment (LRE) requirements (Arguelles, Hughes, & Schumm, 2000; Cook & Friend, 1995; Fennick, 2001; Weiss & Lloyd, 2003).

Rationale for Current Study

Co-teaching as a model of content delivery has been practiced in the preparation of dually licensed general and special education teachers (Bacharach, N., Heck, T., & Dahlberg, K., 2008). Other studies at the higher education level indicated that co-teaching at this level is indicative of integrated general and special education programs, sometimes also referred to as 'unified' programs (Blanton & Nowacek, 1995; Wenzlaff, T., Berak, L., Wieseman, K., Montroe-Baillargeon, A., Bacharach, N., & Bradfield-Kreider, P. 2002). Because of the growing popularity of co-teaching at the K-12 level, many special education preparation programs are including co-teaching in their curricula (York-Barr, Bacharach, Salk, Frank, & Beniek , 2004; Friend, 2009; Stang & Lyons, 2008). However, there is a dearth of research studying co-teaching outside of the special education domain (Bacharach, N., Heck, T., and Dahlberg, K., 2008).

During spring 2009, the co-authors began co-teaching a course entitled: *Introduction to Special Education and the Diverse Learner* at Ohio Dominican University (ODU), combining two sections of the course. The students were both middle childhood and intervention specialist teacher-education candidates. The candidates taking the co-taught course at ODU, as well as teacher education students at the University of Cincinnati taking a co-taught course, were asked to provide input regarding the models of co-teaching that they experienced during these courses at their respective universities. This provided key information about the knowledge, skills, and dispositions gained by teacher education candidates regarding their attitudes of the co-teaching process and expertise of the co-teaching partners. Respect for other perspectives was the most frequently stated attitudinal benefit (Kroeger, S., Miller, K., Michael, M., & Laine, C., 2009).

Given NCLB and the requirement of special educators to be 'highly qualified' in all subjects they teach when using a pull-out model of instructing students, The Ohio Department of Education is supportive of pursuing alternative delivery options for teaching all K-12 students in LRE settings, which includes co-teaching. In the state of Ohio, several institutions have received federal assistance (e.g. 325T grants) or smaller state department of education funds, to facilitate more merged and/or integrated programs, and have used co-teaching or collaborative approaches in this shift (Kroeger, S., Miller, K., Michael, M., Laine, & C., 2009). Therefore, other teacher preparation programs in Ohio have explored creating more 'merged' or 'integrated' programs for their intervention specialist and general educator candidates, as have other programs in the country (Pugash and Blanton, 2009). Some teacher education programs who are part of a voluntary group, the Ohio Inter-University Consortium to Improve the Teaching of Students with Disabilities, are studying this shift. This has increased the practice of co-teaching in pre-service programs in Ohio. However, in Ohio, there is a lack of research regarding the knowledge, practice, and intention levels of teacher educators at the higher education level, regardless of their discipline.

Methods

A mixed methodology model was employed using both qualitative and quantitative analysis to collect all aspects of the attitudes of teacher educators regarding co-teaching at the higher education level. Rather than generate a random sample of participants, the entire population of Ohio teacher educators was accessed from the websites of all 49 private and public colleges and universities.

With the lack of research about the knowledge, practice, and intention levels of teacher educators regarding co-teaching, the co-authors decided to gauge those levels across the state of Ohio using a survey. When used in applied social settings, research using surveys is practical and efficient because it can access an entire population, rather than simply a sample. The ultimate purpose behind using a survey was straightforward, in that we wanted to elicit information from

one or more people in order to transmit that information to others (Sudman & Bradburn, 1982).

Participants

This study surveyed the entire teacher educator population of the 49 Ohio public and private institutions with teacher education programs, using computer -assisted survey information collection CASIC) (Bradburn, Sudman & Wansink, 2004). The CASIC system used was Survey Monkey, but the survey design option chosen was customized by the authors (www.surveymonkey.com, 2010). Teacher-educator email addresses were found on each college or university website and manually entered one by one into the database on Survey Monkey.

Survey Instrument

Survey Monkey was used as the tool to distribute and elicit responses from all of the teacher educators in the 49 four -year education programs in Ohio. The survey was constructed using three different types of questions to obtain various types of information. Questions were designed to elicit attitudes regarding knowledge and practice of co-teaching at the higher education level in teacher education programs, as well as intentional behaviors. All questions used were either questions about current and past use, or behavioral intention questions about future use (Sudman & Bradburn, 1982; Bradburn, Sudman & Wansink, 2004; Fowler, 1995).

The survey was divided into four sections illustrating the a) demographics of the population, b) knowledge, c) practice and d) intention to practice co-teaching at the higher education level. Prior to the first distribution of the survey as a pilot, colleagues at the institutions where the authors teach were asked to preview the survey questions for content validity. Another pretest of the logic format of the CASIC survey was self-implemented in order to detect errors.

Potential respondents were given the option to decline to participate at the very beginning, and a thank-you page was added as an option from Survey Monkey. As participants donated their time to complete the survey, best practice suggests thanking them for their input (Bradburn, Sudman & Wansink, 2004; Dillman, 2007). Potential participants were also made aware of the nature of the survey and the intention from the beginning. In addition, participants were made aware that any individually identifying information would not be used.

Demographic section. The demographics section asked for a) respondents' university or college email address, b) number of years of teaching at the university or college level, c) number of courses taught, d) rank, e) affirmation of co-teaching at this level and f) affirmation of institutional support of co-teaching. Furthermore, it was asked about whether or not the administration of the institution supported co-teaching with appropriate load distribution and/or funding. Another question was included to ascertain the name and nature of courses, including the disciplines of the co-teachers. The last question was about whether or not the teacher education program responding, had received federal or state funding (e.g. 325T grants), to assist with the practice of co-teaching. There were no questions about whether or not they were special or general educators.

Knowledge, practice and intentional level sections. Likert scales were used to gauge respondents' opinions. There were three types of Likert scales used. One scale used, gauged respondent agreement levels using a 5 point scale, with 5 being strongly agree, and 1 being strongly disagree, and 3 representing a neutral opinion. Another scale gauged the a) overall level of co-teaching knowledge, b) use of co-teaching models and c) intention to use co-teaching as a model at institution of higher education (IHE) level. Two other Likert scales were employed that measured the a) overall level of co-teaching knowledge using ratings of little, some, satisfactory, extensive, or expert level knowledge and b) overall intention to practice co -teaching as a model at the IHE level using ratings minimal, some, satisfactory, extensive intention or intention that has been realized in a future proposed course.

The last type of question involved the 'knowledge', 'practice' or 'intention to use co-teaching', which allowed for the participants to comment in an open-ended format. The option to respond to open-ended questions was located at the end of each Likert scale on all three 'knowledge', 'practice' and 'intention to use' sections.

Procedure

In order to increase the response rate from all of the teacher education programs, there were multiple distributions of the survey. There were also two distribution methods used from the CASIC Survey Monkey's option bank.

Response to the survey

Of the 49 programs surveyed, 100% of the programs had two or more persons answering the survey. The best response rate was gained from using personal e-mail messages and using the term "teacher educator colleagues in Ohio."Of the 695 persons surveyed, 68 opted out. Of those 627 that did not opt out, 326 began the survey, which is a 51.9% response rate, and 49 of these declined to participate which is 15% of those beginning. Of these, 277 answered some part of the survey. In some cases, as requested, if the respondents did not co-teach, they were asked to proceed to the 'intention to use' section. Of those total teacher educators surveyed who did not opt-out, a response rate for answering at least one question was 44%.

Results and Interpretation

Demographics

Since the survey was concerned with co-teaching in Ohio, the question "Have you ever co-taught a course at the higher education level?" was answered by only 235 respondents. Of these, 59.2% indicated that they co-taught at the IHE level, and 40.8% indicated that they had never co-taught a course. There were 33.5% that indicated that they were assistant professors, 34.2% that were associate professors, and 20.6 %who were full professors.

Knowledge

Results indicate that there may be some teacher educators practicing co-teaching with little or no knowledge about research concerning the methodology behind the pedagogy. While co-teaching is being practiced by 55% of those responding, the results illustrated that nearly 54.8% of the respondents had little to no knowledge of the 6 models of co-teaching outlined by Lynn Cook and Marilyn Friend (1995). Furthermore, 58.7% of those responding indicated they had little or no awareness of current research regarding co-teaching in Ohio. Of the 226 respondents, 34.6% could describe the 6 models of co-teaching while 5.3 % believed the statement was non-applicable (See Table 1, question 1).

It appears that the Ohio Inter-University Consortium is not widely known and their work regarding co-teaching, even less known. (See Table 1, question 4). This may be indicative of 1) a lack of collaborative work occurring across the general and intervention teacher education programs in Ohio that are not integrated or merged, 2) dissemination of this material to individuals who have no stake in sharing the information, 3) a lack of communication within education programs from the dean or chair to their colleagues, or 4) are from those programs who have no participants in the Inter-University Consortium. There has been an increase of interest in the Inter-University Consortium as the Ohio Department of Education Office of Exceptional Children, disseminated RFPs for small projects to increase co-teaching and merged or integrated programs within the state.

While there is an impetus to encourage programs to become more merged and integrated, the intention to receive more training in co-teaching models and how to teach about co-teaching is perceived as a need by only 40% of the respondents. Finally, the perceived knowledge level is in line with the reported knowledge of co-teaching models with only 20.3% possessing extensive or expert knowledge, and over 50% reporting only some or minimal knowledge about co-teaching. This illuminates the issue of the need to encourage general education and special education programs to work together (See Table 1).

TABLE 1

My awareness level of co-teaching is as follows	SD	D	Neutral	A	SA	NA	Mean	N
1. I can describe the 6 models of co-teaching outlined by Marilyn Friend and Lynne Cook	36.7% (83)	18.1% (40)	5.3% (12)	14.2% (32)	20.4% (46)	5.3% (12)	2.62	226
2. I am aware of current research in Ohio regarding co-teaching	30.7% (69)	28% (63)	12.9% (28)	14.2% (32)	8.9% (20)	5.3% (12)	2.39	225
3. I am aware of current practices described by Marilyn Friend	34.1% (77)	19.9% (44)	5.8% (13)	15.9% (36)	19% (43)	5.3% 12	2.64	226
4. I am aware of Ohio inter-university consortium and their work regarding co-teaching	38.5% (87)	28.8% (64)	8.8% (20)	8.8% (20)	9.3% (21)	5.8% (13)	2.17	226

Lack of knowledge regarding co-teaching is a significant issue in Ohio, since Ohio is striving to improve ratings provided by the Federal government in terms of the number of students in LRE settings. It is imperative that general education is on board, and that co-teaching is taught and modeled at the pre-service level (See Table 2).

TABLE 2

Please choose your level of co-teaching knowledge	Minimal	Some	Satisfactory	Extensive	Expert	NA	Mean	N
Please describe your perceived level of knowledge regarding co-teaching	19.9% (45)	29.6 (66)	25.2% (57)	15.9% (36)	4.4% (10)	4.9% (11)	2.53	226

Practice

Of the respondents answering about practice, a total of 51.2% agreed or strongly agreed that they had co-taught a course at the university or college level (See Table 3, question 1). Of those indicating that they co-teach, a total of 46% indicated that they used a variety of co-teaching models to share the content of the course that they teach (See Table 3, question 2), and only 34.3% agreed or strongly agreed that they model co-teaching in their course. Furthermore, only 26% agreed or strongly agreed that they explicitly teach about the co-teaching models, which corresponds to the above statistics representing their knowledge level of the co-teaching models (See Table 3, question 4), and 22.4% had a requirement of their teacher education candidates to demonstrate co-teaching in their field experiences (See Table 3, question 5).

Finally, for the question regarding the requirement for simulations of co-teaching by candidates their courses, only 25.8% indicated that they had this as a requirement (See Table 3, question 6).

TABLE 3

Please select the # that corresponds to your level of practice regarding co-teaching	SD	D	Neutral	A	SA	NA	Mean	N
1. I am currently co-teaching or have co-taught a course at the university or college level for at least one semester or quarter (if not skip to intention section)	26.1% (53)	3.9% (8)	2% (4)	17.7% (36)	33.5% (68)	16.7% (34)	3.36	203
2. My co-teacher and I use(d) a variety of co-teaching models in order to share the content of the course	8.6% (15)	4.6% (8)	15.5% (27)	23.6% (41)	22.4% (39)	25.3% (44)	3.62	174
3. My co-teacher and I use(d) a variety of co-teaching models in order to demonstrate the co-teaching models for students;	12.0% (21)	13.1% (23)	15.4% (27)	18.9% (33)	15.4% (27)	25.1% (44)	3.17	175
4. I explicitly teach about the co-teaching models	26.6% (47)	18.6% (33)	11.9% (21)	11.3% (20)	14.7% (26)	16.9% (30)	2.63	177
5. I require my students to demonstrate co-teaching in their k-12 field experience	24.2% (43)	20.2% (36)	12.9% (23)	12.4% (22)	10.1% (18)	20.2% (36)	2.55	178
6. I require my students to simulate co-teaching in the college classroom	23.6% (42)	19.7% (35)	13.5% (24)	12.9% (23)	12.9% (23)	17.4% (30)	2.66	178

Intention to Co-Teach

The final section of the survey measured 220 respondents' intention to co-teach. Only 21.8% indicated an intention to incorporate all models of co-teaching in future higher education courses, and almost half indicated that they were neutral in their intention to use all of the co-teaching models or believed the intention statement to be not applicable. Half of the respondents indicated they had little or no intention to use one or more models of co-teaching as illustrated by using strongly disagree, disagree, or neutral (See Table 4, questions 1&4).

A slightly higher number of respondents, 39.1%, were determined to get more training on a) how to use co-teaching for their own practice and b) how to teach more about co-teaching that occurs in K-12 classrooms. Almost half intend to get more training on how to teach candidates about co-teaching and explore the possibility of using co-teaching at the higher education level as a model, which is positive (Table 4, questions 3 & 4).

Discussion

The results demonstrated that a large number of teacher educators in Ohio practice co-teaching. Of those who co-teach, some commented that they could not correctly define co-teaching because of the fluidity of its definition. In the qualitative replies garnered from the survey, there were indications that while co-teaching was occurring at the higher education level,

TABLE 4

Please select the appropriate # to correspond to your intentions about co-teaching	SD	D	Neutral	A	SA	NA	Mean	N
1. I intend to use all models of co-teaching in my higher education courses	12.3% (27)	16.8% (37)	34.1% (75)	13.6% (30)	8.2% (18)	15% (33)	2.87	220
2. I intend to get more training so that I know more about how to co-teach	10.9% (24)	11.4% (25)	30% (66)	30.9% (680	8.2% (18)	8.6% (19)	3.15	220
3. I intend to get more training so that I know more about how to teach about co-teaching	11% (24)	12.3% (27)	25.6% (56)	32.4% (71)	9.1% (20)	9.65 (21)	3.18	219
4. I intend to use one(1) or more co-teaching models for delivery in college classroom	9.5% (21)	10% (22)	30% (66)	24.1% (53)	15.5% (34)	10.9% (24)	3.29	220
5. I intend to explore the possibility of using co-teaching in the university or college classroom as a model of content delivery	7.7% (17)	10.5% (23)	26.4% (58)	31.4% (690	13.6% (30)	10.5% (23)	3.37	220
6. I intend to explore the possibility of using co-teaching at the University or college level in my courses with the administrators of the university or college where I am employed	13.3% (29)	11% (24)	30.7% (67)	22.5% (49)	9.6% (21)	12.8% (28)	3.05	218
7. I intend to seek to receive grant funding in the future to support the use of co-teaching in the university or college classroom where I am employed	19.9% (43)	21.3% (46)	32.4% (70)	9.3% (20)	6.9% (15)	10.2% (22)	2.58	216

TABLE 5

Please select the most appropriate intention level regarding use or intention to use co-teaching as a model at the university or college level	Minimal	Some	Satisfactory	Extensive	Realized in future course	NA	Mean	N
Please describe your intention level for increasing the use of co-teaching in university or college courses that you currently teach or will be teaching	24.9% (55)	27.6% (61)	20.8% (46)	10% (22)	7.2% 16	9.5% (21)	2.42	221

many could not describe the 6 models of co-teaching outlined by Cook & Friend (1995). Of particular interest is the low number of respondents who indicated that they explicitly teach about or require candidates to use co-teaching in their fieldwork or coursework.

Some indicated issues with the practice of co-teaching in that a) co-teaching has not been validated to date as an evidence-based practice b) the definition is either problematic or too limiting, as it was developed for special and general educators who team-teach in K-12 settings, c) some do not value the experience of collaboration, or they have had bad experiences with their co-teaching partners, d) roles regarding knowledge of content and delivery need to be clearly delineated for each co-teaching partner at the outset for it to be ideal, and e) lack of funds or knowledge of where to obtain funds for having teacher education candidates practice in the field, are not published.

While these are all valid issues, they reflect themes that have emerged before in much of the literature on K-12 co-teaching, and are also examples of reasons given for not pursuing co-teaching in the col college classroom (Duchardt, Marlow, Inman, Christensen & Reeves, 1999). However, a) if roles and responsibilities are changing in K-12 because of the diversity in the K-12 classroom b) more co-teaching is occurring in Ohio school districts and c) the emphasis on the 'Race to the Top' is about the statistics of student achievement, then it is imperative that teacher training programs adapt to reflect what is occurring. The research regarding co-teaching has not focused on the effect of co-teaching on student learning in cognitive and statistical terms in the past, but there currently is a momentum to do so.

Regarding the results from the questions focused on 'intention to use' models of co-teaching, and the establishment of co-taught courses at the IHE level, there were some respondents who indicated the need for authentic settings in which their teacher education candidates could experience co-teaching , as well as the need to explore funding and scheduling options. Of the 221 responding, a high percentage of 75% indicated that they had 'some' to an 'extensive' intention to co-teach further, or in the future, but only

7.2% had already proposed a course to co-teach (See Table 5). Certainly one positive result demonstrated a great percentage reporting that they intended to seek more knowledge regarding co-teaching for their own classroom teaching and because of what is occurring in Ohio.

Due to the discussion above, the following questions have come to light: If collaboration is not a value, then why does every Specialized Professional Association (SPA) regard collaboration as an essential standard for accreditation? If it is being practiced in the K-12 setting and we are preparing teacher education candidates to teach in these settings, then why are we not practicing co-teaching at the IHE level?

Implications and Conclusion

Of those respondents practicing co-teaching, (no matter what the model used), where two or more teachers deliver content at the higher education level, the qualitative data indicated that there is a belief by some that teacher education candidates gain a much deeper understanding of differentiated instruction, co-teaching models, the elements of universal design for learning, and response to intervention. Others indicated that co-teaching in the college or university classroom not only gives teacher candidates a situation that is authentic, but also the disposition of value for varied perspectives of how to teach all students. Instead of looking at co-teaching in isolation, it may be necessary, as Pugash and Blanton (2009) suggest, to study and reevaluate our teacher education programs in terms of overall collaborative efforts. This may require shifting the paradigm from discrete to integrated programming for all teacher education candidates. There also may be a need to research reasons that keep teacher education programs discrete, where co-teaching may occur only sometimes, not regularly or by intentional design. It may be that the standards for the Specialized Professional Associations need to demonstrate the need for collaboration at the teacher education level, and states need to fully support the move to merged or integrated programs. If NCLB requires that all students show progress, then discrete teacher education programs are supporting the pedagogy of isolated practice, and therefore will not be supportive of K-12 teachers' realization that they are *all* responsible for *all* children and their progress.

While "shared inquiry" is not a value common in traditional college classrooms, teacher educators who demonstrate and model collaboration within the college classroom can use this as a opportunity for explicitly teaching reflective practice and how to work with others towards the common goal of student achievement (Brownell, Ross, Colon & McCallum, 2005; Hudson-Ross & Graham, 2000; Stang & Lyons, 2008). In this way candidates will learn to reflect with colleagues, and practice together, not only for their own benefit of professional development, but also to encourage student belongingness rather than exclusion in the K-12 general education classroom. It is still apparent however, that more research needs to be done to affirm recent longitudinal studies demonstrating academic gains in co-taught classes, and to prove that working together can produce better achievement results than working in isolation.

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What should be the role of teacher education in helping student teachers learn to teach?

Marlissa Hughes Stauffer, Ph.D.

Introduction

The prevalent idea that students' learning relates to the quality of their teachers (Hagger & McIntyre, 2006, as cited in Hagger et al., 2008; Darling-Hammond, Holtzman, Gatlin & Heiling, 2005) has lead to a closer examination of what teacher education departments are doing to help prepare effective teachers (Ingvarson & Rowe, 2008). Furthermore, the demand for high-quality teachers has created increased pressure on teacher education programs to examine how they are preparing pre-service teachers (Duncan, 2009; H. R. Rep. No. 4137, 2008; Scheeler, 2007).

The most obvious juncture of pre-service education and P-12 education is student teaching. Pre-service teachers themselves identify student teaching as supremely important (Feiman-Nemser, 2001), but the student teaching experience has, for some reason, not often been one of the reforms addressed by teacher education programs as they seek to improve the quality of pre-service teachers entering the field (Rodgers & Keil, 2007). Rodgers and Keil (2007) relay problems related to assuring the quality student teaching experiences for teacher candidates, such as unqualified supervisors or a lack of training for cooperating teachers. Zeichner (2005) also notes frankly some of the reasons why some university supervisors may be ineffective in helping student teachers. There is certainly a multitude of reasons, not always related to the quality of the university supervisors themselves, as to why student teachers may work with little support from their teacher education programs. Some of these include the lack of funding to pay mileage and the lack of time to observe.

In addition to the above limitations, I would add the belief on the part of many pre-service education departments that student teaching is less a part of the academy and more a part of the P-12 school setting. As a result, the university may play little role in the actual learning of the student teacher during student teaching. The primary responsibility for a student teacher's success may rest heavily on the individual student teacher with the support of the cooperating teacher, but with little help from anyone within the education department. However, as external sources hold pre-service programs more and more accountable for the effectiveness of their graduates, teacher educators may need to understand exactly what a pre-service teacher program can do to help student teachers become more effective teachers.

Literature Review

Daniel Lortie (1975) in his seminal work, *Schoolteacher: A Sociological Study*, asserted that the teacher's prior "apprenticeship of observation" in elementary and high school overshadows what a pre-service education program teaches. Furthermore, Tabachnick and Zeichner's 1981 study declared pre-service education "a wash" when the student teacher began teaching; prior experiences persisted in spite of these programs. Scheeler (2008) has suggested why ideas and skills taught in per-service education may not make their way into the actual practice of student teachers and teachers:

> Unfortunately skills and techniques that teachers learn and practice in college classrooms are not always maintained over time, nor do these

> skills necessarily transfer to actual classrooms with children. It is one thing to identify critical teaching skills, but to what extent are teacher preparation programs promoting mastery of these skills? Teachers cannot generalize skills they have not adequately learned. Newly certified teachers may be highly qualified due to coursework yet not be very effective once in their own classrooms because they do not generalize newly acquired teaching techniques to real world settings (p. 146).

Scheeler's idea then might lead us to ask what it is that student teachers do draw on as they begin their student teaching assignments. What do they use to navigate this challenging last stage of the licensing process?

An expected answer to the question, "Upon what do student teachers draw as they make day-to-day decisions in their student teaching assignments?" is that prior experience teaches them. The idea of learning to teach by teaching is common. However, research suggests that teaching decisions made during student teaching are influenced by information gained from education courses (Scheeler, 2008), the ideas and practices of cooperating teachers (Anderson, 2007) and from others (Britzman, 1991). This information includes the conditioning and presuppositions from the schooling that student teachers themselves experienced in elementary and secondary school (Lortie, 1975), negotiation with cooperating teachers (Britzman, 1986), and the influence of the school and district where they might be student teaching (Calderhead & Shorrock as cited in Hagger et al., 2008). This list of influences is not exhaustive, but it does suggest a host of elements at work in the student teachers' minds as they make decisions in their final practicum.

Donald Schon (1983), in his work on reflection as a means of learning, proposes the idea that the practitioner reflects in the midst of practicing and draws "a *repertoire* of examples, images, understandings, and actions" (p. 138). This idea is linked closely to Daniel Lortie's (1975) idea of an "apprenticeship of observation," but I wondered what all had built the student teacher's *repertoire*, and what continued to build it through student teaching.

Methodology

To access how the student teachers were learning to teach, I spent a full day weekly with four student teachers throughout their student teaching semester. During observations, I took notes and informally spoke with the student teachers between classes, but I conducted a more formal interview at some point during each observation day. Often I simply asked, "Why did you do that?" because I was trying to figure out what they drew on as they made choices. I also conducted formal interviews before, in the middle, and at the close of the student teaching experience. In addition, I interviewed each cooperating teacher and university supervisor.

At the end of data collection and after early preliminary coding of responses to interview questions, I stepped back from my research in order to begin to think about my questions and what I had observed in the field. I created an outline for grouping my data related to both my questions and to the general themes that had emerged. I used a constant comparative method (Glaser and Strauss, 1967) as I navigated the abundance of transcribed notes and field notes. This use of data reduction (Miles and Huberman, 1984) allowed me to organize my field notes and transcriptions. As I put together the data on the particular themes, I began to make sense of the patterns that emerged from the grouped data surrounding a particular theme.

Simultaneously, I looked for "critical incidents" (Angelides, 2001) as representations of either reoccurring or significant reflective moments in the student teaching experiences of each participant. Measor (as cited in Angelides, 2001, p. 432) explains that such incidents "provoke the individual into selecting particular kinds of actions, they in turn lead them in particular directions, and they end up having implications for identity." I looked for critical incidents in particular as they related to how the student teachers were working to draw from prior experiences or someone in their current teaching situation. I attempted then, as Miles and Huberman (1994) noted (drawing from Wolcott, 1982), to "explicate the ways people in particular settings come to understand, account for, take action, and otherwise manage their day-to-day situations" (p.7). This research focused on what the student teachers drew upon to manage their "day-to-day" student teaching.

Findings

The student teachers were not all applying theories learned in the academy to their practice as they reflected, but they were working from a "*repertoire* of examples, images, understandings, and actions" they had "built up" (Schon, p. 138). That *repertoire* seemed to be made up of things the student teachers valued in their understanding of good teaching, and at times it was composed of things they simply thought of as able to help their students learn. As I studied what each participant drew upon, certain patterns emerged that both complemented and contradicted some of the previous research on student teachers.

Role of Prior Experiences and Observation of Current Cooperating Teachers

The role of prior learning experiences broadly included everything from formal prior P-12 schooling to other education experiences outside the university pre-service program, such as taking music lessons. I also included the influence of their cooperating teacher here because the influences were in a P-12 setting where the teacher they observed was the "expert." Granted, they most probably observed their cooperating teachers differently than they did their own P-12 teachers, but both experiences were a matter of watching others who were teaching in P-12 settings. All of the participants drew on prior learning experiences to help them in their student teaching assignments, but they were not simply following years of an "apprenticeship-of observation," as Lortie (1975) suggested, that "acquaints students with the tasks of the teacher and fosters the development of identifications with teachers" (p.67). Lortie asserted that this form of socialization "does not… lay the basis for informed assessment of teaching technique or encourage the development of analytic orientations toward the work" (p.67). Lortie's assertion may be true, but my participants appeared to have had additional influences that helped them analyze and critique what they had experienced in their own education experiences or were observing during student teaching. Three of the student teachers analyzed their cooperating teachers' practices and critiqued certain techniques and methods used in their classrooms. I am not suggesting that they did not replicate some of the techniques and methods they had seen as students in elementary and secondary schools. However, they also drew upon ideas that they knew were either different from the techniques and methods used by their P-12 teachers and cooperating teachers or that, though in agreement with a P-12 teacher or their cooperating teacher, were chosen because of pre-service preparation or personal ideas about good teaching. They were not simply following their cooperating teachers' practices.

For example, one student teacher's curricular choices and instructional methods were not modeled by his main cooperating teacher. He specifically chose a distinctly different method for teaching English that focused less on direct teaching and more on student practice because of what he valued in teaching English. He had learned about the specific practice in a language arts methods course at the university. Although another of the student teachers valued using authentic methods, which his cooperating teacher used, such as building models to practice physics concepts, he said he valued and wanted to use the method because of his prior learning experiences in K-12 settings and because of what he had learned during pre-service education. Work with his cooperating teacher was an affirmation of his earlier ideas, but he specifically chose a different behavior management plan than his cooperative teacher used based on personal ideas about discipline and ideas he had learned at the university.

The third student teacher originally mimicked some of her cooperating teachers' practices, but negative prior experiences in her own K-12 classes led her to try more creative methods in teaching. She wanted to be creative as a student teacher because, she said, "I don't want it to be boring for them because I was bored a lot in high school and I don't remember anything [from] when I was bored." Moreover, she observed certain teachers (not her cooperating teachers) who were using creative methods, and she thought their practices were effective for the students. Although she sometimes followed guidelines she disagreed with that were set out by her cooperating teachers, such as repetitive seatwork, she also tried to adapt their practices to move them more in line with her own more creative, student-centered methods and techniques. In addition, as she encountered problems with management and instruction, she referred back to ideas she had learned while at the university, specifically ideas about planning well for each class period and establishing clear expectations for students.
The fourth student teacher was not critical of his cooperating teachers, but he was critical of certain methods and practices used by teachers. He was deliberately trying to avoid those techniques, such as being punitive with discipline and using too much lecture when teaching. He was specifically trying not to replicate

things he had seen others do in his own learning experiences as a K-12 student and things he had learned in education classes at the university.

This same participant early on referred to the value of experiences prior to pre-service education that had helped him learn to teach. He was a non-traditional age student who said he learned to teach from personal experiences – having children, watching others teach, teaching EMT courses, teaching college courses, and teaching in the military. On my first day of observation I mentioned how much he seemed to enjoy the classroom. He told me, "This is not my first rodeo." And when I had asked him in the middle of student teaching if he wanted more help from personnel at the university, he said he did not because he felt they had not been in the P-12 classroom recently. He valued his previous experiences as important for teaching, so he was relying heavily on them to help him do what he needed to do in student teaching. Still, he thought the university needed to teach him more about the area where he seemed to have a problem – behavior management. Apparently, his experiences had not prepared him to know how to deal with the difficulty, and he thought that both the university and his cooperating teachers should have helped him learn more about the issue. He was the most dissatisfied with his student teaching of the four participants because he believed he had not receive enough support in learning how to teach – though he began his student teaching experience very confident in his abilities to teach.

Role of Pre-Service Education

Use of prior learning experiences at the university varied greatly among the participants. All of the participants expressed that their pre-service education had been valuable for them, which was surprising given the critiques I had heard and read about pre-service education. During student teaching, they referenced different parts of the university preparation as important and highlighted certain things they had read or learned about in general that they saw as applying to their student teaching. Although three mentioned the value of methods courses, discussed below, it is important to note that one student teacher also felt the pre-service program had been influential in helping her want to be professional in her teaching and in giving her a few teachers who modeled for her what she could do as a teacher. She mentioned this influence in our first interview but also at the end of her student teaching experience.

Methods Courses

Three participants referred at different times to ideas from some of their methods course, but one participant was clearly drawing often on a methods class to plan curriculum. The challenge for him was trying to implement ideas from "Writer's Workshop" well. I asked him what he wished we had gone over more in his university preparation. He explained, "I think that the thing that I feel like I'm most lacking is really a picture of what an effective writing workshop looks like." He said the professor clearly wanted them to do writing workshop in their own classrooms. However, the student teacher expressed the disappointment, "I was never able to actually experience or even see one." The lack of support in developing and using this instructional approach first introduced to him in a university course made it challenging for him to implement it successfully in his student teaching assignment. In his final interview, he said he had ways he would do the method differently the next time he taught. He had learned from his student teaching, but he had not felt successful in implementing this particular strategy during student teaching.

Two other student teachers cited ideas and methods they were using that had been taught in their methods courses, such as the importance of authenticity, inquiry, and hands-on methods. However, at times they found it hard to match the ideas of what they wanted to do with the realities of the classroom. For example, one participant noted the value of using the jigsaw method, but he believed that within his classroom the lecture method allowed him to progress through material more efficiently. These three student teachers seemed highly aware of what methods they were employing and why they were teaching as they were. The fourth student teacher, the one most dissatisfied with his student teaching experience, did not specifically articulate methods when talking about curriculum or instruction as much as he addressed learning styles. He referred to using visuals, technology, or repetition to help different types of learners. When he was planning, however, he said that he drew on the students' textbooks, content standards, and student interest. He almost never referred to his pre-service education courses except for his special education classes, which made sense in the first half of the semester because he was working as a special education teacher. This may be one of the reasons that the second half of his semester was more challenging, since at that point he was teaching as a general educa-

tion teacher.

The *repertoire* they had developed from prior experiences and pre-service education increased their ability to learn and reflect upon their teaching. They were actually able to further develop their *repertoire* during student teaching. For example, once they identified a situation as needing attention, each participant had to sort through ideas and experiences and try to apply these in practice. However, they did not find university faculty especially helpful in reminding them of what was in their *repertoire* as they tried to make decisions. Moreover, the cooperating teachers had more to add to the student teachers' *repertoire*, but the student teachers received very few specific references to what they had learned in their pre-service education program.

University Supervisor as Reminder of What is in their *Repertoire.*

Two of the participants mentioned particular conversations with the university supervisor as pivotal learning points within their student teaching experience, what Angelides (2001) might call a "critical incident." One was the student teacher who had complete control over the curriculum he was teaching for the majority of his classes. He sought out his university supervisor and explained that he was "pretty frustrated." He said that she reminded him of things he already knew from earlier course work. She also shared things she had observed in his classroom, and her comments helped him realize what he could work on to make it better. Later, in his final interview, he referenced his university supervisor's help as very important. The other participant who had a conversation with her university supervisor that seemed fundamental to her growth during student teaching was a student teacher who felt her cooperating teachers wanted her to teach much as they did. She felt at first that she had very little leeway in planning, managing the classroom, or teaching the lessons. Her university supervisor reminded her to teach from her own personality. The student teacher said, "I'd heard that before, but I took a step back and realized trying to be like" the cooperating teachers "was not working for me. I would try to be him and then her from period to period, but it was frustrating me because the kids were not behaving." After that conversation with her university supervisor, the student teacher gradually tried more and more of her own methods, developing an increased ability to reflect on her own teaching. Her university supervisor was not a professor in the pre-service education department; he was a retired principal, so he did not specifically allude to course work from her classes, but he did remind her of an important teaching principle that was already in her *repertoire*.

Other than the student teacher who contacted his university supervisor for help, the student teachers rarely mentioned the university supervisor as helpful. They were all doing well in their student teaching, receiving positive feedback from their supervising teachers, but they were not receiving much specific help. One noted,

He [the university supervisor] only comes for one class every two weeks, so he hasn't really been here a lot, but he does give me like two pages of notes when he comes. I think I would appreciate it if he was [sic] here for like maybe 3 classes or for all day once in a while. But as it is, he's pretty hands off and I like that, so I wouldn't want to change that.The student teacher emphasized how much he appreciated the freedom he had, but he also wanted more observations by his university supervisor.

Conclusions

This research, though limited by its sampling of only four student teachers, suggests that student teachers do draw upon their prior pre-service education experiences as they learn to teach during student teaching. However, if we in teacher education want to have a greater influence on the learning of our student teachers, we may need to be more present during student teaching in order to remind them of what ideas in their *repertoire* may help them address the situations they are facing as they learn to teach. In addition, we may need to be more selective in terms of who ultimately works with student teachers in their assignments (see Zeichner, 2005). The recent Blue Ribbon Report (November 2010) suggested the need for closer integration of practice with content in teacher preparation. In the section entitled, "What Needs To Be Done," the authors noted, "It is time to fundamentally redesign preparation programs to support the close coupling of practice, content, theory, and pedagogy" (iii). Arguably, we already help them to create a *repertoire*, but we may need to help them to access it more as they practice their pedagogy.

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