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■ Undergraduate Research in Teacher Education: A Rationale for Broader Engagement

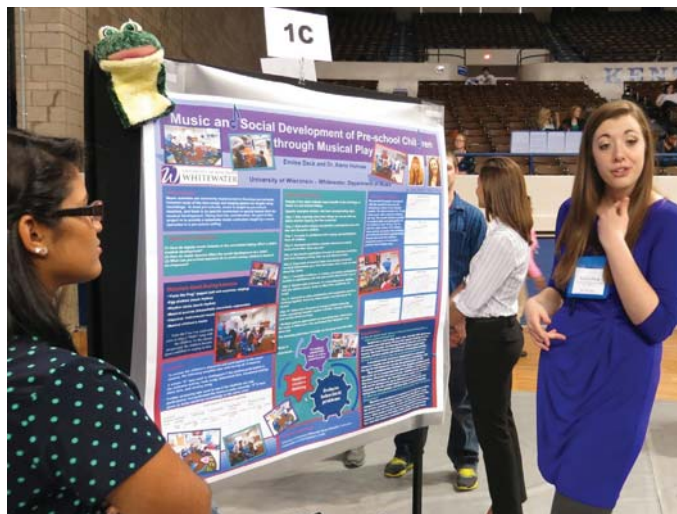
Based on discussions of the faculty-administrator network (FAN) at NCUR conferences, CUR conference presentations, and a few published articles, we have identified several ways that students choosing education careers can engage in undergraduate research projects that provide practice in the use of specific teaching skills. The knowledge, skills, and dispositions that effective educators use today include expertise in evidence-based teaching and learning, intervention designs, and reflective action. Innovative and inquiry-based teaching, reliance on evidence-based interventions, and reflection on practice represent three instructional approaches that provide opportunities for undergraduate research (UR) in teacher-education programs (Mills 2010). However, a coherent research and theoretical base describing the effects of UR engagement on specific teaching practices has not yet developed. We hope this article will encourage further discussion of how undergraduate research can enrich pre-service experiences for teacher-education majors and spark more research on the effects of undergraduate research on specific teaching practices.

In this article, we present a rationale for embedding undergraduate research in teacher-education programs. First, we outline key instructional areas, such as knowledge, skills, and dispositions that educators employ. Next, we share examples of undergraduate research projects that teacher candidates have conducted involving instructional practices in pre-kindergarten through high school classrooms. And finally, we conclude with suggestions for future scholarship to explore the effects of undergraduate research on pre- and in-service educators.

Three Common Pedagogical Approaches

Pre-professional programs that aim to prepare highly skilled educators base their curricula on methods that are research-based. The No Child Left Behind Act (U.S. Department of Education 2001) requires that educators utilize “scientifically-based research” to make decisions about curricula and interventions. In this section, we provide an overview of recognized best practices in teacher-education programs that can be met through undergraduate research. The areas of focus are (a) innovative and inquiry-based teaching and learning, (b) evidence-based interventions, and (c) reflective teaching.

Innovative and inquiry-based teaching and learning. Today's educators must rely on innovative practices that prepare



A candidate in music education presents her undergraduate research on observed social gains in young children as a result of music activities.

learners to seek, process, and critically analyze information they receive or access (Windschitl, Thompson, and Braaten 2008). Innovation in teaching includes the use of relevant and contemporary tools and approaches that motivate students to engage in inquiry-based learning (Mizuko et al. 2013). Therefore, educators must effectively use technologies that are powering societal transformations in the way information is accessed and knowledge is communicated. Furthermore, they must know how to equip learning environments and guide learners through inquiry-based processes (Brophy 1983; Wentzel 2002).

Inquiry-based curricula are employed in a variety of educational disciplines (e.g., science, history, and language arts). Generally, inquiry-based thinking is a process through which learners acquire and analyze sufficient information to be able to make claims that are valid and tested (Levy, Thomas, Drago, and Rex 2013). Teaching this process requires knowing discipline-specific techniques and tools to gather and analyze data, communicate and propose answers that are tested for accuracy, and provide explanations and predictions that can be useful in similar situations in the future (Schwarz and White 2005). As educators guide students through an evidence-seeking process, they assure that the concepts taught are relevant for students (Institute of Education Sciences 2012) and that learners' outcomes are evaluated us-

ing authentic assessment (Minner, Levy, and Century 2010). To make learning through inquiry relevant, instructors and students jointly investigate topics and communicate results to peers or other audiences (e.g., family members, community agencies). Additionally, educators respond to the unique learning needs of individual students by implementing carefully designed interventions.

Reliance on evidence-based interventions. The abilities to translate research into practice and to implement procedures for verifying the effectiveness of a classroom intervention are now required competencies for teachers. According to the Individuals with Disabilities Education Act (2004), all students must receive high-quality instruction and tested interventions as a prerequisite to the determination of learning or emotional/behavioral differences. As a result of this mandate, professional standards require that educators rely on evidence-based instructional strategies or interventions (CCSSO 2011; CEC 2012). Most commonly, interventions are designed to support learners' knowledge and skills in the areas of reading and math and to enhance learners' motivation in the area of social-emotional development. The implemented methods must be tested for effectiveness to determine how well a learner responds to an intervention (Allington 2009; Ohio Center for Autism and Low Incidence [OCALI] 2014; Sulkowski, Joyce, and Storch 2012).

Today's classrooms represent significant variations in students' learning needs. Educators must be equipped to identify accessible instructional materials and interventions that are known to positively impact all students' knowledge, skills, and motivation to learn (Stahl, Kitchcocks, Hendricks, Johnson and Siller 2010). Through the "What Works Clearinghouse" (Institute of Education Sciences 2014), educators can gain an overview of research-based instructional strategies so that they can identify, implement,



An aspiring teacher in special education shares results of a classroom intervention on the quality of peer interactions between students with and without Autism.



A pre-professional educator in curriculum and instruction shares qualitative research results on positive effects African American educators have on students.

and assess interventions that are known to support students' learning. In all cases, education teams are concerned with data-based decision making to determine the effectiveness of interventions (Buzhardt et al. 2010; Mazzotti, Rowe, and Test 2013). Team members also assess the fidelity with which interventions and instructional strategies are implemented and, through reflection, improve practices (Alberto and Troutman 2002; Keller-Margulis 2012).

Reflection on teaching and learning practices. Highly qualified educators engage in purposeful reflection, which although long acknowledged as critical to effective teaching, remains a complex skill. Reflection on teaching involves the abilities to focus on content knowledge taught to learners, to be fully alert during interactions with learners, to show vigilance to effectively respond to changes in students, and to be committed to student success (Dewey 1933). Schön (1992) identified three types of reflective practices that educators employ: reflection-in-action, reflection-on-action, and reflection-for-action. More specifically, these areas of reflective teaching include: (1) adapting teaching methods while teaching is under way or in action (Schön 1983); (2) using reflection on action to respond to student learning through observation and assessment (Hole, 2003; Morin and Conderman 2003); and (3) engaging in reflection for action to assure equal access to education through equitable and inclusive practices (Gore and Zeichner 1991; LaBoskey 1994). Reflective teaching must be practiced and demonstrated prior to achieving certification as an educator (Thorsen and DeVore 2012).

Teacher candidates are required to engage in field-based practicums. Field-based instruction lends itself well to UR, and the benefits of an UR experience for university students as future professionals are widely recognized (Craney

et al. 2011; Hartmann, Widner, and Carrick 2013; Hunter, Laursen, and Seymour 2007; Malachowski 2003).

Undergraduate Research in Teacher Education

Evidence suggesting positive outcomes of UR in teacher education, including field-based practice, is emerging (Harrison, Dunn, and Coombe 2006; Manak and Young 2014; Moore and Gilliard 2008; Slobodzian and Pancsofar 2014). To date, only a modest number of examples of UR in education programs have appeared in the professional literature, but analysis of those examples suggests the inherent potential for a research experience to include opportunities for inquiry-based learning; researching and implementing evidence-based practices; and reflecting on one's teaching.

Manak and Young (2014) described undergraduate research in a preparation program in which teacher candidates selected topics of interest prior to beginning a 40-hour classroom clinical experience. The university students completed a literature review on their topic and developed questions that they then shared with classmates before pursuing answers through data collection at their clinical site. The teacher candidates acquired and applied important research techniques that they will utilize as educators, including translating research into practice, recording and analyzing

observational data, developing survey questions, and conducting interviews. The candidates disseminated their projects in a poster presentation that provided opportunity for reflection. In this example, teacher candidates engaged in inquiry, researched evidence for specific practices, collected their own evidence, and reflected on what they had learned throughout the experience.

Clearly, the clinical experiences required of all pre-service educators provide a setting and a rationale for UR. A field-based research project may begin with articulation of questions and translation of relevant literature that informs implementation of an intervention or strategy. Analysis of the evidence for its effectiveness follows. Reflection on the learning that occurred during the experience is a vital part of education research (Slobodzian and Pancsofar 2014). Other multi-stage UR projects similar to the one above have been implemented successfully by pre-service educators. Examples include faculty mentors and undergraduates employing action research during teaching practice (Zambo and Zambo 2006); early childhood educators conducting research in an associate of arts program (Moore and Gilliard 2008); and Australian pre-service educators reporting their increased knowledge of, and appreciation for, the importance of research for informing their teaching (Carboni, Wynn, and McGuire 2007).



Reflection following instruction: An education team reflects on how learning experiences contribute to child learning outcomes.

The potential for UR to positively affect students' disposition toward the professional literature has been captured in the reflections of student researchers (Klingel and Erbes 2012). Strand (2006) reported the effects of a field-based UR project introduced into a music education program. The teacher candidates reflected on the qualitative effects of the experience in reflective journals. The results suggested students felt the experience enhanced their identities as professionals. In an example from Georgia Southern University, teacher candidates were invited by local schools to implement UR projects focused on the effectiveness of the school's educational programs in meeting the goals in its school improvement plan (DeVore, Drawdy, Palmer and Munk 2014).

Although clinical experiences provide a rich environment for UR, inquiry-based examples from settings beyond the school room also exist. An entire class of pre-service physical educators surveyed 500 school principals regarding their attitudes toward and practices regarding physical education (Culp and Ertel 2013). In another example, teacher candidates conducted interviews and analyzed print and recorded media in an investigation of the expansion of a school voucher program in Wisconsin (Sconzert and Zimmerman 2013).


We have restricted the review here to published examples, but we know of many more positive examples of UR worth mentioning, including posters presented by teacher candidates at NCUR and professional conferences. Many such presentations have shown candidates' abilities to measure students' engagement and learning through reliable observation. For example, undergraduate researchers have presented projects describing how they tested the effectiveness of teaching strategies by using a single-subject research design. Others have demonstrated how they adapted teaching practices in response to reflection. The teacher candidates used qualitative analysis to interpret video segments and reflective journals. At FAN sessions, teacher educators have also shared examples of how they creatively incorporated undergraduate research into education courses and field practicums.

Looking Toward the Future

The growth of undergraduate research in education programs has been modest when compared to that in other disciplines, for a number of reasons. Some teacher educators question the potential of UR to enhance preparation of new educators. Others consider rigorous and dynamic certification requirements to stand in the way of busy students' engagement in undergraduate research. Yet the contributions UR can make to best practices provide a compelling rationale for its inclusion in all teacher-preparation programs. At this time our discipline would benefit from a national survey of teacher-education programs to determine how many provide or require UR, to add to our understanding of the possibilities for meaningful experiences.



Reflection on teaching often involves team-based decision making, which is a skill undergraduate research students in education effectively practice in the field.

A compelling rationale for UR is its inherent potential to stimulate and facilitate inquiry-based learning, recognition of and commitment to evidence-based interventions, and the practice of reflective learning, all regarded as best practices in teacher preparation. As teacher educators we have the opportunity to share experiences and results of studies on UR through the new CUR affinity group, Education Research and Teacher Preparation. If we commit ourselves to scholarship focused on the potential impact of an undergraduate-research experience on a teacher candidate's development, we can contribute significantly to the knowledge base of best practices in pre- and in-service professional development. 

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