

Strategies for Mentoring and Engaging Undergraduate Students in Planning, Conducting, Writing, and Presenting Research

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Abstract: The purpose of this qualitative auto-case study research was to examine the processes involved in the development of undergraduate student abilities to understand, plan, conduct, write, present, and evaluate research through the use of coursework and research symposiums. We have documented our roles as university professors working at a mid-size public university in a southwestern state to involve undergraduate students in research. The catalyst for our work centers on the integration of the constructs of the Hierarchy of Mentoring Intent and Involvement Levels Framework (Mertz, 2004). Using this framework our desire was to bridge the mentor/mentee experience by reaching four contextualized goals: (a) Preparing undergraduate candidates to understand research to implement best practices as practitioners; (b) help them reflect on their practices; (c) support national accrediting body standards; and (d) support departmental program outcomes. Additionally, through an annual student research symposium we provided students the opportunities to engage in research and to understand how research can be embedded into their work as future educators. In this article, we discuss how to integrate research into non-research coursework as well as how to build student self-efficacy in research engagement through conference planning and participation. We have utilized over nine years of feedback regarding student success in research to underpin the strategies and practices discussed in this article.

Undergraduate research encompasses inquiry or investigation conducted by the undergraduate student that addresses a specific research question, utilizes appropriate research methodologies, subsequently resulting in the disseminations of findings (Undergraduate Research Opportunity Center, 2014). The research process is important for many reasons, as it: (a) integrates young scholars in the community of learning; (b) motivates undergraduates to become independent thinkers; (c) ensures the research experience becomes a necessity (Merkel, 2003; Schwartz, 2005); and (d) prepares students for graduate studies (Adamsen, Larsen, Bjerregaard, & Madsen, 2003). Additionally, researchers have further documented many benefits of research participation for undergraduates, including improved ability to think and work like a scientist, clarification of career plans, improved preparedness or desire for graduate studies, and higher STEM retention rates (Espinosa 2009; Hunter et al. 2006; Laursen et al. 2010; Seymour et al. 2004).

Moreover, as teacher educators, we have noticed that engaging undergraduate students in research also provides students opportunities to: (a) connect practices that are research based to help children they will teach; (b) use information to critique their own practices as emerging professionals; (c) apply information from their own personal work and interests to what they do professionally; and (d) present research for peer review emphasizing the importance of contributing to the knowledge base in the field. Furthermore, we view undergraduate research engagement as an opportunity to foster lifelong learning with students and better prepare them for graduate studies.

More and more, institutions have been challenged to involve students in research experiences to enhance their learning as educational programs have realized the benefit of research at early stages of education (Rampersaud, 2013; Webb, 2007; Merkel, 2003). This emphasis on undergraduate research is supported by national accreditation standards as well as our departmental accreditation outcomes. For example, one of our Southern Accreditation of

Colleges and Schools (SACS) program outcomes is for all students to demonstrate writing competency.

Additionally, the Council for Accreditation of Educator Preparation (CAEP) has outlined core standards to guide students in attaining proficient knowledge in research. Item 1.2 of Standard 1: Content and Pedagogical Knowledge states, “Providers ensure that completers use research and evidence to develop an understanding of the teaching profession and use both to measure their P-12 students’ progress and their own professional practice” (CAEP, 2013, p. 3). A provider in this standard refers to an educator preparation program. This term refers to the organization preparing for accreditation irrespective of whether the agency is a district/school program, alternative pathway program, or higher education institution (CAEP, 2013). Additionally, CAEP acknowledges,

Candidates need experiences during their preparation to become proficient in applications of digital media and technological capabilities. They should have opportunities to develop the skills and dispositions for accessing online research databases, digital media, and tools and to identify research-based practices that can improve their students’ learning, engagement, and outcomes (CAEP, 2013, p.22).

Beyond accreditation and on a different level, Tan (2007) notes that the essence of undergraduate research is the development of supportive, encouraging, and intellectual partnership among students and between students and their faculty mentors through which they apply knowledge gained in the classroom to new questions and problems. Craney et al. (2011) further contend that these high quality interactions that are centered on educationally meaningful activities with peers and faculty mentors not only have the most gains in student outcomes, but they also positively impact college retention. More importantly, undergraduate student participation in research also impacts skill development in a positive manner. Salsman, Dulaney, Chinta, Zascavage, and Joshi (2013) contend that engaging in research broadens the student’s understanding in the chosen field, along with nurturing and developing student problem solving skills. Beyond recognizing the benefits of undergraduate student engagement in research, instructional faculty must also provide mentoring to support the efforts.

Mentoring and Building Undergraduate Student Self Efficacy in Research

Mentoring is a process where a mentee is provided with guidance, modeling, and encouragement to assist and enhance their professional growth and development (Cokley, 2000; DeFreitas, 2007). Faculty mentoring of students leads to a greater sense of belonging and a connectedness to the institution, which in turn leads to persistence through graduation (Cokley, 2000; Lundberg & Schreiner, 2004). The relationship with faculty was found to be a stronger predictor of student learning than even past experiences (Lundberg & Schreiner, 2004).

Undergraduate research activities require support, such as mentoring, guidance, orientation, and training (Greene, 2005; Shakespeare, 2005). Merkel (2003) describes undergraduate research as a partnership between students and their mentors through which students apply knowledge gained in the classroom to explore new problems and increase intellectual capacity. Lopez (2001) identified mentoring among the contributions that universities should make to improve education. Undergraduate students however, tend to approach research with discomfort and lack of confidence. For this reason, having research mentors in place to ease the discomfort students may feel can be an important component to undergraduate students research success.

Working closely with a faculty mentor can be life-changing especially for students who normally do not excel in school and/or for students who are from underrepresented groups (Leggett, 2003; Stocks, Ramey, and Lazurus, 2004). As research mentors, teachers sustain human and intellectual connection with their students in the quest for knowledge and understanding (Lopatto, 2004). For many students, the undergraduate research experience will spark a life-long quest for research and discovery (Stocks et al., 2004).

Mentoring has long been recognized as contributing to an individual's professional and personal success (Suedkamp-Wells, Ryan, Campa, & Smith, 2005). This success is evidenced in a study by Lev, Kolassa, and Bakken (2010) of undergraduate nursing students' evaluation of their self-efficacy to conduct research. In their study, Lev, Kolassa, and Bakken (2010) found the assigned mentors of the nursing students in their respective study perceived the students to be much more self-confident in their ability to conduct research than the actual students perceived their own abilities. Still other research has shown that having meaningful interactions with faculty can increase students' chances of persisting to degree completion in their chosen field (Cole & Espinoza 2008).

Opportunities to present in the everyday class session should be given to undergraduate teacher candidates in all of their teacher education courses. Once undergraduate teacher candidates are comfortable presenting research in front of their peers in the classroom setting, they may be ready to present their research at conferences. Lopatto (2005) contends that when students are encouraged to participate in research and present at conferences, they gain a sense of self-confidence and personal development, patience, and tolerance. Lopatto (2005) further found that these traits are not specific to just the sciences, but these traits are found in any undergraduate completing research. Undergraduate research mentoring programs can aid students in obtaining experience in research while developing critical thinking, problem solving, and communication skills (Kinkel & Henke, 2006). As students gain more experience in research, they will develop the confidence and persistence necessary to complete their projects (Petrella & Jung, 2010), defend their ideas, and present their work to the scientific community (Stocks et al., 2004).

Conceptual Framework

Hierarchy of Mentoring Intent and Involvement Levels

The framework for this study is based on Mertz's *Hierarchy of Mentoring Intent and Involvement Levels Framework* (2004). Mertz's framework is derived from the mentoring research as well as Kram's (1983) distinctions of the functions of mentoring which uses the constructs of intent and involvement for distinguishing and categorizing mentoring relationships and roles. Intent in this framework is concerned with *why* the relationship is undertaken, the *ends* sought, and how each party to the relationship sees and values those *whys* and *ends*. The model recognizes three functional categories of intent and ties them to different relationships—psychosocial development (modeling), professional development (advising), and career advancement (brokering)—different roles are associated with each category: role model or peer pal and teacher or coach with psychosocial development; counselor, advisor, or guide with professional development; and sponsor or benefactor, patron or protector, and mentor with career advancement.

On the other hand, involvement within the framework is concerned with what is required of each party to the relationship, the physical and emotional costs, the nature and level of investment

required, and the intensity of interaction required by the relationship. Moreover, the roles within the framework represent a continuum of relationships (Holland, 1998; Hurley, 1988; Shapiro et al., 1978). These constructs are visualized in a pyramid hierarchy. The pyramid allows for representing the relative capacity for engaging in the relationship at each level of involvement. In a nutshell, each construct is meant to reflect the increasing involvement and intensity required by the relationship and the change in primary intent as one moves from base (modeling) to apex (brokering). The roles are arranged to suggest a hierarchy based on the degree of involvement required by the relationship.

Mertz’s framework goes further to differentiate the types of mentoring by introducing levels of involvement required of the mentee. The framework is composed of six levels which progress from the lowest level of involvement and interaction in mentoring which is *Role Model, Peer Pal, or Supporter* (Level 1). In viewing the components of the framework viewing the framework at the lowest level and ascending up the pyramid (from Level 1 to Level 6), the interaction and intensity of involvement increase ending at Level 6 (Mentor), which is the highest level due to the degree of involvement (see Figure 1). The numbering of levels is not designed to quantify the level of involvement but rather to signify differences from least (Level 1) to most (Level 6). In mentoring undergraduate students with research, the professor and/or mentor must assume mentoring intent and involvement through all levels.

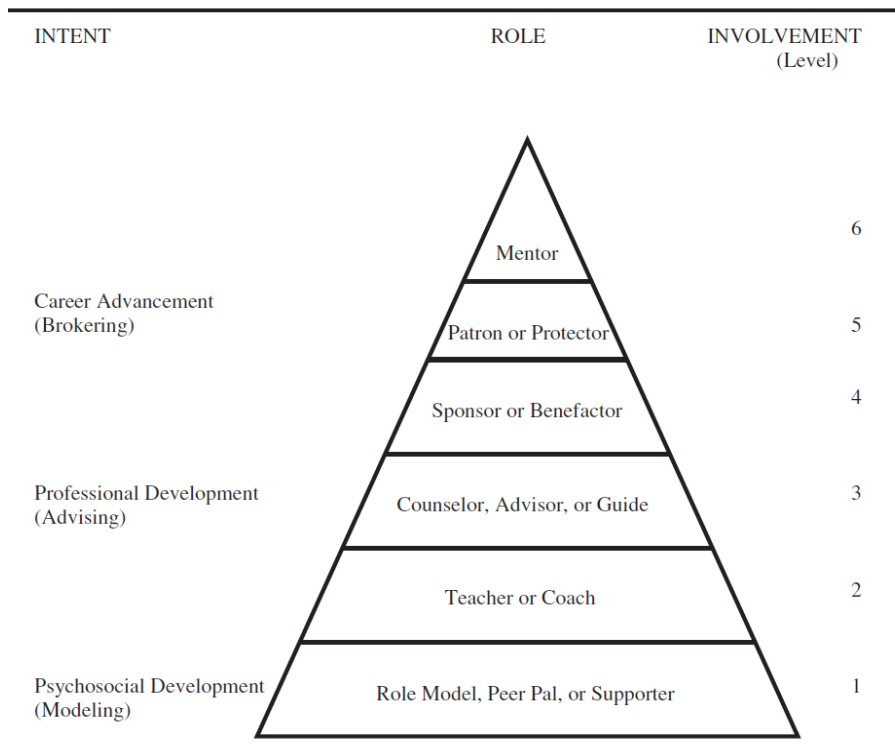


Figure 1: Mertz’ *Hierarchy of Mentoring Intent and Involvement Levels Framework* (Mertz, 2004).

In the subsequent paragraphs of this text, we share practices we have found highly effective in engaging undergraduate students in research. We approach each narrative providing the context of which we operate our work with students. Additionally, we situated the work in the context of practices that are appropriate for young adult and adult learners.

Integration of the Constructs of the Mertz's Mentoring Framework in Undergraduate Courses

The department offers specialized research courses at the graduate level, however integrates research methods into coursework that engage undergraduate students in research and creative activities. Additionally, we provide instruction to teacher candidates on how to use research to work with special populations and exceptional education learners. These courses consist of traditional classroom lecture-based instruction, which provide the students opportunities to acquire foundational scientific research knowledge. Given there are no undergraduate research courses, Mertz's *Hierarchy of Mentoring Intent and Involvement Levels* offers a framework of which to ensure students gain research experiences through a mentoring model.

These courses require the instructor to work one-to-one with students; to offer guidance and insight into the research process from: the development of the research topic, exploration and development key questions for consideration into planning the research project, devising of a research plan including teaching students how to evaluate appropriate literature, search and locate appropriate resources, and lastly compose a research proposal. At the end of each semester in the professional education core courses related to assessment or classroom management, each student is also required to give a conference style proposal presentation.

As research mentors, our goal is to help the students develop and execute research skills, which will prepare the students to achieve their full scholarly potential in preparation for future advanced studies. The ultimate goal of the research focus is for each student to develop critical thinking, inquiry, communication, and analytical skills while guiding students as they connect research theory to practice and aid in their future disseminating results through conference presentations and publications.

Undergraduate teacher education candidates are often intimidated by the thought of conducting research. Helm and Bailey (2013) contend that even in courses that consist of research methods, undergraduate students may feel overwhelmed at best. In working with undergraduates who are teacher education candidates, it is best to emphasize the importance of research in teacher education. In teacher education, all theories and strategies for teaching are research based, with the ideal being that theory based strategies impact student learning in a positive manner. When the importance of obtaining information pertaining to research-based teaching strategies is stressed, undergraduate teacher education candidates understand the relevancy, and rise to the challenge with proper guidance and mentoring.

Various kinds of activities can be turned into teacher education research assignments. We have used writing activities that are inclusive of incorporating research based information which are instrumental in assisting undergraduate teacher educators to critically think and reflect on their practices. This specific example of a writing activity is similar to a journal activity, but adding the research component builds on the process.

An example of a writing activity that can be used in non-research teacher preparation courses asks the candidate to discuss why he or she became a teacher, and in the assignment, the student discusses the theorists he or she has had the most influence on his or her teaching. The activity requires students to cite a minimum of three references in this reflection narrative. This approach is used as an initial process to introduce students to the beginning stages of research. This activity eases them into research by connecting it to their personal reasons for becoming a teacher. By having them apply research and theory to their personal stories, they are able to understand how these pieces can be infused in what they do. This process eliminates research as an intimidating and higher level process. Engaging in research makes one a partner in the creation of knowledge (Shamari & Kfir, 2002). Throughout the research process, the instructor should mentor each student as they explore their respective research topics. In instances where there is a large class, the instructor can secure the assistance of a trained graduate, research, and/or teaching assistant or accomplished graduate level student writers who could serve as volunteers.

Additionally, we give various opportunities to undergraduate teacher candidates to present research in the classroom setting as a precursor to presenting at a workshop or conference. We give the undergraduate teacher candidates the opportunity to conduct research on an assigned education-related topic, specifying that they must present via an oral presentation, have a written presentation, complete the work in APA 6th edition format, and cite references and subsequently score their presentations using a rubric that includes all of the important parts necessary for writing and presentation. Again, these levels target the roles of the mentor as *Role Model*, *Peer Pal*, or *Supporter* (Level 1), *Teacher or Coach* (Level 2), and *Counselor, Advisor, or Guide* (Level 3) along Mertz's framework.

To assess research writing and presentations at the undergraduate level, we use scoring tools such as rubric, metrics, and/or checklists. One example of areas assessed on a rubric at the undergraduate level for a diversity project is as follows:

1. The researcher uses power point to present his or her research to the class group.
2. The research gives a brief overview of the culture highlighted.
3. The research tells about cultural nuances that impact student learning.
4. The researcher gives suggestions of ways to teach the student.
5. The researcher includes correct references and citations according to the APA 6th Edition Manual.

The scoring system ranges from target, acceptable, and unacceptable. The feedback relates to *Teacher or Coach* (Level 2) and *Counselor, Advisor, or Guide* (Level 3) along Mertz's framework.

Classroom Strategies for Engaging Undergraduate Student Interest in Research

Depending on the course content and focus, instructors can assign a topic(s) of interest in the field of study related to the course. Then they can provide several choices or have students choose a topic area of interest concerning a current interest in the field and then require students to select 3 to 5 articles from professional journals. With undergraduate students, the instructor has to provide instruction on the difference between a popular magazine (e.g. *People Magazine*) and a professional refereed journal. This piece includes helping students understand appropriate print and web-based resources. The instructor must help students understand e-databases and online scholarly sources vs. popular reference sources such as Wikipedia®.

Additionally, the instructors should have students write article reviews of their chosen articles. In using this format, the instructor provides the structure for the review indicating what to include in the review in addition to an American Psychological Association (APA) reference format. The instructor should emphasize a review of the research format in lieu of simply providing article summary or annotated bibliography. For example, the sections of the review could include references, summary of important content, and a critique where the students might be instructed to document how the article content could be used to enhance them professionally and/ or discuss the quality of the article in content and methods.

Guide the students to write a short position paper of five pages where they would first outline the content based on the chosen topic and the supporting content from the articles reviewed. The instructor should provide a sample outline format. The integration of their position on a topic and the supporting documentation should be the emphasis of the paper. The instructor identifies the relationship of the outline as a first draft of the paper, and the use of subheadings, transitions, and summaries that will help organize logical thought.

Additionally, the instructor should provide students the opportunities to present their review of the articles during several classes during the semester allowing for practice of the skill of presentation. Also, provide the structure of the presentation, which could follow the written format. The instructor should evaluate paralinguistic along with emphasizing a dialogue style. These initial presentation opportunities will prepare students for more structured and advanced settings.

Demonstrated Mentoring Practices through Students' Research-based Presentation

Each year, the Department of Curriculum and Instruction hosts a student research symposium which allows students who are mentored to demonstrate their acquired knowledge of research. The annual student research symposium provides a welcoming and appropriately competitive venue for undergraduate and graduate students to showcase the research projects and subsequent findings. The symposium experience is designed to perfectly mirror professional and national conferences students will participate in while practitioners in the field; this includes having professional judges to evaluate the paper and poster sessions along with panel presentations. For this symposium, the educational team utilized varied strategies to model the level of expectations for professionalism and detail commensurate with national top-tier research conferences we attend as professionals in the field.

For their work, students had opportunities to win prizes for best paper or poster but, more importantly, the students gained valuable experience integrating skills learned from their mentors in preparing work, presenting original research to a lay audience and defending their research. The major difference of this student research conference is that students were not passive but active partners in every aspect of the conference from the marketing, organization, planning, and hosting of the conference. These skills closely align with all levels of the Mertz's framework as the undergraduate student mentee were not only able to receive feedback and guidance, but also engage in activities where they serve in a research conference planning role. To this effort, we personally sponsored and provided financial support to and give students incentives for participation such as gift cards for the winning poster group and winning paper presenter. These efforts align with Mertz's *Levels 4 - Sponsor or Benefactor* and *Level 5 - Patron or Protector*).

Discussion

The department does not offer undergraduate research courses in education. Although, we found that by adding mentoring in research within the courses the students *do take* has helped students with constructing a research project and understanding the necessary elements of a research project. Working with the students in their professional core and methods courses further emphasized the students' need for additional support with effectively presenting researched information and acquiring a greater depth in content knowledge of the respective research topics of interest. Through this process, we recognized there are a number of reasons why students may experience some difficulty in engaging in research including but not limited to: lack of confidence, nervousness and/or need for improvement of written and oral communication skills. Additionally, students may have selected topics they are interested in, but may not have a strong knowledge base of the topic. With the support of a more time intensive mentoring or research coaching experience, the instructor can identify specific strategies tailored to the students' areas of need.

At the end of the symposium activities, the judges were asked to debrief the students concerning ways to improve the development and dissemination of research projects and presentations. This feedback which provided strategies for enhancing the presentations and areas of strength and weakness aligned with the framework construct of *Career Advancement (Brokering)* on Mertz' scale. Students and their mentors had the opportunity to question the judges regarding suggestions for further enhancement. Based on the feedback, we identified that the students should engage in additional opportunities for writing and presenting research throughout the academic semesters leading up to the symposium. Additionally, more emphasis should be placed on *Professional Development (Advising)* with the framework, where mentors engage in more frequent counseling and guiding activities to improve the quality of the presentations and depth of subject content knowledge.

What is more evident in evaluation of the effectiveness of the symposium, the undergraduate level students should be required additional opportunities to develop skills in presenting research. At a cursory level and although they do not take a formal research class at the undergraduate level, the students' evaluations of the symposium show they had a strong appreciation for the presentation opportunities as well as the information gained from participation in the activities.

In debriefing with students after the symposium, the oral feedback revealed students truly benefitted from the symposium in terms of: (a) exposure to research presentations, (b) exposure to content knowledge on educational best practices, (c) learning about the structure of conference presentations, and (d) having opportunities for undergraduate and graduate students to interact with each other. This piece supports the idea that research-based mentoring is vital to the successful development of future students' interests in research. We use the evaluative feedback to provide the students' perspectives in order to enhance our roles as faculty members supporting student involvement in formal research presentations. Although we acknowledge a need for additional instruction in research presentations and sharing information, we realized that facilitating an interest in research could help students' complete independent learning so they can become more effective. There needs to be more emphasis placed on undergraduate student researchers attending professional research conferences where they can observe effective presenters model appropriate strategies. Additionally, opportunities to co-present at national conferences could augment students' research knowledge and experience which contributes to advanced levels of competency and aligns to the construct of *Career Advancement (Brokering)*

with the framework where the mentor acts as a sponsor or benefactor for the student mentees' development.

Overall, the evaluation form feedback affirmed the success of the symposium regarding student engagement in research as well as solidified the continued role mentoring activities played in the development of students' interest in research. Although the students were participating at the novice level as researchers, they embraced the symposium as an opportunity for exposure and growth as reflected in the scores they assigned each aspect of the conference. All scores were 4.5 or higher (excellent) for all categories of the evaluation results.

The symposium activities were featured in a local newspaper. The article entitled *Educational Conference Helps Tomball Resident Prepare for a Career in Teaching* featured the symposium and gave one student's perspective of the experience that acknowledged the benefits of the symposium. One student stated, "Participating in professional development, such as the conference, extends her preparation in being a professional in the field of reading [her academic content area]. It gives me the opportunity to research topics that can aide me and my team in the classroom and beyond." Additionally, the student recognized her faculty mentor for "helping her in her studies" and "exposing her to a vast amount of knowledge." Last, she stated that without her faculty mentor, "I do not know where I would be" (Johnson, 2014, p. 3A). These types of affirmations support the effectiveness of mentoring at all levels along Mertz's framework particularly the highest category, *Level 6 - Mentor*.

Implications for Teacher Educators and Conclusions

Ensuring that undergraduate students are adequately prepared for a future that encompasses a research agenda is a very notable challenge facing current teacher educators. Teacher candidates and in-service teachers must be able to use data to impact instruction of their students. Since integrating research and scholarship into the undergraduate curricula is a critical national educational standard (CAEP, 2013) and is also essential for the completion of the education degree, there are major implications regarding students' educational experiences.

To effectively support the future development of undergraduate students' interests in research, educational programs must ensure that research strategies remain integrated into the programs' objectives, course curricula, and procedural and instructional strategies and are reinforced by the instructional team. This commitment further requires all faculty members to engage in research on best practices for how research efforts among undergraduate student can be enhanced and to use findings to plan and develop strategies that can be employed when working with students as they embark upon future research endeavors. The new approaches must be incorporated into practice modalities that integrate current foundational research knowledge including principles and theories coupled with new and innovative research perspectives that will help to student to garner a richer appreciation of research. We want to secure sponsored research funding to provide more opportunities for undergraduate student engagement in research to provide a smaller student researcher to mentor ratio. We would like to provide additional opportunities for those students who demonstrate promise for success in graduate studies and interest in conducting more focused action research projects.

As a result of this new found appreciation, it is the hope that faculty will see major attitudinal changes towards research including cognitive and affective gains for students, increased retention rates, higher grade point averages, and greater clarity of academic and career goals particularly as

it relates to areas of work with a research-based focus (Eagan, Sharkness, Hurtado, Mosqueda, & Chang 2010). We envision undergraduate engagement in research as an opportunity to prepare more effective teacher candidates who will utilize and collect data to reflect on and subsequently improve their teaching. Ultimately, this focus will produce better-prepared and more reflective teachers.

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