JOURNAL OF EDUCATIONAL RESEARCH & PRACTICE

Journal of Educational Research & Practice
2022, Volume 12, Issue 1, Pages 18–35
DOI: 10.5590/JERAP.2022.12.1.02

Original Research

WALDEN UNIVERSITY

Effects of an Undergraduate Research Experience on Pre-Service Teachers' Perceptions

Erin Pearce, PhD
Tarleton State University, Stephenville, Texas, United States
https://orcid.org/0000-0002-8149-7236

Jesse Brock, EdD
Tarleton State University, Stephenville, Texas, United States
https://orcid.org/0000-0002-2943-9717

Phillis Bunch, EdD
Tarleton State University, Stephenville, Texas, United States
https://orcid.org/0000-0003-3326-2261

Contact: pearce@tarleton.edu

Abstract

Pre-service teachers (PSTs) often lack the self-efficacy necessary to effectively implement STEM education into their classrooms. Undergraduate research experiences (URE) can help fill this void by providing opportunities for PSTs to engage with STEM content and K–12 students in a field-based research context. This case study details the impact a URE had on PSTs' STEM self-efficacy and views on research. The URE consisted of STEM curriculum development, teaching the curriculum at a local middle school, gathering research data, and presenting results at academic conferences. Participation in the URE positively influenced the PSTs' self-efficacy in STEM and changed their perceptions regarding research. This research provides practical value to educator preparation programs (EPPs) as an option to enhance STEM education for PSTs.

Keywords: *undergraduate research, STEM education, self-efficacy, pre-service teachers*

Date Submitted: March 1, 2021 | Date Published: February 3, 2022

Recommended Citation

Pearce, E., Brock, J., & Bunch, P. (2022). Effects of an undergraduate research experience on pre-service teachers' perceptions. *Journal of Educational Research and Practice, 12*, 18–35. https://doi.org/10.5590/JERAP.2022.12.1.02

Introduction

There has been an exponential growth in the amount of academic scholarship on STEM integration in the classroom (Li et al., 2020). Studies reveal that there is a positive relationship between successes in the current innovative age and STEM education (Breiner et al., 2012; Li et al., 2020; Suchman, 2014;). On this note, Breiner et al. (2012) stated that the core STEM disciplines are essential to "creating better prepared high school and college graduates to compete globally" (p. 3). Incorporating academic findings into governmental policies, the current STEM movement's purpose (according to the Committee on STEM Education, 2018) is to intellectually foster students, both at the K–12 and higher education levels, to become future leaders and workers in the ever-advancing knowledge-based economy.

Responding to this correlation, many state governments require K–12 teachers to implement STEM activities in their classrooms (AIP, 2017; Ridgeway & Brown, 2018). While some boosts regarding student achievement have been made over the past few years (Pál et al., 2018), there are still needed improvements (Camera, 2019; Desilver, 2017). At the root of primary and secondary students learning STEM education are the abilities of teachers. Despite noble intentions, teachers often lack training and/or the knowledge needed to effectively implement STEM education activities (Eckman et al., 2016). Many educators shy away from STEM education because they do not feel confident in implementing problem-based learning activities (Campbell et al., 2018). They may lack the content knowledge or the "know-how" to effectively engage students in relevant lessons. In these situations, many teachers opt to engage students with fun science activities, such as the creation of goo and deem them STEM. Although this approach is exciting for students, these activities often lack the problem-solving component and critical-thinking skills that true STEM activities elicit. Expanding on these noted inefficiencies, a 2015 report published by the Pew Research Center revealed that only 29% of Americans viewed STEM education in the K–12 setting as above average, while 46% of polled American Association for the Advancement of Science members labeled the STEM education curriculum and classroom integration as below average (Pew Research Center, 2015).

Given this concerning data, it is no surprise that there is a recent call to give more focus and attention to educator preparation programs (EPP) offered at colleges and universities regarding STEM education (Corlu et al., 2014; Ejiwale, 2013; Mangiante & Moore, 2020). To better foster student STEM learning in K–12 school systems, pre-service teachers (PSTs) must be knowledgeable about STEM content and comfortable with STEM classroom integration. However, research has found that teachers lack self-efficacy regarding STEM education (Nadelson et al., 2013; Stohlmann et al., 2012). EPPs need to do a better job at providing future teachers with a strong foundation and understanding of STEM integration. Despite this dire need, EPPs rarely offer courses to undergraduates that focus primarily on the pedagogy of STEM education; this topic tends to be reserved for master's programs. By providing opportunities to engage in undergraduate research experiences (UREs) centered on STEM education, PSTs can gain the self-efficacy needed to effectively implement STEM across the curriculum.

Conceptual Framework

The conceptual framework utilized in this study combined the concepts of self-efficacy and effective faculty mentorship. Bandura (1997) defines *self-efficacy* as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). These beliefs are developed from mastery experiences, vicarious experiences, verbal persuasion, and physiological feedback and are, therefore, a significant component of the social cognitive theory (Bandura, 1986). Expanding on the context of Bandura's theory, Tschannen-Moran and Woolfolk-Hoy (2001) consider self-efficacy to be a motivational construct that determines the amount of effort given by an educator. Teachers with high self-efficacy are more likely to search for and implement innovative instructional strategies (De Neve et al., 2015; Depaepe & König, 2018; Riggs & Enochs, 1990), modify their instruction based on student need (Whitley et al., 2019), and find teaching meaningful and rewarding (Karabatak & Alanoğlu, 2019). It is no coincidence that these characteristics also align with EPP goals for PSTs.

At the higher education setting, faculty members are responsible for providing learning experiences and environments for PSTs. There are several models of effective faculty–student mentorship relationships and structures (Law et al., 2020). This study incorporates Linn et al.'s (2015) mentor model of knowledge integration to frame a URE aimed at increasing the self-efficacy of pre-service teachers. Based on Linn et al.'s (2015) model, effective mentorship has four stages: guiding students to develop ideas to frame the URE, expanding their content knowledge by conducting an experiment, leading students toward a more complete understanding of their field, and assisting students in developing their identities as researchers and future practitioners through reflection. The last stage can be conducted through surveys, conference presentations, and writing research reports. Mentors, according to Linn et al. (2015), guide students through these four stages toward accomplishing knowledge integration of the ideas spurned through the URE.

Literature Review

Significance of STEM Education

Based on economic predictions, job openings in the STEM sector will dramatically increase over the next decade. To ensure that the United States remains competitive on the global scale, national policy makers have directed state governments to focus on STEM instruction in efforts to provide students with 21st-century skills essential for success in an ever-changing world of exponential technological growth (Beswick & Fraser, 2019). Problem-based learning approaches at the heart of STEM instruction prepare students for this future by affording experiences for students to enhance their technological and critical thinking skills (Bybee, 2013).

Benefits of K–12 STEM instruction are prevalent in the literature for every age (Bybee, 2013; Eshach, 2006); however, the dire need for STEM education during the middle school years cannot be overlooked (Lin et al., 2020; Rodriguez, 2018; Sondergeld et al., 2020). During this time, students begin to form their opinions and attitudes toward STEM, which serve as a motivational catalyst or block for STEM learning. Bishop (2015) found that students educated within the framework of a STEM program were more likely to choose a career in the STEM field. Thus, it is crucial that educational institutions provide opportunities for students to be introduced and immersed in STEM education.

STEM Classroom Integration

The advantages and urgent need for STEM education are apparent in the media and on the forefront of educational agendas nationwide. However, educators—the facilitators of knowledge, those that have the most profound effect on student learning (Nye et al., 2004; Rivkin et al., 2005)—are reluctant to implement STEM. A lack of self-efficacy in STEM education is often the root cause of this hesitation (Campbell et al., 2018; Nadelson et al., 2013; Stohlmann et al., 2012). However, the blame should not fall on the educators. Under global pressure, national and state policy makers have made directives to "do STEM" without the necessary support. These orders have forced school districts and EPPs to instruct teachers to incorporate more STEM education into their classrooms without providing fundamental coursework or training for STEM instruction (Eckman et al., 2016).

To comply with these directives, educators often seek fun "STEM" activities online; however, these engaging activities often do not incorporate the other areas of STEM: technology, engineering, and mathematics. The actual number of subject areas combined during a lesson plan that are required to classify a lesson as STEM is an ongoing debate among researchers (Bryan et al., 2015; Bybee, 2013; Williams, 2011); nonetheless, most will agree that a correlation exists between the integration of the subject areas and the authenticity of the problem-based learning approach (English, 2016; Honey et al., 2014; Peters-Burton et al., 2019; Vasquez et al., 2013). Unfortunately, STEM subjects are often siloed into their own individual learning stations or centers in classrooms across the nation and even into separate departments in higher education settings (Breiner et al., 2012). This is the result of unfamiliarity with best practices in STEM instruction and, ultimately, a lack of opportunities for growth.

Undergraduate Research Experience

Scholarship reveals that UREs are beneficial to undergraduate students on several developmental fronts (Gilmore et al., 2015; Linn et al., 2015; Lopatto, 2007; Walkington, 2015). Engaging in research increases undergraduate students' overall academic success and retention (O'Donnell et al., 2015), fosters interdependence and critical thinking (Lopatto, 2003), and raises self-confidence and self-efficacy (Zambo & Zambo, 2007). In their efforts to analyze whether these benefits applied directly to undergraduates earning degrees in STEM fields, Russell et al. (2020) found that undergraduate students were more likely to pursue graduate degrees and careers in STEM-related fields after engaging in faculty mentored UREs.

In EPPs, the typical research engagement is provided through traditional coursework, such as research method textbooks and lectures (Reis-Jorge, 2005). The general thought is that teacher educators need to be teaching-oriented as teaching experiences play the main role in mastery experiences and content knowledge of student development, classroom management, and establishing a teaching philosophy (Darling-Hammond & Bransford, 2005; Kosnick & Beck, 2009; Ure, 2010).

However, there is a recent trend in EPPs to train students to be research oriented (Reis-Jorge, 2005). UREs increase PSTs' research knowledge and self-identity as future teachers (Reis-Jorge, 2005). In their study on education PSTs, Guilbert et al. (2015) found that participants recognized the benefits of research experiences, expressing that most PSTs should engage with research projects during their training in teacher education programs. Guilbert et al. (2015) concluded that "studies should consider the types of support and guidance that the university can provide to more effectively promote educational research at the undergraduate level" (p. 184).

Purpose of the Study

The purpose of this case study (Yin, 2012) was to analyze how students perceive their experiences during a semester-long URE. Scholarship has found that successful UREs are centered around effective faculty mentorship (Hall et al., 2018). The current study was conceptually guided by the knowledge integration mentor model, which emphasizes a faculty–student relationship built on the concepts of student autonomy and reflection (Linn et al., 2015). Specifically, we examined if the URE altered and shaped the PSTs' self-efficacy in STEM, overall STEM content knowledge, pedagogical technique as K–12 teachers, future academic endeavors, and their overall thoughts on the research process itself. Qualitative data from a validated open-ended survey questionnaire completed by the five pre-service students that participated in the URE yield insightful findings on the benefits of the URE, allowing us to make claims and suggestions on the need for EPP faculty to implement and oversee undergraduate student research experiences (Gilmore et al., 2015; Linn et al., 2015). The two guiding research questions for this study are directly tied to the PST experiences during the URE. These questions were:

1. Did participating in the URE affect PSTs' self-efficacy in teaching STEM?
2. Did participating in the URE affect PSTs' perception of research?

Methods

This study examines the implementation and effectiveness of a newly developed URE at one university. The URE was designed by the primary investigator to promote best practices in STEM pedagogy and to enhance pre-service teachers' self-efficacy. Given the context, we chose to examine the impacts and benefits of the URE through a single-case study research design (Yin, 2012). Investigators utilize single-case studies to gain perspectives on an empirical unit or phenomenon, with the ultimate goal being to inspire future action and decision making (Scholz & Tietje, 2002). We were interested in gaining student perspectives on the URE in hopes of modifying the research experience, as well as implementing future UREs within the EPP. To accomplish this task, we collected and analyzed qualitative data from completed open-ended survey responses from the five pre-service students who participated in the URE.

Description of Context and URE

This study took place at a public university in Texas over a 2-year period. The primary investigator, an Assistant Professor of Curriculum and Instruction, received a research grant that allowed the faculty member to purchase supplies for a STEM-related research study conducted in a local public school. The primary investigator contacted a local middle school to gauge interest in creating a university–school relationship for the study. A 7th-grade teacher volunteered her class to be a part of the study.

The faculty member framed the URE around the concept of STEM classroom integration. Following the mentor model proposed by Linn et al. (2015), the faculty member guided the PSTs during the URE, which included designing a STEM curriculum, teaching the designed curriculum in a 7th-grade classroom, collecting research data on the effects of the curriculum, and presenting results at academic conferences.

Sample

The sample for this study stemmed from purposeful sampling methods. Typically utilized in qualitative research, purposeful sampling allows investigators to select participants that fit within the examined phenomenon or case (Patton, 2015). Furthermore, sampling in qualitative research often relies on a participant selection procedure that results in choosing participants “whose main credential is experiential relevance” (Gupta & Awasthy, 2015, p. 231) to the study’s central purpose. According to Creswell & Guetterman (2019), there are at least nine different types of sampling methods that are considered to be purposeful in nature. Fitting in the purposeful context, homogenous sampling is used when investigators specifically need to include participants in the study that share “membership in a subgroup that has defining characteristics” (Creswell & Guetterman, 2019, p. 208). The following paragraph details how the investigators utilized purposeful sampling procedures during the participant selection process.

The awarded grant allotted monetary stipends ($250 per student) to undergraduate students for participating and contributing with the research project. According to the grant guidelines, a participating student had to be enrolled in the university’s education preparation program to be considered. Therefore, following the framework of homogenous sampling, a specific subgroup of students was considered a potential participant. To ensure all pre-service teachers at the university received an opportunity to apply for one of the student research positions, the faculty researcher consulted with the faculty from each college that oversaw the teacher candidates in their college. These faculty contacts sent a flier to each teacher candidate to gauge interest. Interested students contacted the primary investigator for an interview. In all, a total of eight pre-service teachers scheduled a one-on-one interview with the investigator about participating in the research project. At the interview, students were asked questions regarding their reasons for wanting to engage in the research experience. They were also given a scenario and asked to create a lesson that incorporated science, technology, engineering, agriculture, and mathematics. After the completion of the interviews, five female pre-service teachers were chosen to take part in the 5-month URE, based on their application, faculty recommendations, and interview. As shown in Table 1, the participating students represented a range of academic disciplines and varied in STEM content knowledge prior to project participation.

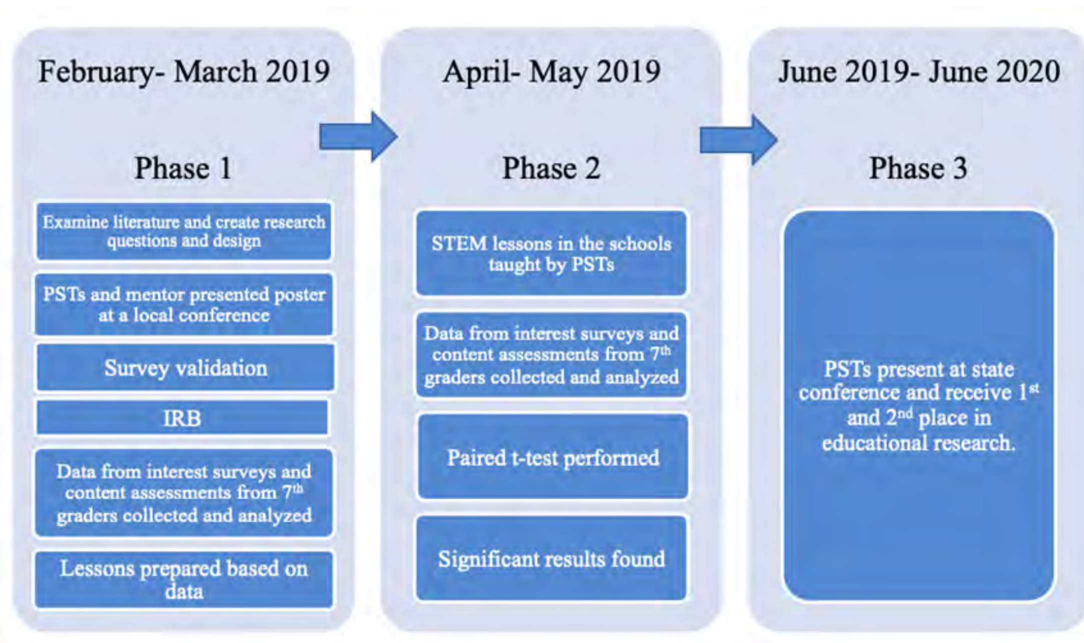
Table 1. *Participant Demographics*

Student	College	Major	Teaching Certificate
1	Agriculture	Agriculture Services & Development	6–12 Ag., Food, & Natural Resources
2	Agriculture	Agriculture Services & Development	6–12 Ag., Food, and Natural Resources
3	Science & Technology	Mathematics	7–12 Mathematics
4	Education	Interdisciplinary Studies	EC-6 Core Subjects With ESL Supplemental
5	Education	Interdisciplinary Studies	EC-6 Core Subjects With ESL Supplemental

Note: 6–12 = sixth through 12th grade ; 7–12 = seventh through 12th grade; EC–6 = Early childhood through sixth grade; Ag. = agriculture; ESL = English as a second language

Over the span of 5 months, the PSTs completed the URE in three phases: project design, STEM week implementation, and conference presentations. (See Figure 1 for the URE phases.) At the first meeting with the primary investigator, the students completed a participant consent form and completed Collaborative Institutional Training Initiative (CITI) training to ensure they had knowledge regarding research ethics and compliance. With the faculty mentor's guidance, the PSTs wrote a cooperating facilities letter for the middle school administration and consent forms for the 7th-grade students. The PSTs also created a content-based assessment over natural disasters and had the assessment validated by three science education experts. Once the students had all of the necessary paperwork created, they met with their mentor to complete the IRB process and began brainstorming ideas for their STEM natural disasters lesson plans.

Figure 1. *URE Timelines*



Note: This figure details the activities associated with the URE.

Three weeks before STEM instruction, the primary researcher addressed the local 7th-grade class regarding the procedures and necessary paperwork for the upcoming STEM week. At that time, the 7th graders completed the content-based assessment on natural disasters and a STEM interest survey. The last four numbers of their student ID were used instead of their name for confidentiality purposes. The students took home a research consent form that required both the student and parent/guardian signatures. The PSTs used the data from the pre-test assessment on content knowledge to guide the creation of their lesson plans for the week. Once the consent forms were returned, the PSTs deleted pre-test results of students that did not give consent or did not return the forms.

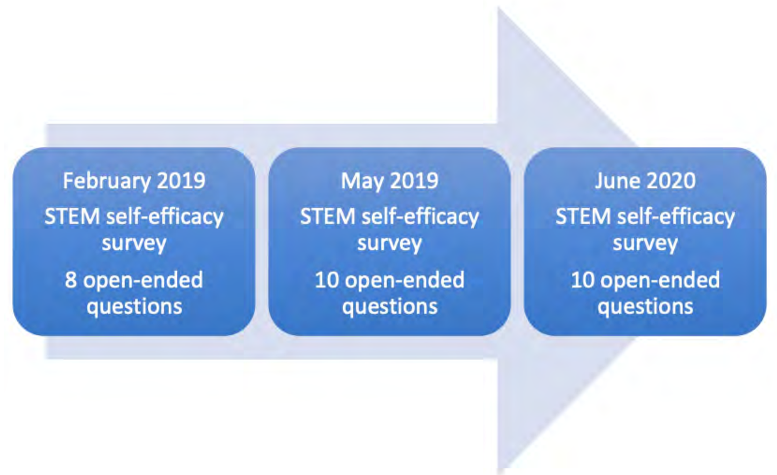
During STEM week, each PST individually taught their own STEM lesson to the 7th-grade classroom. The lessons were created to flow with an introduction to natural disasters on the first day and then subsequent lessons specifically related to different types of natural disasters. After the completion of STEM week, the PSTs administered a post-test of content knowledge and the same STEM interest survey to the 7th-grade students. The post-test assessment and the post-survey were exact replicas of the assessments administered prior to STEM week. The natural disasters post-test scores were entered, and the results were found to be statistically significant through a paired t-test ($p = 0.0002$, $df = 32$). In addition, the change in STEM interest was also found to be statistically significant ($p = 0.0022$, $df = 32$).

The next semester, the faculty mentor and PSTs discussed the research findings in more detail. As part of the awarded grant from the university, the participating students were required to submit a conference presentation proposal for the institution's undergraduate research symposium. After meeting and talking about their findings from STEM week, the PSTs expressed further interest in presenting their findings at additional academic conferences. Three of the five students submitted proposals and were selected to attend a state undergraduate research competition. Two of the students worked together to create a research poster displaying the results of the STEM interest survey, and the other student's research poster focused on the results of the content-based assessment. The single student won first place in educational research and the pair won second place in the same category. Two months later, the first-place winner was selected to attend a national undergraduate research conference with her mentor.

Data Collection & Analysis

To gather qualitative data, the primary investigator developed a survey questionnaire. The questionnaire consisted of eight open-ended questions structured around the PSTs' perceptions of STEM and research. As tools for research collection, questionnaires must be validated (Kazi & Khalid, 2012). As a result, the questionnaire was sent to three experts in teacher education, both in pedagogy and research, in order to ensure content validation (Petric & Czarl, 2003). Data collection was divided into three phases (see Figure 2). Students were administered the questionnaire prior to engaging in the URE, at the immediate conclusion of the URE, and then one year after the URE was completed. At each stage of data collection, the participating students completed the same open-ended questionnaire. The students added a four-digit number to each survey instead of their name to increase confidentiality.

Figure 2. *Data Collection Timeline*



Note: This figure depicts a chronological timeline of the data collection procedures.

Questionnaire responses were coded using open, axial, and selective coding methods (Corbin & Strauss, 2014). Open coding methodology allowed for the identification and tentative naming of conceptual categories. Each category was the end result of the organization of similar words and phrases in the answers. Using axial coding (Corbin & Strauss, 2014), the conceptual categories were then reexamined to determine if similarities existed between each category. These categories were then collapsed even further into themes (selective coding). When examining qualitative data, having more than one investigator code data enhances trustworthiness and rigor of data analysis (Church et al., 2019). Therefore, two investigators coded data independently to the point of saturation. After each investigator completed independent coding, a process of inter-coder reliability took place. The two coding investigators came together to discuss their data interpretation until an agreement was made on which emerging themes were the most appropriate (MacPhail et al., 2016).

Results

As noted earlier, participating students responded to three open-ended questionnaires: pre-URE, post-URE, and 1-year later. Data analysis of questionnaire responses revealed four main emerging themes. These themes were associated with the URE's impact on the participants regarding their overall interests, confidence, and perspective of both STEM curriculum and research integration in the K–12 classroom setting. The four themes were: (a) perspective on research, (b) STEM self-efficacy, (c) societal value of STEM, and (d) enhanced professional advantage.

Change in Perspective on Research

The URE had an immense impact on student perceptions and helped rectify many strongly held misconceptions regarding research. In the pre-survey, Student 2 responded that research was "creating your own results," and Student 4 viewed research as a "bunch of scientists working in a lab." This viewpoint is a common misconception with pre-service and in-service teachers who typically view research and science exclusive to White males working alone in a laboratory setting (Kim, 2006). However, immediately after the URE, student perspectives were immensely changed. This shift was apparent when Student 4 realized that "not all research is created equal," and shared the following view a year after the URE:

> I used to view research as scientists in labs poking at experiments. After doing this research, I now see it for more than just that. I see it as a way to ease our curious minds and find solutions to problems or even just a way to better things that we are doing. I see research as a way to continuously improve on practices that are in place in the classroom.

Not only had the misconception been amended, the quote above suggests that this student also gained a new appreciation for research and its role in society and in the classroom. This was not the only instance of a newfound excitement for research. Student 1's pre-survey mentioned that research was "a time-consuming, but necessary part of society." The student responded to the same question much differently in the post-survey by stating, "Research is a necessity! We always need to be looking for ways to improve!" It even appeared that her excitement had amplified 1 year later.

> Research is an invaluable practice. We HAVE to have research to improve. The words "pursuit for the truth" come to mind when I hear the word "research." Research is vital to society. Without research, we exist in an endless loop never improving. Research shows society what methods work better than our current ones, what methods don't work, and what we should research next time. Regardless, if research does not suggest/represent the desired result, valuable information is found.

> Prior to this experience, I saw research as a daunting task that required extreme amounts of thought and time. After participating in this undergraduate research experience, I now see a greater value in research and that it can be quite fun as well. I had a blast conducting this research.

In the post-survey and 1-year later survey, the students also highlighted the importance of educational research. Teachers conducting their own research in the classroom were viewed as significant when Student 4 concluded that she "realized how much research can provide us for the classroom." Likewise, Student 1 relayed the nature of research in the classroom by stating the following:

> Teachers should absolutely perform research on their own classes. A teacher can learn a lot about the effectiveness of their lesson plan or activity by conducting research in their classroom. I believe that teachers conduct their own forms of research on their students all of the time. This research may not be official, but comparing their students' reactions to different activities to find the better activity is still a form of research.

As demonstrated in the quotes above, the students involved in the STEM URE gained a new respect and excitement for research in general and how it can make a classroom more effective. What was once restricted to White males in a lab became a reality to those who had a desire to answer questions for the advancement of their students and society. However, the change in viewpoint was not restricted to their views on research. The undergraduate researchers also had a change in perspective towards STEM education.

Increase in STEM Self-Efficacy

One of the benefits of the URE was an increase in knowledge and experience delivering effective STEM instruction. This led to an increase in self-efficacy in teaching STEM lessons. Prior to the URE, many of the participants housed doubt in their ability to teach effective STEM lessons. When asked if they could teach a STEM lesson, Student 2 stated, "No, I need more help." Students 1, 4, and 5 expressed that they could probably teach a STEM lesson if given resources, help, and/or adequate preparation time to research how to effectively create and implement a STEM lesson; however, all three also mentioned that they were "not comfortable" or "not confident" in performing the task. Likewise, Student 3 mentioned that she would be "more comfortable teaching some subjects of STEM more than others." The previous quote demonstrates a common occurrence in the pre-URE mindset. Like most pre-service and in-service educators (Breiner et al., 2012), the participants involved initially viewed STEM as separate entities instead of the integration of subject areas. However, this viewpoint was remedied with the URE.

In the post-survey, Student 4 described her newfound view of integrated STEM education as a significant piece of a school's curriculum and "most effective when all the parts of STEM are interconnected." One year after the URE, this student stated that "When these subjects are taught individually, it's hard to see how they can all fit together. However, when taught together it's easy to see the big picture and how they might apply to a certain field of work."

Learning how to create an effective STEM lesson was key to increasing the students' self-efficacy. When asked about their confidence level in delivering STEM instruction in the post-survey, Student 1 expressed the following:

> I could absolutely teach a STEM lesson right now! This experience has given me confidence in my ability to teach STEM. It also increased my confidence in my ability to teach overall.

Likewise, Student 3 stated that the experience gave her "the tools to teach a STEM lesson." Mirroring the findings of Bandura (1997), Student 4 mentioned that viewing her team aided her understanding of STEM and "that after experiencing others' lessons and my STEM lesson, I know how to prepare and what to expect from teaching a STEM lesson."

One year after the URE, the confidence had not waned. Student 1 still had "full confidence" that she could teach a STEM lesson on the spot and that "teaching a STEM unit in front of a class does not frighten me…. When it came time for me to start teaching during my clinical teaching experience, I felt more confidence in my ability to teach because I had taught students during this undergraduate research experience." Likewise, Student 2 described that the URE was "one of my moments where I realized I love teaching."

Societal Value of STEM

Prior to taking part in the research experience, several students recognized that STEM curriculum integration had societal value. Student 5 wrote that America's society and STEM were integrated. Therefore, according to Student 5, incorporating STEM integrated lessons would allow "students to be hands-on and use real-world situations" during problem-solving and critical-thinking activities. Student 4 claimed that "STEM education is important and a growing field" in the current societal setting of an expanding and advancing technology sector. In the post-survey responses, some students advanced their understanding of STEM's importance to today's world. Student 3 claimed that "STEM is imperative to the world we live in today." Advancing on this particular concept, Student 1 wrote that "the world runs on science, technology, engineering, and math!"

Pre-survey data also provided evidence that students recognized the importance of research. For example, Student 3 claimed that research "allows society to run as efficiently as possible." Expanding on the notion, Student 5 wrote that research yields "medical benefits, economics, world climate, etc." Post-survey responses continued this perception. Student 4, who initially framed research as a procedure being done by "scientists in labs," claimed research can be—and is—done by the general population in everyday settings. Student 4 wrote: "[W]e are constantly growing as a society and we have to figure out how to advance all aspects of the world," which shines light on the importance of conducting research.

Enhanced Professional Advantage

There were two associated codes within the theme of *enhanced professional advantage*. The associated codes were: (a) graduate school; and (b) occupational careers. Overall, this theme emerged from responses in the 1-year later survey. In answering questions on the 1-year later survey, three students claimed that the URE positively influenced their current situations. Two of these students tied their experiences with the research project with their continued educational journey. Student 2 noted that the URE directly influenced her current enrollment as a master's degree student. On the other hand, at the time of the 1-year later survey, Student 1 was still an undergraduate. Student 1 wrote that her gained experiences with the STEM research project encouraged her to continue on her path towards graduate school. Explaining the impact of the URE in more detail, Student 1 wrote: "It has always been my plan to attend graduate school, but I've always been nervous about the research that graduate school requires. I now feel more confident in my ability to conduct research and succeed in graduate school."

Like Student 2 and Student 1, Student 4 noted that the URE had personal longitudinal benefits. It is unclear if Student 4 was a graduate student at the time of the 1-year later survey, as the student did not mention their current educational status. However, Student 4 claimed that the URE impacted their abilities to succeed in the job search process. When speaking about the resume screening procedures of K–12 teaching job openings, she noted that the research experiences, conference presentations, and project collaboration would aid her in being "a stand-out candidate" when compared to other applicants. Expanding on this concept, Student 4 wrote: "My experiences with this research has shown my employers that I am willing to work and continuously improve the environment in my classroom."

Discussion

The undergraduate researchers came into the URE lacking self-confidence in their understanding of STEM content and pedagogy. Like most pre-service and in-service teachers (Eckman et al., 2016), they did not have formal training in their EPP on how to implement STEM effectively in a K–12 classroom setting. Based on their pre-test questionnaire responses, this lack of background knowledge negatively affected their confidence. However, data analysis revealed that the implemented URE positively impacted PSTs' self-efficacy in teaching STEM and conducting research.

Badura's self-efficacy theory (1997) provides valuable insight into the large impact the URE had on the PSTs self-efficacy. This URE provided all four sources of influence: mastery experiences, vicarious experiences, social persuasion, and emotional/physiological states. A fifth source, imaginal experiences (proposed by James Maddux, 2013), was also a component of the URE. Mastery experiences, such as the successful creation and execution of STEM lessons and conference presentations, had a positive effect on the students' beliefs. Although the students expressed that they had "jitters," they felt excited and prepared, having visualized and practiced the timing of both the instruction and the presentation of their research (Maddux, 2013). The URE also served as a PST community of practice. The students reviewed each other's lessons and offered encouragement throughout the process, especially on "teaching day." By viewing their teammates practice and deliver fruitful lessons, the PSTs engaged in valuable vicarious experiences that ultimately increased their self-efficacy in their own teaching. Last but not least, social persuasion played a large factor in the resulting PSTs' self-efficacy. The students were constantly encouraged by their mentor, each other, and the 7th-grade science teacher, who asked if she could use their lessons for the next school year. In addition, the students were encouraged by university faculty and staff when they presented and won awards at conferences.

Altered perceptions resulted from the mentor model of knowledge integration (Linn et al., 2015). From the beginning, the mentor ensured that the students were an integral part of the design and implementation of the URE. Although each came with their own misconceptions regarding research and STEM instruction, they quickly rectified their initial position when examining STEM education literature through the guidance of their mentor. This examination also allowed the students to view examples of research designs, which were discussed when forming the URE. Designing and implementing the research design not only made the students more knowledgeable about components of research but also made each of them more competent in their understanding of STEM content and pedagogy. As highlighted by Linn et al. (2015), the knowledge gained by study and implementation allowed the PSTs to experience the significance of educational research in their field, leading to a better understanding of how data can be used to improve instruction. By creating a team atmosphere, opportunities for the PSTs to be involved in every step of the URE, and asking them to reflect on their experiences, the mentor guided the students in developing their own research identities. The PSTs progressed from initial views of research being limited to White males in a lab to self-identifying as researchers.

Implications for Instruction

As detailed above, the research findings tie into Bandura's (1997) argument that the strongest basis for the development of self-efficacy is successful experience. Based on these results, the authors believe that within the recent trend toward research-oriented EPPs is the need for faculty–student UREs centered around practical settings. Given the effectiveness of the mentorship model in this study, the authors encourage EPPs to structure UREs on the concepts of student autonomy (Gilmore et al., 2015), small networks of research participants (Gilmore et al., 2015), and the emphasis on reflection of findings (Linn et al., 2015). Future research is still needed to gain insight into how UREs impact the self-efficacy of education PSTs. We posit that longitudinal case studies would be most beneficial for analyzing how the UREs impact participants regarding their post-undergraduate years, such as their journeys into graduate school and or a professional setting.

The results of this study show that undergraduate PSTs benefit immensely from participating in a URE, based on their future field, by altering perceptions and affecting self-efficacy. Since the literature reveals a multitude of benefits associated with an increase in self-efficacy (Beltman et al., 2011; Chestnut & Burley, 2015; Holzberger et al., 2013; Schwarzer & Hallum, 2008), it is imperative that EPPs begin examining how to provide this type of experience for all of their undergraduate students. Reserving research opportunities for graduate work greatly limits the number of educators who could be positively influenced by a field-aligned research project, ultimately affecting millions of K–12 students. According to Hussar et al. (2020), 58% of US public school teachers have earned graduate degrees. While this number is promising, it still highlights that 42% of 3.5 million educators in the public school system may have limited knowledge of data and research. One must also take into consideration that some states require a master's degree to teach; thus, the data points are skewed and will vary by region and state.

EPPs must start aligning their coursework to practice by adding educational research experiences focused on positively influencing PSTs' self-efficacy. Since self-efficacy influences whether an educator will incorporate more STEM instruction into their curriculum, coursework and research experiences should highlight mechanisms to increase self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and psychological feedback (Bandura, 1997). However, the implementation must consider many factors.

As noted in our study, mentorship is key to providing a valuable URE. An impactful experience at the undergraduate level requires support and possible restructuring of faculty workloads. Timeline considerations are also important; a URE that spans the program would be ideal to enhance the experience and prevent panic from a declined IRB or other intricacies associated with the research process.

Implications for K–12 Classroom

UREs benefit PSTs, and thus K–12 students, in two major ways. Increased self-efficacy in educators leads to greater resiliency (Beltman et al., 2011), more commitment to education (Chestnut & Burley, 2015), less burnout (Schwarzer & Hallum, 2008), and high-quality instruction (Holzberger et al., 2013). The fact that this URE was centered on STEM content and pedagogy also gives the PSTs an advantage in receiving STEM education training from their mentor. As a result of the enhanced confidence, the PSTs will be more likely to implement STEM lessons into their future classrooms, ultimately affecting K–12 students by eliciting the higher-order, critical-thinking skills necessary to achieve STEM learning outcomes. It is evident that future research on URE classroom implications is needed. While beyond the scope of the current study, one potential research topic that would have added insight into the overall benefits and impacts of an URE included examining vicarious experiences of the in-service, 7th-grade teacher while she watched the STEM research project occur in her classroom.

Limitations

This study has several noteworthy limitations. First and foremost, the position of the primary researcher possibly limited the collected data. The primary researcher acted as the mentor to the students during the URE; therefore, participant responses may have been influenced by the strong relationships with the mentor. Although responses were confidential, the PSTs may have been hesitant to reveal struggles or challenges with the URE. The small number of participants is both a limitation and strength of this study. A limited number of participants allowed for a more personalized experience for each participant and the primary researcher. The research team was able to meet easily as a group, and the primary researcher was able to easily attend to any of the PST's questions or concerns. In this instance, the advantages of a small sample size outweigh the disadvantage of less generalizable results.

Conclusion

This study provided undergraduate, pre-service teachers with a growth opportunity that most future and current educators are not afforded. Not only did these students learn appropriate pedagogy for STEM instruction, but they also designed and conducted an actual research study from beginning to end, acquiring awards and accolades during the process. This study documents their STEM research experiences and highlights the value of a URE on PSTs' self-efficacy and the subsequent positive changes in PSTs' perception of themselves, educational research, and the societal value of STEM. This study fits into the recent trend toward research-oriented education preparation programs. The authors support the call-to-action for an increase in the amount of faculty–student UREs centered around practical teacher education settings.

References

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* Macmillan.

Beltman, S., Mansfield, C. F., & Price, A. E. (2011). Thriving not just surviving: A review of research on teacher resilience. *Educational Research Review, 6*(3), 185–207. https://doi.org/10.1016/j.edurev.2011.09.001

Beswick, K., & Fraser, S. (2019). Developing mathematics teachers' 21st century competence for teaching in STEM contexts. *ZDM Mathematics Education, 51*(6), 955–965. https://doi.org/10.1007/s11858-019-01084-2

Bishop, A. E. (2015). *Career aspirations of high school males and females in a science, technology, engineering, and mathematics program* [Doctoral thesis, Maryland University]. https://doi.org/10.13016/M27H00

Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. (2012). What is STEM? A discussion about conceptions of STEM in education and partnerships. *School Science and Mathematics, 112*(1), 3–11. https://doi.org/10.1111/j.1949-8594.2011.00109.x

Bryan, L. A., Moore, T. J., Johnson, C. C., & Roehrig, G. H. (2015). Integrated stem education. In C. C. Johnson, E. E. Peters-Burton, & T. J. Moore, *STEM Road Map: A Framework for Integrated STEM Education* (pp. 23–37). Taylor and Francis Inc.

Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. NSTA Press.

Camera, L. (2019, December 3). US students show no improvement in math, reading, science on international exam. *US News.* https://www.usnews.com/news/education-news/articles/2019-12-03/us-students-show-no-improvement-in-math-reading-science-on-international-exam

Campbell, C., Speldewinde, C., Howitt, C., & MacDonald, A. (2018). STEM practice in the early years. *Creative Education, 9*(1), 11–25. https://doi.org/10.4236/ce.2018.91002

Chestnut, S. R., & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching profession: A meta-analysis, *Educational Research Review, 15*(1), 1–16. https://doi.org/10.1016/j.edurev.2015.02.001

Church, S. P., Dunn, M., & Prokopy, L. S. (2019). Benefits of qualitative data quality with multiple coders: Two case studies in multi-coder data analysis. *Journal of Rural Social Sciences, 34*(1), 1–14. https://egrove.olemiss.edu/jrss/vol34/iss1/2

Committee on STEM Education of the National Science & Technology Council. (2018). *Charting a course for success: America's strategy for STEM education*. United States National Science & Technology Council. https://www.energy.gov/sites/default/files/2019/05/f62/STEM-Education-Strategic-Plan-2018.pdf

Corbin, J., & Strauss, A. (2014). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (4th ed.). SAGE Publications.

Corlu, M. S., Capraro, R. M., & Capraro, M. M. (2014). Introducing STEM education: Implications for educating our teachers for the age of innovation. *Education and Science, 39*(171), 74–85. http://yoksis.bilkent.edu.tr/pdf/files/7283.pdf

Creswell, J. W., & Guetterman, T. C. (2019). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (6th ed.). Pearson.

Darling-Hammond, L., & Bransford, J. (Eds.). (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do.* Jossey-Bass.

De Neve, D., Devos, G., & Tuytens, M. (2015). The importance of job resources and self-efficacy for beginning teachers' professional learning in differentiated instruction. *Teaching and Teacher Education, 47*, 30–41. https://doi.org/10.1016/j.tate.2014.12.003

Depaepe, F., & König, J. (2018). General pedagogical knowledge, self-efficacy and instructional practice: Disentangling their relationship in pre-service teacher education. *Teaching and Teacher Education, 69*, 177–190. https://doi.org/10.1016/j.tate.2017.10.003

Desilver, D. (2017, February 15). US students' academic achievement still lags that of their peers in many other countries. *Pew Research Center*. https://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/

Eckman, E. W., Williams, M. A., & Silver-Thorn, M. B. (2016). An integrated model for STEM teacher preparation: The value of a teaching cooperative educational experience. *Journal of STEM Teacher Education, 51*(1), 71–82. https://doi.org/10.30707/JSTE51.1Eckman

Ejiwale, J. (2013). Barriers to successful implementation of STEM education. *Journal of Education and Learning, 7*(2), 63–74. https://doi.org/10.11591/edulearn.v7i2.220

English, LD. (2016). STEM education K–12: Perspectives on integration. *International Journal of STEM Education, 3*(3). https://doi.org/10.1186/s40594-016-0036-1

Eshach, H. (2006). *Science literacy in primary schools and pre-schools*. Springer.

Gilmore, J., Vieyra, M., Timmerman, B., Feldon, D., & Maher, M. (2015). The relationship between undergraduate research participation and subsequent research performance of early career STEM graduate students. *The Journal of Higher Education, 86*(6), 834–863. https://doi.org/10.1080/00221546.2015.11777386

Guilbert, G., Lane, R., & Van Bergen, P. (2015). Understanding student engagement with research: A study of pre-service teachers' research perceptions, research experience, and motivation. *Asia-Pacific Journal of Teacher Education, 44*(2), 172–187. https://doi.org/10.1080/1359866X.2015.1070118

Gupta, R. K., & Awasthy, R. (2015). *Qualitative research in management.* SAGE Publications.

Hall, E. E., Walkington, H., Shanahan, J. O., Ackley, E., & Stewart, K. A. (2018). Mentor perspectives on the place of undergraduate research in academic identity and career development: An analysis of award winning mentors. *International Journal for Academic Development, 23*(1), 15–27. https://doi.org/10.1080/1360144X.2017.1412972

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology, 105*(3), 774–786. https://doi.org/10.1037/a0032198

Honey, M., Pearson G., & Schweingruber, H. (Eds.). (2014). *STEM integration in K–12 education: Status, prospects, and an agenda for research.* The National Academies Press. https://doi.org/10.17226/18612

Hussar, B., Zhang, J., Hein, S., Wang, K., Roberts, A., Cui, J., Smith, M., Mann, F. B., Barmer, A., & Dilig, R. (2020). *The condition of education 2020* (NCES 2020-144). National Center for Education Statistics at IES. https://nces.ed.gov/pubs2020/2020144.pdf

Karabatak, S., & Alanoğlu, M. (2019). The mediator effect of stress on teachers' self-efficacy beliefs and job satisfaction. *International Journal of Contemporary Educational Research, 6*(2), 230–242. https://doi.org/10.33200/ijcer.558094

Kazi, A. M., & Khalid, W. (2012). Questionnaire designing and validation. *Journal of the Pakistan Medical Association, 62*(5), 514–516. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1013&context=pakistan_fhs_mc_women_childhealth_paediatr

Kim, H. (2006, March 19). How do we change pre-service teachers' perceptions of scientists using digital storytelling. In C. M. Crawford, R. Carlsen, K. McFerrin, J. Price, R. Weber, & D. Willis (Eds.), *Proceedings of SITE 2006—Society for Information Technology & Teacher Education International Conference* (pp. 689–691). LearnTechLib. https://www.learntechlib.org/primary/p/22124/

Kosnick, C., & Beck, C. (2009). *Priorities in teacher education: The 7 key elements of pre-service preparation.* Routledge.

Law, D. D., Hales, K., & Busenbark, D. (2020). Student success: A literature review of faculty to student mentoring. *Journal on Empowering Teaching Excellence, 4*(1), 22–39. https://doi.org/10.15142/38x2-n847

Li, Y., Wang, K., Xiao, Y., & Froyd, J. E. (2020). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education, 7*, Article 11. https://doi.org/10.1186/s40594-020-00213-8

Lin, K.-Y., Hsiao, H.-S., Williams, P. J., & Chen, Y.-H. (2020) Effects of 6E-oriented STEM practical activities in cultivating middle school students' attitudes toward technology and technological inquiry ability. *Research in Science & Technological Education, 38*(1), 1–18. https://doi.org/10.1080/02635143.2018.1561432

Linn, M. C., Palmer, E., Baranger, A., Gerard, E., & Stone, E. (2015). Undergraduate research experiences: Impacts and opportunities. *Science, 347*(6222), Article 1261757. https://doi.org/10.1126/science.1261757

Lopatto, D. (2003, March). The essential features of undergraduate research. *Council on Undergraduate Research Quarterly*, 139–142.

Lopatto, D. (2007). Undergraduate research experiences support science career decisions and active learning. *Life Sciences Education, 6*(4), 297–306. https://doi.org/10.1187/cbe.07-06-0039

MacPhail, C., Khoza, N., Abler, L., & Ranganatham, M. (2016). Process guidelines for establishing intercoder reliability in qualitative studies. *Qualitative Research, 16*(2), 198–212. https://doi.org/10.1177/1468794115577012

Maddux, J. (Ed.). (2013). *Self-Efficacy, adaptation, and adjustment: Theory, research, and application.* Springer.

Mangiante, E. M. S., & Moore, A. (2020). Elementary pre-service teachers' reflections on integrated science/engineering design lessons: Attending, analyzing, and responding to students' thinking. *Journal of STEM Teacher Educator, 54*(1), 1–23. https://doi.org/10.30707/JSTE54.1/GXXR8897

Nadelson, L. S., Callahan, J., Pyke, P., Hay, A., Dance, M., & Pfiester, J. (2013). Teacher STEM perception and preparation: Inquiry-based STEM professional development for elementary teachers. *The Journal of Educational Research, 106*(2), 157–168. https://doi.org/10.1080/00220671.2012.667014

Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis, 26*(3), 237–257. https://doi.org/10.3102/01623737026003237

O'Donnell, K., Botelho, J., Brown, J., Gonzalez, G. M., & Head, W. (2015). Undergraduate research and its impact on student success for underrepresented students. *New Directions for Higher Education, 2015*(169), 27–38. https://doi.org/10.1002/he.20120

Pál, J., Marec, C., & Schwabe, M. (2018). *Country note: United States. In Programme for international student assessment (PISA): Results for 2018*. PISA. https://www.oecd.org/pisa/publications/PISA2018_CN_USA.pdf

Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). SAGE Publications.

Peters-Burton, E. E., House, A., Han, E. M., & Lynch, S. J. (2019). Curriculum and instruction at exemplar inclusive STEM high schools. *The Journal of STEM Education: Innovations and Research, 4*(2), 193–212. https://doi.org/10.51355/jstem.2018.45

Petric, B., & Czarl, B. (2003). Validating a written strategy questionnaire. *System, 31*(2), 187–215. https://doi.org/10.1016/S0346-251X(03)00020-4

Pew Research Center. (2015, January 29). *Public and scientists' views on science and society*. https://www.pewresearch.org/science/2015/01/29/public-and-scientists-views-on-science-and-society/

Reis-Jorge, J. M. (2005). Developing teachers' knowledge and skills as researchers: A conceptual framework. *Asia-Pacific Journal of Teacher Education, 33*(3), 303–319. https://doi.org/10.1080/13598660500286309

Ridgeway, B., & Brown, V. (2018). AgVenture: Establishing the link between STEM and agriculture. *Journal of Youth Development, 13*(4), 179–189. https://doi.org/10.5195/jyd.2018.617

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education, 74*(6), 625–637. https://doi.org/10.1002/sce.3730740605

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417–458. https://econ.ucsb.edu/~jon/Econ230C/HanushekRivkin.pdf

Rodriguez, L. (2018, October). From interest to identity: Creating and nurturing STEM kids in middle school. *Science Scope, 42*(3), 79–85. https://www.jstor.org/stable/26611869

Russell, S. H., Hancock, M. P., & McCullough, J. (2020). Benefits of undergraduate research experiences. *Science, 316*(5824), 548–549. https://doi.org/10.1126/science.1140384

Scholz, R. W., & Tietje, O. (2002). *Embedded case study methods: Integrating quantitative and qualitative knowledge.* SAGE Publications.

Schwarzer, R., & Hallum, S. (2008). Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses. *Applied Psychology, 57*(1), 152–171. https://doi.org/10.1111/j.1464-0597.2008.00359.x

Sondergeld, T. A., Provinzano, K., & Johnson, C. C. (2020). Investigating the impact of an urban community school effort on middle school STEM-related student outcomes over time through propensity score matched methods. *School Science and Mathematics, 120*(2), 90–103. https://doi.org/10.1111/ssm.12387

Stohlmann, M., Moore, T. J., & Roehrig, G. H. (2012). Considerations for teaching integrated STEM education. *Journal of Pre-College Engineering Education Research, 2*(1), 28–34. https://doi.org/10.5703/1288284314653

Suchman, E. L. (2014). Changing academic culture to improve undergraduate STEM education. *Trends in Microbiology, 22*(12), 657–659. https://doi.org/10.1016/j.tim.2014.09.006

Tschannen-Moran, M., & Woolfolk, H. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783–805. https://doi.org/10.1016/S0742-051X(01)00036-1

Ure, C. L. (2010). Reforming teacher education through a professionally applied study of teaching. *Journal of Education for Teaching, 36*(4), 461–475. https://doi.org/10.1080/02607476.2010.513860

Vasquez, J., Schneider, C., & Comer, M. (2013). *STEM lesson essentials, grades 3–8: Integrating science, technology, engineering, and mathematics.* Heinemann.

Walkington, H. (2015). *Students as researchers: Supporting undergraduate research in the disciplines in higher education*. The Higher Education Academy. https://www.heacademy.ac.uk/sites/default/files/resources/Students%20as%20researchers_1.pdf

Whitley, J., Gooderham, S., Duquette, C., Orders, S., & Cousins, J. B. (2019). Implementing differentiated instruction: A mixed-methods exploration of teacher beliefs and practices. *Teachers and Teaching, 25*(8), 1043–1061. https://doi.org/10.1080/13540602.2019.1699782

Williams, P. J. (2011). STEM education: Proceed with caution. *Design and Technology Education: An International Journal, 16*(1), 26–35. https://files.eric.ed.gov/fulltext/EJ916494.pdf

Yin, R. K. (2012). *Applications of case study research* (3rd ed.). SAGE Publications.

Zambo, D., & Zambo, R. (2007). Action research in an undergraduate teacher education program: What promises does it hold? *Action in Teacher Education, 28*(4), 62–74. https://doi.org/10.1080/01626620.2007.10463430

JERAP

The *Journal of Educational Research and Practice* is a peer-reviewed journal that provides a forum for studies and dialogue about developments and change in the field of education and learning. The journal includes research and related content that examine current relevant educational issues and processes. The aim is to provide readers with knowledge and with strategies to use that knowledge in educational or learning environments. *JERAP* focuses on education at all levels and in any setting, and includes peer-reviewed research reports, commentaries, book reviews, interviews of prominent individuals, and reports about educational practice. The journal is sponsored by The Richard W. Riley College of Education and Leadership at Walden University, and publication in *JERAP* is always free to authors and readers.