A National Examination of Undergraduate Educational Research

Kymberly Harris   Juliann McBrayer
Steven Toman   Katherine Fallon

Georgia Southern University

This quantitative study utilized secondary data collection from the abstract archive of the National Council of Undergraduate Research (NCUR), an organization which promotes scholarly, creative, and collaborative research with undergraduate students. Descriptive statistics determined that 90% of the research projects involved primary data, 71% was collected within P-12 communities, and 17% of projects were mentored by faculty conducting research from a Carnegie classified R1 ranked institution. These results provide an explicit understanding into research currently being conducted at the undergraduate level and seek to spark interest in further collaborative projects to promote undergraduate research.

The opportunities provided through the partnership between the faculty and the undergraduate student researcher promote expansive educational goals for the student, including "empowered learning (including problem solving and teamwork), informed learning (allowing the student to study the natural, social, or cultural world), and responsible learning (approving the study of the self and social problems" (Lopatto, 2006, p. 1). The importance of mentoring undergraduate students through research experiences is seen in better learning outcomes for students. In addition, the partnership created in mentoring students provides opportunities for faculty to have a real impact on both the student and the discipline (Malachowski, 1996).

A faculty mentor is an essential support, guide, and leader for the successful culmination of research experiences for any student, but especially for those who are in their undergraduate program and may have had little exposure to conducting research (Malachowski, 1996). In the field of education, the opportunities for research while an undergraduate are fewer than those found in other social science fields (Manak & Young, 2014). It would be beneficial to find out where UR in education is occurring and determine the academic background of faculty who are mentoring these students to replicate the UR models of inquiry that are currently in use. The current study sought to examine where undergraduate research (UR) in education is occurring

(setting) and the type of research being conducted by the UR students (methodology). The study also examined the academic preparation of faculty mentors who supported UR projects. The research study employed the following research questions:

- Research Question 1: Where (setting) is undergraduate educational research being conducted in the P-12 arena?
- Research Question 2: What types (methodology) of undergraduate educational research are being conducted in the P-12 arena?
- Question 3: What are the faculty backgrounds (academic preparation) of those mentoring the students?

Review of the Literature

The purpose of this literature review was to examine the benefits of UR for students, faculty, and the institutions. Since a closer examination of the data revealed specific characteristics in the academic preparation of faculty mentors of UR, the research that describes the benefits of mentoring UR is provided. Lastly, this literature review identifies factors that influence faculty mentors to participate in UR.

The Foundation of Mentoring Undergraduate Research

Research supporting the benefits of UR for both the faculty who engage with the undergraduate students and the students who conduct the research has been in existence for nearly 40 years and continues to receive attention in academic journals (Alderton & Manzi, 2017; Malachowski, 1996). Engaging undergraduate students in research has been identified as a "high impact" practice for over a decade (Kuh, 2008).

Faculty seeking to provide UR experiences equitably are vital to advancing research at the undergraduate level. Although UR is beneficial to students in honors colleges, UR is especially valuable to those students who are first generation, low-income, and from racially minoritized groups (Brownell & Swaner, 2010). Faculty who engage in UR may be aware of the potential impact of these experiences on students who have not had the same opportunities afforded to them.

Benefits of Undergraduate Research for Students

The benefits to students participating in UR include improved retention in the undergraduate program and higher grade point averages (Burns & Goldin, 2017; Collins et al., 2017; Falconer & Holcomb, 2008). Additionally, greater satisfaction with one's undergraduate program from exposure to content area was noted (Patten et al., 2018). Pearson et al. (2017) discovered that greater than 80% of students in his study believed their involvement in research was educationally enriching. Additional research supports the growth of students' generalizable skills such as data analysis, reading comprehension, and presentation skills (Kuh, 2008; Lopatto, 2010).

Student engagement in UR is correlated to various personal and career development attributes (Salsman et al., 2013). These included building a higher tolerance for obstacles, attaining confidence in working independently, and understanding the importance of supporting evidence for claims (Kortz, & van der Hoeven Kraft, 2016; Petrella & Jung, 2008; Lopatto, 2010). Students participating in UR have noted that the experience has increased aspirations for furthering education and career pathways in their field, by allowing them to enhance professional resources and develop professional and academic networking systems (Adedokun et al., 2012; Dvorak & Hernandez-Ruiz, 2019; Lopatto, 2010). Participating in UR has also been linked to increased chances for successful acceptance into graduate schools and aiding students in career choices (Falconer & Holcomb, 2008).

Benefits of Undergraduate Research for Faculty Mentors

While UR significantly benefits students, the inclusion of undergraduate students in research projects provides direct benefits for faculty mentors (Webber et al., 2012). Webber and colleagues (2012) found that faculty members reported benefits that specifically addressed their own career goals, including producing peer-reviewed publications that impact faculty promotion and tenure attainment, and increased recognition in one's department and discipline (Fenn et al., 2010). Collaborating with undergraduate students either within the faculty member's own line of research or the student's efforts toward scholarship can lead to personal satisfaction in helping students become critical thinkers (Greenawald, 2010). While including undergraduate students in research projects has been attributed to significant benefits in scholarship, this inclusion has further been correlated with improvements in teaching skills (Madden et al., 2013). It has also been noted that faculty involved in UR efforts may become more motivated and develop renewed interest in their own research (Malchowski, 2003). Faculty also report a closer link to their institution's core values and mission after engaging in UR (Eagan et al., 2010). Faculty who mentor undergraduates tend to have a more positive view of their students because of the professional relationship developed with them (Eagan et al., 2010). Zydney et al. (2002) found that 41% of survey respondents reported an improvement in their quality of life at their institution when engaging in research with undergraduate students.

Benefits of Undergraduate Research for the Institution

Higher participation in UR at the university-level has been correlated to institutional support, increased student-faculty communication, and higher academic performance from students (Collins et al., 2017; Lopatto, 2010). In addition, recruitment of students who are interested in attending graduate schools can be promoted with visible and documented opportunities for UR. UR has also been a contributing factor to extending the value of an undergraduate degree for those students who complete research and expanding an institution's prestige by providing these opportunities (Elgren & Hensel, 2006). Perhaps one of the most visible benefits of participation in UR is the increase in student retention (Moore, Avant, & Austin, 2008).

Benefits of Undergraduate Research in Educator Preparation

The UR experience provides an ideal context for prospective educators to demonstrate practices of innovative and inquiry-based teaching and learning, familiarity and competence in evidence-based interventions, and reflective teaching (DeVore & Munk, 2015). Participation in UR programs have been linked to increased interest in becoming an educator (Dvorak & Hernandez-Ruiz, 2019). Additionally, pre-service teachers who engaged in UR have noted improvements in teaching techniques through developing further understanding of the connection between educational theory and teaching practice (Manak & Young, 2014). This comprehension leads to the development of more purposeful and collaborative educators in the field (Madden et al., 2013; Manak & Young, 2014). This experience in research may "increase the likelihood of transformative learning and....could support classrooms'' (Harris et al., 2018, p. 17).

The act of observing and collecting data on students in the classroom is a practical skill that teachers conduct daily. Conducting UR while in a teacher preparation program is beneficial because it promotes the refinement of both teaching and service skills (Levy et al., 2013). The aggregation and analysis of student learning and behavioral data are research skills that are often overlooked in teacher preparation (Harris et al., 2018). Data collection provides evidence of student progress and teacher impact, and, when incorporated into a larger skill set, becomes an embedded daily occurrence that informs one's practice (Slobodzian & Pancsofar, 2014).

Barriers to Undergraduate Research

The overall effort on providing research opportunities to pre-service teachers continues to be inconsistent (Manak & Young, 2014). Many of the barriers that apply to all UR also apply to UR in education. These barriers include the amount of time invested in teaching undergraduate students to do research (Lei & Chuang, 2009) and the lack of recognition or reward (Wayman & Dickson, 2008). Perhaps the most distressing finding is the lack of knowledge by academic faculty on how to conduct research with undergraduates (Brew & Mantai, 2017). The lack of information regarding faculty professional development to support UR seems to support this finding.

Undergraduate students in colleges of education are typically enrolled in a teacher preparation program and have limited elective options because the program often requires pedagogy in education courses and content in discipline specific courses (Goodwin, 2010). Because of the adherence to accreditation and licensing commissions, teacher education programs may have little room to address traditional research coursework as stand-alone courses (Manak & Young, 2014). This inflexibility in teacher preparation programs may tend to provide research skills within the coursework (data collection and analysis of individual achievement by the students they teach, for example) without providing the implicit link to these activities as research skills. The lack of undergraduate research may be found to some degree in the data collection of this study: in the collection of UR presented at the NCUR during the 10 years reviewed, there were over 40,000 presentations accepted for this conference. Our study population was 430 presentations, representing a little more than 1% of all accepted proposals.

Educational Backgrounds of Faculty Mentors

Faculty experience with undergraduate researchers is a strong indicator of continued research and inclusion of students into their projects (Shortlidge et al., 2016) and faculty experience is vital in prompting the effectiveness of sound UR. A general overview of faculty educational backgrounds is helpful in deciphering the research skills these faculty have who are mentors for UR.

Faculty experience, outside of the field of research, further influences the level of faculty-student engagement when working together on scholarly projects. Faculty with experience only in an academic setting and no experience in the field, are likely to conduct research with a focus on evidence-based practices anchored in theory, not their own experiences (Tolman et al., 2019). It is important to identify the educational backgrounds of faculty members whose students proposed and presented at a national conference that is focused on UR itself, and not a specific discipline. Specifying faculty characteristics that lead to mentoring could prove useful in identifying faculty likely to participate in UR.

Methods

Research Design

A descriptive quantitative study utilizing content analysis was the selected methodology to examine UR being presented at the National Conference on Undergraduate Research (NCUR). Quantitative content analysis provides a systematic way to quantify unstructured and/or qualitative data (Rose et al., 2014). The data analysis sought to describe the extent to which undergraduate educational research was being conducted nationwide, as reflected in conference proposals submitted to the annual NCUR, and to examine faculty educational backgrounds of those mentoring students in their research pathways. Acknowledging this study does not seek to determine causal relationships, our discussion does not address questions of how/when/why the characteristics occurred; therefore, descriptive statistics are the most appropriate analysis (Mertler, 2018; Patten & Newhart, 2018). This orientation resulted in calculation of the frequency of each data point collected and included attributes of the students' research projects, including type of presentation (oral or poster), the setting of the project (P-12, higher education, community), the methodology approach used (qualitative, quantitative, or mixed-methods), and faculty educational backgrounds of those mentoring the specified UR. Additionally, frequency of the data point distribution was analyzed for the faculty' member's terminal degree, Carnegie classification of where the faculty member completed their doctoral degree, and Carnegie classification of the faculty member's current institution. Data for this study were collected from abstracts submitted for the years 2008-2017.

Study Site

The Council on Undergraduate Research hosts an annual conference, which is described as the leading national conference devoted exclusively to undergraduate student research and creativity in all disciplines. Presentations at NCUR are typically conducted by the students themselves, with mentoring by faculty, which means students are not usually collecting data for a faculty member, but instead pursuing their own line of research. While UR is certainly being

conducted that is not presented at NCUR, we assert that NCUR is the leader in UR and provides a barometer for what is occurring nationally. The accepted proposals from NCUR are publicly available on CUR's website.

Data Collection

The descriptive analyses measure focused on content analysis. Content analysis allowed for a "systematic assignment of communication content to categories according to rules, and the analysis of relationships involving those categories using statistical methods" (Riffe et al., 2005, p. 3). The collected data were analyzed to identify typical characteristics of the content qualities examined (Riffe et al., 2005) and in the case of this study, attributes of UR being conducted nationwide. Data were collected from the NCUR abstract archive compiling undergraduate student research projects that were presented at NCUR conferences since 2008 and related to the field of education (n=430 after removing seven entries that did not fit the search criteria for UR).

The research team was intentionally composed of members who have practitioner experience in conducting extensive research with students, as they would be able to assist in the coding of attributes of UR and work to operationally define the intended variables. Following this operationalization, the research team collected the data through an exhaustive online search to determine the selected demographics for each UR project. This data collection was limited to data that were publicly available. Furthermore, we triangulated the data through a collection and comparison of the current institution and faculty terminal degree from the publicly available NCUR dataset. The compiled data of attributes of UR and faculty educational backgrounds were described through descriptive statistics (measures of central tendency). Based on the search parameters and faculty listing on departmental websites, the data collection yielded insight into the faculty member's institution of current employment, institution of awarded degree, and highest terminal degree received. Table 1 illustrates the number of abstracts that were described as education proposals in each of the years of the projects presented at NCUR from 2008-2017.

Table 1

NCUR Abstract Archive - Student Project Time Span

Year of Presentation	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008-2017
Number of Presentations	14	36	28	41	32	41	59	50	62	67	430

Note: Of these 430 presentations, there were 265 unique faculty members who mentored the research.

Data Analysis

Data analysis included coding to operationalize what constituted primary versus secondary data collection and whether the methodology was qualitative, quantitative, or mixed-methods to assign value to each of these categories. Analysis of the data sought to describe the attributes of types of undergraduate student research, faculty advisor educational backgrounds, and the qualifications of the university the student is producing research from. This resulted in calculation of the frequency of the distribution of attributes (data points) of the UR projects and faculty members' educational backgrounds.

Reliability and Validity

Riffe et al. (2005) stressed the need to establish reliability and coding utilizing quantitative content analysis. To ensure inter-rater reliability, members of the research team reviewed and agreed upon each coding of the variables, which were the attributes of UR being conducted in education nationwide as exemplified in these conference proposals. This reliability was tested by beginning the search for attributes of UR projects and faculty educational backgrounds and jointly reviewing/discussing their definition according to the coding scheme. This process showed a saturation and consistency in reliability between the research team. Furthermore, the data were triangulated through a collection and comparison of student work and faculty educational backgrounds.

With regards to validity, it was appropriate to ensure qualitative validity, as that was the mechanism that yielded the data for the quantitative content analysis. The authors reviewed each of the proposals for the type of research that was described in the abstract and coded whether the research included qualitative research, quantitative research, or a ixed methods type of research. Our methodology for qualitative coding of these proposals for data analysis met four out of five of Maxwell's (1992) criteria for establishing validity: descriptive validity, interpretive validity, theoretical validity, and evaluative validity. As this study examined all presentations conducted nationwide via NCUR from a set timeframe, we cannot speak to the fifth criteria of validity and generalizability, as we are studying a complete population.

<div align="center">

Results

</div>

The initial interest of the researchers was to determine the setting and the method of the research that education undergraduates were conducting, and an examination of the presentations sought to detail the trends of UR for education majors. Data collected was grouped according to types of settings identified in the undergraduate educational research abstract. We found 71% of research occurred exclusively in Preschool-12th grade (P-12) settings and 23% in other settings such as higher education or the community. In 6% of the descriptions, the authors were unable to determine where the research was conducted. Settings and methods identified in the research proposals' abstracts are found in Table 2. Over half of the presentations utilized qualitative methods (53%), 25% of the presentations employed quantitative methods, and 20% used mixed methods. To note 2% were coded as unknown as the conference description did not

denote the methodology type. Additionally, it was noted that there was a split between the number of oral presentations (52%) and poster presentations (48%) amongst undergraduate researchers.

Table 2

Descriptive statistics of identified settings and methodology found in presentation descriptions

Context		n	Percent
Presentation	Oral	223	52%
	Poster	207	48%
Setting	Exclusively within P-12	306	71%
	Settings outside of P-12 (e.g., higher education, community)*	100	23%
	Unknown	24	6%
Method	Quantitative	107	25%
	Qualitative	229	53%
	Mixed Methods	84	20%
	Unknown or N/A	10	2%

Note: n = 430.
* P-12 data may be jointly included within this sample.

The researchers also determined the types of educational backgrounds as noted by degree types of faculty mentors listed on the NCUR proposals. Examination of terminal degrees of the 265 faculty who mentored UR at NCUR showed a disproportionate number had PhDs (78%) compared to EdDs (15%; Table 3). Acknowledging the theoretical difference between PhDs (research-oriented) and EdDs (practitioner-oriented), these findings are to be expected as faculty with research backgrounds may be more likely to gravitate towards research activity. It may also be that those faculty who completed PhDs are more likely to be employed at institutions of higher education than those who have completed EdDs who are prepared to work as practitioners, and as such would be more likely to have opportunities to work with students (Tolman et al., 2019).

Table 3

Descriptive statistics of the faculty terminal degree advising UR presentations

Degree	n	Percentage
Ph.D.	206	78%
Ed.D.	40	15%
Master's	4	2%
Unknown	15	6%

*n=265, which includes the 15 faculty whose terminal degree status were not provided by NCUR and could not be found elsewhere.

The Carnegie Classification organizes institutions of higher education in the United States into categories as doctoral universities with research activity are classified with an "R" status (R1, R2, or below), where R1 institutions have the highest research activity. Examination of the faculty who mentored UR at NCUR showed that 66% completed their doctorate at an R1, while 16% at an R2, and 6% at a doctoral granting institution. This finding supports that most of the faculty who mentored undergraduate students who presented at NCUR received their doctorates at institutions where they were exposed to expectations of high research activity. Examination of the Carnegie Classification of the institutions where these faculty currently work and where they mentored the UR students showed interesting results. Most of the faculty mentored students at non-doctoral granting research institutions, with 52% coming from master's granting institutions, and 10% from bachelor's granting institutions. From the doctoral universities identified with UR activity, 17% are at R1s, 11% at R2s, and 8% at doctoral granting institutions. This finding is particularly interesting, as most of this faculty mentorship for UR is not coming from doctoral universities with high research activity. Collectively, the R1, R2, and doctoral granting institutions only account for 36% of the UR activity, as seen in Table 4.

Table 4

Descriptive statistics of Carnegie classification where faculty completed their degree and Carnegie classification of faculty member's current institution where UR is being presented

	Carnegie Classification of Institution of Faculty Matriculation		Carnegie Classification of Faculty Member's Current Institution	
R1	176	66%	46	17%
R2	43	16%	30	11%
Doctoral	17	6%	21	8%
Master's	3	1%	139	52%
Bachelor's	-	-	27	10%
Other	4	2%	2	1%
Unknown	22	8%	-	-

*n=265, which includes the 22 faculty whose terminal degree status/institution were listed and were not retrievable.

Discussion

 The findings from this study can be utilized as a barometer for UR that is occurring nationwide. While there are certainly institutions where UR occurs that do not have students who are presenting at NCUR, we can argue that those who do are likely committed to providing resources for UR, which includes travel for faculty/students to the NCUR conference. In reviewing conference sites of the host cities of NCUR, participant proximity to the conference site did not seem to be a factor in attendance.

In the table that provides comparisons between the degree-granting institutions versus the institution where their undergraduates (UG) conducted research, 66% of the faculty completed their degrees at R1 institutions. Recognizing that the majority of faculty (60%) will be working at bachelor/masters institutions, institutions of higher education should explore mechanisms to prepare faculty to mentor undergraduate and graduate student research, which will look very different than working with doctoral students.

The authors found that 71% of research was conducted within a P-12 school setting. Additionally, 53% is qualitative compared to 25% that is quantitative and 20% mixed methods. Since most education majors have a goal of teaching in a school setting, the high percentage of research conducted there lends itself to the authentic experiences involved in professional

schools and colleges of education. Since most states nationally require extensive field experience hours for teacher certification (Education Commission of the States, 2018), it may be that many of the students are utilizing their time in the field to conduct research.

Students are conducting research in P-12 settings more often than any other setting by a large percentage. In general, this may be a result of several different factors. What follows are possible explanations for why undergraduate students conduct their research in P-12 settings:

- It may be convenient for students to collect data in their required field placement activities because they have access to subjects and participants who can be easily observed.
- Most UR occurs in the junior and senior years of a student's program, and it is at this point where students are most likely in field placements for at least part of their program of study.
- The act of teaching is by nature a data collection system, either through permanent product or observation, and the P-12 setting provides access to this data.
- Many preservice teachers collect pre- and post-test scores, interest inventories, journal reflections and other activities required in their practice, and as such have access to data that is appropriate for analysis and therefore can be disseminated easily.

It also appears the methods used in UR are primarily qualitative. A component of teacher preparation is asking questions of clinical and university supervisors, students and other stakeholders, and their peers. This type of interaction would naturally lend itself to interviews, open-ended surveys, and other qualitative methods such as oral history and content analysis. This use of qualitative research may also result from the ease of conducting this type of research, including case studies and focus groups (Mertler, 2018).

The authors found when reviewing the data of the terminal degree of the faculty mentors, 78% of the faculty mentoring students had a PhD compared with 15% holding an EdD. Further investigation is needed to determine if PhDs are more inclined to do research in general and, specifically, research with UR students. Additionally, this may indicate that the large representation of PhD faculty as mentors illustrates a commitment to promoting student research. Presentations at NCUR are typically conducted by the students themselves, with mentoring by faculty, which means the students are not simply collecting data for a faculty member but are instead pursuing their own line of research. Perhaps the research focus of the PhD faculty leads them to seek out other research avenues for students. Because of the background that a faculty with a PhD has experienced, it may be that the faculty see research experiences as a viable learning tool for students and recruit students for participation in UR.

Implication for Practice for Students

Engaging in UR has been shown to benefit students with skill development such as self-confidence, furthering education or career solidification, higher grades, and promoting recognition for achievements (Falconer & Holcomb, 2008; Petrella & Jung, 2008). The added value for students is that presenting at research conferences allows for growth in professional communication skills, which will be valued in future career paths (Kent et al., 2019).

The data collected in this study indicated that most students (70%) were enrolled at institutions below the R2 level/ master's degree-granting institutions, in contrast to the majority of the faculty mentors who had matriculated at R1 institutions. It does appear that UR is more likely to be conducted by those students enrolled at universities that are not considered "high research." There is no research to provide any insight into why this particular conference attracts students and faculty in education from universities that are not considered "high research" institutions;" it may be that there are expectations within their own institutions that promote mentoring or UR scholars.

Implications for Faculty Practice

We recommend that faculty members continue to pursue research projects with undergraduate students. We further recommend faculty to provide collaborative and engaging projects to allow students to gain confidence in research and personal development skills, while formalizing a professional relationship with their faculty. Considering the benefits of conducting research to preservice teachers, it would be helpful if university faculty in colleges of education were provided models of embedding research opportunities in their curricula.

Additionally, to prepare these faculty to mentor UR, we recommend sending all newly hired tenure-track faculty to NCUR in their first year so they are exposed UR as presented on a national scale. The data collected in this study indicate that faculty who come from "high research" universities are likely to continue this emphasis on research, only as a faculty mentor instead. Exposure to UR early in one's academic career might motivate new faculty.

Building UR into the Tenure and Promotion guidelines may provide another level of support. Determining the support of UR as a valued part of faculty expectations would increase visibility of faculty projects that include UR. It would be beneficial to recognize not only the undergraduate researchers at the university but also acknowledge publicly the faculty who mentored them.

At the institutional level, we recommend that greater recognition for scholarship with undergraduate students be expressed universally across faculty disciplines. We believe this can be attained through increased verbal recognition, greater expectations in promotional standards, and more availability to university-wide research symposiums with presentations led by undergraduate students. Larger steps in this direction could promote the factors suggested in

the research that benefit institutions, such as institutional support, increased student-faculty communication, and higher academic performance from students (Collins et al., 2017; Lopatto, 2010).

Finally, we recommend that colleges of education investigate curriculum changes that might embed research experiences within the program coursework. These opportunities, referred to as course-based undergraduate research experiences (CURES), could be structured in a variety of ways within existing curricula to draw more attention to the need for data collection and analysis in the job expectations of many educators and educational leaders. Undergraduates who participate in CURES cite a variety of professional growth milestones, including improvement in teamwork and communication skills (Harris, Babkoor, Gu, & Kremer, 2016). Rather than create new courses that might affect the program of study, embedding these experiences into existing curricula may provide a clearer link to skills that teachers and other education professionals use in their classrooms. Providing education majors with a strong rationale for why they should engage in UR (improved skills) may promote implementation of research opportunities in education programs of study (Hensel, 2018).

Recommendations for Future Research

We recommend future research be conducted to gather a more in-depth understanding of UR being conducted nationwide. First, we suggest further breakdown of components related to the specific projects of these undergraduate students: where and what are undergraduate students doing? This includes a further understanding of the specific methodology used within primary data collection (e.g., survey, interviews, focus-groups, or observations) and who the participants are collecting data from (e.g., students, teachers, or parents). Additionally, to what extent is research being conducted that is aligned to teacher competencies, helping students further understand current techniques and perspectives of teachers within the field?

Second, we suggest a further understanding of the institutional demographics of the students who are pursuing studies in research leading to presentations. Specifically, are these universities composed primarily with undergraduate students, leading to a higher focus on these individuals? Do high expectations for mentoring of undergraduate students have some effect on the tendency to pursue research projects with undergraduate students, and in turn, support the Tenure and Promotion process?

Third, we suggest gathering a more in-depth understanding of faculty discipline and research focus. Does the UR project's focus align with the faculty member's research agenda? How many students are participating in independent research, focused on their own interests, versus research that imitates their mentor's agenda?

Conclusion

Our review of research of NCUR abstracts, which were self-classified into the "education" category, provided a snapshot of the settings in which the research took place and the methods

of the research being conducted by students. It also provided information regarding the faculty mentors' educational preparation. We believe these outcomes will further advance mentoring of undergraduate student research, leading to benefits not only for the student, but the faculty mentor, institution, and the field of education. Additionally, we believe developing a greater understanding into faculty research focus, faculty educational backgrounds, and university demographics will lead to discovery of the key attributes that contribute to the development of student participation in research.

References

Adedokun, O., Zhang, D., Parker, L., Bessenbacher, A., Childress, A., & Burgess, W. (2012). Understanding how undergraduate research experiences influence student aspirations for research careers and graduate education. *Journal of College Science Teaching, 42*(1), 82-90.

Alderton, E., & Manzi, M. (2017). Engaging students: An authentic undergraduate research experience. *The Professional Educator, 42*(1), 1-12.

Brownell, J.E., & Swaner, L.E. (2010). *Five high-impact practices: Research on learning outcomes, completion, and quality.* Association of American Colleges and Universities.

Brewer, A. & Mantai, L. (2017). Academics' perceptions of the challenges and barriers to implementing research-based experiences for undergraduates. *Teaching in Higher Education, 22*(5), 551-568.

Burns, D. P., & Goldin, A. (2017). Undergraduate research experiences in the liberal arts: The case of parent advisory councils. *Transformative Dialogues: Teaching & Learning Journal, 10*(1), 1-9.

Collins, T. W., Grineski, S. E., Shenberger, J., Morales, X., Morera, O. F., & Echegoyen, L. E. (2017). Undergraduate research participation is associated with improved student outcomes at a hispanic-serving institution. *Journal of College Student Development, 58*(4), 583–600.

DeVore, S., & Munk, D. (2015). Undergraduate research in teacher education: A rationale for broader engagement. *Council on Undergraduate Research Quarterly, 35*(4), 12-17.

Dvorak, A. L., & Hernandez-Ruiz, E. (2019). Outcomes of a course-based undergraduate research experience (CURE) for music therapy and music education students. *Journal of Music Therapy*, *56*(1), 30–60.

Eagan, M. K., Jr., Sharkness, J., Hurtado, S., Mosqueda, C. M., & Chang, M. J. (2011). Engaging undergraduates in science research: Not just about faculty willingness. *Research in Higher Education*, *52*(2), 151–177.

Education Commission of the States. (2018). *Policy snapshot: Teacher development and advancement.* https://www.ecs.org/research-reports/key-issues/teaching/.

Elgren, T., & Hensel, N. (2006). Undergraduate research experiences: Synergies between scholarship and teaching. *Peer Review*, *8*(1), 4-7.

Falconer, J., & Holcomb, D. (2008). Understanding undergraduate research experiences from the student perspective: A phenomenological study of a summer student research program. *College Student Journal*, *42*, 1–13.

Fenn, A. J., Johnson, D. K., Smith, M. G., & Stimpert, J. L. (2010). Doing publishable research with undergraduate students. *The Journal of Economic Education*, 41(3), 259-274.

Goodwin, L. (2010). Globalization and the preparation of quality teachers: Rethinking knowledge domains for teaching. *Teaching Education*, *21*(1), 19-32.

Harris, K., Williams-Johnson, M., & Sparkman, D. (2018). Innovation in preservice teacher preparation: Undergraduate research in special education. *Journal of Transformative Learning*, *5*(2), 16-27.

Harris, A., Babkoor, M., Gu, T., & Kremer, G.E. (2016). Course-based undergraduate research: A review of models & practices. Proceedings of the ASME Design Engineering Technical Conference, Vol. 3. Boston, MA. doi:10.1115/detc2015-46126.

Hensel, N. H. (2018). *Course-based undergraduate research: Educational equity and high-impact practice*. Stylus Publishing.

Kent, C., Allen, P. J., Harding, S., & Fielding, J. L. (2019). The psychology undergraduate research conference: A pathway to publishing? *Frontiers in Psychology, 10*(491) 1-4.

Greenawald, D.A. (2010). Faculty involvement in undergraduate research: Considerations for nurse educators. *Nursing Education Perspectives 31*(6): 368–371.

Kortz, K. M., & van der Hoeven Kraft, K. J. (2016). Geoscience education research project: Student benefits and effective design of a course-based undergraduate research experience. *Journal of Geoscience Education*, *64*(1), 24–36.

Kuh, G. D. (2008) *High impact educational practices: What they are, who has access to them, and why they matter.* Association of American Colleges and Universities, *1*(1) 1-44.

Levy, B.L., Thomas, E.E., Drago, K., & Rex, L.A. (2013). Examining studies of inquiry-based learning in three fields of education: Sparking generative conversation. *Journal of Teacher Education*, *64*(5), 387-408.

Lei, S.A., & Chuang, N.-K. (2009). Undergraduate research assistantship: A comparison of benefits and costs from faculty and students' perspectives. *Education, 130*(2): 232–240.

Lopatto, D. (2006). Undergraduate research as a catalyst for liberal learning. *Peer Review, 8*, 22–25.

Lopatto, D. (2010). Undergraduate research as a high-impact student experience. *Peer Review, 12*(2), 27-30.

Madden, L., Ammentorp, L., DeNarie, J., & Farrell, T. (2013). Benefits of faculty-undergraduate research collaboration in teacher education. *CUR: On The Web, 34*(1), 15-20.

Malachowski, M. (1996). The mentoring role in undergraduate research projects. *Council on Undergraduate Research Quarterly*, December, 91-95.

Malachowski, M. (2004). A research-across-the-curriculum movement. *New Directions for Teaching and Learning, 2003*(93): 55–68.

Manak, J., & Young, G. (2014). Incorporating undergraduate research into teacher education: Preparing thoughtful teachers through inquiry-based learning. *CUR: Quarterly, 35*(2), 35-38.

Maxwell, J. (1992). Understanding and validity in qualitative research. *Harvard Educational Review*, *62*(3), 279-301.

Mertler, C. A. (2018). *Introduction to educational research*. Sage Publications.National Science Foundation. (2020, June). Research experience for undergraduates. https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&org=NSF.

Moore, L.S., Avant, F. & Austin, S.F. 2008. Strengthening undergraduate social work research: Models and strategies. *Social Work Research, 32*(4): 231–235.

Patten, M. L., & Newhart, M. (2018). *Understanding research methods: An overview of the essentials.* Routledge Taylor & Francis.

Petrella, J. K., & Jung, A. P. (2008). Undergraduate research: Importance, benefits, and challenges. *International Journal of Exercise Science*, *1*(3), 91–95.

Pearson, R. C., Crandall, K. J., Dispennette, K., & Maples, J. M. (2017). Students' perceptions of an applied research experience in an undergraduate exercise science course. *International Journal of Exercise Science*, *10*(7), 926–941.Riffe, D., Lacy, S., & Fico, F. G. (2005). *Analyzing media messages*. Lawrence Erlbaum Association.

Rose, S., Spinks, N., & Canhoto, A. I. (2014). Management research: Applying the principles. Routledge. https://doi.org/10.4324/9781315819198

Salsman, N., Dulaney, C. L., Chinta, R., Zascavage, V., & Joshi, H. (2013). Student effort in and perceived benefits from undergraduate research. *College Student Journal*, *47*(1), 202–211.

Shortlidge, E. E., Bangera, G., & Brownell, S. E. (2016) Faculty perspectives on developing and teaching course-based undergraduate research experiences. *Bioscience, 66,* 54-62.

Slobodzian, J. T. (2014). Integrating undergraduate into teacher training: Supporting the transition from learner to educator. *CUR Quarterly, 34*, 43-47.

Tolman, S., McBrayer, J.S., & Evans, D. (2019). Educational leadership doctoral faculty academic qualifications and practitioner experiences in Georgia. *International Journal of Doctoral Studies, 14,* 85-104*.*

Wayment, H. A., & Dickson. K. L., (2008). Increasing student participation in undergraduateresearch benefits students, faculty, and department. *Teaching of Psychology, 35*(3), 194–197.

Webber, K., Nelson Laird, T. F., BrckaLorenz, A. (2012). Student and faculty member engagement in undergraduate research. *Research in Higher Education, 54*(2), 227-249.

Wei, C. A., & Woodin, T. (2011). Undergraduate research experiences in biology: Alternatives to the apprenticeship model. *CBE Life Sci Educ 10,* 123–131.

Zydney, A. L Bennett, J. S., Shahid, A., & Bauer, K. W. (2002). Faculty perspectives regarding the undergraduate research experience in science and engineering. *Journal of Engineering Education*, 9/(3), 291-297.