
Perspectives on Undergraduate Research Mentorship: A Comparative Analysis Between Online and Traditional Faculty

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Abstract

With an increase in distance faculty, it is important to understand how faculty perceptions of undergraduate research mentorship differ between distance and traditional faculty. Perceptions were examined in a medium sized, not-for-profit university with both residential and distance faculty. Residential faculty were more likely to mentor or were very interested in undergraduate research, but overall interest in mentorship was similar across campuses. Faculty status or career experience was not correlated to interest or engagement in research mentorship. Traditional faculty were more likely to report time commitment as a significant barrier than distance faculty. Other barriers and benefits were aligned between campuses, with top benefits, barriers, and motivators being student-focused as opposed to faculty or institution-focused. The majority of faculty surveyed hold undergraduate research as an integral component of higher education. Recommendations for future include the exploration of online student motivation and preparedness to engage in research as well as the mindset (fixed versus growth) of faculty regarding student motivation and preparedness.

Introduction

Undergraduate research is commonly cited as a high-impact practice, offering benefits to students, faculty, institutions, and the field (Buff & Devasagayam, 2016; Craney et al., 2011; J. Eagan M.K. et al., 2011; Russell et al., 2007; Shanahan et al., 2015; Szecsi, 2015; Webb, 2007). Undergraduate research experiences can vary, including research assistantships, curricular experiences, and summer programs. Curricular experiences can be embedded in a course as a course-based undergraduate research experience (CURE) or may constitute the course (capstones, senior/honors thesis, or independent studies). Student clubs may also engage in research.

Faculty report multiple benefits of undergraduate research. Faculty have identified improved career satisfaction and improved quality of their research program from student ideas, hard work, energy, and research products (e.g. publications and presentations) as benefits of undergraduate research mentorship and supervision (Coker & Davies, 2006; M. D. Cox, 1997; Zydney et al., 2002). Research mentorship

and supervision allows development of close relationships and an active role in students' professional growth, which can improve faculty understanding of student skills and knowledge development needs for research success (Rorive & Brint, 2013). Undergraduate research is linked to student retention and increases in graduate program enrollments, with clear benefits to faculty members with graduate research programs (Council on Undergraduate Research, 2017; M. K. Eagan et al., 2013; Foertsch et al., 2000; Nagda et al., 1998). Undergraduate research increases diversity and inclusiveness in scientific research and in industry (Banger & Brownell, 2014; Carpi et al., 2017; M. K. Eagan et al., 2013; McDermott, 2016). Faculty interested in increasing diversity within their field may be more likely to mentor undergraduate research (Morales et al., 2017).

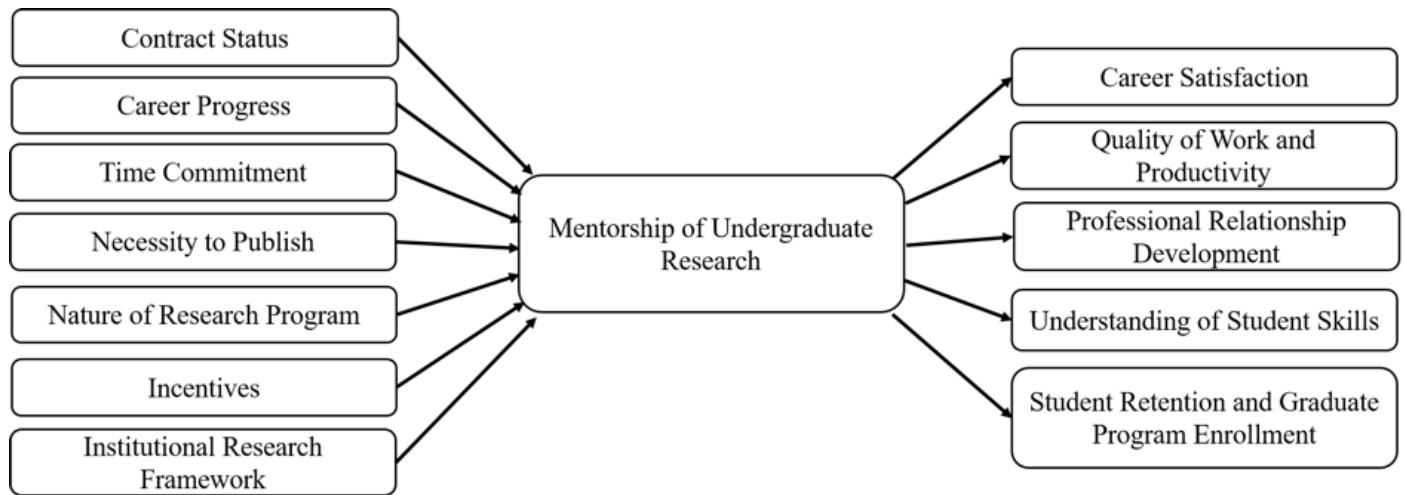
While increasing faculty participation in undergraduate research increases opportunities for students (Wayment & Dickson, 2008; Webber et al., 2013), many barriers to faculty mentorship exist. Faculty contract status may inhibit research mentorship involvement. The majority of faculty at U.S. institutes are non-tenure track (NTT) and contingent (adjunct) faculty. Tenure-track and tenured faculty (TT) are much more likely to engage in a robust research program (Hurlburt, 2016). This means that the content experts most students are closest to do not have undergraduate research opportunities to offer through their own research program. However, it is worth noting that non-tenure track faculty may serve as important mentors to students engaged as research, depending upon the institution's program. It is unknown at this time what level of research expertise is needed to effectively teach a course embedded with undergraduate research (Auchincloss et al., 2014). For multiple reasons, undergraduate research may not produce publishable results, reducing the incentive for participation for tenure-track faculty (Buddie & Collins, 2011; Coker & Davies, 2006).

Time investment in undergraduate research mentorship is another notable barrier. Undergraduate research is time-consuming to supervise due to planning, training, and supervision responsibilities than graduate student research (Brew & Mantai, 2017; Buddie & Collins, 2011; Coker & Davies, 2006; Wayment & Dickson, 2008; Webber et al., 2013). Faculty who perceive mentorship and supervision as time consuming may be less likely to serve as mentors (Morales et al., 2017). Adjunct and non-tenure track faculty may not identify a favorable cost-benefit analysis for the time investment required to mentor undergraduate research (M. F. Cox & Andriot, 2009). Career progress also can be an influencing factor, with mid-career faculty more likely to mentor undergraduate research than early-career or late-career faculty (Morales et al., 2017).

Universally, faculty members also face institutional barriers that may reduce undergraduate research mentorship, including research culture, incentives, and professional development programs. If an institution does not foster a strong undergraduate research culture, both faculty and student motivation for participating in undergraduate research may be low (Buddie & Collins, 2011). A lack of institutional incentives for investing time and energy into undergraduate research may also be a barrier for faculty, particularly faculty without an intrinsic motivation to support undergraduate research (Masterson, 2017). Potential incentives include tenure credit as institutional service, stipend, reduced teaching load, special grant funding for faculty-student research projects, or public recognition (Buddie & Collins, 2011; Malachowski, 2017; Mateja & Otto, 2007; Wayment & Dickson, 2008). Public recognition of research accomplishments through internal awards or symposiums can foster a strong research culture (Malachowski, 2017; Masterson, 2017). An online research hub accessible to all faculty and students could foster research culture (Morrison, 2017).

Professional development and a faculty learning community for faculty engaged in, or interested in engaging in, undergraduate research is likely to increase faculty participation in undergraduate research (Buddie & Collins, 2011; Friedman, 2016). There is a gap in faculty pedagogical knowledge in developing student research skills (Brew & Mantai, 2017; Wagner et al., 2011). The role of research mentor is multi-faceted, including coaching technical skills development, disciplinary knowledge, process knowledge, and career or graduate school preparation (Gafney, 2005; National Academies of Sciences, Engineering, and Medicine, 2017). Students report that their faculty mentor had a larger impact on their experience than they expected (Houser et al., 2013). Variability in defining the mentorship role and interactions limits evaluation of the impact of mentorship on undergraduate researchers (Crisp & Cruz, 2009).

In traditional settings, the literature has established clear drivers for faculty mentorship of undergraduate research as well as outcomes and benefits (Figure 1). Faculty barriers to mentoring undergraduate research may be greater for online and distance faculty, compared to their counterparts at traditional campuses. Anecdotally, challenges to distance mentoring of undergraduate research include matching mentors and mentees and communicating effectively (Albuja & Greenlaw, 2014). Distance mentoring of doctoral students has shown similar challenges in communication, but also note that learner autonomy is a key variable in the relationship (Kumar et al., 2013).



Note. Drivers are on the left; Outcomes are on the right.

To explore the unique situation of full-time faculty mentoring undergraduate research in a distributed model, we tested the following alternate hypotheses:

1. Fewer full-time distance campus faculty will state they are involved in undergraduate research than full-time traditional faculty
2. Fewer full-time distance campus faculty will state they are interested in undergraduate research than full-time traditional faculty
3. Distance faculty and traditional faculty perceive different barriers to undergraduate research
4. Distance faculty and traditional faculty perceive different benefits to undergraduate research

Methods

Participants

Data was collected from faculty currently employed at a medium-sized private university with two traditional residential campuses (8,300 students, predominantly traditional students) and a distance learning campus (23,000 students, predominantly non-traditional students). Participants were selected using purposive sampling. Those surveyed were full-time faculty; adjunct faculty were excluded. The residential campuses employ 549 full-time faculty ($n = 84$, response rate 15.3%) while the distance campus employs 141 full-time faculty ($n = 35$, response rate 24.8%). At each residential campus, the percent of full-time faculty who are tenure-track or tenured is 63% and 81%, respectively. At the distance campus, 40% of the full-time faculty is tenure track or tenured. Contingent faculty were excluded from the study to limit moderating variables such as the influence of external institutions with which contingent faculty might also be employed.

Both residential campuses had undergraduate research support programs while the distance campus did not have an established undergraduate research program. The nature of the undergraduate research program differed between the two residential campuses. One residential campus offered a support program through the library with the goal of promoting research, scholarly, and creative activities at the

undergraduate level. This residential campus offered workshops, networking opportunities, and an undergraduate research symposium. The other residential campus offered a formal Office of Undergraduate Research with the goals of helping students 1) apply critical thinking, ethics, and information analysis in decision-making, 2) understand the nature of research, and 3) utilize discipline-based inquiry skills in their communities to create or understand new knowledge. This second residential campus has a developed Undergraduate Research Strategic Plan for 2020.

Procedure

Faculty at the residential campuses and the distance campus were asked to complete an online survey to determine their engagement and interest in supervising undergraduate research as well as their perceptions on benefits and barriers. The institutional review board deemed the survey exempt prior to administration of the survey; informed consent was not collected.

We used a cross-sectional survey research design. A team of faculty across multiple disciplines, including faculty who were well experienced with undergraduate research mentorship, developed the survey. The survey tool contained 17 closed questions, including 5 demographic questions. See Appendix for the survey questions used in this study. The body of existing literature and related studies (Shokair, 2002) informed the survey options regarding potential faculty benefits and barriers.

The survey was administered anonymously using the QuestionPro platform. Confidentiality was maintained as no personally identifying information was collected in the survey, including IP address. Survey data was collected in September and October 2018. Responses were voluntary (non-probability sampling). Responses were divided into two major categories in order to evaluate the research hypotheses: residential and distance (faculty).

Data Analysis

All survey data were treated as nominal. The research hypotheses were evaluated with Chi-square ($\alpha = .05$) with the appropriate degrees of freedom (Gay et al., 2006). Specifically, answers provided by distance and residential faculty were compared using the Chi Square test of independence which compares the frequency of the answers between two groups to determine if distance and residential faculty responses were statistically different from each other. Fisher's Exact tests were run when Chi Square analysis yielded low cell count warnings. Carmer's V statistics were used to determine effect size for significant results. In some cases, similar categories of answers were combined to facilitate statistical analysis (e.g. in some cases *agree* and *strongly agree* were considered a positive response). StatCrunch Data Analysis on the Web and Statdisk were used for data testing (Triola, 2013).

Results and Discussion

Compared to an analogous study conducted at the University of California, Irvine (Shokair, 2002), the general results of this study suggest our aggregate faculty share similar perspectives on the benefits of mentoring undergraduate research, but appear more student-oriented in their perspectives on the primary barriers and incentives. At both the distance and residential campuses, 83% of faculty held the belief that undergraduate research is an integral component of education, regardless of career choice. In answering overall questions about mentoring students in research involvement and interest, residential and distance campus faculty answered the questions differently. An asterisk (*) indicates statistically significant differences in the data tables.

Faculty engagement in undergraduate research mentorship

For the first hypothesis, we reject the null and accept the alternate hypothesis that significantly fewer distance campus faculty stated they were involved in undergraduate research than residential campus faculty (Table 1, $p < 0.001$ at 1 degree of freedom (df) with a low Cramer's V effect size of 0.218). Residential faculty were more likely to have engaged in undergraduate research mentorship recently (Table 1, $p = 0.002$, 4df, with a low Carmer's V effect size of 0.272). Testing our first hypothesis, only 6%

of distance faculty state they were currently engaged in undergraduate research compared to 36% of residential faculty.

Table 1

Differences in Distance versus Residential Faculty on Interest and Involvement in Undergraduate Research Mentorship (alpha = .05)

	Chi square	p-value	Fishers exact p
Differences in how recently distance vs. residential faculty mentored undergraduate research	17.52	0.002*	0.005*
Ha ₁ Difference in distance vs. residential faculty stating current involvement with undergraduate research	11.31	<0.001*	<0.001*
Ha ₂ Difference in distance vs. residential faculty stating interest in undergraduate research	10.32	0.035*	0.015*

Two institutional factors may have led to this discrepancy. Historically, the distance campus faculty focused primarily on teaching and service while residential faculty focused on teaching, service and research. The disparity in tenure track and tenured faculty between campuses can further explain these differences. Residential campuses also have direct access to undergraduate students who live on campus. Distance campus students are typically older working adults who are dispersed throughout the US, Europe and Asia.

We believe that this tenure disparity can be partially mitigated by the analysis of tenure track selection and review processes to remove biases that disadvantage remote working professionals. For example, access to undergraduate students who can participate in collaborative undergraduate research projects with remote professors might be improved with improved connectivity between residential and remote instructors and students. For example, ‘matchmaking’ that pairs remote instructors both with undergraduate students interested in conducting research, and perhaps also extending to residential campus instructors.

Despite the prevalence of both TT and NTT faculty at the residential and distance campuses, and despite what the literature suggests regarding faculty contract status (tenure track versus non-tenure track) and engagement in undergraduate research, Spearman’s rho revealed no correlation between research mentorship and contract status (or any other demographic variables). There were no correlations stronger than 0.43, with most under ±0.25. Furthermore, NTT faculty did not identify their faculty status as a significant barrier, regardless of campus affiliation.

Faculty interest in undergraduate research mentorship

For the second hypothesis, we rejected the null hypothesis (Table 1, p=0.035, 4df, with a low Cramer’s V effect size of 0.214) that there are no differences in interest in undergraduate research mentorship based on campus affiliation. Significantly more residential faculty were either actively engaged or very interested in mentoring undergraduate research than distance faculty, although both groups showed a high level of interest overall. The percent of faculty indicating an overall positive interest in mentoring students in undergraduate research was higher for residential faculty (89%) than distance faculty (86%).

Aligned with engagement in research mentorship, Spearman’s rho did not reveal a correlation of interest in research with any demographic variables in this study, including career experience and faculty status.

Perceived barriers to undergraduate research mentorship

This survey explored potential faculty barriers to undergraduate, as reported in previous literature, with the goal of identifying any differences in perceived barriers across the distance and traditional campuses (Table 2). Overall, only 1 of the 14 potential barriers showed a difference between how residential and distance faculty responded. Time commitment was a perceived barrier by more residential faculty than distance faculty ($p=0.018$, $df 1$, with a low Cramer's V effect size of 0.175), therefore we rejected the null hypothesis, finding significant differences between the distance and residential faculty. Approximately 94% of traditional faculty reported time as a barrier, while 77% of distance faculty perceived this as a barrier. It is important to note here, though, that over three quarters of all faculty identified time as a significant barrier to undergraduate research mentorship. Interestingly, though, the self-reported time investments from faculty engaged in undergraduate research mentorship did not vary significantly across campuses, with a p-value of 0.88, at 3 df and a low Cramer's V effect size of 0.071). For all other barriers, we failed to reject the null hypothesis. Largely, there were no differences in perceived barriers to undergraduate research mentorship between the campuses.

Table 2

Differences in Distance versus Residential Faculty on Perceived Barriers to Undergraduate Research Mentorship (alpha = .05)

Perceived barrier	Chi square	p-value	Fishers exact p
Time commitment	5.57	0.18*	0.028*
Lack of student motivation or commitment	1.169	0.28	0.347
Deficient student knowledge to perform research	0.349	0.555	0.766
Deficient student skills to perform research	2.46	0.117	0.148
Lack of stipend or course release	2.67	0.103	0.141
Suitability of research area for undergraduate research	0.423	0.516	0.572
Access to resources	0.237	0.626	0.786
Access to interested students	0.25	0.617	0.785
Career progress (early in tenure process)	1.72	0.19	0.224
Lack of public recognition	0.953	0.329	0.391
Faculty status (no research requirement)	0.028	0.867	1
Lack of training in research mentorship	2.19	0.139	0.234
Safety concerns with undergraduate researchers	0.403	0.526	0.74
Personal confidence level	1.42	0.233	0.326

While differences across campuses were minimal for most barriers, some barriers were more widely perceived by faculty than others (Table 3). A majority of campus and distance faculty alike indicated that undergraduate students were deficient in skills, knowledge and motivation to perform research. These top barriers identified in our survey were focused on students' preparedness and capabilities, which contrasts with previous investigations that identified more faculty-oriented barriers, including time, lack of support and resources, and lack of recognition or rewards (Shokair, 2002).

Table 3

Aggregate Perceived Faculty Barriers to Undergraduate Research Mentorship

Perceived barrier	Agree (%)	Disagree (%)
Lack of student motivation or commitment	82.1	17.9
Deficient student knowledge to perform research	77.2	22.8
Deficient student skills to perform research	75.9	24.1
Lack of stipend or course release	72.5	27.5
Suitability of research area for undergraduate research	70.7	29.3
Access to resources	64.5	35.5
Access to interested students	63.6	36.4
Career progress (early in tenure process)	42.1	57.9
Lack of public recognition	31.4	68.6
Faculty status (no research requirement)	30.4	69.6
Lack of training in research mentorship	29.0	71.0
Safety concerns with undergraduate researchers	27.0	73.0
Personal confidence level	18.9	81.1

Recent literature into fixed versus growth mindset of faculty (Aragon et al., 2018) may be useful in informing professional development and faculty recruitment efforts for research mentorship. Faculty concerns may be founded; the literature on student motivation and preparedness is mixed, with some reporting varying levels of perceived preparedness for research (McCave et al., 2014) and others reporting strong motivation and preparedness (Shaw et al., 2013).

Although distance learning students are geographically separated from faculty (unlike the residential campuses), responses were similar from both faculty groups who also indicated limited access to interested students. A lack of stipends for extra work and suitability of research area were reported as barriers by distance and campus faculty, though this was not a major barrier identified in our study.

Perceived benefits to undergraduate research mentorship

This survey explored potential faculty benefits of undergraduate research, as reported in previous literature, with the goal of identifying any differences in perceived benefits across the distance and traditional campuses (Table 4). For each potential benefit, we failed to reject the null hypothesis. There were no differences in perceived benefits of undergraduate research mentorship between the campuses. The majority of faculty agreed with each potential benefit from mentoring undergraduate research (Table 5). Our faculty aligned with previous literature (Shokair, 2002), identifying an improved understanding of undergraduate student learning needs and skills needed for research as key benefits of mentoring undergraduate research. Faculty recognized their role in students' professional growth as a key benefit, which is supported by seminal research that identifies the influence of undergraduate research on professional socialization as well as personal and intellectual development (Hunter et al., 2007).

Table 4

Difference in Distance versus Residential Faculty on Perceived Benefits to Undergraduate Research Mentorship (alpha = .05)

Perceived benefit	Chi square	p-value	Fishers exact p
Active role in students' professional growth	0.305	0.581	1
Improved understanding of undergraduate skills needed for research	0.280	0.597	1
Improved understanding undergraduate student learning needs	0.378	0.538	0.682
Valuable student contributions to research program	0.539	0.463	0.674
Improved teaching methods	1.66	0.197	0.273
Improved research projects	0.582	0.445	0.497

Table 5

Aggregate Perceived Faculty Benefits of Undergraduate Research Mentorship

Perceived benefit	Agree (%)	Disagree (%)
Active role in students' professional growth	98.8	1.2
Improved understanding of undergraduate skills needed for research	95.8	4.2
Improved understanding of undergraduate student learning needs	88.9	11.1
Valuable student contributions to research program	87.0	13.0
Improved teaching methods	82.1	17.9
Improved research projects	76.8	23.2

Deriving Context for Future Research

While the results of this study have limited generalizability, it is possible to take key ideas from this work in order to derive context for future research and institutional planning. Specifically of interest are 1) overlap and disparity between faculty and student interests and 2) motivating faculty to engage in research mentorship.

There was close agreement of faculty interest in various formats of undergraduate research between campuses. Faculty interest ranged between 43 – 60% for CURE, independent studies, capstones, and research team. According to a prior study by the authors of this work, student interest in a CURE was strongest and aligned with faculty interest (65% interest by residential students, 42% interest by distance students (Deleted for peer review). The authors' prior study showed lower student interest in independent study and extracurricular research opportunities (<37% interest) (deleted for peer review), which did not align with the stronger interest by faculty for these formats for undergraduate research.

Faculty identified their interest in assigning students specific roles in a research team. Differences in responses between campuses were not statistically significant. However, there were stark differences in the roles faculty were interested in assigning to undergraduate researchers (Table 6) and those that students are most interested in (deleted for peer review). Despite being the role that students were most interested in, faculty indicated relatively low interested in assigning undergraduate researchers to hands-on research, either in the laboratory or in the field. The most popular role faculty were interested in assigning to undergraduate researchers was the preparation of the literature review but this role showed low student interest (deleted for peer review). Similarly, faculty supported student preparation of conference materials but students showed significantly less interest. Faculty and students did agree on data analysis and manuscript preparation as a potential role, though.

Table 6

Comparison of Student and Faculty Interest in Undergraduate Research Role

Research role	Faculty interest (%)	Student interest (%) (deleted for peer review)
Laboratory research	31	49
Field research	32	57
Literature review preparation	57	27
Conference presentation	53	26
Data analysis	39	40
Manuscript preparation and submission	44	47

At the sample university, the noted overlaps and disparities between faculty and student perspectives on undergraduate research offer specific, actionable pressure points through which to influence the university’s research culture. For example, the overlap of faculty and student interest in CURE funding, training, and project initiatives. Similarly, the disconnect between faculty and student interest in the roles of hands-on research and literature review research suggests the need for clear communication and understanding of both faculty and student needs, which could include training/learning opportunities that define the work and value of different roles in undergraduate research. The overlap and misalignments noted here should encourage institutions to seek out and define their students’ and faculty research culture as a pragmatic first step.

Methods of motivating faculty to mentor undergraduate research can aim to either remove a barrier or emphasize a benefit. No potential motivators revealed statistically significant differences across campuses. Aggregate results are presented in Table 7. The top barriers identified in this survey were student-focused, as were the top motivators identified by faculty (motivated students, students with prepared research plans/experimental designs, and increased funding for internal research grant programs with undergrads). By contrast, a previous study identified faculty-oriented incentives, with, “provide more support, resources,” “provide more recognition,” and “give course credit” rounding out the top three (Shokair, 2002). However, it should be noted that, our aggregate faculty identified “course release” as the fourth most popular motivator, falling only .03% behind third.

Table 7

Aggregate Motivators for Faculty Mentorship of Undergraduate Research

Potential motivator	Agree (%)	Disagree (%)
Motivated students	100.0	0.0
Students with prepared research plans/experimental designs	96.2	3.8
Increased funding for internal research grant programs that involve undergraduates	87.1	12.9
Course release	86.9	13.1
Research mentorship stipend	84.3	15.7
Professional development for research mentorship	76.1	23.9
Annual college award for student research mentorship	55.2	44.8
Clear tenure guidelines regarding undergraduate research supervision and mentorship	53.4	46.6
Recognition in internal publications	45.5	54.5

The aggregate faculty’s primary focus on student benefits as a motivating factor in mentoring their research matches their student-centered perceptions of the primary barriers and benefits. Rather than

institutional barriers such as internal research culture and available incentives (Buddie, Collins 2011; Masterson 2017), or personal grievance such as time commitment and publish-ability of results (Webber et al. 2013, Coker, Davies 2006, Buddie, Collins 2011), our primary results are focused on the student's motivations, successes, needs and the pedagogical implications thereof. All surveyed faculty agreed that "motivated students" represents both a motivating factor and a benefit, comparable to the majority (82.1%) of aggregate faculty that cite "a lack of student motivation or commitment" as a barrier.

Distinct from barriers reported in the literature, faculty at both campuses did not perceive professional development as a barrier to undergraduate research mentorship. However, faculty did indicate professional development as a motivating fact. While professional development for traditional faculty is well-established in the literature, there is a growing body of work exploring professional development for distributed faculty (Barczyk et al., 2011; Eib & Miller, 2006).

In the context of the sample university's research culture, this study's findings concerning the primacy of student-oriented motivations and limitations are welcome news. This study's findings that faculty are primarily student-focused in their motivation to mentor undergraduate research is a positive reflection of the university's ethos of service to students. This study's findings that the perception of unmotivated students represent a barrier to faculty participation in undergraduate research clearly suggests the need for additional investment in action. The divergence between this study's findings that faculty are focused on student-oriented motivations and barriers as opposed to professionally-oriented benefits and barriers identified by other studies suggests a perhaps less cynical vision of faculty mentorship in undergraduate research. Future research should continue to investigate the complex, nuanced landscape of faculty participation in undergraduate research, perhaps zeroing in on the dynamic between professional and student factors.

Limitations of Study

A major limitation of this study was the inability to control for differences in institutional support of undergraduate research across the campuses. Because a larger study including multiple institutions would also have this limitation and because the comparison between distance and traditional faculty has not yet been explored in the literature, this limitation was not addressed. A second limitation is that (as with any survey) respondents voluntarily participated. In this research, the majority of faculty from both campuses did not participate and their views were not included in the results, thus limiting generalizability. This study does provide important insights into faculty engagement in undergraduate research at the test university but does not necessarily describe faculty supervision of undergraduate research at other universities, even of similar size and composition. Future work will include additional universities to improve external validity.

Additionally, the exclusion of contingent faculty limits this study's results. As noted earlier, contingent faculty were excluded to limit moderating variables. At the sample university, contingent faculty are not restricted from (and are likely to) instruct at other academic institutions. Excluding these faculty was intended as a means of focusing the study on the sample institution's specific internal undergraduate research culture. The exclusion of contingent faculty was not intended as a commentary on the strength or value of their contribution as faculty in undergraduate research. Compelling research shows adjunct faculty exhibit the same skill, competency, and value-added as full-time faculty in online instruction (Maxson, 2017).

It is possible that cause and effect may be conflated. The strong culture of undergraduate research participation at one of the residential campuses could stem from the presence of an office of undergraduate research. This is challenging to ascertain as institutional data is not available to investigate participation rates prior to the formation of the office. However, this can be a consideration when collecting data at campuses, particularly if an office may be established.

Conclusions

Previous literature does not make a distinction between distance and online campuses with respect to undergraduate research mentorship. This study sought to explore how faculty barriers to mentoring

undergraduate research might be different for distance/online campuses and traditional campuses. This is an important area of research to enable administration and faculty to design and optimize undergraduate research programs for the unique needs of nontraditional faculty and students.

Key findings from this study are:

- A large majority of all faculty surveyed (83%) held the belief that undergraduate research is an integral component of education regardless of career choice.
- Significantly fewer distance campus faculty report involvement in undergraduate research than residential campus faculty. However, both distance and residential campus faculty have a high level of interest in undergraduate research mentorship.
- Of the 14 potential barriers explored, only time commitment showed differences between residential and distance faculty. Residential faculty perceived time commitment as a greater barrier, despite the data revealing that both samples are equally interested in undergraduate research and share 13 of the 14 perceived barriers. Both faculty groups perceive institutional barriers, despite considerable research support for residential faculty compared to distance faculty.
- Distance and residential faculty perceived top barriers that were student-centered: lack of motivation, deficient student knowledge, and deficient student skills. This aligned with student-centered motivators for engaging in research mentorship. Furthermore, the top benefits for research mentorship reported by faculty were also student-centered.
- There are distinct differences in faculty and student interest in the type of projects and student roles for undergraduate research.

These results may indicate that a cohesive institutional approach to undergraduate research mentorship should address most perceived barriers and benefits in a similar fashion across campus faculty members. Distance and residential faculty experience similar benefits and barriers and are motivated by similar factors, all of which are student centered.

The data from this study suggests that institutions wishing to engage distance or traditional faculty in undergraduate research mentorship may be effective if they design opportunities that 1) bolster student motivation and commitment, 2) develop student knowledge and skills, and 3) address time and resource constraints.

At this time, it is unclear if faculty perspectives regarding student motivation and preparation is founded. It is possible that professional development could address fixed versus growth mindset in this regard, as well as assisting faculty in identifying suitable research within their research agenda for undergraduates.

Institutions may wish to consider how to address the discord between undergraduate research roles faculty are most interested in assigning to students and those that students wish to take on. Because every surveyed faculty member reported they were motivated by motivated students, this study suggests that research skills should be infused into introductory courses to prepare students and boost both confidence and motivation, preparing them for future research opportunities.

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Appendix A

Survey Questions Used in the Study

1. While associated with your current (removed for blind review) Campus, have you supervised or mentored an undergraduate research project?
2. While associated with your current (removed for blind review) Campus, what types of undergraduate research projects have you supervised? (select all that apply)
 - a. Senior thesis/capstone
 - b. Field study
 - c. Bench-scale study
 - d. Pilot study
 - e. Clinical study
 - f. Survey/social research
 - g. Scholarly work in humanities
 - h. Other
 - i. Not applicable: I have not mentored any undergraduate research projects at (removed for blind review)
3. When mentoring undergraduate research projects, how many hours per week do you typically spend on undergraduate research projects (per project)?
 - a. < 1 hour per week
 - b. 1 -2 hours per week
 - c. 3 - 4 hours per week
 - d. 5+ hours per week
 - e. Not applicable: I have not mentored any undergraduate research projects at (removed for blind review)
4. During the 2017-2018 academic year, how many undergraduate students did you work with as a mentor for their undergraduate research?
 - a. 0 undergraduates
 - b. 1 - 2 undergraduates
 - c. 3 - 5 undergraduates
 - d. 6 - 10 undergraduates
 - e. 11 - 15 undergraduates
 - f. 16 - 20 undergraduates
 - g. 21 - 25 undergraduates
 - h. > 25 undergraduates
5. How have you connected with students regarding potential undergraduate research opportunities? (select all that apply)
 - a. The student found me
 - b. I advertised the opportunity in my class(es)
 - c. The opportunity was advertised via mass student email
 - d. The opportunity was advertised on an (removed for blind review) website
 - e. Other
 - f. Not applicable: I have never mentored undergraduate research at (removed for blind review)
6. What is your interest level in mentoring future undergraduate research?
 - a. I am already engaged in undergraduate research mentorship
 - b. Very interested
 - c. Interested
 - d. If the right student/project came along
 - e. It does not fit into my plan

f. Unsure

7. For each of the following formats for executing undergraduate research, indicate your interest level: (very interested, interested, if the right student/project came along, it does not fit my plan, unsure)

- a. Embedded within your course
- b. Teaching an independent study
- c. Teaching a capstone course
- d. Mentoring a student volunteering with an existing research team
- e. Mentoring a student club engaged in research

8. For the common products that result from research projects, indicate what you perceive student interest is in each type: (very interested, interested, if the right student/project came along, it does not fit my plan, unsure)

- a. Grant proposal
- b. White paper
- c. Meta-analysis
- d. Review article
- e. Research article
- f. Editorial
- g. Manual or standard operating procedures
- h. Technical report
- i. Trade journal article
- j. Conference presentation or poster

9. Indicate your level of interest in assigning a student with each common role in a research team. (very interested, interested, if the right student/project came along, it does not fit my plan, unsure)

- a. Literature review
- b. Hands-on research (laboratory)
- c. Hands-on research (field)
- d. Data analysis
- e. Manuscript drafting, editing, submission
- f. Conference materials preparation and presentation
- g. Consulting
- h. Project management
- i. Safety management
- j. Computer coding
- k. Development of survey tools (e.g. questionnaires)
- l. Other

10. For each of the following statements, indicate the degree to which you agree or disagree: (strongly agree, agree, neutral, disagree, strongly disagree)

- a. Working with undergraduate researchers has improved my understanding of the learning needs of undergraduate students.
- b. Working with undergraduate researchers has improved my understanding of the skills that students need before doing research.
- c. Undergraduate research as an integral component of education, regardless of career choice.
- d. Working with undergraduate researchers improves my teaching methods.
- e. Working with undergraduate researchers improves my research projects.
- f. Undergraduate research mentorship allows me to play an active role in students' professional growth.
- g. Student contributions (e.g. ideas, hard work, energy) to my research program are valuable.

11. How likely are each of the following potential barriers to influence your decision to serve as a mentor for undergraduate research in the future? (very likely, likely, neutral, not likely, very unlikely, not applicable)

- a. Time commitment
 - b. Lack of public recognition
 - c. Deficient student skills to perform research
 - d. Deficient student content knowledge to perform research
 - e. Lack of student motivation or commitment
 - f. Lack of stipend or course release
 - g. Safety concerns with undergraduate researchers
 - h. Access to resources
 - i. Suitability of my research area for undergraduate research
 - j. Lack of training in research mentorship
 - k. Career progress (early in tenure process)
 - l. Faculty status (non-tenure track with no research requirement)
 - m. Personal confidence level
 - n. Access to interested students
12. How likely are each of the following to motivate you to participate as an undergraduate research mentor? (very likely, likely, neutral, not likely, very unlikely, not applicable)
- a. Annual college award for student research mentorship
 - b. Recognition in (removed for blind review) (internal research magazine)
 - c. Research mentorship stipend
 - d. Course release
 - e. Increased funding for internal research grant programs that involve undergraduates
 - f. Professional development for research mentorship
 - g. Clear tenure guidelines regarding undergraduate research supervision and mentorship
 - h. Motivated students
 - i. Students with prepared research plans/experimental designs
13. What is your College affiliation within the Daytona Campus?
- a. COAS
 - b. COA
 - c. COB
 - d. COE
14. What is your gender?
- a. Male
 - b. Female
 - c. Non-binary
 - d. Prefer not to say
15. What is your career experience?
- a. I am very early career (under 5 years in higher education)
 - b. I am early career (5 - 9 years in higher education)
 - c. I am mid-career (10 - 19 years in higher education)
 - d. I am late career (20+ years in higher education)
16. Do you consider yourself a member of an ethnic group? This may be a sensitive question. We want to establish if the demographics engaged in undergraduate research mentorship align with overall faculty demographics. Undergraduate research has been shown to increase minority representation in certain fields (e.g. STEM).
- a. Asian
 - b. Black or African American
 - c. Hawaiian or Pacific Islander
 - d. Hispanic, Latino, or Spanish
 - e. Indian
 - f. Middle Eastern or North African
 - g. White

- h. Other race, ethnicity, or origin
- i. Prefer not to say

17. What is your faculty status?
- a. Tenured faculty
 - b. Tenure-track faculty
 - c. Non-tenure track faculty
 - d. Adjunct faculty

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