

Methodology and Research Practice

# Successfully Publishing With Undergraduate Coauthors in Psychology: Insights From Faculty With Top Track Records

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Keywords: Publishing with undergraduates, Mentoring in psychology, undergraduate coauthors, undergraduate publication

<https://doi.org/10.1525/collabra.94261>

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## Collabra: Psychology

Vol. 10, Issue 1, 2024

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Research in psychology and other fields has demonstrated the benefits of faculty-undergraduate collaborative research and shown that these research experiences can culminate in publication. To date, there has not yet been an in-depth investigation of the factors that enable faculty to successfully publish with undergraduate coauthors. In the present study, we used blended reflexive qualitative and quantitative methods to understand faculty perspectives on the topic by recruiting 38 faculty with extensive experience publishing with undergraduate coauthors from institutions in three categories: predominantly undergraduate, masters-granting, and doctoral-granting. These faculty responded to an open-ended survey regarding their experiences publishing with undergraduates. Although these faculty find great joy and meaning in publishing with undergraduates, they report facing obstacles such as a lack of student training, high rates of student turnover, and lack of time to dedicate to the process. Based on our results, we recommend that if institutions seek to increase their rates of faculty-student publication, they should dedicate resources, especially time, for student-faculty collaboration. In addition, departments should offer advanced training in scientific writing to facilitate student success in publication.

A large body of research across many fields highlights the numerous benefits of faculty-undergraduate research collaboration (Kuh, 2008; Lopatto, 2010). For example, benefits are realized by institutions, who see gains in recruitment and retention (Laursen & Rasmussen, 2019; Lopatto, 2004); by faculty, who gain satisfaction and productivity (Elgren & Hensel, 2006; Nolan et al., 2020; Potter et al., 2009; Shortlidge et al., 2016); and of course by students, who gain research, critical thinking, and communication skills, as well as graduate school and career preparation (Bauer & Bennett, 2003; Davis & Warfield, 2011; Eagan et al., 2013; Hunter et al., 2007; Lei & Chuang, 2009). However, until recently there was a dearth of research examining the tangible outcomes of faculty-undergraduate research collaborations—such as coauthored publications—and how best to achieve them.

Within the past decade, a few notable empirical studies on this topic have emerged. First, a study of the top 10 research universities in clinical medicine and pharmacy found that undergraduates were coauthors on approximately 10% of the peer-reviewed papers published by faculty from these schools (Gouda et al., 2016). A similar study in chemistry and physics at four primarily undergraduate

institutions across a 10-year period found that 15% of undergraduate research experiences produced peer-reviewed articles (Mellis et al., 2018). More recently, studies in the field of psychology have begun to explore the prevalence and predictors of undergraduate coauthored publication.

Giuliano and colleagues (2022) sought to identify predictors of undergraduate publication in psychology by surveying a convenience sample of 244 faculty from graduate-serving and undergraduate-serving institutions across the United States. These faculty had, on average, 5 coauthored journal publications with undergraduates (1.5 of which had an undergraduate as first author). Moreover, faculty at undergraduate-serving institutions were more likely to publish journal articles with undergraduates, whereas faculty at graduate-serving institutions were more likely to present at conferences with undergraduates. Finally, both institutional factors (such as higher selectivity, more resources and support, and a lower teaching load) and faculty characteristics (such as higher faculty rank, more experience, and close relationships with students) predicted higher undergraduate publication rates.

Because that study was limited by its nonrepresentative sample (i.e., a convenience and snowball sample of faculty

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interested in the topic of undergraduate research), Giuliano et al. (2023) attempted to obtain a more accurate accounting of the highest potential base rates of undergraduate publication in psychology by examining the curricula vitae of faculty from psychology departments at highly-ranked U.S. colleges. Most of the sample (83%) had at least one peer-reviewed paper with an undergraduate, and just over half (58%) had at least one publication on which an undergraduate was first author. On average, these faculty had 7.5 coauthored undergraduate publications (representing 19% of their total publications) and 1.5 first-author undergraduate publications (representing 5% of their total publications). Consistent with prior research (Giuliano et al., 2022), faculty of higher rank were more likely to publish with undergraduates (both in general and as first author), and faculty at PUIs and Masters' institutions were more likely than R1 faculty to publish with undergraduates. The research reviewed thus far suggests that coauthored undergraduate publication in psychology (Giuliano et al., 2022, 2023) and other fields is fairly common, and is becoming increasingly more common over time, particularly in the past 20 years.

Although we have an idea of some of the institutional and faculty factors that facilitate undergraduate publication and may be driving this trend, we know much less about what the coauthoring experience itself is like from the faculty perspective, including the perceived barriers and challenges, as well as the keys to success. In the current study, we sought to address some of these missing pieces by surveying highly successful faculty mentors (i.e., frequent producers of coauthored undergraduate publications) about their mentoring goals and style, their keys to success, as well as their perceived benefits, challenges, and barriers to publishing with undergraduates. Understanding general approaches to mentorship and the keys and barriers to success can help inform those wishing to create or promote successful undergraduate research opportunities that benefit students, faculty, and institutions alike. We expect that providing descriptive data on the experience itself, including mentors' individual approaches, can help highlight trends and variations that might contribute to successful mentorship. To analyze faculty responses, we used a blended reflexive/quantitative content coding approach. Because of the dearth of research in this area, and our open-ended approach, our analysis was exploratory in nature.

## Method

### Data Accessibility Statement

All numeric data, coding procedures, materials, and analyses are available via the Open Science Framework (Howell & Giuliano, 2023; <https://osf.io/9ha2j/>) with one exception: Open-ended responses, which can identify spe-

cific participants, violating their informed consent, are available by email request to the first author and IRB approval at the second author's institution to join the project as an approved researcher.

## Participants and Procedure

In April of 2021 we created a list of all tenured/tenure-track psychology faculty at 20 Baccalaureate Colleges (i.e., Predominately Undergraduate Institutions; henceforth PUIs), 20 Masters Colleges and Universities (i.e., M1s, henceforth Master's), and 20 Doctoral Universities (Very High Research Activity; henceforth R1s) using Carnegie Institute classifications (Indiana University Center for Post-secondary Research, 2018). To select these programs, we identified the top 20 ranked programs in U.S. News & World Report rankings (2021) in each category. We recognize that these rankings are both controversial and flawed (Jaschik, 2022; Saul, 2022; Tierney, 2013; Tremayne-Pengelly, 2023). Our hope is not to reify or justify the U.S. News & World Report rankings. Instead, we chose to use these rankings for two reasons: First, we wanted to identify universities where faculty would be highly research-productive and where they were likely to have multiple publications (presumably some of which would be with undergraduates). Second, unfortunately, there does not yet exist a strong alternative to the U.S. News & World Report rankings.

We used a random number generator to select 8 faculty from each list (or the whole department if there were fewer than 8 faculty) and emailed a total of 459 faculty members requesting their vita with publications with undergraduates labeled (e.g., by highlighting or underlining them).<sup>1</sup> Of those, 157 responded, 131 of whom had published with an undergraduate at least once. We then counted the number of undergraduate publications faculty had with undergraduates and identified the 15 most-frequent producers of coauthored undergraduate publications within each institution type (PUI, Master's, R1). The initial sample was comprised of 19.1% assistant professors, 25.4% associate professors, and 55.4% full professors. We did not collect data other than vitae from this initial sample, so we do not know age, gender, or ethnicity for these participants.

In October of 2021, we sent individual emails to these 45 faculty members telling them that they were one of the most-frequent producers of undergraduate publications in our sample. We explained that we were conducting a 15-minute open-ended online survey to better understand the keys to success in publishing with undergraduates and offered a \$15 [Amazon.com](https://www.amazon.com/) gift card as compensation. The response rate was high, with 38/45 (84%) faculty completing the survey, including 14 faculty at PUIs, 14 faculty at Masters-granting institutions, and 10 faculty at R1s. [Table 1](#) presents the sample information for the 38 faculty respondents. The numbers of undergraduate publications in this group ranged from 13 to 47 at PUIs, 6 to 37 at Master's

<sup>1</sup> This initial list and the data from it are reported in Giuliano et al. (2023).

**Table 1. Participant Demographics**

	<i>M</i> ( <i>SD</i> ) or %
Age	54.0 (11.4)
Gender	
Female	57.9%
Male	42.1%
Ethnicity	
White	89.5%
Black, Asian, Latino/a/x/e, or Mixed Race/Ethnicity*	10.5%
Rank	
Assistant or Associate Professor*	15.8%
(Full) Professor or Higher	81.6%
No Response	2.6%

Notes: \*To prevent from identifying any person, we collapsed across multiple groups.

institutions, and 8 to 30 at R1s. These groups also reported 0 to 16 (PUI), 0 to 9 (Masters), and 0 to 8 (R1) first-authored undergraduate publications.

**Measures**

The survey consisted of two parts; a full list of questions appears in the online supplement. After completing basic demographic questions, participants were asked eight open-ended questions, five of which were of primary interest to our analyses.<sup>2</sup> Specifically, participants responded to the following questions:

1. How would you describe yourself as a mentor? What are your primary goals in mentoring undergraduates? (0 missing responses; *n* words: *M* = 97.1, *Md* = 81.5)
2. What do you think are the primary keys to your success in publishing with undergraduates? Feel free to mention any factors related to your institution, department, curriculum, yourself, or the students. (1 missing response; *n* words: *M* = 82.0, *Md* = 62.0)
3. What are the biggest barriers/challenges to publishing with undergraduates that you face? (0 missing responses; *n* words: *M* = 60.4, *Md* = 45.5)
4. What do you most enjoy about publishing with undergraduates? What do you see as the benefits? (1 missing response; *n* words: *M* = 54.1, *Md* = 45)
5. Are there any aspects you don't enjoy and/or that you perceive as costs? (2 missing responses; *n* words: *M* = 43.0, *Md* = 25)

**Coding Team Positionality**

All three authors—one professor at a PUI (T), one associate professor at a research institution (J), and one under-

graduate student (W)—engaged in qualitative coding. Both faculty authors (T & J) participated in undergraduate research, published with their undergraduate mentors, and have supervised several undergraduates in research—T much more extensively than J. T was also J's undergraduate-research mentor and is currently W's undergraduate-research mentor. T and J have both been academically affiliated with PUI and doctoral-granting research institutions. The online supplement contains a fuller review of each author's experience with undergraduate research and discusses other identities that might have affected the interpretation of the open-ended responses.

**Qualitative Coding**

Qualitative analysis occurred in four stages. Stage 1: Prior to coding the responses, all three authors read papers on (reflexive) thematic analysis and (qualitative) content analysis (e.g., Braun & Clarke, 2021; Vaismoradi et al., 2013) as well as several examples of how these qualitative approaches had been applied (e.g., Byrne, 2022; de Vel-Palumbo et al., 2018). Together, the authors collectively decided to take a blended approach to thematic coding—using a bottom-up response-driven approach to identifying common ideas in the data and then assessing the frequency with which each of these ideas occurred.

Stage 2: Using a reflexive thematic analysis approach to identify codes and themes (i.e., a bottom-up approach to coding), we identified shared ideas in responses to each of the questions (Clarke & Braun, 2021). To do this, all three authors independently read all of the responses to each question and then went back through and created a list of codes that summarized frequent ideas mentioned in the responses. The goal was to have a code that would capture each idea that participants communicated in response to each question. From there, the authors met and discussed their coding schemes to collectively create a single coding scheme for each question.

Stage 3: Next, we took a quantitative content-coding/codebook approach to analyzing the data, coding each response for the presence or absence of each theme identified and then examining the frequency with which each code emerged (Braun & Clarke, 2021; King & Brooks, 2018). Throughout coding, we adjusted the coding scheme as needed—adding necessary codes and subtracting codes that seemed redundant or not applicable. All authors independently coded for the presence or absence of each code in each response. We then combined the responses into a single spreadsheet and individually examined disagreements. At that point, any author/coder could resolve the disagreement independently (e.g., if they noticed they missed a code). Rates of agreement at this point ranged from 85-95% and are reported for each question in the results. Next, we met again to discuss and resolve any remaining disagree-

<sup>2</sup> We asked three additional questions. The first was about how faculty recruit and select students. The second was about what students do to earn authorship. The results from those analysis appear in the online supplement. We also asked one question about faculty's own undergraduate research experience, but there were too few responses for thorough analysis, so we do not report these results.

ment on whether each code applied to each response. Because the final coding schemes are different for each question, we present them alongside the results.

Stage 4: After analyzing all data question-by-question, all authors read each participant's response to all questions as a whole in order to identify cross-cutting themes. We took a fully reflexive thematic analytic approach (Clarke & Braun, 2021) to these categories; thus, we did not code quantitatively for the specific mention of any phrase or idea or compute agreement between raters. Instead, each of the authors identified what they saw as consistent themes and then met to discuss them. The themes reported in the results section represent those the authors collectively agreed on during this final discussion, rather than all that were initially identified separately.

## Results

### How would you describe yourself as a mentor? What are your primary goals in mentoring undergraduates?

Table 2 presents the coding scheme and results for the question about faculty members' goals as a mentor and self-descriptions of their mentorship style. The authors initially agreed on 86% of the codes. Responses generally centered around three ideas: (1) goals in mentorship, (2) the amount of structure provided in mentorship, (3) interpersonal mentorship style. To avoid redundancy with the table, we summarize the most prevalent responses here. We do the same in all written results sections. Given the small sample size from each type of institution, we do not present frequency percentage data separately as a function of institution type, nor do we compare frequencies using inferential statistics. Nevertheless, all data are available and tagged by institution type via the open science framework (Howell & Giuliano, 2023; <https://osf.io/9ha2j/>).

#### Goals in Mentorship

Mentors generally suggested that they have mentorship goals of promoting the development of scientific (56%) and career/life skills (23%). Promoting scientific skills generally involved allowing students to learn how to do research or to be independent researchers through experience with specific aspects of research (e.g., writing, design, data analysis) or with the research process in general. The career and life skills category included responses focused both on building specific skills (e.g., teamwork, time management) and allowing students to explore their future career trajectory and path. For instance, one faculty member's response was simply, "Supporting their learning and career goals."

Several respondents indicated that they sought to promote positive affect and cognitions surrounding science and student's scientific ability, and in particular, promoting students' excitement or joy around science. These responses focused on the transmission of excitement from the advisor to the student or stoking a student's intrinsic interest in science, such as allowing students to experience "the excitement of coming up with good ideas." As an ex-

ample, one faculty member said that they "...aim to help undergraduates have fun with science."

#### Amount of Structure Provided in Mentorship

Responses regarding the amount of structure provided in mentorship were not particularly common (18%), but generally took two polar forms: high structure (10%) or low structure (8%). Some faculty mentioned that they provided a high-structure, hands-on experience for students, such as having a clear timeline for the project and regular meetings (10%). One faculty member expressed it this way: "I am hands on. I meet with my lab as a group once a week for an hour. In addition, all students in my lab are a leader or co-leader on a specific research project. I meet with the project leader and co-leader for an hour each week, too, for a project meeting. When a student is writing a proposal for an honors thesis or a senior independent study project, I meet with them individually for an hour each week to help them review the literature and design their study."

By contrast, others mentioned that they took a low-structure/hands-off approach (8%), giving students primary control over the project and its progression, as exemplified by the following: "Fairly unstructured but will meet regularly with students, and as needed, my goal is to stimulate curiosity and interest in a topic, give feedback on research design, future research, and my grad students do a lot of the supervision, and we then have joint meetings all together."

#### Interpersonal Mentoring Style

Finally, in discussing their mentoring style, many faculty described their interpersonal style or approach. Most frequently, faculty reported providing emotional support for students (28%), typically involving mention of interpersonal warmth and social support for the student or of working alongside the student as they grow in their capacities (e.g., "I would say that I'm a nurturing, warm, and enthusiastic mentor."). Faculty also mentioned treating students as collaborators (18%)—specifically the idea that they treat students as fully engaged members of the research team rather than as simply "assistants." For example, one faculty member said, "try to get them to take part and to take leadership of all aspects of publishable research from question identification, research, experiment programming, data collection, data analysis, and paper write up. All the students take part in creating research posters for conference presentation. Usually it is only the leaders of the project that continue to work on the manuscript all the way through to publication. I want my students to be able to take ownership of their project and to be able to explain the work to other scientists." Additionally, many faculty mentioned that they hold students to high standards and have high expectations for their involvement (18%), as in this quote: "I hold my students to high standards. I convey to them that I trust them and that I firmly believe they are capable of doing great work in the laboratory and as young scholars."

**Table 2. Responses to “How would you describe yourself as a mentor? What are your primary goals in mentoring undergraduates?”**

Code	Definition	Example	%
<b>Goals in Mentorship</b>			
Scientific Skill Building	Mentoring students to teach psychological science or to improve their scientific aptitude	I am focused on skill building for my students... Hard skills such as research design; development of assessment tools - online surveys, interview scripts; data collection, entry and analysis; preparing results in graph, figure or narrative; writing and presenting...	56.41
Promoting Excitement/ Joy in Scientific Pursuit	Promotion of positive affect toward science/ the scientific experience	I... have more fun leading students through the research process and getting them excited (which gets me excited).	35.9
Providing Tangible Benefits (Publications/ Presentations)	A tangible outcome such as a publication or presentation	My goal as a mentor is for my students to conduct publishable research and have at least one opportunity to present their research at a national research conference.	25.64
Career/Life Skill Building	Mentoring students to teach broad translatable skills and help them discover career/life paths and trajectories	...to support them in considering future career goals (e.g., pursuing research career, going to graduate school), to provide them with experience where they need to persist in case of challenge	23.08
Promoting Personal Growth/ Efficacy/ Worth	Promoting/revealing student self-worth or teaching them to be efficacious	...I shine a light on all that is wonderful about them. There is a gem in every student; I mine it so they see it in themselves.	15.38
Promoting Learning/ Curiosity	Promoting intellectual growth or increased curiosity	...my goal is to stimulate curiosity and interest in a topic	10.26
Gaining Mutual Benefit	Mentorship benefits both the mentor and the student	I look to create a win-win scenario, where the undergraduate contributes to a postdoc's and graduate student's project, and receives training in return.	7.69
<b>Structure Provided in Mentorship</b>			
High Structure/ Hands-On	Providing high levels of guidance and/or structure	I set clear time schedules, with tasks broken down into small units.	10.26
Low Structure/ Hands-Off	Providing low levels of guidance and/or structure	I try to challenge them to take ownership of the research. I only provide structure when asked to. I typically expect them to be self-motivated and to take responsibility for getting tasks done.	7.69
<b>Interpersonal Mentorship Style</b>			
(Emotionally) Supportive	Providing emotional support/care/warmth to students	I would say that I'm a nurturing, warm, and enthusiastic mentor.	28.21
True Collaboration	Students as equal partners/contributors in research	I treat my students like collaborators rather than research assistants. I welcome their ideas and I give them quite a bit of responsibility...	17.95
Provide High Expectations	High standards for students' participation in research	By asking my students to take the lead every step of the way I have found that they take ownership of the project and strive to do the work at a high level, typically a much higher level than students did in the past when they were simply doing what I told them to do.	17.95
High Investment	Mentor discusses investing a lot of time/ effort/energy	I invest a lot of time and energy into my mentees.	12.82

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**What do you think are the primary keys to your success in publishing with undergraduates? Feel free to mention any factors related to your institution, department, curriculum, yourself, or the students.**

Table 3 presents the coding scheme and results for the question asking about the primary keys to faculty success in publishing with undergraduates. The authors initially agreed on 88% of the codes. The responses fell into three broad categories: faculty factors, institutional factors, and student factors.

**Faculty Factors**

Faculty frequently suggested that their personal mentoring style was key to their success (58%). Not surprisingly, the most common elements mentioned in this category were similar to those observed when faculty responded to the previous question about their mentorship style: (1) treating students as collaborators/colleagues (e.g., “Students are treated as colleagues and co-investigators as much as possible;” 33%), (2) promoting a positive working atmosphere (e.g., creating a “fun research lab” environment; 33%), and (3) having high expectations for students and pushing them to match those expectations (“they know that expectations are [h]igh and they must be met if they want to remain with me;” 33%).

**Institutional Factors**

In terms of institutional factors, faculty most frequently mentioned the importance of their institution providing resources for research (56%). These included money for conducting research or to pay undergraduate research assistants (mentioned by 65% of those discussing resources), a system that provides them with time to do research such as a low teaching load or a reduced teaching load for mentoring undergraduates in research (mentioned by 55% of those discussing resources), or infrastructure for research such as dedicated lab space (mentioned by 50% of those discussing resources). As an example, one faculty member touched on multiple resource categories in noting that, “My institution provides generous structural support: A teaching credit for supervising student research, great facilities, and a generous start-up package. Money, space, and time are the most important.”

Faculty also mentioned that the structure and norms at their institution contributed to their success in publishing with undergraduates. Specifically, 28% of faculty noted that at their institution it is normative and valued to conduct research with undergraduates or that they had an institutional “culture of collaborating with undergrads.” Similarly, 17% mentioned that their department’s curriculum supports the training of undergraduates to prepare them for research or allows them to collect data for publication with undergraduates (e.g., coursework in methodology and statistics, learning to read research papers, and requiring conducting research for credit). An additional 11% of participants noted that they did not have any graduate

students, which facilitated them publishing with undergraduates (e.g., “We do not have graduate students so undergraduates are the only option...”).

Finally, faculty mentioned the importance of having institutional incentives for conducting research with undergraduates (19%). Specifically, they discussed the utility of offering students course credit for conducting research (17%; e.g., “by allowing students to get course credit or be paid for research in faculty labs”) and for research with undergraduates to reflect positively on them for the purposes of merit, tenure, and promotion evaluations (8%; e.g., “it does get acknowledged as something extra toward merit evaluation, which does impact pay for the subsequent year”).

**Student Factors**

At the student level, faculty generally mentioned factors internal to the student as contributing to their success in publishing with undergraduates. Most commonly, they highlighted the importance of student motivation (e.g., “students [here] want to do research,” mentioned by 77% of those discussing student factors) and student talent (“The institution where I work enrolls highly talented and highly-achieving students;” mentioned by 64% of those discussing student factors).

**What do you most enjoy about publishing with undergraduates? What do you see as the benefits?**

Table 4 presents the coding scheme and results for the question asking about the benefits of publishing with undergraduates. The authors initially agreed on 85% of the codes. Faculty generally emphasized two types of benefits: benefits to themselves as faculty (66%) and benefits to students (71%).

**Benefits to Faculty**

Given that the question asked faculty what they enjoy about conducting research with undergraduates, it is perhaps not surprising that the largest category of responses regarding benefits to faculty mentioned the personal intrinsic benefits of working with students (mentioned by 66% of respondents noting benefits to faculty)—such as having fun doing the work, feeling a sense of fulfillment, or feeling a sense of pride. For instance, one faculty member said, “I just love spending time with undergraduates. Having weekly meetings with them in pairs or individually lets me get to know them extremely well. I really like them! ”

Faculty also focused on the benefits to their research program that working and publishing with undergraduates provided them (mentioned by 32% of respondents noting benefits to faculty). One respondent, for example, admitted that “I’m not terribly self-motivated to publish (especially at this point in my career—I’ve already been promoted to Full and my priorities are in Faculty Development rather than scholarship), publishing with undergraduates keeps me on-track. They act as my accountability team.” Nearly

**Table 3. Responses to “What do you think are the primary keys to your success in publishing with undergraduates? Feel free to mention any factors related to your institution, department, curriculum, yourself, or the students.”**

Code	Definition	Example	%
<b>Faculty Factors</b>			72.22
Mentorship Style			58.33
<i>Students as Collaborators</i>	Treats students as equals/collaborators	Making undergraduates feel like they're colleagues—treating them not like "test tube cleaners" (as I often refer to it) but as scientists who are at the level of graduate students.	19.44
<i>Optimistic or High Expectations</i>	Has high expectations or holds students to high standards	I push them pretty hard and our lab sets up a culture of working independently, taking ownership, working hard, and being reliable.	19.44
<i>Positive Atmosphere</i>	Positive environment/atmosphere in their lab	We do our best to create a very respectful environment that both expects students to excel, but keeps the mood of the lab relaxed, very open and as supportive as possible.	19.44
<i>Personal Passion</i>	Has personal passion or motivation	I love doing research with undergraduates, and I am willing to dedicate the time to this endeavor.	11.11
<i>Providing Structure</i>	Providing clear expectations or a strong structure	I am pretty directive because I want their final product to be a publishable paper—to do that, I need to work with them to develop more directed ideas.	8.33
System of Research			22.22
<i>Student Co-Mentorship</i>	Students mentor other students	Because undergraduate students are typically directly mentored by graduate students and postdocs, we have more bandwidth to involve undergraduates in our work (compared to if only I worked with these students).	16.67
<i>Topic of Research</i>	Their specific topic of research lends itself to undergraduate work or promotes enthusiasm	I constrain their research projects to be ones that I have expertise in, that we have the technical resources for, that can be completed in a year, and that they have the ability to be able to analyze the data in an appropriate manner.	5.56
<i>Effective System</i>	Has a good/effective system in place	I have figured out a good system that works for me and my students to be productive.	2.78
Personal Effort	Personal willingness or effort to engage in research with undergraduates	Intentional effort on my behalf to push students to take the lead in developing, conducting, and writing up the results of their own research study.	22.22
Research Skill/Productivity	Faculty research abilities or their overall productivity	...I have a ton of ideas.	11.11
Needing Help/Labor	Needing student labor	I... need people to run participants.	8.33
<b>Institutional Factors</b>			66.67
Resources			55.56
<i>Money</i>	Funding for research or research assistants available	...I award up to 3 ugrad research assistantships (40 hours/semester at min wage) per fall, spring, and summer, as well as offer up to 2 research fellowships for ugrad where faculty mentor gets \$1000 and student gets \$4000.	36.11
<i>Time</i>	Some factor provides them time to conduct research	A 2-2 teaching load that left time to do research and not only teach	30.56
<i>Infrastructure and Supplies</i>	Resources such as lab space or meeting space that facilitates research	My institution encourages a lot of research activity by...providing research infrastructure to faculty (animal facility with no per diem costs, shared equipment).	27.78
Norms	The university or department has a culture of undergraduate research	Our department... values research with students and the mentoring of students...	27.78
University Incentives			19.44

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Code	Definition	Example	%
<i>Course Credit for Students</i>	Students can get course credits for involvement in research	Students... can take 1-3 credit hours per semester and each credit hour receives a separate letter grade. They all want to see As on their transcript, so they (generally) do what is asked and expected of them.	16.67
<i>Merit for Faculty</i>	Research with undergraduates reflects well on them in merit actions (e.g., tenure/promotion)	[My university] promotes the teacher/scholar model in recruiting faculty and all our of promotion and reappt standards	8.33
Curriculum Development	Department/ university have developed the curriculum in a way that facilitates undergraduate research	My institution... supports faculty/student research engagement as part of our curriculum	16.67
No Graduate Students	Do not have graduate students	There are no graduate students, whose academic and professional needs would necessarily take precedence over those of undergraduates.	11.11
<b>Student Factors</b>			<b>61.11</b>
Student Motivation	Mentions the enthusiasm/desire/ motivation of students	The institution where I work enrolls highly-talented and highly-achieving students, many of whom come from families with extraordinary intellectual capital. The student body as a whole aspires to scholarly achievement.	47.22
Student Talent	Mentions the intellectual or research talents of the students	[Our] undergraduates often graduate at the very top of their high school class, and come... with enormous reserves of energy and intelligence, usually a strong work ethic and enviable reasoning skills (as much as I would like to take credit!)	38.89
Good Training	The curriculum or training promote student skill for research	Our students develop a strong background in statistics (3 required courses for the major and minor).	5.56

half of those who mentioned research benefits (49%) described an increase in their own productivity (e.g., increases in data collection, publication, presentations). Others mentioned that working with undergraduates improved their research practices or questions (mentioned by 32% of respondents noting research benefits), such as by providing original personal perspective from someone “not steeped in the modern literature” or by requiring faculty to engage in high-quality research practices (such as scientific transparency/open science). Additionally, some faculty mentioned that students provided them with accountability—forcing them to stay up-to-date with the emerging literature and research practices as well as moving the publication process forward (noted by 24% of respondents mentioning benefits to faculty). Others reported that they personally improved from their experiences with undergraduate research, such as by learning new information from students (mentioned by 24% of respondents noting benefits to faculty; e.g., “It keeps me engaged. I learn a lot from their questions.”)

Still other benefits mentioned by faculty included access to unique activities, such as having writing retreats, attending conferences, or doing atypical but enjoyable research projects that they would not do otherwise (mentioned by 19% of respondents noting benefits to faculty). For example, one faculty member noted, “I like working with smart

and engaged young people. I enjoy the fact that they are free to follow their interests and research questions that are close to their hearts and to their lived experience. (Graduate students seldom have the luxury to do that.)”

Finally, faculty mentioned interpersonal benefits, such as establishing social and professional relationships with their students that continue after they leave the university (e.g., “Many research collaborations with undergraduates have led to long-standing personal/professional relationships”; mentioned by 19% of respondents noting benefits to faculty) and receiving professional recognition or “kudos” for their work with undergraduates (e.g., “Undergraduate research is valued at my institution. I have been named a Distinguished Faculty [career award] and was just awarded an endowed professorship,” mentioned by 19% of respondents noting benefits to faculty).

**Benefits to Students**

Many of the categories of benefits that faculty mentioned for themselves also applied to students, including professional benefits, intrinsic benefits, and personal benefits. The most frequently mentioned benefits to students were professional. For example, faculty mentioned that research provided students with experiences that helped improve their professional skills that advance their career (mentioned by 69% of respondents noting benefits to stu-

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**Table 4. Responses to “What do you most enjoy about publishing with undergraduates? What do you see as the benefits?”**

Code	Definition	Example	%
<b>Benefits to faculty</b>			65.79
Faculty Intrinsic Rewards	Hedonic or meaning benefit to conducting research	It is just a lot of fun to work with them.	43.59
Access to Unique Activities	Engaging in activities or research they would not otherwise	I think the thing I enjoy most is that we can conduct research projects that are whatever we find interesting at the time...we spend time doing science rather than chasing the most fundable topics.	12.82
<b>Research Benefits</b>			21.05
<i>Increased Productivity</i>	Benefit to own publication record/ data-collection ability	...Publishing with students boosts my publication record	10.26
<i>Improved Research Questions and Practices</i>	Student involvement makes the research questions better	I also find that when I collaborate with students it forces me to articulate the rationale for each step in the process and the logical progression of the paper content, leading to what I think (hope) may be a better product.	7.69
<i>Accountability</i>	Student research keeps them accountable for publishing or staying up-to-date with the field	Publishing with undergraduates keeps me on-track. They act as my accountability team.	5.13
<i>Self-improvement</i>	The research helps them grow	It is renewing and energizing to engage with upcoming generations of students. I learn from them.	5.13
Relational Benefits	They establish social/professional relationships with the undergraduates	...creates future potential collaborations for myself and a new crop of students.	12.82
Professional Benefits (Beyond Publication/Presentation)	Extrinsic rewards to them as a professional	Benefits include... the kudos I receive professionally (e.g., looks good to people in charge of evaluating my productivity)	12.82
<b>Benefits to Students</b>			71.05
Professional Benefits	Benefits to student career or graduate school prospects	It's helped every student advance in their career even if it's not primarily a science career. That's the most satisfying part of all mentoring.	48.72
Learning the Field	Provides students an introduction to being scientists or members of the profession	It's wonderful to...see them becoming thoughtful consumers and producers of science.	28.21
Student Intrinsic Rewards	Students imbued with positive affect such as pride or excitement	I like seeing them get excited about research	25.64
Self-improvement	Promoting student feelings of growth, efficacy, accomplishment, or empowerment	I love watching them grow in their knowledge and confidence.	23.08
Publications/Presentations	Students get publications or presentations	Students with multiple undergraduate publications tend to do exceptionally well after leaving my institution	23.08

dents), as well as their scientific skills as they learn the field of psychology (mentioned by 28% of respondents noting benefits to students). Further, faculty mentioned providing students with vita-building, tangible products such as publications and presentations (mentioned by 32% of respondents noting benefits to students).

In addition to professional benefits, faculty described the intrinsic benefits to students, such as getting to enjoy

the research process or having fun doing their own science, as well as self-growth and self-improvement—such as growing in confidence or self-efficacy (mentioned by 32% of respondents noting benefits to students).

## Are there any aspects you don't enjoy and/or that you perceive as costs? What are the biggest barriers/challenges to publishing with undergraduates that you face?

Although our survey asked two questions separately (one about unenjoyable aspects and one about barriers), we found that the codes and themes that emerged for the questions overlapped substantially. As such, we created a coding scheme using the codes we identified for both questions and applied it to responses for both questions. As a result, there are some codes that have "N/A." Consistent with the shared coding scheme, we present the results for both responses together here, focusing on commonly emerging themes.

Table 5 presents the coding scheme and results for the questions regarding the perceived *barriers* to undergraduate research and the perceived *unenjoyable aspects/costs* of undergraduate research. The authors initially agreed on 93% of the codes.

Four major subcategories emerged for each of the responses: Student factors, faculty factors, institutional factors, and field factors.

### Student Factors

Faculty responses regarding the barriers and unenjoyable aspects/costs of publishing with undergraduates focused on two types of student factors: (1) a lack of skills to carry out publishable research and (2) a lack of time or motivation (i.e., prioritizing other activities).

Of those mentioning student factors, by far the biggest issue that emerged was student skill (58% barriers; 44% unenjoyable aspects). In particular, these responses emphasized a deficit of overall research skill/ability—such as lacking experience designing a study or keeping lab equipment clean or being too novice (of responses mentioning student skill: 53% barriers; 50% unenjoyable aspects). Responses related to skill also highlighted students' poor writing ability (of responses mentioning student skill: 47% barriers; 50% unenjoyable aspects). To a lesser extent, faculty also mentioned that students lacked data analytical skills (of responses mentioning student skill: 27% barriers; 27% unenjoyable aspects).

Related to these issues, some faculty also lamented the comparative difficulty of conducting research with undergraduates compared to conducting research with graduate students, other faculty, or by themselves (of responses mentioning student skill: 31% barriers; 39% unenjoyable aspects). For example, faculty typically noted that research was more difficult or required greater effort when collaborating with undergraduate coauthors.

Another common theme across student factors was a general perception that students did not have sufficient time nor motivation to significantly contribute as collaborators. Specifically, faculty often mentioned students' busy schedules and conflicting commitments (of responses mentioning student issues: 38% barriers; 22% unenjoyable aspects). Additionally, they discussed students' inability to stay motivated and committed to conducting research (of

responses mentioning student issues: 27% barriers; 39% unenjoyable aspects).

### Faculty Factors

In addition to student factors that created barriers or represented unenjoyable aspects of research with undergraduates, faculty described some personal, faculty-level factors. The clearest of these issues was faculty lack of time, often due to competing responsibilities (e.g., teaching, personal research projects, service to the university, or even family/home life; of responses mentioning faculty issues: 94% barriers; 60% unenjoyable aspects).

### Institutional Factors

Faculty mentioned three factors at the department or institutional level that were either barriers to, or unenjoyable parts of, conducting research with undergraduates: (1) program timing/turnover, (2) lack of resources or support, and (3) lack of rewards. Of the faculty mentioning institutional factors that were barriers to publishing with undergraduates, 82% indicated that students are often in their lab for too short of a time to complete the full research process—often only for a semester or a year at most. Similarly, 63% of faculty who mentioned institutional factors suggested that this rapid turnover and constant need to train new students was an unenjoyable part of conducting research with undergraduates.

### Field Factors

The final organizing code that emerged capturing barriers to publishing with undergraduates and unenjoyable aspects/costs of conducting research with undergraduates were issues with the field or the science more broadly. Largest among the barriers was the sheer amount of time required to conduct a publishable product (70% of responses discussing field factors). Faculty described the high standards for research publication and the consequential high time and effort required to reach these standards. In a similar vein, some faculty lamented the soaring standards for publication, which creates an additional barrier to publishing with undergraduates (20% of responses discussing field factors).

Finally, faculty described difficulty with logistics and coordination as a major source of unenjoyment in conducting research with undergraduates (75% of responses discussing field factors). Specifically, they noted difficulties arising from having to do tasks such as managing constant applications, organizing a consistent line of research amid frequent undergraduate turnover, and having to constantly train new research assistants.

### Cross-Cutting Themes

The authors identified themes that emerged across questions, coding these into three categories: (1) overarching themes (2) individual faculty differences, and (3) institution-type differences.

**Table 5. Responses to “What are the biggest barriers/challenges to publishing with undergraduates that you face?” and “Are there any aspects you don’t enjoy and/or that you perceive as costs?”**

Code	Definition	Example	Barriers/Challenges		Costs/Unenjoyable Aspects	
			%	Example	%	
<b>Faculty Factors</b>			42.11		39.47	
Time	Lacks the time to devote or has alternative responsibilities	Time is the biggest challenge given competing teaching, research, and service demands.	39.47		I put a lot of time into mentoring graduate students. That's more than enough to fill all of my time and then some.	23.68
Motivation			5.26			
<i>General Lack of Motivation</i>	Lack of personal motivation	I don't particularly enjoy writing for publication, so I'm not a very good cheerleader for them. In fact, my last student-authored publication only happened because the students want to write it up. I was burned out on the project and had no interest in thinking about it further."	5.26		I don't really enjoy research writing, so the truth is that I probably wouldn't do it myself...	2.63
<i>Past Experiences</i>	Negative past experiences hinder their desire to conduct research with undergraduates again	N/A	0		[When students step away, it] can be hard on my own productivity, resulting in many hours of training and mentorship that stop short of earning a "coin of the realm" (e.g., pub; poster; etc.)	7.89
<i>Demotivation over Time</i>	Decreased motivation/excitement toward undergraduate research across time	Motivation...at this point in my career I don't need to publish as much as before (nor do I have the time, with other responsibilities), so I've intentionally limited the extent to which I work with students on research.	2.63		I've worked closely with undergrads on research for the past 20 years, so at this point I don't find it that novel or exciting as before.	2.63
Skill/Ability	Mentions lack of personal skill/ability	Honestly, my biggest barrier is that I'm not very good at explaining why writing needs to be revised... I also struggle to focus on "big picture" issues with their writing...rather than copy editing.	5.26		N/A	0
Prioritize Other Outcomes	Mentions prioritizing other outcomes for students engaged in research	I have a strong desire for students to attend conferences and present... That means, I typically have more new projects each year than I am able to focus on for manuscript preparation. This is the only way for students to get travel money from our institution to go to a conference. So, I have project after project after project that former students have completed that I cannot write into manuscripts.	7.89		N/A	0
<b>Student Factors</b>			68.42			47.37

Code	Definition	Barriers/Challenges		Costs/Unenjoyable Aspects	
		Example	%	Example	%
Skill/Ability			39.47		
Writing	Mentions students' lack of writing ability	Undergrad coauthors are not very helpful for writing collaboration (I have strong views about how things should be written, and few undergrads have developed sufficient mastery to improve upon my approach).	18.42	They are usually not very good writers so a lot needs to be heavily edited. It is very time consuming.	10.53
Data Analysis	Mentions students' lack of ability to do statistical analysis	Students aren't that helpful in data analysis.	10.53	Yes, their lack of preparation for my kind of research. I no longer teach statistics, and the current ANOVA instructors do not teach conceptually.	7.89
Overall Skill/Ability	Mentions lack of skills generally or non-writing/non-analytic skills or lack of preparation	Undergrads are not professionally at a place where they can successful transform a paper/poster/thesis into a published work...	21.05	Students really don't have enough time to learn to program, do statistics, etc. They don't have time or the expertise to keep the lab software and equipment in good condition. They are still young and are juggling their ugrad classes and growing up at the same time as working in the lab.	10.53
Motivation	Mentions students not being committed or motivated or mentions disinterest	Undergraduates rarely have the time (or motivation) to do the necessary work to see a paper through to publication.	18.42	A constant onslaught of applications from undergraduates whose abilities and commitment are difficult to judge and of whom many will flake after initial engagement.	18.42
Time/Conflicting Commitments	Mentions students not having the time to carry out research (not because of program length)	It's the same as with anyone else: time. They are often as overcommitted as the rest of us so it can be hard to carve out enough time to work on the papers.	26.32	Sometimes students give up/aren't committed/overly committed to other things...	10.53
Comparative Difficulty	Mentions how research with undergraduates is particularly slow or difficult	Publishing with undergrads is slower than with grad students because they simply don't have as much experience yet.	21.05	In some circumstances, it would be faster and easier for me to just write the paper myself.	18.42

Code	Definition	Example	Barriers/Challenges		Costs/Unenjoyable Aspects	
			%	Example	%	
Too Many Students	Suggests that they simply cannot accommodate the number of students who are interested	N/A	0	I would be a more productive scholar if I worked with one or two students per semester rather than 4 or 5.	5.26	
<b>Institutional Factors</b>			44.74		21.05	
Resources/Support	Mentions lack of resources to support undergraduate research	Limited institutional support (little pay, no course release time, etc.) for mentoring student research.	10.53	I must turn most students away because of limited equipment availability in my lab...	7.89	
Program Timing/ Turnover	Mentions students only being available for a short amount of time in the program	Often a student is around for 4-6 months, not long enough to get a study started, data collected, analyzed, report written, etc.	36.84	I still find it difficult to manage the rapid turnover and need for constant recruiting/training.	13.16	
Lack of Rewards	Mentions lack of incentives or rewards for engaging in research with undergraduates	I've been told directly by colleagues that it's a waste of time since we get next to nothing for it.	2.63	N/A	0	
<b>Field Factors</b>			26.32		21.05	
Field Changes	Mentions changes to the field or field's standards	Standards for publication have soared and it is difficult to publish single studies and studies with modest sample sizes, even if they are jam-packed with innovative ideas and methods.	5.26	N/A	0	
Time/Effort Required for Research	Mentions the high time/effort required to conduct research	It can sometimes take 1-2 years to get a paper out the door, and if they don't really respond to emails and contribute to the ongoing efforts, it sometimes doesn't make sense to include them as a coauthor.	18.42	It takes a lot of time to do research- including supervising them	5.26	

Code	Definition	Barriers/Challenges		Costs/Unenjoyable Aspects	
		Example	%	Example	%
Difficulty with Logistics/Coordination	Mentions some difficulty with the coordination of research	It can be tricky to coordinate multiple students working on drafts of a paper...	2.63	...with no longer-term institutional memory you must always be personally recruiting and training new undergraduate researchers.	15.79

## Overarching Themes

Two consistent themes emerged when considering responses holistically: (1) resources—in particular, time—are key to success in publishing with undergraduates, and (2) writing is the hardest part of undergraduate research.

**Resources are Key.** Consistently across questions, it was clear that resources are key to success in publishing with undergraduates. Faculty reported needing course reductions and dedicated time for undergraduate research. Additionally, they mentioned needing dedicated student time—either by paying students or by allowing them to take a course for credit. They also lamented the mismatch of the longer timeline to publication relative to how long they typically work with undergraduates (e.g., “Many are in my lab only one year, and then they graduate and go onto other things”), suggesting that they were better able to publish with students who stayed in their lab longer. Moreover, faculty acknowledged that research with undergraduates takes much longer than research by themselves or with graduate students. By contrast, those who had access to resources such as time, money, or space often reported these as a boon to the likelihood of undergraduate publication (e.g., “I can count my lab in my course load and this makes a big difference”, “Students can write small grants for travel funds, for materials, and even for money for MTurk subjects”, “Having my own dedicated lab space is key”).

**Writing is Difficult.** Although faculty described a variety of barriers to publishing with undergraduates, writing seemed to be the consensus most difficult part, as illustrated by the following quotes: “They are usually not very good writers, so a lot needs to be heavily edited; it’s very time consuming,” “It is unusual for undergraduates to be able to write a useful first draft”. In general, faculty discussed that undergraduate writing is far off from publishable/professional writing, and that it can be difficult and time-consuming to train students to the level where they can contribute significantly as a coauthor.

## Individual Differences in Faculty Perceptions

There were two key individual differences that emerged in faculty members’ view of undergraduate research; these involved their self-perceptions and the outcomes they sought for their students.

**Self-Perceptions.** First, we found that the way faculty discussed their primary role in working with students varied. Specifically, faculty seemed to think of themselves as either a “sage” or a “collaborator”. Faculty who saw themselves as a sage generally perceived themselves as having knowledge and imparting that knowledge onto undergraduates. Responses typical of a *sage* self-view describe faculty as holding the keys to knowledge and understanding. Sages generally saw students as unprepared to conduct science independently and in need of specific faculty guidance to make their way toward being able to conduct independent research. Importantly, these respondents did not denigrate undergraduates. Instead, they simply treated undergraduates as students who need to be taught a skill, and, in doing

so, these faculty shouldered the burden for moving projects forward. A prototypical response was:

*I am someone who peels back the curtain like Toto did in the Wizard of Oz—let them see what lies beyond the curtain: the false starts, the excitement of coming up with good ideas, the challenges in reading research articles, the fun of seeing what the data analyses show us, or going back to the drawing board!*

On the opposite extreme, responses typical of a *collaborator* self-view suggested that the students were true equal partners in the work. Collaborators deferred to the students for project ideas and approaches and generally let those students guide their own experience. These respondents appeared to view students as ready to make a substantive contribution and put much of the onus on the student. A prototypical response was:

*...my approach when mentoring students is to form a true collaboration in which the students work with me as an equal partner on a research project from beginning to end. ... I do not dictate what we work on. Rather, the students and I discuss... I defer to the students and ask them how they think we should proceed. This student-led approach to the work sets in motion a critical process that stays consistent throughout our project ...*

**Student Outcomes.** A second individual difference that emerged from responses was in the extent to which faculty sought to develop students as scientists versus broader members of society. Many faculty focused particularly on training students as scientists. These responses were primarily restricted to discussing scientific development but did not mention promoting broader efficacy or developing transferrable skills, as in the following comment: “My goal is to...give them the tools they need to soon begin asking their own questions in the field.”

By contrast, other faculty were more likely to emphasize general student growth. These faculty focused on developing transferrable skills and promoting student self-worth, as illustrated by this response: “I seek to support and grow their personal capacities. I shine a light on all that is wonderful about them. There is a gem in every student; I mine it so they see it in themselves.”

## Differences Based on School Type

We noticed that, as a general rule, responses from faculty at PUIs and Master’s institutions seemed more similar compared to responses from R1 faculty. Indeed, one clear trend in the overall responses was that respondents from PUIs ( $M = 83.62$  words,  $SD = 56.40$ ) and Master’s institutions ( $M = 80.29$  words,  $SD = 75.10$ ) offered longer and subjectively more thorough responses than did those from R1 institutions ( $M = 35.01$  words,  $SD = 27.92$ ). We compared the effect of school type on word count of responses to all questions using multilevel modeling and including a random intercept for each participant to control for the fact that response length to the questions was nested within each participant. This analysis confirmed that both faculty from PUIs ( $b = 48.61$ ,  $SE = 15.36$ ,  $p = .003$ ) and faculty from Mas-

ter's institutions ( $b = 45.27, SE = 15.15, p = .005$ ) wrote significantly more words than did those from R1s. In addition to the response-length differences, faculty at R1s seemed to differ from PUI and Master's faculty in (1) their overarching goals and (2) the types of barriers and issues they discussed.

**Primary Goals.** Related to the individual differences in student outcomes identified earlier, we found that faculty at PUIs and Master's institutions more frequently framed their work with undergraduates as providing core development and promoting growth generally, whereas faculty at R1s tended to focus specifically on scientific development and mutual benefit. A prototypical contrast is illustrated by the responses below:

- PUI: "My hope is that working with others in a research lab and having a mentor who sees and respects them can help them develop a strong sense of self and a sense of value..."
- R1: "I view it as a collaboration with two broad goals. First, the undergraduate research assistant deserves a strong learning experience in which they learn directly about the underlying design and goals of the study they are working on. When this goes as well as possible, some undergraduates have risen to the level of coauthors on peer-reviewed papers. Second, we benefit from the undergraduates' assistance because it allows our research team to collect more data while still having adequate time for data analysis and exploration."

**Barriers and Issues Discussed.** Finally, we noticed that faculty at Master's and PUIs (relative to R1 faculty) tended to focus on their broader ecological context. For example, faculty at Master's or PUIs frequently mentioned institutional support, course loads, and field-wide barriers to publication. By contrast, faculty at R1s almost exclusively focused on their lab in responding to every question and rarely mentioned institutional, departmental, or field-wide factors as promoters or barriers to success. We also noticed that faculty from Master's and PUIs did at times point to their own inadequacies and flaws, whereas R1 faculty did not make similar comments.

## Discussion

To date, very little empirical research has examined faculty-undergraduate coauthored publication in psychology (c.f., Giuliano et al., 2022, 2023) and none specifically address the factors that facilitate or hinder successfully publishing with undergraduates. As such, we sought to extend the literature in this area by conducting an in-depth qualitative study of faculty with strong records in producing undergraduate publications. We acknowledge that our study has limitations (as discussed below); nonetheless, several interesting themes emerged from faculty responses that,

although they warrant replication and cross-validation in future research, illustrate important lessons about the factors that can help or hinder the process of publishing with undergraduates.<sup>3</sup>

## Lessons Learned

### *Successful Faculty Have Several (but not all) Traits in Common*

One important lesson suggested by our results is that a wide variety of mentoring styles are possible (Holmes & Roberts, 2019), and all can be successful in producing undergraduate coauthored publications—whether a faculty member is a *Sage* or *Collaborator*, whether they are more hands-on or they emphasize independence and struggle, and whether they are at a PUI, Masters, or R1 institution. Indeed, our sample of highly successful faculty tend to have three traits in common: A genuine enjoyment of working with undergraduates, a sense of personal efficacy, and a willingness to adapt.

A common theme that emerged from reading faculty responses was that they genuinely love working with and mentoring undergraduates. They describe the collaboration as fun and rewarding, both in terms of their own personal satisfaction and the satisfaction that comes from teaching students the skills that will help them in the future. Although there are also extrinsic benefits (e.g., collaborating with undergraduates can increase a faculty member's overall productivity), the focus was more often on intrinsic enjoyment and rewards. Consistent with research on the power of intrinsic motivation (Deci & Ryan, 2013), an inherent interest in collaborating with undergraduates is an important characteristic of faculty who are successful at publishing with them.

Next, successful faculty feel capable of producing undergraduate coauthored publications (they have a sense of self-efficacy to do so; Bandura & Walters, 1977). That is, successful faculty have found a collaborative publishing process that works for them and that they are happy with, although the nature of that process looks different for each faculty member (Adams, 2019; Scisco et al., 2019). A second component of their self-efficacy is having a pool of talented, motivated students to work with. Although faculty sometimes mentioned a lack of certain skills (such as writing or data analysis) as a potential barrier to publishing with undergraduates, overall, they seemed grateful and appreciative of the quality of students at their institution (e.g., "Our students are highly capable for undergraduates", "We have a lot of students who are 'grad-school ready' and just need some guidance").

Finally, successful faculty are willing to adapt. They frequently acknowledged that publishing with undergraduates is slower than is publishing alone or with faculty or grad-

<sup>3</sup> Readers may also be interested in a special collection of 43 (mostly non-empirical) articles on the topic of "engaging undergraduates in publishable research." The editorial (Giuliano et al., 2019) can be found [here](#) and contains links to a diverse array of articles by faculty authors that suggest ways to both address the challenges and optimize the experience of publishing with undergraduates.



uate student collaborators, and that it requires a lot of effort to help get undergraduates up to speed, yet they seem to readily accept this tradeoff because of the intrinsic rewards. As one faculty member noted when asked about the biggest challenges of publishing with undergraduates: “Not so much a challenge, but a resignation to the fact that the process will be slow. I believe the work that my colleagues and I do with undergraduates is as good as our colleagues with graduate students, but the pace of our work is much slower. There’s a lot of handholding in this research environment, but it’s well worth the effort. The experience itself is joyful and deeply rewarding.”

### ***Resources are Essential and Time is the Most Important Resource of All***

Throughout participant responses, time (in one form or another) emerged as the most frequently mentioned necessary resource for publishing with undergraduates. Variations on this theme included issues with the amount of time it takes to complete a project, the extra time it takes to mentor undergraduates, timing of projects that leads to turnover, and time lost due to turnover. Other necessary resources included infrastructure (such as lab space), money to conduct research and to pay undergraduate collaborators, and incentives—particularly those related to time—for faculty-undergraduate collaboration, such as incorporating undergraduate research into faculty course load (Mickley Steinmetz & Reid, 2019; Stefanucci, 2019) and giving course credit to students for conducting research.

If universities are serious about providing their undergraduates with research and authorship experiences, it is imperative that they “put their money where their mouth is” and provide more resources (such as those described above, including money for research and paying research assistants and time in the form of student course credit and reduced faculty course load) that enable faculty to engage in high quality, publishable research with their undergraduates. In the meantime, many faculty have developed strategies for maximizing resources, such as saving time by using group-based or ladder mentoring in the lab (Detweiler-Bedell & Detweiler-Bedell, 2019; Dunbar, 2019; Overman, 2019) and collaborating across institutions to share equipment, resources, technology, and expertise (Bukach et al., 2019; Goldey et al., 2019; Hammersley et al., 2019). Departments can also scaffold their curriculum (Mendoza & Martone, 2019; Mickley Steinmetz & Reid, 2019; Reavis & Thomas, 2019) so that research training takes place throughout courses in the major, and not just during research methods courses. Models that encourage or reward students for working longer in a research lab (e.g., at least a year, but preferably with options for a second or third year) would help solve issues associated with timing and turnover, as faculty who work with undergraduates for a longer time are more likely to publish with them (Giuliano et al., 2023). As noted by many in our sample, it is also helpful when there are incentives for publishing with undergraduates and when department and university norms specifically support publishing with undergraduates (e.g., “My department and university value and reward research

collaboration with undergraduates. It is at least as valuable for me to publish an article with student authors outside my primary area of expertise than to publish a single authored paper in my primary research area”).

### ***Writing is Crucial for Coauthorship, but Difficult to Teach***

Writing was frequently listed as one of the most challenging barriers to publishing with undergraduates. Half of all faculty who mentioned students’ lack of skill as a barrier specifically mentioned their lack of writing ability. Moreover, faculty lamented that teaching students to write at the level required for publication takes a lot of time and/or requires skills that many faculty do not have. Clearly this is an area that warrants more empirical attention in the future to identify ways to carve out time for writing with undergraduates (one possibility is student writing weekends or retreats; Scherman, 2019). It is also important to find effective ways to teach undergraduates to write professionally at the level needed to publish, such as through the development of psychological-scientific-writing-specific curriculum or including specific writing activities and handouts for students in classes (see Giuliano, 2019).

### **Limitations and Future Directions**

The present study offered extensive in-depth insight into the mentorship of and publishing with undergraduate coauthors. Nevertheless, this work is merely a first step in providing a full understanding of faculty-undergraduate publication, and its limitations suggest several important directions for future research. Perhaps the most noticeable limitation is in our ability to generalize from this sample, which involved faculty who frequently publish with undergraduates from schools ranked highest by U.S. News & World Report rankings (2021). We hoped that this sample could provide insight into keys to success from a sample of faculty who regularly published research with undergraduates. Nevertheless, we recognize that these faculty likely have very different experiences with undergraduate research compared to faculty at other types of institutions, such as community colleges or “Special Focus Research” institutions, as well as those at institutions where resources and undergraduate preparation (but not necessarily motivation) may be lower.

A related limitation is that we intentionally targeted those who had published most frequently with undergraduates. Thus, our findings are unlikely to generalize to the field’s experience as a whole. For example, missing from these data are people who regularly conduct research with undergraduates, but have been unable to publish (much or at all), or those who shy away from research with undergraduates altogether. Future work should compare the motives and drives of faculty in each of these groups to more thoroughly understand the joys and perils of publishing with undergraduate coauthors.

A final limitation to the generalizability of the present findings was that our sample consisted heavily of tenured faculty. This was almost certainly because more senior fac-

ulty generally have more publications and there is a strong positive correlation between the number of publications a faculty member has and the number of publications they have with undergraduates (Giuliano et al., 2022). Although more senior faculty are likely to have the most *experience* publishing with undergraduates, junior faculty are increasingly more likely to publish with undergraduates early in their career (Giuliano et al., 2023). As norms around publishing with undergraduates shift and early career researchers become increasingly involved in this process, it is possible that some barriers may become more potent (such as time and rewards), but also that some benefits may become more influential (such as promoting personal growth as a scientist). Because of the above-mentioned limitations to generalizability, it is crucial for future research to more fully tap the population involved in—or actively opting out of—publishing with undergraduates.

In addition to issues of generalizability, we would be remiss not to acknowledge our own potential biases as researchers. This research was conducted by one faculty member at a PUI, one undergraduate researcher, and one faculty member at a high-research-activity, doctoral-granting university. As such, our extensive experience with the joys and tribulations of publishing with/as an undergraduate(s) gave us specific insight into the responses. Indeed, we harbor collective expertise surrounding publishing with undergraduates, having experienced it ourselves from multiple angles and published prior research on the topic. Nonetheless, given that we all have our own experiences publishing with (and/or as) undergraduates, we likely brought our own biases into the reading and coding of the data. Although we took great care to try to eliminate bias by converging on coding schemes and content codes, we might have missed some important nuances in coding that others (e.g., at a different type of institution or with a different type of experience) might have noticed.<sup>4</sup>

Finally, our study focused exclusively on the faculty perspective on publishing with undergraduate coauthors (see Matthews & Rosa, 2018, for an undergraduate perspective). If publishing with undergraduates is a puzzle, then we have only endeavored to piece together half of it. As such, future research should examine what successful undergraduate coauthors think supported or hindered their own success.

For example, it is possible that the factors undergraduates perceive as influencing their success center primarily around their own and their faculty mentor’s abilities (and they may be less aware of how factors such as faculty teaching load and institutional resources impacted their success).

## Conclusion

In sum, the present study involved an in-depth, qualitative investigation of the practice of publishing with undergraduate coauthors, highlighting the approaches, joys, and pains of the process from faculty with successful track records. Many of these faculty reported deriving great joy and meaning from collaborating and publishing with undergraduates, while also acknowledging some significant barriers and challenges. Our results suggest the importance of resources, especially time, and the need for advanced training in scientific writing. At the same time, our results indicate that faculty can be successful publishing with undergraduates using many different approaches and with many different goals in mind—yielding significant benefits for students, faculty, and institutions alike.

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## Author Contributions

Contributed to conception and design: All authors  
 Contributed to acquisition of data: All authors  
 Contributed to analysis and interpretation of data: All authors  
 Drafted and/or revised the article: All authors  
 Approved the submitted version for publication: All authors

## Competing Interests

The authors have no conflicts of interest to declare.

Submitted: March 07, 2023 PDT, Accepted: November 20, 2023 PDT



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<sup>4</sup> Given the potential for the authors’ personal experiences to color their interpretation of responses, we describe each author’s experiences with undergraduate research in the online supplement.

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