

A tool for clarifying expectations in undergraduate research experiences

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ABSTRACT Articulating clear and achievable expectations is fundamental to both education and organizational management. In this article, we provide a simple intervention for clarifying expectations—and establishing that these expectations have been understood—which proved beneficial both to community college interns and to their internship mentors in biotech-related undergraduate research experiences. Internship mentors were asked to utilize a simple Expectation Clarity Tool to outline the expectations, success metrics, baseline assessments, and training strategy and support that would be foundational to their intern's project. These included expectations around conceptual, technical, performance, and professional skills and behaviors. Concurrently, but independently, community college interns were asked to complete the same type of exercise as a way of identifying gaps in their knowledge and understanding of their mentor's expectations and their internship project. The mentor's completed Expectation Clarity Tool was then shared with their intern. As a result of completing this relatively simple intervention, the majority of mentors reported that it increased their confidence as a mentor, taught them a new mentoring skill, changed how they will mentor trainees moving forward, and positively impacted their relationship with their trainee. On the intern side, the majority of interns reported that engaging in this intervention, both as an independent exercise and in obtaining their mentor's completed Expectation Clarity Tool, increased their confidence as an intern and positively impacted the success of their internship.

KEYWORDS community college, expectations, internship, transparency, undergraduate research experience, biotechnology, work-based learning, backward design, mentoring, professional skills

Undergraduate research experiences (UREs) have been shown to play a significant role in student motivation to persist in science, technology, engineering, and

mathematics (STEM), especially for students who are from groups historically underrepresented (HU) in STEM (1–3). There has been a recent push to broaden participation in UREs by community college students, who on balance represent the most diverse undergraduate student populations in the United States (4). As part of that effort, our community college's partnership with a top-tier research university has been endeavoring to improve UREs for community college students utilizing best practices in education pedagogy and organizational management. In evidence-based pedagogical laboratory practices in the classroom, clear goals and formative assessments with regular feedback scaffold hands-on learning experiences (5). However, in many laboratories, trainees are expected to “absorb” what they need to learn by watching others speak about science in laboratory meetings and by reading papers, without a clear sense of what knowledge or skills they need to acquire, what performance and behaviors they are expected to exhibit, or regular feedback on their progress. In our 2020 publication, “The Supervisory Role of Life Science Research Faculty: The Missing Link to Diversifying the Academic Workforce?” we made the case that not recognizing the managerial role of mentors created role conflicts and managerial competency gaps that negatively impacted the success of students from HU groups (6). As a result of the lack of management competency in science workplaces, trainees are often left to guess about unspoken norms and expectations, leaving those with the least previous exposure to these workplaces most at risk of failing to understand what is expected of them. Many URE programs include outlining broad student learning outcomes and summative assessments for internships to evaluate student and program performance. However, in our 15 years of experience working with community college biotech students in academic internships, we have seen that an overview of learning outcomes and assessment measures is often insufficient and abstract for students. They remain unclear about how they will obtain those learning outcomes and how they will be evaluated by their internship mentor.

In our 2020 publication, we outlined a framework of pedagogical practices for supporting trainees in research labs that could lead to systematic improvements in expectation clarity (6). This included “design(ing) training plans that take into account the prior conceptual knowledge and skills of the trainee, the duration of the research experience, and the goals of the research experience. Using backward design principles and specific language, research (mentors) can hereby set clear learning objectives for the trainee, provide information of success metrics to evaluate said learning goals, and develop a training plan to ensure that research mentors have used appropriate teaching techniques that meet the laboratory's standards.” We subsequently provided examples of backward-designed mentor expectations for an undergraduate or community college intern (6).

In developing interventions for the City College of San Francisco (CCSF) Bioscience Internship program, we have leveraged this pedagogical practice by creating an Expectation Clarity Tool with guidelines that explicitly ask both internship research mentors and their community college interns to engage in developing backwarddesigned training plans, utilizing the example outlined in our previous publication (6).

PROCEDURE

Description and application

Our Bioscience internship program supports community college biotech students in semester-long part-time internships in local labs, predominantly at the University of California, San Francisco (UCSF).

Within the first 2–4 weeks of the internship, mentors of two cohorts of interns (2020 and 2021) were asked to complete an Expectation Clarity Tool, which encourages mentors to think through and communicate as explicitly as possible what they expect their intern to attain around conceptual knowledge, technical skills, job performance, and professional behavior and attitudes; the mentors were also pressed to take a baseline assessment of their interns to identify what training and support will be required for the intern to meet these expectations; and finally, they are asked to develop the evaluative criteria they will use to assess whether the intern has indeed met their expectations. At the same time, the interns from one cohort (2021) were asked to independently fill in, as best they could, a different copy of the same Expectation Clarity Tool in order to help them start identifying potential

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gaps in their knowledge of what is expected and places where they might proactively seek additional clarification (e.g., Should this experiment take a week to complete, or just a few hours? What resources are there to troubleshoot a new technique? What depth of knowledge is needed for a particular concept during the internship?).

Mentors and interns were given 2–3 weeks to complete the activity (Fig. 1). The mentor's completed Expectation Clarity Tool was then shared with their intern, and the intern was asked to reflect in an online discussion (supplemental) on the differences between what they had understood and outlined for their assignment and what their mentor outlined, as well as any additional gaps in knowledge or understanding

TIMELINE for a 16-week internship	MENTOR	MENTEE
Week 1 - 2 (5-10% into the URE)	Blank spreadsheet with instructions & examples provided separately to Mentors & Mentees	
Week 2 - 3 (10-20% into the URE)	Mentor & Mentee Complete the Spreadsheet Assignment: Complete spreadsheet for 5+ goals/expectations based on their expectations for their mentee over the course of the URE Focus: Clarify what goals/ expectations must be met for a solid letter of recommendation	Assignment: Complete spreadsheet for goals/expectations based on their own knowledge of their mentor's expectations Focus: Identify gaps in understanding - areas of the spreadsheet they can't fill out
Week 3 (15-20% into the URE)	Mentor's completed spreadsheet provided to mentees for review	
		Reflection: Review mentor's completed spreadsheet, compare to what they had outlined (Supported Cohort Discussion) Focus: Identify any points of confusion and possible clarifying questions to ask
Week 3 - 4 (15-25% into the URE)	Discuss Mentor's completed spreadsheet	
	Activity: Set-up a time to review their completed spreadsheet with their mentee Focus: Clarify any points of confusion	Activity: Discuss their mentor's completed spreadsheet with their mentor Focus: Identify any points of confusion and ask clarifying questions
Through the remainder of the internship/URE	Revisit/Revise/Discuss	
	Mentor and mentee use the mentor's completed spreadsheet for regular check-in meetings, update progress, revise expectations throughout the URE	

FIG 1 Outline and timeline for implementation of the Expectation Clarity Tool in a community college biotechnology internship program with community college interns (mentee) and their academic research internship mentors (mentor).

around expectations they may still have. Interns were not asked to share their independently completed Expectation Clarity Tool with their mentor as power differentials make this potentially disadvantageous for interns and may prevent them from being open regarding their gaps in understanding when completing the assignment.

Preliminary results

At the end of the internship, mentors and interns were asked to report on their experiences with the Expectation Clarity Tool through an online survey (Tables 1 and 2).

Safety issues

This project was done in compliance with the CCSF Institutional Review Board, which found the project exempt from full IRB review per Section 101.b of the Common Rule for

TABLE 1 Data collected through online surveys from two mentor-intern cohorts (Spring 2020 and 2021), in which the internship mentors were asked to what level they agreed with statements related to the completion of the Expectation Clarity Tool, $n = 27^a$

Mentors reported that completing the tool/spreadsheet:	
Increased my confidence as an inclusive mentor	59% (16 of 27)
Taught me a new inclusive mentoring skill	85% (23 of 27)
Changed how I will mentor trainees moving forward	85% (23 of 27)
Impacted my relationship with my trainee positively	63% (17 of 27)

^aPercentages and counts correspond to respondents who agreed or strongly agreed with each statement.

TABLE 2 Data collected through online surveys from two mentor-intern cohorts (Spring 2020 and 2021), in which the interns were asked to what level they agreed with statements related to their experiences obtaining their internship mentor's Expectation Clarity Tool, $n = 28^a$

Interns reported that...	Obtaining the completed tool/ spreadsheet from their mentor:	Doing a self-assessment of their mentor's expectations (completing the tool/spreadsheet on their own; 2021 only):
Increased my confidence as an intern	57% (16 of 28)	50% (8 of 16)
Taught me something	46% (13 of 28)	63% (10 of 16)
Changed my behavior as an intern	46% (13 of 28)	25% (4 of 16)
Positively impacted the success of my internship	64% (18 of 28)	56% (9 of 16)

^aPercentages and counts correspond to respondents that agreed or strongly agreed with each statement.

the Protection of Human Subjects, and the UCSF Institutional Review Board, which found the project exempt under Common Rule 1991 categories (IRB submission #18–24752).

CONCLUSION

This fairly straightforward intervention created positive impacts for both community college interns and their research mentors during a semester-long internship in which most students had no previous research lab experience. All aspects of the intervention led to a majority of interns and mentors reporting increased confidence in their roles. Perhaps more importantly, it positively impacted the bulk of mentor-intern relationships (63%) and the intern's perceived success of those internships (64%). As a result of using the tool, most mentors reported learning a new skill (85%) and were likely to change the way they would mentor moving forward (85%). Two-thirds of the mentors felt the tool increased their confidence as an inclusive mentor. Although we feel this is a positive result, we attribute this lower percentage to two possible phenomena: (i) The Dunning–Kruger effect, in which people with lower competence overestimate their abilities (as a result, increased competence may not result in increased confidence), and (ii) the potential lack of understanding that the tool can help create a more inclusive environment for mentees by making the unspoken norms and expectations transparent to all.

The Expectation Clarity Tool can be used by virtually any URE program to help mentors and interns build a more transparent understanding of expectations. While we believe the strongest impacts of this intervention result from both mentors and interns completing the tool and discussing it together, the exercise still appears beneficial when interns complete it independently. This helps interns identify gaps in their knowledge and understanding of what is expected of them, how they will be evaluated, and what teaching and support they will receive to achieve those expectations. They can then use that information to determine what conversations they should be initiating with their mentor. While developed for UREs, this tool offers the potential to increase transparency and communication in any work-based experience in which one individual has supervisory responsibilities over another, including training of graduate students, postdocs, and employees.

Once completed, the Expectation Clarity Tool is not only of use during the time of the initial URE but also it can be used repeatedly by mentors to further build and clarify their expectations with any/all future trainees, provide students with metrics to discuss their internship progress in future interviews, and provide internship programs a greater understanding of the expectations their students need to achieve, as well as how they will be assessed and trained outside of the classroom.

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ADDITIONAL FILES

The following material is available [online](#).

Supplemental Material

Supplemental tool template and materials (jmbe00204-23-s0001.docx). Expectation Clarity Tool template and language for implementation.

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