

Creating Community through Faculty Development to Support Inclusive Undergraduate Research Mentorship

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Abstract:

This paper explores a pilot Community of Practice designed to increase faculty understanding of the needs of their undergraduate research students from underrepresented and underserved communities and support faculty in their roles as intentionally inclusive research mentors. Research suggests that supportive and effective faculty mentoring is critical to the success of undergraduate researchers. Specifically, for students from underrepresented and underserved populations, it is critical that mentoring be intentionally inclusive. Our research indicates that faculty at our institution are unprepared to effectively and inclusively mentor undergraduate researchers from traditionally underrepresented and underserved groups and that existing professional development opportunities for faculty on our campus were not designed to address this gap. Second, we show how we utilized a Community of Practice model to pilot an intervention designed to respond to these research findings that focused on the development of intentionally inclusive mentoring relationships. Through building a Community of Practice for faculty researchers focused on inclusive mentoring practices, we worked to provide faculty with knowledge, tools, and skills to

recruit and work with undergraduate researchers from traditionally marginalized groups in more meaningful ways. In addition, we worked to provide spaces for faculty to increase the awareness of their research practices with students, connect across disciplines, and develop an ongoing community.

Key Words:

Undergraduate research, mentor, community of practice, underrepresented groups, faculty development, diversity, inclusivity.

Introduction

In 2008, the Association of American Colleges & Universities (AAC&U) identified ten High Impact Practices that promote greater learning, improved retention rates, faster progress-to-degree, and higher graduation rates (Kuh, 2008). Participation in undergraduate research was named as one of those ten high impact practices. Undergraduate research experiences (UREs) are “an inquiry or investigation conducted by an undergraduate that makes an original intellectual or creative contribution to the discipline” and can occur “on- or off-campus of the home-institution” (Business Higher Education Forum, 2013, p. 2). Specifically, the AAC&U suggests that undergraduate research allows faculty to “connect key concepts and questions with students’ early and active involvement in systematic investigation and research” which in turn creates a lasting impact and works to promote community and connection with the campus and educational pursuits (AAC&U, 2008). Research indicates that participation in UREs increases retention of students in STEM fields (PCAST, 2012), enhances clarification of career path, helps crystallize student identities as scientists and/or engineers, and develops student understandings of the research process (Seymour, et al, 2004; BHEF, 2013). As Hunter et al. (2007), describes: “Overwhelmingly, students define [undergraduate research] as a powerful affective, behavioral, and personal discovery experience whose dimensions have profound significance for their emergent adult identity, sense of career direction, and intellectual and professional development” (p. 69). Additional positive impacts include the development of technical, problem-solving, and presentation skills; increased interest in graduate education, and higher proportions of students earning advanced degrees (Laursen et al., 2010, p. 33), as well as higher GPAs and higher job placement rates (Seymour, et al, 2004; BHEF, 2013).

Like other high impact practices, UREs have been shown to improve the persistence of students from groups that are underrepresented and underserved in STEM fields, in particular (National Research Council, 2012). Indeed, “evidence shows the power of undergraduate research as a tool for engaging minority students in authentic science in order to overcome past societal disadvantages and develop individual talent in communities that have not had the opportunities” (Laursen et al., 2010, p. 134). For students from groups currently underrepresented and underserved in STEM, working closely and regularly with faculty mentors is linked to increased student persistence, graduation rates, and higher GPAs (Cole, 2010; Kim & Sax, 2009; Hurtado et al., 2011). Undergraduate research experiences can also function as part of the social process by which students integrate their “gender, racial, and ethnic identity” and “science [and engineering] identity” (Carlone & Johnson, 2007) – suggesting that students do not need to choose one over the other.

Due to the high success rate of undergraduate research as a learning tool for student persistence and retention, participation in undergraduate research plays a large role in programs such as the federally-funded Ronald E. McNair Post Baccalaureate Achievement Program (commonly referred to as the McNair Scholars Program) that are explicitly designed to increase retention and graduation rates among traditionally underrepresented and underserved student groups in STEM. At universities like our own that do not have a research-focused program like McNair for students from these groups, undergraduate research experiences still function discursively as a highly visible component of retention and graduation strategies. However, students who are first generation, from low socioeconomic backgrounds, and/or from groups underrepresented in STEM are less likely to participate in undergraduate research experiences (Hurtado et al., 2011) for reasons that include higher obligations to family and inability to travel away from family or bring family to the program (Hurtado et al., 2011), discomfort with the lack of cultural sensitivity towards underrepresented groups in recruitment (Cole & Espinoza, 2008) and an under-awareness of the benefits of participating in undergraduate research programs (Campbell et al., 2002; Hurtado et al., 2011). At our institution, we have also found high variance in the visibility of undergraduate research experience opportunities to different student groups (Parent et al., 2016).

When students from underrepresented and underserved groups do participate in undergraduate research experiences, these students face additional barriers in participating in research projects, including an unwelcoming/inhospitable research environment (Hurtado et al., 2011). In addition, while inequitable/ineffective mentorship by faculty is identified as a contributing factor to an unwelcoming/inhospitable research environment in a number of studies, little research explores how faculty mentorship contributes to this (Prunuske et al., 2013).

Why do these mentorship challenges emerge? Many academic faculty who advise and mentor students in undergraduate research experiences would agree that they are invested in the success of their students. They are committed to being “effective teachers” and mentors. They know that “[p]oor mentorship contributes to losses of minority students at each level of education” (Prunuske et al., 2013, p. 404). However, at the same time, faculty undergraduate research mentors are not trained, nor are they supported in providing “diverse and multicultural classrooms” and research experiences (Chesler & Young, 2014, pg. 7) or in the examination of “their assumptions and roles relative to a multicultural campus and how they interact with students” from traditionally underrepresented and underserved populations (Scisney-Matlock & Matlock 2001, pg. 75). This tension between the desire to be effective and make a difference with students, and limited resources, support, and training led us to ask the question: As undergraduate research mentors, how prepared are we to meet the needs of students from underrepresented and underserved groups?

This paper first describes our efforts to explore the current status of undergraduate research mentorship by faculty of students from underrepresented and underserved groups at our institution. Our research indicated that faculty at our institution are unprepared to effectively and inclusively mentor undergraduate researchers from traditionally underrepresented and underserved groups and that existing professional

development opportunities for faculty on our campus were not designed to address this gap. Second, we show how we utilized a Community of Practice model to pilot an intervention designed to respond to these research findings that focused on the development of intentionally inclusive mentoring relationships.

This project is shaped by the specific identity of our institution as a large public state university in rural California. California Comprehensive Polytechnic State University (CCPSU) is a predominantly white institution (PWI) with a strong polytechnic identity and a commitment to the pedagogy of “Learn by Doing.” We primarily serve undergraduate students. In efforts to be more representative of the state population our institution serves, multiple campus-wide initiatives have been initiated to recruit and retain a more diverse population of students and create a more inclusive campus climate. These initiatives respond to findings from our first campus-wide climate survey in 2014, which documented unwelcoming and exclusionary environments for students from underrepresented and underserved groups and are further motivated through recommendations by our accrediting body. However, while our project is context-specific, we believe that our discussion of the creation and impacts of a Community of Practice focused on the development of intentionally inclusive mentorship relationships between faculty and students from underrepresented and underserved groups will benefit faculty from a wide array of institutional and research mentorship contexts; staff in Centers for Teaching and Learning and University Diversity Offices charged with faculty professional development to increase inclusivity and equity; and campus administrators that focus on research and undergraduate research.

Exploring How Current CCPSU Faculty Research Mentors Approach Mentoring (2014-15 Academic Year)

This section of the paper describes our efforts to explore the current status of undergraduate research mentorship by faculty of students, in general, and students from underrepresented and underserved groups at our institution, in particular.

Methodology for Data Collection

In 2015, we conducted a study to gain a more comprehensive understanding of the landscape of undergraduate research at CCPSU. Data were collected from faculty, staff, and students through a survey circulated widely throughout the university and through in-depth open-ended interviews. For the purposes of this report, we focused on survey data and analysis gathered from faculty who currently functioned as undergraduate research mentors at the institution when they responded to the survey. Data collection was approved by our Institutional Review Board and occurred over a five-month period beginning in February 2015, and ending in June 2015. The survey was periodically e-mailed out by Dean’s Offices through all six of CCPSU’s colleges (by e-mail), e-mailed to targeted research labs, student clubs, and faculty/staff associations. The survey was also posted to public forums for the campus community, and included in faculty-oriented newsletters.

Before participating in the survey, participants were provided an informed consent document and indicated agreement to participate in the survey. The participants were allowed to provide their names or complete the survey anonymously. No questions were

required. The survey included a variety of questions that were structured in a multiple-choice fashion, ranking, Likert scale, and essay response, soliciting both quantitative and qualitative data. All quantitatively oriented questions were followed with opportunities for faculty respondents to provide written comments. Survey completion was projected to take 28-30 minutes. Open-ended questions were designed to gather detailed information about:

- faculty mentors' attitudes, expectations, and experiences with undergraduate research,
- faculty roles as advisors and mentors for both traditional and underrepresented student populations,
- research project design,
- recruitment and mentoring practices,
- diversity and inclusivity efforts in undergraduate research, and
- how faculty members perceived the role of undergraduate research at this particular campus.

Data utilized for this paper were drawn from responses by 41 faculty currently serving as undergraduate research mentors at the time of their response to the survey. Faculty from each college at CCPSU participated, with the exception for the College of Architecture and Environmental Design. The highest response rates were in the Colleges of Engineering (5.3% of all lecturer and tenure-line faculty) and Science & Mathematics (5.5% of all lecturer and tenure-line faculty). While this is a relatively low response-rate, we felt comfortable moving forward with this small data set as our target population was faculty members *who already mentor undergraduate researchers* and this population, at our institution, is known to be much smaller number than total faculty members. In the future, we hope to extend this data collection effort to include a larger number of participants.

Findings from the Survey of Faculty Who Currently Serve as Undergraduate Research Mentors

In order to assess the preparedness of faculty in working with researchers from underrepresented and underserved groups, we analyzed this survey data to gain a better understanding about the landscape of undergraduate research at our institution and faculty engagement with this practice. Responses to the open ended survey questions were coded in Dedoose, a software program that supports qualitative and mixed-methods data analysis. Researchers first independently worked with the qualitative data to develop discursive codes/themes based on the responses (Gee, 2005; Miles & Huberman, 2004; Robson, 2002). During our coding analysis we primarily used descriptive coding (Saldaña, 2009). In ongoing discussions, we corroborated our analyses, continued to develop codes, and identify emergent themes.

After careful review of the data, we identified several themes (outlined in the table below). As highlighted in the table, data analysis revealed that many faculty respondents indicated that they do not have the space or time to mentor and reflect on their mentoring practices; do not have access to funding to support more (and more diverse) undergraduate research students; and do not have knowledge of the

challenges that students from underrepresented and underserved groups may face in undergraduate research experiences or in higher education, more broadly.

Findings on Mentorship	Percent of Faculty Reporting (n=41 current faculty research mentors)
Faculty members do not have the space or time to mentor and reflect on their mentoring practices.	65%
Faculty are have difficulty finding funding and feel they are not given the proper amount of time to apply for grants that could potentially fund more (and more diverse) undergraduate researchers.	42.5%
Faculty researchers are unfamiliar with different struggles that underrepresented students may face	35%
Faculty research mentors engage a colorblind approach to mentorship.	32.5%

TABLE 1: Status of Faculty Mentorship of Undergraduate Research Experiences at CCPSU

However, what particularly stood out to us was that multiple faculty respondents who were actively seeking to be “inclusive mentors” identified colorblindness as the most effective approach to undergraduate research mentorship. Some of the faculty participant responses that indicated colorblindness or a colorblind approach include:

“I do not see a specific difference between the research experience for an underrepresented student vs. a represented student.”

“I don’t believe I treat students differently depending on their ‘underrepresented status.’”

“I don’t know if they [undergraduates] are underrepresented or have a low GPA, etc. so I don’t do anything special or different.”

Although colorblindness may seem like an ideal approach, it can actually contribute to experiences of exclusion because colorblindness insists we exist in a post-racial society, and “explains contemporary racial inequality as the outcome of nonracial dynamics” (Bonilla-Silva, 2006, p. 2). Bonilla-Silva (2006) suggests that this approach, in fact, materializes as a form of racism (“colorblind racism”). Colorblindness assumes all students (including those underrepresented) start on an equal playing field and any fallback is the student’s fault, ignoring the vast history of social, economic, and educational policies that have cumulatively disadvantaged people of color. In addition, by ignoring the students’ racial or ethnic background, colorblindness renders their life experiences and unique points of view to be “invisible” or invalid.

For the purposes of this paper, we wish to highlight two additional findings of importance from the analysis of survey responses of faculty who currently mentor undergraduate researchers:

1. There is not a cohesive, campus-wide shared understanding of what “undergraduate research” is across disciplines and how it intersects with our “Learn by Doing” motto. While respondents from the College of Science & Mathematics had high degrees of agreement over the definition of undergraduate research and see undergraduate research as a clear example of “Learn by Doing,” responses from faculty in other colleges varied widely.

2. Recruitment and enrollment into on-campus research experiences is largely informal and not transparent to students. CCPSU does not have a centralized way for students to apply and enroll into research experiences. Most undergraduate researchers find their research experiences by talking informally with faculty. This enrollment method seems to contribute to disproportionately lower rates of participation by students from underrepresented and underserved groups in undergraduate research experiences.

Creating a Community of Practice to Support Intentionally Inclusive Faculty Mentoring (2015-16 Academic Year)

As described above, our research findings demonstrated that while faculty at our university have a strong desire to be effective undergraduate research mentors, they are not prepared to meet the needs of all students, particularly those students from groups underrepresented and underserved in STEM. That is, there is a gap between our faculty's desire to be effective and "make a difference" and their ability to do so. Additional resources, support, and training is needed. In response to these research findings, we utilized a Community of Practice model to pilot an intervention designed to prepare faculty research mentors to effectively, inclusively, and equitably mentor undergraduate researchers from traditionally underrepresented and underserved backgrounds while also providing space for reflection, collaboration, and support for a shared interest in creating institutional change.

A Community of Practice (CoP) is a group of people "who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger-Trayner & Wenger-Trayner, 2015). Providing faculty development options is an important way to begin forming communities. Creating such communities for faculty has been identified as a "promising practice that offer members an intellectually and emotionally supportive venue in which to examine and enhance their curricular and pedagogical approaches" (Anderson, Bond, Davis-Street, Gentlewarrior, Savas; 2014, pg. 2). Our pilot Community of Practice was co-designed and facilitated by the CCPSU Center for Teaching, Learning & Technology (CTLT), the federally-funded Louis Stokes Alliance for Minority Student Participation (LSAMP) in STEM Program, and a serving volunteer member of the California State University STEM VISTA AmeriCorps Program:

- The Center for Teaching, Learning & Technology has a rich history of establishing and facilitating Professional Learning Communities, which are "cross-disciplinary faculty and staff groups of six to fifteen members ... who engage in an active, collaborative, yearlong program with a curriculum about enhancing teaching and learning and with frequent seminars and activities that provide learning, development, the scholarship of teaching, and community building" (Cox, 2004, p. 8).
- The LSAMP Program is designed to support undergraduate students who face or have faced social, educational and/or economic barriers to careers in science, technology, engineering, and mathematics (STEM) fields. The goal of the LSAMP Program is to increase the persistence and graduation rates of students from underrepresented groups who major in STEM disciplines.

- The CSU STEM VISTA AmeriCorps Program is an initiative to support the academic and professional success of students from historically underrepresented populations in STEM, including low-income, first generation, students of color and women. VISTA members are placed in CSU STEM departments, colleges, and academically-based institutes to support new and existing efforts and build capacity to offer more engaging, hands-on learning experiences, such as service learning, internships, and undergraduate research.

To design our Community of Practice, we focused on the three characteristics that are central to its organization: the domain, the community, and the practice (Wenger-Trayner; 2010; Wenger-Trayner & Wenger-Trayner, 2015), as detailed in Table 2. Design of our recruitment process, workshop goals, workshop structure, and formative and summative evaluation methods, were shaped by our understanding of domain, community, and practice.

	Definition (Wenger-Trayner & Wenger-Trayner, 2015)	CCPSU Community of Practice
Domain	“A community of practice is not merely a club of friends or a network of connections between people. It has an identity defined by a shared domain of interest. Membership therefore implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people” (p. 2).	Faculty recruited to participate in the pilot Community of Practice were selected because of their shared commitment to increasing the participation in and success of students from underrepresented and underserved communities in undergraduate research experiences via the development of intentionally inclusive faculty-student mentoring relationships.
Community	“In pursuing their interest in their domain, members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other; they care about their standing with each other” (p. 2).	Members of the Community of Practice participated in 8 hours of face-to-face workshops over an 8-week period, with independent work assigned between meetings. The workshops included shared activities and were designed to support community-building and information-sharing. During the workshops, participants demonstrated willingness to share ideas, ask questions, and build relationships.
Practice	“A community of practice is not merely a community of interest—people who like certain kinds of movies, for instance. Members of a community of practice are practitioners. They develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems—in short a shared practice. This takes time and sustained interaction” (p. 2).	The workshops and meetings were designed to provide space to focus on the practice of mentoring via the identification of shared experiences, challenges, and successes in mentoring undergraduate researchers and the development of strategies to address the challenges, thereby encouraging members to move out of just sharing ideas to implementing and “practicing” aspects of mentoring.

TABLE 2: Community of Practice Design

Recruitment

For the pilot Community of Practice, we elected to recruit faculty from the CCPSU College of Science & Mathematics, rather than advertising to faculty in all six colleges at

our university. This college was selected because undergraduate research has the strongest institutionalized support in the College of Science & Mathematics (CSM), in terms of availability of undergraduate research positions, funding, space, and number of existing faculty research mentors. In addition, our previous research suggested that faculty in this college (as compared to faculty in other colleges) have a stronger commitment to a shared understanding of the meaning and benefits of undergraduate research experiences. Due to this strength in numbers, we were able to select pilot participants from CSM who were already interested and invested in inclusive undergraduate research mentorship: five Biological Sciences faculty members, four Physics faculty members, and one Mathematics faculty member.

Goals

The goals of the pilot Community of Practice explicitly responded to our research findings. By the end of the workshop series participants would be able to:

1. Understand the differences between underrepresented and non-underrepresented undergraduate researchers, and their specific needs.
2. Utilize inclusive language, tools, and practices, and be able to leverage campus resources to recruit, engage, and create dialogue with underrepresented undergraduate researchers.
3. Identify and write grants with regard to diversity and inclusivity, and hosting a diverse body of undergraduate researchers.

Structure

Participants in this workshop series met four times over eight weeks for a total of eight hours of face-to-face meetings. Workshop meetings included activities, discussions, and work towards the production artifacts. They were also assigned homework that would engage the knowledge acquired in the workshop. To encourage connection and community building between meetings, and to create a repository of resources and artifacts, we designed and utilized an online learning management “classroom” space (LMS). Our LMS also provided (and continues to provide) a platform where participants could share tools they designed, useful articles, and more.

	Description	Pre-Workshop Readings	Pre-Workshop Homework	Artifacts Produced During Workshop	Formative Evaluation Protocol
1	Getting Started Workshop 1 guided our faculty participants towards self-reflection on their current undergraduate research mentorship practices. This workshop also included a presentation of our research on the status of undergraduate research mentorship at our institution (described above) and a discussion about how “colorblindness” is incongruent with inclusive mentoring practices.	Selections from Revealing the Invisible by Sherry Marx (2006) “Color-blindness is counterproductive” by Adia Harvey-Wingfield (2016)		Create K-W-L Chart (What do I know? What do I want to learn? What have I learned?) Develop Profile of an “Ideal” Undergraduate Researcher (version 1) Start Mentoring Experience Reflection Narrative	During the workshop meeting: Parking Lot At the end of the workshop meeting: Muddiest Point (3” x 5” card)
2	Workshop 2 was action-oriented and focused on introducing inclusive language, practices, and tools to our participants. In this workshop, we introduced mentor-mentee charters and participants began to draft charters for peer review.	“Mentoring in a Post-Affirmative Action World” by Jean Girves, Yolanda Zepeda, and Judith Gwathmey (2005)	Continue to develop Mentoring Experience Reflection Narrative from your perspective as a student and from the perspective of a mentor.	New Draft of “Ideal” Undergraduate Researcher Profile [after completing reflection activity in previous workshop] Start Undergraduate Research Mentor-Mentee Charter	During the workshop meeting: Parking Lot At the end of the workshop meeting: Side 1: Burning Questions (3” x 5” card) Side 2: Ah-ha Realizations (3” x 5” card)

	Description	Pre-Workshop Readings	Pre-Workshop Homework	Artifacts Produced During Workshop	Formative Evaluation Protocol
3	During Workshop 3, we continued discussion about mentor-mentee charters, provided an opportunity for peer review, and discussed inclusive recruitment.	Selections from Teachers as Cultural Workers by Paulo Freire (1998)	Continue to develop Undergraduate Research Mentor-Mentee Charter. Start to explore ideas for recruiting and selecting undergraduate research students.	Peer Review of Undergraduate Research Mentor-Mentee Charter Drafts	During the workshop meeting: Parking Lot At the end of the workshop meeting: What do you know and want to know about writing grants with a focus on recruiting and mentoring underrepresented students? (3" x 5" card)
4	Workshop 4 was led by the Director of the Grants Development Office and a Grants Analyst within that office. Discussion was focused on drafting thorough and promising diversity impact statements for undergraduate research funding, and collaborative research proposals.		Post your revised Undergraduate Research Mentor-Mentee Charter in response to Peer Review Identify possible funding sources that you would like to discuss with a grants analyst Bring a copy of an Impact Statement to the workshop (if you have one)		

TABLE 3: Workshop Structure

Formative Evaluation

At the end of each of the first three workshop meetings, participants were given an opportunity to reflect on what they learned via formative evaluation protocols called Classroom Assessment Techniques (CATs). CATs provided learner-centered and facilitator-guided reflection on intermediate points throughout the learning process (Angelo & Cross, 1993). Utilizing a variety of formative evaluation tools was intentional in order to model a range of ways in which faculty can collect robust feedback quickly. Formative evaluation data then shaped follow-up workshops, and was explicitly addressed as part of workshop design. We also utilized the “Parking Lot” method during the workshop meetings, which allowed participants to post questions, comments, discussion points, and so forth throughout the meetings. This ensured that we saw and heard all questions, or were able to return to questions/comments/points of uncertainty from previous parts of the workshop.

At the end of Workshop 1, we utilized the “Muddiest Point” protocol. This protocol is designed to allow participants to reflect on what they have engaged with and ask clarifying questions to help make the process more “clear” when moving forward. Participants were asked to describe where they might be struggling with the material presented or ask still-lingering questions. As seen in Table 4, analysis of participants’ “Muddiest Points” identified the following themes: funding; recruitment and selection; research project design; and resources.

Funding	<ol style="list-style-type: none"> 1. “Funding technical projects...getting students up to speed...and persuading peers it is possible to do such a project.” 2. How to do research at Cal Poly given the high teaching load and not much support from Cal Poly. Need outside funding, but outside funding wants to see results, meaning papers, so I need to focus on “good” students, so it can be self-sustainable.”
Recruitment and Selection	<ol style="list-style-type: none"> 1. Tension between wanting to recruit more URM students who would benefit from research and being overwhelmed by the number of students who approach us. 2. Recruiting students...beyond them just coming to me. Particularly getting students early on. (Not when they are just looking for a senior project.) 3. If faculty are already overwhelmed by the number of interested researchers, they can afford to be selective and take the “best” researchers. How, then, are the lower-performing or not outstanding students (who may benefit the most) going to be selected? How do we encourage this broadly across campus (especially with faculty who wouldn’t participate in a workshop such as this one?) 4. Processes for recruiting URM to research and mentoring relationships? 5. How do I effectively recruit students, but still do that in an inclusive way?
Research Project Design	<ol style="list-style-type: none"> 1. I feel like the correct project could help more – I really want to make micro-projects for 1st and 2nd year students so I can get them early on. 2. If you are doing a 3 credit or 1 credit research class with 2 students, should the research be scaled to the time? OR should the research be only as long as that quarter? i.e. is it best to have the student “complete” a research component or is it okay for them to just help out and be recognized in any publication?
Resources	<ol style="list-style-type: none"> 1. What additional help do we provide underrepresented students? 2. Students from underrepresented backgrounds sometimes are the most reluctant to talk one-on-one with professors – including attending office hours. How do I promote them approaching me? This includes but is not limited to research. 3. How can I work smarter (more efficiently) as a mentor, rather than just harder?

TABLE 4: Muddiest Point Classroom Assessment Technique

The “Muddiest Points” evaluation following Workshop 1 was an important part of the workshop series because 1) participants’ questions confirmed the needs identified in our 2015 study (described above), and 2) these responses shaped group dialogue and activities that took place in later workshops. For example, we decided to start Workshop 2 by engaging in dialogue about the Muddiest Points.

At the end of Workshop 2, we employed the “Burning Questions” protocol, which allowed participants to voice concerns or immediate questions about content (indicating areas where they still believed they were struggling or had questions). This protocol was paired (on the reverse of the 3” x 5” card) with a prompt inviting participants to share “Ah ha! Realizations” (Table 5).

Burning Questions (side 1)	Ah-ha! Realizations (side 2)
How do we reach more of the Cal Poly Community?	Our focus is shifting and we have so much more to do...but the steps are becoming more clear.
If I favor underrepresented students, I have to say ‘no’ to others, sometimes highly motivated and matching students. It doesn’t feel right... for both students.	<ul style="list-style-type: none"> - idea of shadowing - syllabus for research - ask former students for feedback
1. Is the desire to be a productive scientist at tension with the desire to be a good mentor? i.e. How can I achieve both goals simultaneously? 2. Is it possible to build a large physics lab?	I’ve been inadvertently creating a community by working with several students. The best way to make it sustainable is to start recruiting students early.
I’m still stymied by how to select students, particularly, how do I turn a student down (fire?) when I need to do this in a fair and transparent way?	Based on today’s discussion, I think I should give my research students an opportunity to fill out a “course” evaluation (anonymously) for feedback.
How do you feasibly create “micro-projects” from your broader research? (Micro-project = 1- or 2-quarter doable project for a novice)	Go to dorms to find/engage students
Is the level of structure (mentor compact) going to work for me?	Building a mentoring program sounds <u>really</u> complex.
What do we mean by undergraduate research at Cal Poly? In particular, what do deans think it means?	N/A
In regards to mentoring and helping students - who is questioning whether or not the student should stay in their major? They need to give themselves a chance to gain confidence.	N/A
The charter seems too formal for me - I like the mentoring tools (re: expectations and reflections from example worksheets) do you think it is essential to have a charter?	N/A

TABLE 5: Burning Question and A-ha! Classroom Assessment Technique

At the end of Workshop 3, our formative evaluation protocol asked participants to respond to the prompt “What do you know and want to know about writing grants with a focus on recruiting and mentoring underrepresented students?” The responses to these questions were provided to the Grants Development Office Director and Grants Analyst to guide their development of Workshop 4, which focused on grant-writing. Participant responses indicated a wide range of grant experiences (with some participants having received no grant support; others internal grant support only; and others with extensive histories of external support). Questions included in the participant responses focused on what funding agencies were looking for in terms of demonstrated commitments to diversity, inclusivity, and equity.

These formative evaluation protocols provided us the opportunity to reflect on the current workshop content as well as a launching point to engage in rich discussion at the beginning of the next meeting. As facilitators, we tried to find answers in the literature as well as utilize other resources including group discussion itself to find answers, build consensus, and create community support.

Summative Evaluation

At the end of Workshop 4 we provided our participants a summative survey evaluation via an emailed link to an online survey, in which we asked participants to evaluate the workshop series in full. We were primarily interested in learning the relevance of our workshop content to what our participants do in their research experiences, and how the workshop did or did not support their ideas about inclusive mentorship. Summative evaluation indicated that perhaps our greatest area of success in this pilot was our creation of space for dialogue and reflection. As findings from our previous research had suggested that faculty members are not provided an intentional space to reflect on mentoring practices or learn best practices in mentoring (or to even thoroughly mentor students), we designed the community of practice to include strong components of reflection, brainstorming, and dialogue. We often ran out of time to finish discussion (indicating success to us), and it was also reflected in the summative evaluation data that this component resonated most with participants. One participant noted that, “it was really helpful to hear how other faculty are mentoring their undergraduates in research, and have the time and facilitated space for conversations about it.” In the summative evaluation, faculty participants appreciated the chance to “talk with other faculty, especially in other departments, who are thinking about similar issues,” and the reduced hierarchy between the mix of lecturers, tenure-track faculty, tenured faculty, and department chairs. The open and intentional space for discussion led to sharing of best practices and opportunities for collaboration. By the end of the series, both participants from Biological Sciences and Physics were exploring new options for collaboration. This strong dialogue brought to light the many ways in which faculty members are thinking about undergraduate research experiences and mentoring in various fields, and allowed us to calibrate our workshop for future cohorts.

Discussion: Negotiating Language and Planning for Next Year (2016-17)

As indicated in the formative evaluation data provided above, the greatest area of tension was in response to our proposal that inclusive faculty mentors should utilize

Mentor/Mentee Charters. Mentor/Mentee Charters — also known as research learning contracts — are identified as a best practice for intentionally inclusive mentorship (Mabrouk, 2003). The purpose of the charter is to provide faculty members with an initial opportunity for collaboration with incoming undergraduate researchers (Mabrouk, 2003). While these documents are sometimes referred to by different names, we decided to use “charter” terminology, as this language was shared by a peer institution that also provides inclusivity-oriented undergraduate research mentorship training. As workshop facilitators, we provided some initial options or components for beginning the charter drafting process such as:

- A summary of the research project,
- Spaces for the undergraduate researcher and faculty research mentor to introduce themselves, and their personal and professional interests and goals,
- Share expectations for collaboration during the research experience,
- Lab/technical procedures,
- Plans for communication, and
- Other organizational ideas.

Although we proposed the Mentor/Mentee Charter as an inclusive method for inviting undergraduate researchers to the table and reducing hierarchy between mentor and mentee, many participants wrestled with the term “charter.” Parking lot items from Workshop 2 (the session in which Mentor/Mentee Charters were introduced) provided additional evidence of this tension: “A formal written compact feels forced and intimidating... is it necessary?” and “Do you think it is essential to have a contract?”

Via further discussion with our workshop participants and ourselves, we have realized that negative reactions were largely in response to the word “charter.” Many participants saw the term “charter” as akin to “contract” or “syllabus” and were concerned that a charter might, in fact, establish a hierarchy between mentor and mentee. We believe that this pushback was evidence of a desire to more deeply understand the document’s purpose and demonstrates the critical thought that participants were putting into the work to be inclusive mentors. As discussions about the “charter” progressed throughout the workshop series on days 3 and 4, faculty participants seemed to be drawn to phrases such as “professional development plan” instead of “charter” because of their belief that the term “professional development plan” is more explicitly responsive to student backgrounds, needs, and desires. As we look towards next year, we are carefully re-evaluating this section of our workshop design.

Based upon our reflections and observations of the pilot cohort, and analysis of the summative evaluation data survey data collected from participants, we continue to believe that there is value in offering professional development for faculty to support their efforts to become intentionally inclusive undergraduate research mentors. However, the feedback from the pilot participants has led us to rethink some of the components of the pilot workshop structure and look for ways to refine artifacts that will better promote a shared understanding of positionality, identity, and background between mentors and undergraduate researchers. We are currently focused on revising

Workshops 2 and 3 in response to participant responses to Mentor/Mentee Charters. In addition, discussion with and feedback from our pilot cohort has identified that participants desire greater exposure to existing assessments of the experiences of students from underrepresented and underserved groups in undergraduate research experiences and tools for conducting their own formative and summative evaluations of their mentee experiences. Finally, participants overwhelmingly desire additional opportunities to collaborate and connect within a community.

We continue to work through our findings from our research on the status of undergraduate research at our institution and the reflections and evaluations of the pilot workshop series. Our focus continues to better serve faculty researchers and their undergraduate research students. We have recently developed a 10-minute presentation describing the undergraduate research mentoring workshops to deliver during faculty meetings across campus. Our intention is to schedule meetings with all departments during the first month of the 2016-17 academic year to advertise for next year's cohorts. We plan to conduct at least three five-meeting workshop series in the 2016-17 academic year. In each new iteration we will include previous cohort participants as speakers, facilitators, and mentors to the new participants. Through each session we will continue to add to our online course repository as well as seek additional avenues for participant community building.

Conclusion

Inclusive mentoring of undergraduate researchers can play an important role in helping CCPSU meet our campus goals for a more inclusive campus climate and providing greater support to underrepresented students through research opportunities. This pilot workshop is part of a larger initiative to grow access to and success in undergraduate research experiences for students from underrepresented and underserved groups. As we look forward to scaling our professional development workshop program focused on creating intentionally inclusive research mentors to reach more faculty on-campus, we are simultaneously exploring how our Community of Practice and our students might benefit from increased transparency in the recruitment and selection of undergraduate research students and the recognition of exemplary mentors/mentees through campus awards, marketing, and showcases.

This pilot workshop series has also pushed us to examine our goals for this work. Originally, we aimed to provide professional development opportunity that would allow faculty who lead undergraduate research experiences to work together to identify mentoring techniques that would benefit undergraduate researchers from traditionally underrepresented underserved groups. We found, however, that the importance of our work does not stop with mentoring students. What we discovered was that faculty mentors need a space that supports their own growth and understanding of what it meant to mentor in inclusive and equitable ways. This workshop series collaboration provided us, as facilitators, with the opportunity to support campus initiatives to increase diversity, inclusivity, and equity by supporting those who are working with undergraduate researchers from underrepresented groups on a daily basis in their research and labs.

Often academic research is a solitary process, which can produce feelings of isolation and loneliness (Armstrong, 2012; Shaw, 2014). Communities of Practice can provide a recursive learning environment that is supportive and encouraging where faculty can share experiences, ideas, and collaborate. Ultimately, we see this as an opportunity to connect and overlap with a secondary community of practice, that of the undergraduate researchers. Research has shown that learning communities, like undergraduate research opportunities, are high impact practices that support student retention and persistence (AAC&U, 2008). There seems to be a natural connection between what is useful and “high impact” for students and what would be needed for faculty. Future exploration of the overlap, or third space, and cultivating that space as an inclusive and reciprocal space is needed. Our next steps are to expand the faculty researcher community of practice and begin exploring how to create more intersections between undergraduate researcher communities and the faculty mentor communities as simultaneous communities of practice.

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