PURM
Perspectives on Undergraduate Research & Mentoring

Building Equitable Research Experiences at a Two-Year Community College

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Undergraduate research experiences (UREs) have been known to provide several positive effects on student learning, resilience, networking, and career choices (Fitzsimmons et al., 1990; Lopatto, 2003; Mogk, 1993; Tomovic, 1994; Zydney et al., 2002). UREs have gained traction in the last decade and the impact of these UREs has shifted from anecdote to systematic data (Linn et al., 2015). Many educators, particularly those in the sciences, have seen the growth potential for authentic UREs to be a high-impact educational practice for achieving excellence in undergraduate education (Haeger & Fresquez, 2016; Kuh, 2008; Kuh & Kinzie, 2018; Lopatto, 2006; Lopatto, 2010; Nagda et al., 1998). However, the extensive range of professional and personal benefits has been largely limited to students already at research universities. Further, availability of research opportunities largely during summer puts a limitation on accessibility.

When viewing the historical mission of community colleges, or two-year colleges, there is a robust history of responding to the educational and workforce needs of the community (Belfield & Bailey, 2011). They are differentiated from research-intensive universities by placing a stronger focus on teaching excellence instead of scholarly research. This mission is critical to the higher education ecosystem. But as more students begin their educational journey at a community college, there has been an increased need to prepare them for transfer to the universities (Russell et al., 2007). Research indicates that undergraduate research is a high-impact practice, so there needs to be a mechanism for providing community college students with experience in research (Schuster, 2018; Tuthill & Berestecky, 2017). Unfortunately, many two-year institutions struggle to find a way to provide students with research opportunities due to funding, space, and personnel.

History of Undergraduate Research at Valencia

Many two-year institutions pride themselves on creating exemplary experiences for students inside the classroom. The focus at these schools is typically on teaching and learning. The philosophy of most open access institutions is that anyone who is committed to learning can be successful when provided with the right resources. In 2015, a group of faculty at Valencia College identified a gap in the educational curriculum at the college: access to engage in undergraduate research. Students who were interested in gaining research experience early in their academic experience did not have a clear pathway to do so. Additionally, a handful of faculty members were creating curriculum that encompassed undergraduate research; however, there was no guidance or documentation of this work being done at the college. To address this issue, a small group of faculty and administrators formed an undergraduate research committee (URC) to develop a more defined undergraduate research program.

At the core, the purpose of this group was to create the foundation guidelines to:

- Assess interest among faculty to support the student population and equip/mentor them with the necessary training if required.
- Establish a clear research pathway for students.
- Engage the administration to create pathways to compensate faculty for their active participation so we create sustained interest.

Keeping these broad challenges in mind, we have developed a rich biome of significant UREs at Valencia College across *all* disciplines to provide real personal connections and mentoring opportunities, to promote persistence, and to equip faculty with appropriate training through professional development (PD) while fostering equity at our institution. As an open-access institution, we serve a diverse student population including members from under-represented minorities (URMs), non-traditional students, first-generation college students, students with diverse learning styles, socio-economic backgrounds, cultures, values, and preparedness for college (see Table 1). Studies have documented the increased benefits that arise when minority students become involved in undergraduate research (Hathaway et al., 2002; Nagda et al., 1998). Given the demographics of our college, we wanted to craft a program that would best serve students who have traditionally been underrepresented in this work.

Table 1. *Table of Valencia College Student Demographic from the 2017-2020 Academic Year*

Reporting Year	2017/2018		2018/2019		2019/2020	
Credit Enrollment (Annual)	62,293	100.0%	65,049	100.0%	65,985	100.0%
Gender						
Female	34,923	56.1%	36,935	56.8%	37,517	56.9%
Male	26,279	42.2%	26,654	41.0%	26,578	40.3%
Not Reported	1,091	1.8%	1,460	2.2%	1,890	2.9%
Ethnicity						
African American	10,344	16.6%	10,883	16.7%	11,315	17.1%
Asian	2,766	4.4%	2,903	4.5%	3,079	4.7%
Caucasian	17,271	27.7%	17,007	26.1%	17,314	26.2%
Hawaiian	210	0.3%	180	0.3%	195	0.3%
Hispanic	22,565	36.2%	23,977	36.9%	25,955	39.3%
Multi-Race	1,607	2.6%	1,682	2.6%	1,770	2.7%
Native American	195	0.3%	186	0.3%	167	0.3%
Not Reported	7,335	11.8%	8,231	12.7%	6,190	9.4%
Degree Status						
AA	38,213	61.3%	38,446	59.1%	37,893	57.4%
AAS	0	0.0%	0	0.0%	0	0.0%
AS	9,756	15.7%	9,392	14.4%	10,104	15.3%
Non-Degree	13,929	22.4&	16,782	25.8%	17,468	26.5%
Awaiting	395	0.6%	429	0.7%	520	0.8%

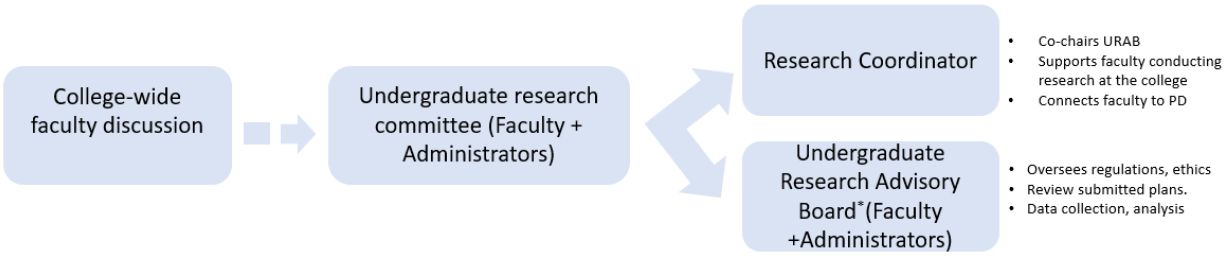
Note: Data compiled by Valencia College's Institutional Research Internal Reports (https://valenciacollege.edu/academics/analytics-and-planning/analytics-and-reporting/reporting/internal/index.php).

We wondered how we might achieve the complexity of this challenge. Authentic research experiences are time- and resource-intensive. To benefit undergraduates transferring to research institutions, or those seeking professional schools and graduate school opportunities, we asked several questions. How can faculty be inspired to carry out some form of undergraduate research in their curriculum? How would we prepare faculty to take on such projects? How will they receive compensation for their active participation? What methods of mentoring are successful? Which systems do we already have in place that might need improvement? And how can we meet the needs of *all* students who are interested in this work while staying cost-effective in a two-year community college? This meant intentionally focusing on nurturing synergistic mechanisms between motivation and ability to understand the students' varying needs, and to respond effectively to those needs in ways to ensure equity in experiences.

Creating Connections through Curriculum

One feature that sets Valencia's undergraduate research program apart from others is that we believe in building a culture of community. Seeing that Valencia is not a traditional research institution, we recognized that we would need to create multiple pathways to develop a sustainable system of research. We chose to focus on our strengths, which include creating close connections with our students and designing a learning-centered curriculum. In this section, we will discuss the pathways that we have created to help faculty and students flourish in the undergraduate research community. To foster growth in this community, we welcome all students, irrespective of their research pathway. As the undergraduate research committee brainstormed the goals, aspirations, and impact of undergraduate research on our diverse student population, it was clear that there was a need to identify a position within the college. This position would serve as a central resource to coordinate all types of research processes at the college and facilitate the development of multiple pathways that lead to a successful and sustainable research program (see Figure 1).

Figure 1. *Sequence map depicting a broad sequence of events*



Note: Undergraduate Research Advisory Board (URAB) members rotate and serve time as service to college.

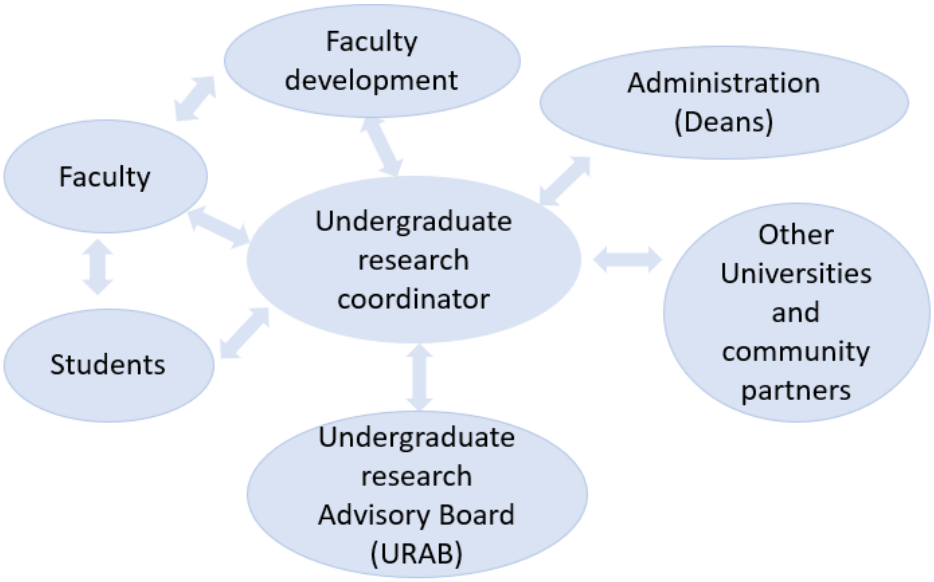
Approved by the college in 2017, Valencia's undergraduate research coordinator is responsible for overseeing and managing all research processes at the college. As shown in Figure 2, the undergraduate research coordinator is the primary resource which connects to all stakeholders in undergraduate research both internally and externally.

Mentoring as the Cornerstone of Undergraduate Research

The last three to four decades have seen an increase in qualitative and quantitative research suggesting the influence of mentoring on success and professional growth of individuals within organizations (Kram, 1983). In creating a culture of connections, peer-to-peer mentoring is seen valuable at Valencia College. Valencia College offers a robust, comprehensive, competency-based, and incentivized Faculty Development Program to all full-time and part-time faculty. Faculty participate in professional development (PD) courses to enhance their practice, develop new and

innovative strategies to improve student learning and use the incentive as personal achievement. These courses are uniquely designed and facilitated by Valencia faculty experts. Within our initiative, in order to assure sustainable interest among potential faculty mentors, we saw a need to offer professional development in mentoring undergraduate research at a two-year institution to faculty seeking to serve as research mentors.

Figure 2. *Depiction of the undergraduate research framework at Valencia College*

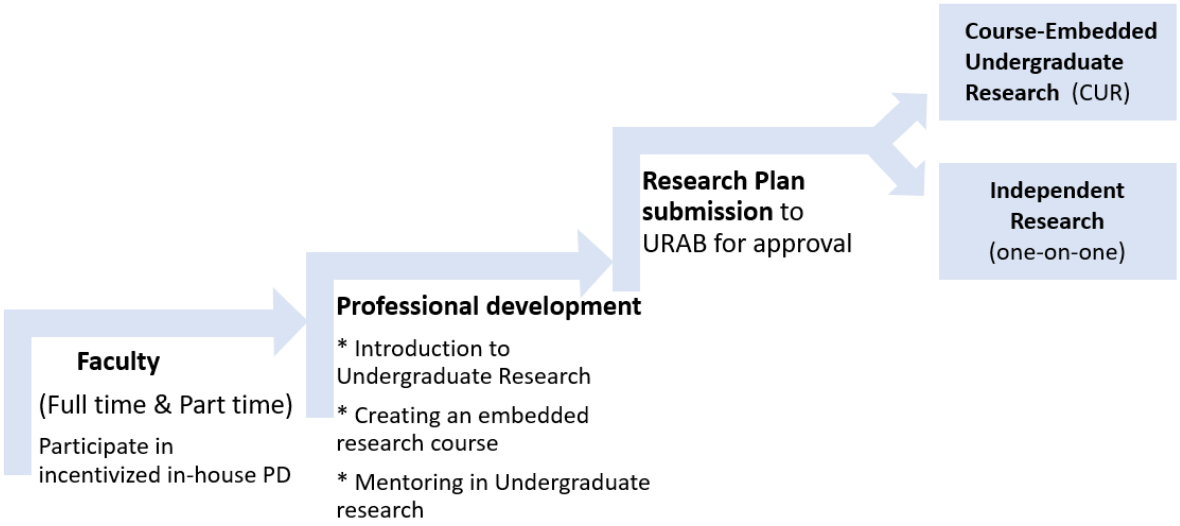


Why Would Professional Development on Mentoring be Required?

With UREs, faculty-student mentoring relationships are considered essential to undergraduate students' decisions to pursue graduate level science (Plund et al., 2006). One of the most rewarding aspects of engaging undergraduate students in research is to make connections with concepts within the field but also foster personal connections (Dolan & Johnson, 2009). In that, teaching research and mentoring research are two *different* initiatives. While teaching research in discipline, faculty communicate knowledge, theories, principles, and methods; in mentoring research, mentors need to effectively communicate everyday problem-solving methods in discipline in addition to communicating the content. Despite the known, well-documented benefits of mentoring, the "best practices" to engage in strong faculty-student mentoring relationships are often considered unclear. Many faculty who are experts in their respective discipline find themselves not equipped or trained to foster this personal connection. The Council on Undergraduate Research (CUR) has provided the mentoring guidelines largely around setting clear expectations from the perspective of students, incorporating routine weekly checks to foster active communication, encourage *all* questions, and value their contribution while fostering increasing independence. While there is significant research about mentoring activities, little is known to elucidate *how* mentors fulfill their roles effectively to conform to the varying needs of the students. Despite the dearth of research in this field, it is widely agreed that mentoring provides critical opportunities and is essential to motivate new scholars and scientists (Dolan & Johnson, 2009; Plund et al., 2006). Development of critical skills as a mentor is vital for creating successful UREs.

To this effect, we have created a sequence of professional development courses that strengthen faculty skills to integrate and scaffold research opportunities for students while keeping mentoring as the basis of their program (Figure 3).

Figure 3. *Professional development process and support for faculty mentors*



Structure of Professional Development Courses

As described before, at Valencia we offer Professional Development (PD) courses to model the model that we are always learning something new. PD courses can focus on a variety of topics, ranging from classroom management to best practices for teaching online. The college offers monetary incentive to complete these trainings to both full-time and part-time faculty. All faculty are encouraged to participate in a voluntary incentive program to engage with PD and high-impact practices such as undergraduate research. There are several benefits for taking PD courses at the institution, the first being that faculty often get to meet new faculty outside of their own department. This creates a forum for networking and interdisciplinary collaboration. Additionally, faculty share best practices with each other which in turn creates stronger research curriculum. Secondly, and specific to undergraduate research PD, when enough hours are completed, faculty can receive a monetary bonus for documenting how they implement this high-impact practice in their classroom curriculum. For each academic cycle, faculty can develop a plan that demonstrates how they are using research to advance their scholarship of teaching and learning inside the classroom. In tandem with PD courses which add to our growth as educators, these projects receive departmental recognition and can lead to participants earning financial compensation for their efforts.

At the beginning stages of bringing undergraduate research to Valencia, we knew that PD courses in this area would be vital for faculty across the college. Working in tandem with the Faculty Development team, the undergraduate research advisory board created three new classes to guide faculty who were interested in getting involved in this work. Figure 3 describes the professional development process and implementation plan for a potential research mentor at the college. It is important to note that as an institution without graduate-level degree programs, we do not attempt to teach faculty how to do research in specific fields. Instead, we expect faculty to bring their prior training and backgrounds to the classroom and use the PD courses to help them find ways to become effective faculty mentors to their students.

Our first course is titled “An Introduction to Undergraduate Research.” In this course, participants learn what research at Valencia can look like. This is a 3-hour PD course where faculty learn about why research is a high-impact practice and discover the various supporting resources at the college. At the end of the class, participants are required to share their ideas with their colleagues and create a rough design about what future research projects they may want to include in their course. This unique course was a catalyst in gearing faculty towards creating undergraduate research

experiences in their own courses. In the end-of-course survey, when asked to comment on *how this specific course helped the participants change their understanding or appreciation of the learning-centered competencies of a Valencia Educator,* all participants reflected on URE as a high-impact practice and centered on learning. For example,

- Faculty Participant 1, "I was able to connect undergraduate research components with learning competencies. For example, having research opportunities in my New Student Experience course can help students become more independent learners, tying in directly with their life skills."
- Faculty Participant 2, "Undergraduate research is an efficient way to infuse learning-centered competencies. Thinking about the opportunity I can create for my students while meeting all competencies is awesome. This program is focused on High-Impact Practices."

Further, when participants were asked to reflect and provide details on how they would directly implement this in their courses, participants unequivocally extended the learning outcomes of the course to projects in support of an embedded model to make a difference and inspire learning to the highest level possible for all students.

- Faculty Participant 3, "This course has introduced me to the use of the library and its resources (i.e., information literacy) and the high-impact practice we can provide with UR. My students will benefit from sessions with librarians to find current literature and ethics. I will incorporate all of these competencies in whatever I am doing as an educator to be effective, make a difference, and inspire learning to the highest level possible."
- Faculty Participant 4, "I will consider the implementation of research in an embedded format for my students. Thanks to feedback from my facilitators and peers, I have a great research idea to implement with career exploration, a major component of New Student Experience."
- Faculty Participant 5, "When determining how to develop an embedded-research method within a class, in order to broaden the student's thinking, you as an educator, have also broadened in implementing these competencies. The educator learns along with the student."

This clearly reflected faculty growth mindset in expanding challenges in their classes beyond the curriculum and investing in ideas to foster growth mindset among students, resilience and mentoring for students.

The second course, "Creating an Embedded Undergraduate Research Curriculum," closely follows the model proposed by the Council on Undergraduate Research (CUR) to embed research into students' regular general education classes to reach more students and better prepare them for future work in their discipline. Having been exposed to a basic structure of research in a two-year college setting, faculty begin the PD course with a class they already teach. They spend four weeks modifying their current class curriculum to incorporate a research project that the entire class will participate in. Research has supported this model, because of the long-term gains seen from students who engage in these types of research experiences (Lopatto, 2007; Lopatto & Tobias, 2010). Moreover, at a two-year college where creating new courses and electives can be difficult due to degree restraints, faculty appreciate being able to take an already existing course and find a way to make it more interactive and more hands-on. The PD course is particularly well-received because in addition to working closely with the college's undergraduate research coordinator, faculty members are also given the chance to share their work with their colleagues. In this sense, Valencia College has successfully harnessed the connections faculty have among each other and within departments.

Throughout this 20-hour PD course, the facilitators emulate the importance of mentorship by offering to meet with faculty individually and providing guidance on their curriculum design. This effort

reflects a crucial aspect of a research-embedded course, such that faculty must establish trust in the classroom early on. Students who enroll in a research-designated class may not realize that the course involves an extra level of work. When first encountering scientific methods, students may be intimidated, and some even experience heightened levels of anxiety (Murtonen, 2005; Papanastasiou & Zembylas, 2008). However, we address this challenge in the PD course by discussing how to introduce the topic of research to students and identifying ways to scaffold project requirements.

At the end-of-course survey, when asked, *how the course has changed their understanding or appreciation being of a Valencia Educator,* participants stated:

- Faculty Participant 6, "Undergraduate research embedded courses offer faculty a lot of information regarding implementing research to teaching. Learning is more fun and efficient through doing. I appreciate this course helps me appreciate the learning centered-teaching strategies better."
- Faculty Participant 7, "I have increased my professional commitment as this class has enabled me to teach my research designated course in the Spring. This course allowed me to better structure a curriculum plan. I had to reconsider my current research assessments and add new, more successful formative assessments."

The final PD course of the trio is one that was recently redesigned to consider how equity-minded practices can enhance the mentor-mentee relationship. "Mentoring in Undergraduate Research" was historically only offered to faculty who were interested in supervising a student completing an Honors research thesis. However, as the undergraduate research program has grown, the course has now expanded to include any faculty interested in supervising a student doing any kind of research at the college. In doing so, we created opportunities for students and faculty outside of the Honors College. Again, rather than focusing on what makes a research project viable, this course centers on what makes a mentorship successful. Faculty who take the course spend a week evaluating their teaching philosophy and identify ways that they can support their student throughout the research process. We have learned that while faculty can come from intensive research backgrounds and have years of expertise in their area, some have never considered their mentorship style.

In the end-of-course survey, when asked, *how the course has changed their understanding or appreciation being of a Valencia Educator,* participants stated:

- Faculty Participant 8, "As a result of this course, I will be more cognizant of communicating with my mentee and making sure we are both in agreement with the expectations of the project and our roles."
- Faculty Participant 9, "This course provided me with a great understanding of the mentor-mentee relationship."
- Faculty Participant 10, "I understand the importance of mentoring and what is expected from each person involved in the process."
- Faculty Participant 11, "I have always wanted to do Undergraduate Research from the role of a Mentor and believe this course has provided me with the necessary tools to make an impact as a Mentor."

In an effort to support our faculty (and students) beyond the PD courses listed above, the undergraduate research advisory board also built an online repository of modules to act as a supplement in the research process. In total, there are 20 modules for faculty to pick and choose from. These modules cover a variety of topics and can be used by students and faculty to enhance or review additional knowledge needed to work on a project. For instance, faculty can import a module on "Lab Safety" as a refresher for students in the STEM disciplines. For our social science researchers, there is a module on the "Responsible Conduct of Research with Human Participants"

to cover ethical standards when working with people. If a faculty member wants their student to prepare a poster for a research conference, they can direct them to the module which walks them through the steps of creating this type of presentation. To encourage use, the modules are accessible in the Valencia Canvas Commons and can be freely uploaded to any Valencia employee's course.

Undergraduate Research Opportunities for Students

As mentioned above, Valencia is committed to creating a research experience that not only boosts students' skills but also strengthens the relationships they have with their faculty members. Students who take research-embedded courses will not only develop lifelong hard skills, but also cultivate soft skills such as collaboration, communication, critical thinking, etc. Working together on a group project can often be stressful; however, most of our students have expressed a genuine feeling of pride and accomplishment after taking these classes. Moreover, these assignments lead to students forming lasting friendships with the peers they worked with.

Research Embedded Courses (Using the CUR Model)

The mission of community colleges is to create settings that emphasize teaching over research. However, the integration of undergraduate research experiences into general education classrooms benefits both students who aim to transfer to four-year universities and those who need preparation for future careers. Since many of our students face challenges taking additional classes and/or electives outside of their degree, introducing research as a part of the class allows these experiences to be more accessible.

Course-embedded undergraduate research experience (CURE or embedded research) is primarily a research model where students are exposed to research through activities embedded *within* the curriculum (Hensel & Davidson, 2018). In that, *every* registered student in the *whole* class participates in research. This increases accessibility of research opportunities and students are more equipped for transfer and completion of their degrees. This model has provided significant value to both the students and faculty. Faculty feel that since research is at the pinnacle of active learning, this pedagogy enhances the learning experience for the students and elevates the scholarly atmosphere of the course. Students apply their knowledge in meaningful ways while learning the course content. Improved student engagement increases their self-confidence and empowers them to think critically and independently. In our experience, students reported a deeper understanding of complex concepts, ability to make connections across concepts, and comfort to collaborate and share their knowledge, hence building a shared learning community for themselves.

The authors of this manuscript have been dedicated to the development, implementation, and assessment of a sustainable model for integrating a UREs into community college curriculum. In the last four years, CURE has been successfully implemented at sophomore level across a variety of disciplines at Valencia College. Briefly, the project would be completed over 10-14 weeks with research components distributed throughout that time. Students are typically required to provide a design indicating how and when the work will be completed, while dividing the work appropriately between the group members. Due to the nature of the projects, students often have to demonstrate specific knowledge of lab safety, chemical safety, work practice controls, survey design, and ethics certification for successful outcomes. The experimental design requires students to work within the time constraints of the course, while ensuring content knowledge. Students are assessed on both process and the product obtained through their research experience. Each stage of planning, development, and implementation serves as a formative assessment for the iterative cycle of a second trial or reflection. Typical implementation of core exercises would require 2-3 lab/class periods and are done hands-on and collaboratively.

Equity in CURE: A Research Methods Course for All Students

Using the CURE model (Hensel & Davison, 2018), Valencia College has spent the last several years encouraging faculty to find ways to embed the high-impact practice into their course curriculum. Faculty have enjoyed developing curriculum that introduces students to disciplinary content while also engaging them in research practices. While these courses have been well-received by students and faculty, the college recognized that not enough courses were being offered to consistently attract students of various disciplines, given that the majority of these classes were in STEM or social sciences and were not always available at many Valencia campuses. In an effort to make undergraduate research more accessible to students, Valencia's undergraduate research coordinator and the Honors research coordinator worked together to redesign a course titled, "Honors Research Methods." Traditionally, this course was only available to students in the Honors program and in a face-to-face modality. After several conversations about ways to engage students in research at the college, the coordinators and faculty for the Research Methods course agreed to convert the course into an online modality while also allowing non-Honors students to enroll in the class. Working with the curriculum committee and the Honors College, the research coordinators decided that any student with a 3.0 GPA or higher could request to take the class. By doing this, we have provided an opportunity for students in *any* discipline to take a research methods course. The course is offered as a 2-credit interdisciplinary elective. Since its redesign and implementation in Fall 2020, the enrollment in this class has tripled. Table 2 summarizes how we restructured our existing course to make it more accessible to everyone at the college. Students who are not members within the Honors College now make up 15% of enrollment. As word gets out about this new pathway, we hope to see a further increase in student registration.

Table 2. *Example of Enhanced Access to Research through an Embedded Course*

Before	Fall 2020	After
Honors program		All students interested in research
Face to face modality only		Available in online modality
Limited access		Enhanced access led to 3X enrollment

To better understand students' growth over the term, faculty who teach UR embedded classes, are asked to distribute a pre/post-survey to capture students' thoughts about the experience. At the end of 16 weeks, when asked, *what did you like most about the course*, most students focused on the skill set that they had developed:

- Student 1, "I thought I knew what research was, but I learned about how the process works logically."
- Student 2, "I learned about the requirements and tools you need to conduct research."
- Student 3, "The content provided -- I learned A LOT about research methods, how to apply these techniques to various aspects of my life, etc. Learning about these concepts is a blessing, and I am glad that I was given the opportunity to do so. I know that everything I have learned will be relevant to the research I conduct later on."

Similar to the CURE courses described above, students in the Research Methods course also become active participants in the research process. Students in this course must not only learn about academic research, but also develop a proposal for their own project within their major. Throughout the semester, students are provided one-on-one support by the instructor, librarians, and data consultants. In fact, there are at least four mandatory meetings to be completed within the term. By including these meetings as a part of the course, students are 1) obligated to keep up with

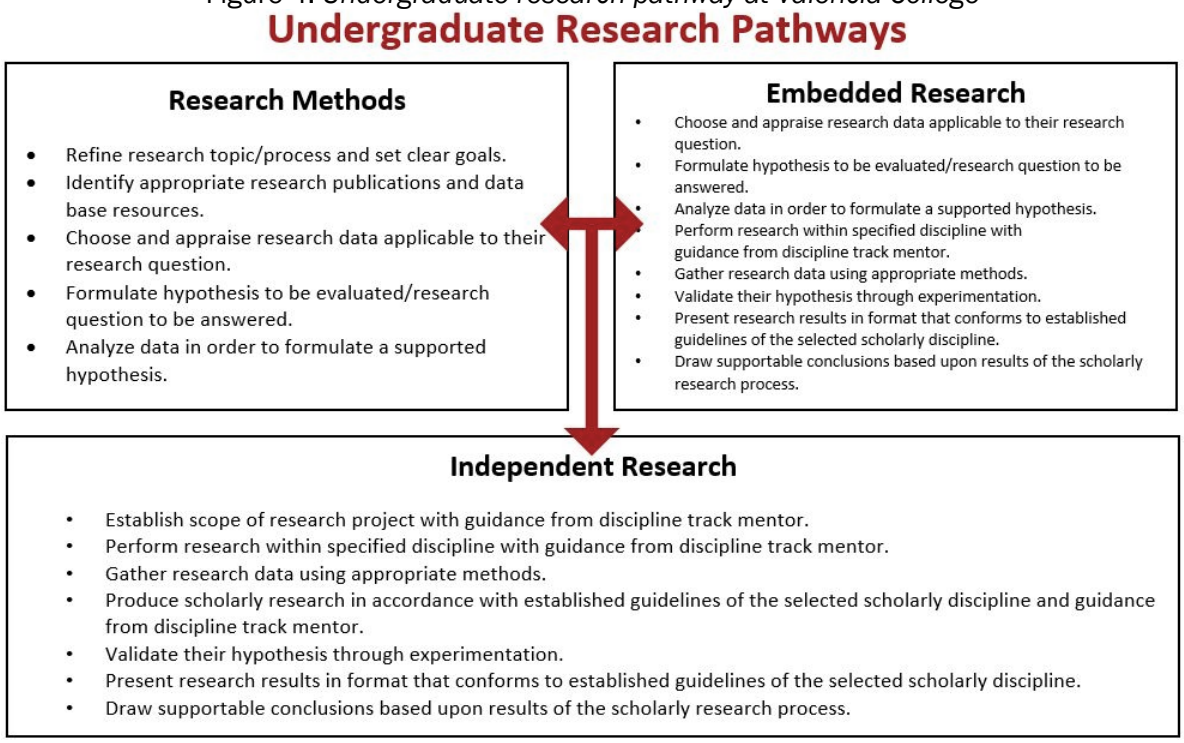
their work and 2) presented with check-in points where they can have personal conversations with academics about their research vision. Later we reviewed the post-survey responses from 51 students who took the course. In the survey, we asked, *how useful did you find the one-on-one meetings with the Librarian?* and *how useful did you find the one-on-one meetings with the Instructor?* All but one student responded, "very useful" or "extremely useful." In fact, some students stated this these interactions were the best part of the course:

- Student 4, "The professor was very kind and responsive to the needs of students and I never felt as if I was 'on my own.' Also, there were plenty of sources for information and easy to digest projects that helped build understanding without feeling overwhelmed."
- Student 5, "I liked how the course introduced the library and how to use it, as well as the number of one-to-one meetings there were."

Independent Studies Research Project

In addition to the embedded courses, students who are truly interested in engaging in research at a higher level can also request to complete their own independent research class with the guidance of a faculty mentor (see Figure 4). To ensure that students are prepared to take on the rigor of completing their own project, the College requests that students complete an application for the course. In the application, the students must identify a mentor, state the project thesis, and outline the purpose and design of the project. From there, the undergraduate research coordinator works with the faculty member and the academic dean to develop viable research goals and create the course. Unlike the research methods course or an embedded research course, students are expected to take a more active role in the research process throughout the semester. Students are required to meet with their mentors weekly, complete a literature review, engage in data collection, and present their findings in a public forum. That said, faculty mentorship is still crucial to student success since faculty help to guide the student in discipline-specific techniques, research design, data interpretation, and presentation preparation. The independent studies course is a 1-credit course which allows us to compensate faculty and transcript this work for the student.

Figure 4. *Undergraduate research pathway at Valencia College*



A post-survey of the class experience revealed the following:

- Student 6, “Personally, this research allowed me glimpses into the fields I aspire to - much of it was wisdom from my mentor. For instance, I was able to conduct research on endosteum, a membrane that lines the interior of bone cavities. This is just one of the many unknowns that come in the path of research - you simply don’t know exactly everything. It is outside of the classroom setting in the textbook where seemingly everything can be answered.”
- Student 7, “After completing my biology class, my professor saw potential in me to do independent research. He then recommended I join the Louis Stokes Alliances for Minority Participation (LSAMP) program where I worked on my research project for four months.”

Networking Beyond the Classroom

Bi-Annual Undergraduate Research Poster Showcase

When developing the undergraduate research program at Valencia, the advisory board knew that one of the requirements to a successful program would be to create opportunities for students to disseminate their work to the public. Although some of this work was happening in small pockets throughout the college, the advisory board tasked the research coordinator with the responsibility of creating a bi-annual, college-wide research poster showcase. Since its inception in 2017, the poster showcase has grown into a major event. The purpose of the poster showcase is to provide students a forum to present their research to the academic community. Oftentimes, our students have never presented in a conference setting, so the showcase at Valencia is touted as low-stakes and encourages students to attend to practice their networking and presentation skills. In an effort to include all potential participants, the advisory board works closely with the Honors College to cover all student costs for the event. Printing for posters is fully funded. Furthermore, winners of the showcase receive ribbons for placing, recognition in the college newsletter, and registration to future conferences. Recently, we have had students participate in the showcase and then go on to present at conferences, such as the Florida Undergraduate Research Conference (FURC), the National Collegiate Honors Council (NCHC), and disciplinary-specific conferences like the Two-Year College Chemistry Consortium (2YC3) and the Southeastern Psychological Association (SEPA).

Over the years, the showcase has attracted not only more students, but more participants from the Orlando community. We have invited experts from the university, the city’s science museum, and even local businesses to act as our judges for the event. As a result, the college’s program is slowly beginning to gain recognition beyond the walls of the institution. There has been an increase in Valencia students who have applied for, and been accepted into, Summer Research Experience for Undergraduates (REUs). Our students are working with faculty at other colleges virtually for 10-12 weeks and most are supported by federal or institutional funds. Students who graduated from the research program are being streamlined into programs at other universities. Many times, they receive fellowships and program funding to support their academic and research endeavors. Faculty members are developing projects with city officials and community partners. It is clear that the more our students exhibit their hard work, the more doors open to them in the educational ecosystem.

We typically follow up with the students who participated in the poster showcase one semester after the event and interview them about their research and presentation experience. Here are a few responses we received:

- Student 8, “I have developed a sense of accomplishment at the time of presentation. Research is a transferable skill that is an efficient research topic. I find myself skimming info quickly, reading thoroughly, when need be, dissecting info better. Improved presentation skills, communication, explaining experiment design properly.”
- Student 9, “Through the Research Showcase I have connected with other resources at other colleges and universities that have offered to help me with graduate school. I have also been

able to connect with other institutions in and around Orlando that have offered me internships and resume building opportunities."

- Student 10, "I was able to present my research at the Valencia Undergraduate Research Showcase and I found myself wanting to do more research afterward. Research has given me hands-on experience that has been invaluable for my academic and professional career. My undergraduate research really gave me the toolset I needed to join bigger research teams at the university. And having research experience on your resume has really set me apart from other candidates."

Undergraduate Research Guest Speaker Series

Another major accomplishment of Valencia's program has been the ongoing Guest Speaker Series. Beginning in Fall 2019, we have had several experts and program directors talk to our students about how to be successful in their UREs. In the summer of 2020, we had eight guest speakers present on topics such as "How to Use your Library Resources", "How Research Helped Me Get into Medical School" and 'How to be a Competitive Candidate for Graduate School". This event attracted over 110 student participants. The following Fall and Spring, we invited back some of the speakers, many of whom work at the four-year university and are hoping to recruit our students. In addition to collaborating with our academic partners, we have also tried to encourage Valencia faculty to participate in the Guest Speaker Series. Last March and April, we invited four faculty members of the college to speak to students about their own graduate school experience and research expertise. Not only were the students impressed with the work of faculty whose classes they have taken, but they also began to connect with faculty on a personal level. Post series, many faculty members reported hearing from students who wanted to know more about their academic journey. Once again, by creating these moments, students begin to realize that research is an accessible and viable path to achieve goals that they may have never considered.

Challenges and Opportunities

Funding and Support

Historically speaking, the workload for most faculty at two-year institutions is embedded primarily in teaching (Boggs, 2010; Trainor, 2015). To provide equitable experiences in the classroom and harness the full potential of undergraduate research, interested faculty need to make this powerful pedagogy a part of their curriculum, which was described as a course-embedded model previously. This is time-intensive and often a deterrent in extensive participation from *all* faculty.

The American Association of Colleges and Universities (AAC&U) has championed undergraduate research as a high-impact educational practice that results in significant benefits for students who participate (Lopatto, 2010). At Valencia, we value undergraduate research and promote it extensively by encouraging faculty to participate in paid PD opportunities, faculty incentive plans and endowed chair fellowships internal to the college. Faculty have enthusiastically participated in these PD opportunities. Faculty have reported enthusiasm to extend their curriculum in providing undergraduate research opportunities to students. Faculty incentive plans as well as endowed chairs have been identified as fertile opportunities for implementing high-impact practices. At Valencia College, a high-impact practice is defined as "additional work to improve Valencia's effectiveness as an institution specifically through a faculty member's engagement in a deliberate, documented process of reflection, planning, action, and observation intended to improve student success." Briefly, faculty participate in a two-year design and implementation cycle to identify a problem of practice, set clear goals, and appropriate methods within the first year. In the second year, they collect and share data, results, and reflection for approval. This initiative to reward engaged faculty has fostered growth and enthusiasm among them to inculcate UREs in their classroom.

Faculty are also highly encouraged to seek external support and collaborate with university faculty at neighboring institutions while making connections and a pipeline of students wanting to pursue graduate work.

Educational Equity

Identified as a sustainable development goal by the United Nations (Ferguson & Roofe, 2020), equity in education is often measured in achievement, fairness, and opportunity. Two important intertwined factors controlling educational equity are fairness and inclusion. This implies while assessing the student's learning, neither their personal conditions nor a comprehensive standard in policy should be a hurdle in their academic success.

Importantly, participating in research has been shown to positively influence student persistence especially in the science, technology, engineering, and math (STEM) fields (Rodenbusch et al., 2016). Further, the length of the URE, as a combination of multiple experiences or a single experience, connections and mentorship, and the work environment have been identified as key reasons for students to continue with research or not. Feeling excluded, lack of support and unfairness have been described as major reasons that create inequities in learning and prevent successful completion of research (Cooper et al., 2019).

We believe that increasing access to funding opportunities for faculty and creating research opportunities for *all* students to gain UREs within the first two years of their higher education is a step forward in removing those inequities. Early exposure to UREs in higher education might help students identify key transferable skills for their future academic lives. These experiences might also help them identify the value and the cost of completing the task and become aware of what motivates them.

Role of the Stakeholders

Administrators

College administrators should find ways to recognize and reward faculty who are actively engaged in UREs. University systems often include "directing undergraduate research" and "collaborating with and mentoring undergraduate students" as criteria for promotion and tenure. However, this may not be a practice in two-year colleges, largely due to the focus on teaching. Developing mechanisms to include *all* faculty in receiving a scholarly credit for engaging with UREs would motivate more faculty to offer research opportunities for undergraduate students. Academic awards, campus-wide news releases, public recognition of students and faculty engaging in undergraduate research are simple yet effective ways to appreciate and recognize their contributions in the campus community. Connecting, collaborating, and partnering with neighboring institutions to explore ways to partner with each other allows to garner interactions in building trust. This will foster deeper cross-campus collaborations as systems to recruit well-prepared and research-experienced graduate students.

Faculty

Faculty must find ways to initiate UREs. While grant funding is an important aspect of many academic programs at universities, at two-year colleges, development of pedagogy can lead to a robust course-embedded research experience that removes inequities in opportunity. When educators consider the development of embedded research within the curriculum, they should also consider including research components for undergraduates including well-defined outcomes for the student and its value to the overall project.

The first step towards developing undergraduate research at the institution is to require in-house professional development to better align with the college's mission of developing robust high-impact practices. Independent of the pathway, identifying one's own mentoring style is an important

cornerstone in developing the UREs. Partnership between the undergraduate research board and New Student Experience can help create a pipeline of first-year students interested in pursuing research and recruit them in a future course.

Students

Students interested in research need to be proactive about gaining research experiences as early in their academic career as possible. They are highly encouraged to interact with the UR office, individual faculty, departments, and internship office to determine their needs. These academic units may be able to recruit or direct students to those opportunities that may not be explicitly advertised at times. The resourcefulness, interest, and perseverance shown in looking for opportunities also becomes an important skill in their own graduate careers in future.

Outreach of the Program

To promote UREs as a pedagogy at the two-year college level, we have coordinated efforts with each departmental unit, student development, college newsletter, undergraduate research advisory board members, faculty senates, faculty members to directly connect students with appropriate faculty or sign up for classes supported by research or research components (Figure 2). These coordinated efforts have led to a growth in faculty participation in URE-related PD courses, support from administration, recognition of research embedded courses in college's newsletter, presentation of our students' work at national and international conferences (Sharma, 2018; Sharma et al., 2019). The undergraduate research board has an official presence on the college's website and opportunities such as the peer reviewed Valencia Poster Showcase and Speaker Series are widely advertised to get student attention.

Conclusion

Two-year colleges have had a history of creating a skilled workforce. In the last two decades, two-year colleges are seen as a problem-solver in accessibility and lowering tuition costs while also serving as fertile spaces to produce leaders, educators, and researchers. Being open-access institutions, they provide higher education opportunities to *everyone,* including underrepresented minorities. As more students have started their educational journey in higher education at the two-year colleges, there is a need to establish sustainable mechanisms to allow for high impact practices, such as UREs to allow for a successful completion, preparedness, and transfer to a university.

The presence of established UREs within the first two years of higher education has been shown to increase persistence and completion by targeting individuals early in their academic career and pursuing opportunities to develop their transferable skills. Lack of robust opportunities, however, reduces access and creates educational inequities for many students especially from the under-represented minorities. We have created a unique integrated platform of interconnected stakeholders to increase access for *all* students in undergraduate research experiences within their first two years of academic life. We found that fostering robust undergraduate research experiences while nurturing mentoring relationships, supporting faculty through an effective pipeline of undergraduate research related PD, and rewarding dedicated faculty are important factors as academic units find ways to bolster research efforts.

Building connections across the college through undergraduate research experiences increases opportunity and accessibility for underrepresented minorities and is inevitably an equity-minded practice. Colleges should actively explore these paths in an effort to maintain relevance, increase persistence, and reduce inequities for all students.

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