PRACTICE

Beyond Learning: Leveraging Undergraduate Research into Marketable Workforce Skills

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Abstract

Learning outcomes can structure and enhance the undergraduate research experience, building skills such as critical thinking/problem solving, communication, and teamwork/collaboration. These skills often correspond to what employers desire in their recruitment of recent college graduates: students possess career competencies that result from undergraduate research and prepare them for the workforce. However, students do not necessarily recognize the value of undergraduate research for workforce preparation, recognize how their research experience has prepared them, and/or are unable to fully articulate their preparedness. The authors discuss the value of integrating learning outcomes across the college experience to enhance undergraduate research and career readiness. They detail the implementation of an integrated model within a primarily undergraduate institution and suggest strategies to best leverage undergraduate research for workforce preparation.

Keywords: *career readiness, learning outcomes, student outcomes, undergraduate research, workforce preparation*

Conducting undergraduate faculty-mentored research is considered a high-impact practice (HIP) with benefits for students such as providing them with a platform outside the traditional classroom to practice integrative and applied learning (LEAP 2007; Kuh 2008). Learning outcomes (LOs) structure and enhance undergraduate research (UR), especially when they reflect career-ready competencies. This article discusses the integration of LOs with UR activities as a vehicle for preparing undergraduates for the workforce. Also suggested are tangible techniques for mentoring students to leverage their UR experience for career readiness. Finally, methods are suggested for careful coordination of services and assessment efforts across departments and offices using a variety of assessment tools, which can assist in effective measuring of the relationship between these outcomes and career preparation for students.

HIPs, such as UR, enable undergraduate students to achieve LOs and thrive as citizens in the global economy (LEAP 2007; Finley 2019). The National Leadership Council for Liberal Education and America's Promise (LEAP) has identified HIPs and developed essential LOs (ELOs, LEAP 2007). These ELOs include critical and creative thinking, written and oral communication, and teamwork and problem solving. The ELOs serve as a framework for higher education: they inform curricula and guide the student experience (LEAP 2007). LOs can guide the UR experience, especially when they are integrated across the entire college experience (Brownell and Swaner 2009). Undergraduate faculty-mentored research has many established benefits (e.g., see Linn et al. 2015) and continues to gain prominence as colleges and universities adopt models for integrating UR on their campuses. When aligned with LOs and integrated in a co-curricular manner, UR can lead to improved student learning gains and skills that elevate students as they enter the workforce (Carpi et al. 2017; Stanford et al. 2017; Carter et al. 2016), particularly depending on the research situation (Walkington 2015). HIPs have been shown to enhance workforce readiness and career attainment (Miller, Rocconi, and Dumford 2018). Purposeful integration of LOs

FIGURE 1. Integrated Model Concept - Shared Learning Outcomes
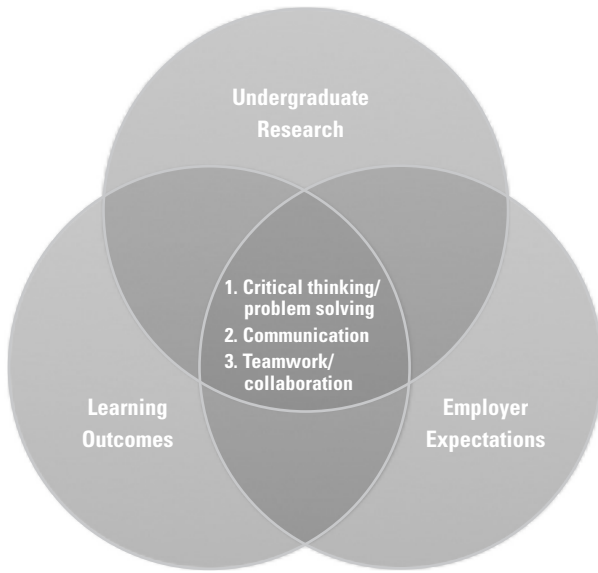
such as critical thinking/problem solving, communication, and teamwork/collaboration in curricula appears to lead to benefits of UR that correspond with those LOs (Lopatto 2004, 2010; Osborn and Karukstis 2009).

One benefit of UR is that the competencies gained by students align with more than just LOs: they also align with competencies often sought by employers. The 2019 Job Outlook report from the National Association of Colleges and Employers (NACE) revealed that critical thinking/problem solving, teamwork/collaboration, and oral/written communication were ranked 1, 2, and 4 in the top-four most highly valued competencies for employers hiring college graduates and in the top-five qualities for employer searches of resumes (NACE 2019), a trend also found by AAC&U (2018). Additionally, employers seek potential employees who possess applied experience such as UR. AAC&U (2018) determined that 81 percent of employers would be more likely to hire a recent graduate with UR experience. Thus, when LOs guide undergraduate faculty-mentored research, this HIP can provide a direct approach to equipping students with competencies that simultaneously meet LOs and employer expectations (see Figure 1 for a conceptualization of this integrated model). Employers value critical thinking/problem solving, communication, and teamwork/collaboration. These three competencies are also ELOs (LEAP 2007). When ELOs inform undergraduate faculty-mentored research, these are benefits that UR provides.

This is especially notable in the context of increased scrutiny of the liberal arts. The liberal arts have been criticized for preparing undergraduates insufficiently for the

workforce (e.g., as discussed in Dorman and Brown 2018; AAC&U 2014). However, the evidence seems to suggest the contrary: there is an inviting synergy between the influence of employer expectations and LOs on high-impact learning opportunities such as UR, and those HIPs better prepare undergraduates for the workforce. For example, in a survey of employers, Chan and Gardner (2013) found that employers look for skills possessed by arts and sciences graduates, including abilities in analyzing data as well as synthesizing and communicating information.

In sum, there is substantial overlap between skills acquired by students through UR experiences guided by learning outcomes and needs of employers for their college hires: students are developing career competencies from UR that prepare them for the workforce. Therefore, successfully integrating LOs across the college experience in ways that provide opportunity for faculty-mentored UR is ideal.

Implementation of an Integrated Model

Like many other small, liberal arts institutions that serve a primarily undergraduate population (PUIs), St. John Fisher College (SJFC) has college-wide LOs that are informed by the AAC&U ELOs. These all-college learning outcomes (ACLOs) include inquiry and analysis; ethical reasoning; written, oral, and visual communication; citizenship and civic engagement; diversity, equity, and inclusion; and content and discourse of field. These outcomes guide and unify student learning experiences through such venues as a student research center, departmental curricula, and the career center. Under this model, UR is conducted with specific LOs that are informed by the ACLOs. Initiatives at SJFC are discussed below that serve the goal of leveraging UR for optimization of employability and provide a valuable role for partnerships among different campus entities, which create a synergy toward accomplishment of this goal. Assessment data showing the benefits of these initiatives also is discussed.

Centralized Research Support

The largest-scale UR initiative at SJFC is the recent development of a Center for Student Research and Creative Work, growing over the last decade and gaining formal status in 2016. Centralized, college-wide support for students and mentors in every discipline is a critical component of the center's mission. Its goals are informed by the Council on Undergraduate Research (CUR)'s *Characteristics of Excellence in Undergraduate Research* (Hensel 2012) and align with the ACLOs and general education curriculum.

A fundamental program of the Center is the Summer Fellows Research Program—a 10-week, intensive, summer UR experience in which faculty mentors from an array of academic programs work with students on projects related to their academic discipline. Students and mentors receive

TABLE 1. Summer Research Program Assessment Data

Outcome	Pre *M* (*SD*)	Post *M* (*SD*)	*t*	df	*p*	*d*
Communication	3.96 (0.65)	4.46 (0.49)	-4.68	30	< 0.001	0.86
Critical thinking/problem solving	3.73 (0.77)	4.38 (0.55)	-4.85	30	< 0.001	0.89
Teamwork	4.58 (0.72)	4.97 (0.18)	-3.01	30	0.005	0.57
Career readiness	4.16 (0.93)	4.71 (0.53)	-3.98	30	< 0.001	0.78

Note: Communication and *critical thinking / problem solving* are two of the eleven outcomes in EvaluateUR and are composed of several items. *Teamwork* and *career readiness* represent single items in EvaluateUR that reflected the authors' outcomes of interest. The values *t*, df, and *p* resulted from a paired-samples *t*-test for each outcome with 32 cases. The effect size, *d*, was calculated specifically for repeated measures designs with pooled standard deviations.

financial support. A primary component of the program is professional development for faculty and student participants. Participants begin with a formal orientation and complete research ethics modules. Optional programming includes a scholarly publishing module administered by a research librarian and informal professional-development meetings. Workshops for faculty focus on topics such as developing documentation of professional growth in the context of UR mentorship. Importantly, this program capitalizes on a partnership with career services. Career services professionals coach students in developing their resumes, articulating their academic work in a workplace context, and improving interviewing skills. After the program's conclusion, students present their work at the annual campus-wide Student Research and Creative Work Symposium.

Assessment of the program has continued to develop within the last few years. Most recently, SJFC served as a 2019 pilot site for the EvaluateUR program funded by the National Science Foundation, which has resulted in a tool now available to all (EvaluateUR 2020). Student learning gains and skills are assessed across 11 outcome categories that improve student success in future academic work and workforce placement (Singer and Zimmerman 2012). Importantly, this assessment has also prompted reflection from research mentors, guiding them toward intentionality as they help students work toward achieving learning objectives. The data from the first wave of assessment of SJFC's Summer Fellows Research Program are promising. Table 1 presents assessment data from mentors, who rated their undergraduate research students at the beginning ("Pre") and at the end ("Post") of the experience through EvaluateUR. These statistics reveal that students made significant gains across their research experience on all outcomes. Furthermore, the effect sizes show that the gains on all outcomes were moderate to strong in magnitude. Students demonstrated significant gains on nearly all outcome measures as rated by their mentors. Notably,

gains were made on key LOs of critical thinking/problem solving, teamwork/collaboration, and oral/written communication. Additionally, students began to see the value of UR for workforce readiness. Thus, there is demonstrable evidence from assessment data that student growth is occurring in relevant LOs and their ability to connect their research experience to workforce readiness.

Individual Programs

There are also departments on campus that have varying commitment levels to UR during the academic year. Psychology is an exemplary program at SJFC in which research skills and career preparation experiences are scaffolded within the majors' degree progression. This approach helps students achieve the ACLOs. Students can take courses outside the formal curriculum to engage in UR under the supervision of a faculty mentor or earn departmental honors through completion of three semesters of a student-led research project. Ultimately, students must successfully write a research manuscript and give an oral defense. Many instructors include formal LOs on their syllabi and ask students to reflect on these outcomes at the beginning and end of the semester. Assessment evidence suggests that these LOs are being met, helping prepare students for the workforce and encouraging more student participation in research. For example, one student wrote:

Reflecting on the course objectives, I really feel as though I've learned a great deal from our SHAPE lab and have experienced growth in many of the areas listed . . . I've gained additional insight as to the implementation of research, the steps that lead to developing a hypothesis, various ways of collecting data, and collaborating with more than one individual to achieve a common goal . . . My thinking skills such as critical-thinking ability, ability to problem-solve, use abstract reasoning, and add innovation have all benefited as a result of our SHAPE lab. I've already been telling other individuals about my experience with independent research and

FIGURE 2. Students Learn to Communicate through UR

have been recommending that if not SHAPE lab, to take a research course.

Such research experiences are optional for the motivated student, but all majors complete curricular research courses such as research methods and statistics. Students also complete at least one advanced research laboratory course, in which groups of students work together to conduct individual research projects under the instructor's guidance. All students write research manuscripts and present their research at an end-of-semester poster session. Figure 2 shows Alex, a fourth-year student who is presenting research conducted as part of an advanced laboratory course. SJFC students present research at the college's annual Student Research and Creative Work Symposium and at regional, national, and international conferences throughout the year.

At the foundation of these courses is the emphasis of LOs. These LOs are informed by both the ACLOs and the APA learning goals (American Psychological Association 2013). Departmental and course learning goals are clearly stated on all syllabi, and instructors discuss these goals with students. When students achieve success in these courses, they have ideally made gains in their development of multiple skills. In one recent laboratory course, 100 percent of students answered *yes* to the anonymous course-evaluation question "Were the course objectives clearly stated?" On the same evaluation, 100 percent of students also answered *yes* to the question "Were the goals of this course met?"

The Psychology Department aims to help students recognize and promote these skills in a required 1-credit career planning course. Students receive training in developing their resumes, building interview skills, writing personal statements for graduate school, and so forth. Instructors partner with career services to provide guest lectures on career preparation strategies. Because of the career

benefits of engaging in HIPs such as UR, the course is also designed to promote additional participation in these activities. Student LOs in this course are assessed with an anonymous evaluation administered to students at the beginning and end of the semester. Students ($n = 52$) have shown gains in familiarity with opportunities outside the classroom, like UR, $t(51) = 3.46$, $p = 0.001$. They also feel more prepared for the workforce, $t(51) = 2.17$, $p = 0.04$. This assessment demonstrates success toward the goal of developing workforce readiness and encouraging students to engage in UR.

Career Services

SJFC recently undertook a strategic effort to synthesize learning with career planning. To boost retention, enrich student learning, and operationalize the intersection between academic work and occupational preparedness, SJFC established the Center for Career and Academic Planning (CCAP) in 2018. At the heart of CCAP's work is career-readiness preparation. Career-readiness includes eight competencies; several of these directly link to SJFC's ACLOs and AAC&U's ELOs (LEAP 2008). CCAP serves as the link between the competencies gained through the HIP of research and competencies expected by employers such as critical thinking/problem solving, teamwork/collaboration, and oral/written communication.

CCAP works directly with students to promote a greater understanding of employer expectations and provide guidance as to how their educational achievements can be explained and highlighted in job applications and interviews. Students learn how to translate the academic terminology of research to employer-friendly language. CCAP provides coaching to help students analyze their research experiences for transferable skills to the workplace (critical thinking) and to improve their communication skills (how to talk and write about their research through the lens of employer expectations and workplace skills). In situations where the research is team-based, students learn to examine and discuss their role on the team as well as their contributions to the final work product (teamwork). These are important focal points for employers during interviews.

For example, the Summer Internship Tuition Support Award program provided financial support for students engaged in a credit-based internship or research experience in summer 2019. This initiative supported nine students in its first year. Several assessment measures were in place. All award recipients wrote a paper reflecting on the role of their experience in preparing them for the workplace (critical thinking and communication) and participated in a panel discussion about the value of the experience to their career readiness (communication and teamwork). Students and their site supervisors also evaluated the students' competencies using a career readiness survey. Finally, students met with

FIGURE 3. Critical Thinking Is Central to UR and Future Work
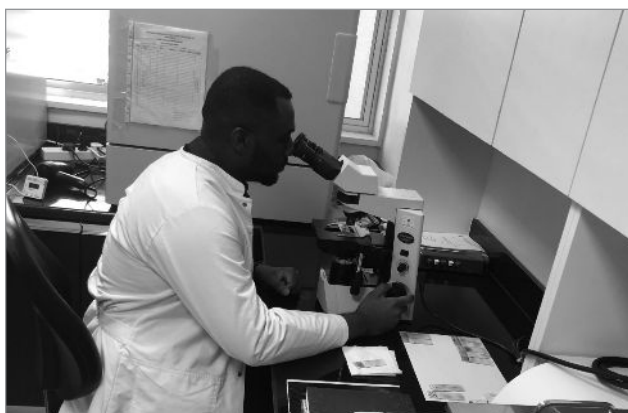
CCAP advisers to explore how they would leverage the experience in their job search process. One student took advantage of this new program to conduct research. Figure 3 shows Andrew, a second-year student investigating anti-malarial drug resistance at the Noguchi Memorial Institute for Medical Research in Ghana to help understand and improve child health.

Intentional Alignment

LOs have provided a framework for the aforementioned initiatives, unifying the student experience at SJFC and resulting in the acquisition of multiple skills. By purposefully incorporating career-readiness as part of the reflective learning of UR, SJFC creates stronger integration between the academic enterprise and work-place competencies. Figure 4 shows this process: LOs that are integrated across the college experience enhance UR. Students work with career service professionals to develop their career readiness in line with employer expectations. Figure 5 outlines this approach to intentional integration, making an explicit connection between learning and career readiness (as suggested in Finley 2019) through the activities and unique assessment data offered by each entity and partnerships that support progress toward the campus's collective goal. A modified logic model of example activities and outcomes allowed for alignment of divisional resources toward a common goal and enhanced collaboration across divisions. By moving away from a siloed checklist model, the data has been placed in conversation across areas for a more complete picture of student learning and career

readiness through research. This has spurred collaborative action and allows for a synthesis of collective impact.
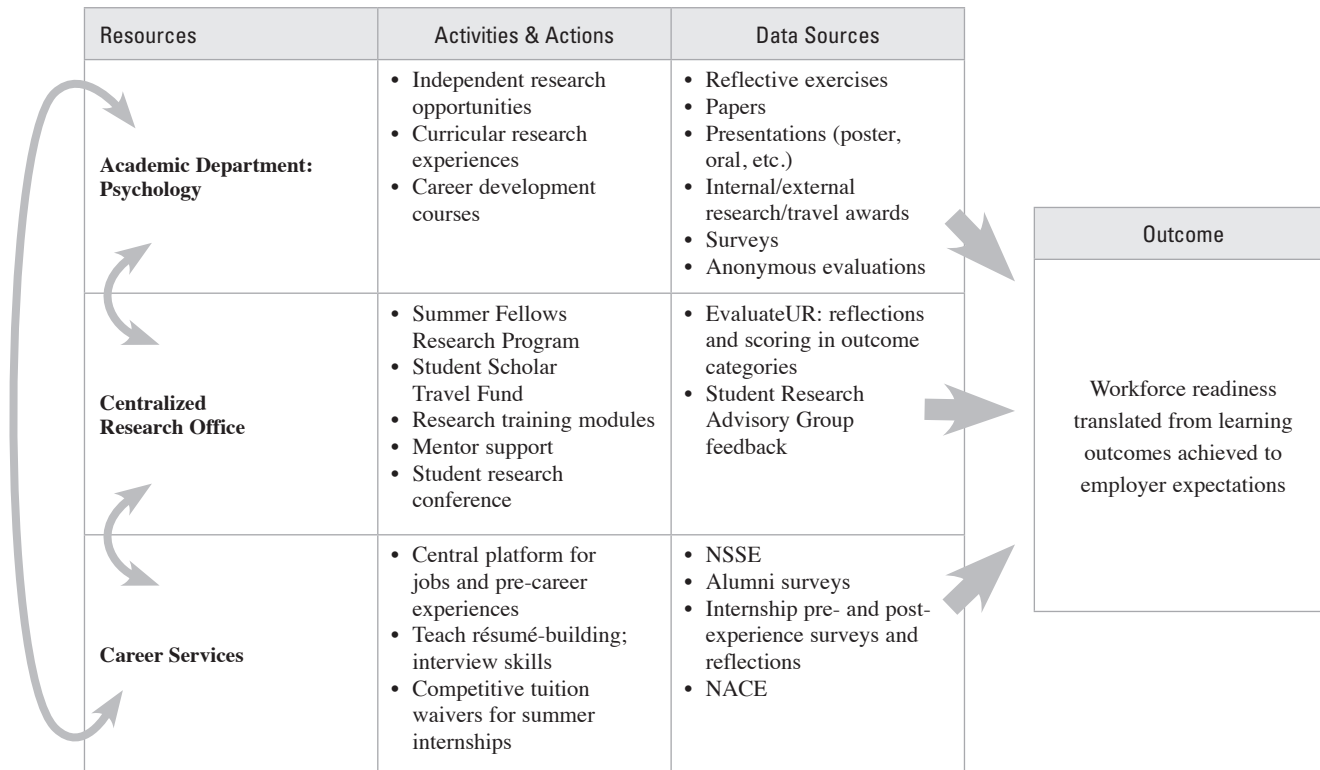
Challenges and Strategies

The skills gained by UR students are desirable in the workforce. However, several issues arise in leveraging UR for workforce preparation. First, students who could benefit from this HIP might not actively seek opportunities to engage in UR or might have had limited opportunity in their field of study. In 2019, only an estimated 22 percent of fourth-year undergraduates had engaged in research (NSSE 2019). Students may not necessarily recognize the value of participating in UR for workforce preparation, especially if they are not pursuing research in graduate school. Second, students who do engage in UR do not always recognize how their research experience has prepared them, nor do they fully articulate this preparedness when communicating with prospective employers or graduate schools.

To overcome these obstacles, a two-pronged approach is suggested for promoting UR as a mechanism for future employment success. One prong involves structural changes to be widely implemented at the collegiate, school, and/or program level. The other prong involves the development of individual students. Assessment is a necessary component of either approach to ensure quality implementation. However, assessment can be conducted in ways that are authentic to each program without one common tool. Together, these assessments can complement each other, providing a rich source of data for institutions to evaluate the alignment of their initiatives.

On the structural level, students must have opportunities to engage in research and be able to recognize its benefits. To optimize opportunities, campus-wide partnerships are recommended that engage in intentional alignment activities as modeled above. When possible, a centralized platform for supporting student research is recommended, such as SJFC's Center for Student Research and Creative Work. Such a center can liaise with individual programs, providing support and resources when possible. A center can also promote best practices in UR across campus and encourage integration of LOs to maximize gains from student research. Moreover, a center can engage with multiple parties across the institution to unify the student experience. Even without a centralized office, faculty and staff

FIGURE 4. Learning Outcomes Connect UR and Career Readiness

Integrated Learning Outcomes → Enhanced Undergraduate Research → Career Readiness Development → Employer Expectations

FIGURE 5. Modified Logic Model of Collaborative UR Efforts Leading to Workforce Readiness

Resources	Activities & Actions	Data Sources		Outcome
Academic Department: Psychology	• Independent research opportunities • Curricular research experiences • Career development courses	• Reflective exercises • Papers • Presentations (poster, oral, etc.) • Internal/external research/travel awards • Surveys • Anonymous evaluations		
Centralized Research Office	• Summer Fellows Research Program • Student Scholar Travel Fund • Research training modules • Mentor support • Student research conference	• EvaluateUR: reflections and scoring in outcome categories • Student Research Advisory Group feedback		Workforce readiness translated from learning outcomes achieved to employer expectations
Career Services	• Central platform for jobs and pre-career experiences • Teach résumé-building; interview skills • Competitive tuition waivers for summer internships	• NSSE • Alumni surveys • Internship pre- and post-experience surveys and reflections • NACE		

can bring together resources and collectively map their individual activities to gather data on outputs. Similarly, there may be challenges to these efforts in an era of ever-decreasing budgets; however, many of these strategies can be undertaken with little or no financial support.

In addition, general education, programs, and departments can design curricula to include research courses. In the previously discussed example, SJFC's Psychology Department requires students to engage in multiple courses centered on the HIP of UR. Given that LOs guide these courses, all majors should have developed competencies after successful course completion. Additionally, SJFC's newest general education curriculum will have research and career readiness integration woven throughout the curriculum. The Honors Program has also laid the groundwork for students to have a clear path to mentored independent research within their academic programs. Thus, even students who do not seek out a research experience will be immersed in this HIP and partake in its benefits.

Academic programs can also advance this mission by partnering with their campus career services units to raise awareness of the benefits of UR for workforce preparation, regardless of the amount of career preparation that faculty can offer. For example, the Psychology Department at SJFC regularly asks a CCAP representative to present

in the department's required career planning course, and several departmental pamphlets have been created through consultation with both parties. Even in situations where a career planning course is not feasible within a department, or when faculty feel unprepared or unable to engage in this undertaking, academic departments and career services can partner to offer workshops to students that are tailored to the major. Undergraduate research should be emphasized in these interactions so that students receive formal prompting to engage in research as a mechanism for career readiness.

Career services representatives also can meet with faculty to discuss the best ways to leverage UR for workforce preparation within departmental programming. In the case of SJFC, CCAP was specifically designed to create a seamless integration between academic advising and career development. CCAP professional staff work closely with faculty to develop and refine LOs that reflect both content knowledge and career-readiness competencies. For example, the director for career services meets with academic program directors to review global learning constructs with the aim of drawing meaningful parallels to the NACE Career Readiness taxonomy. Faculty receive training in how to "translate" the academic language of LOs to the language of the labor market. This then reaches the students, who become more aware not just of what they are learning but how what they learn will transfer to

the working world. In tandem, CCAP advisers serve as resource experts to help faculty develop meaningful class experiences that will tie to career readiness outcomes. Faculty/staff development workshops also can help serve this purpose, focusing on the integration of career readiness into academic programming and instigating discussion of potential collaborations between programs that advance the goal of integration. For example, SJFC has offered sessions aimed at helping faculty integrate career readiness and employer expectations within the classroom.

On the individual level, students can be guided to leverage their UR for workforce preparation. Research students can be encouraged to engage in activities that promote research to other students such as presentations of their research. So that research students can better capitalize on the skills they have gained, research mentors can implement assessment and reflection strategies that encourage metacognitive development and growth (e.g., Picardo and Sabourin 2018). The HIP of ePortfolio creation may be an especially fruitful endeavor in this regard, giving students an edge in hiring (AAC&U 2018). The essential exercise of critical reflection over time allows students to see their own growth and recognize areas for further development. By keeping a digital record of this development, students can utilize this tool with mentors and career services as they translate their skills for better communication to employers. Faculty mentors can encourage ePortfolios, or programs can require them (SJFC requires ePortfolios as part of its general education curriculum). Research students can use career services to receive coaching and preparation along with their reflective ePortfolio to leverage their research experience in their job search strategy.

Conclusions

In summary, widely integrated LOs can maximize gains from student research in ways that align with skills actively sought by employers. Coordinated efforts to unite LOs, UR, and employer expectations can help students leverage their research experience for career readiness. The work at SJFC can serve as a model for institutions that have formal coordination of services and assessment strategies but can work equally well with campuses that do not have such arrangements in place. At SJFC, the goal is to continue to bolster campus-wide partnerships to work toward the common vision of student career readiness. Increasing student participation in UR and helping students leverage their skills is a common goal. Assessment practices will be enhanced by bringing alumni data into the conversation. This data will show trends related to HIPs in college and postgraduation success. In this way, important connections among LOs, UR, and employment skills can be demonstrated further. A fully integrated approach between LOs and UR can help students develop competencies sought by employers and market their competencies.

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