**Undergraduate Research (R) Designation Policy**

Approved by the UW Tacoma Academic Policy and Curriculum Committee (APCC) on December 12, 2018

**Purpose**

This policy defines the criteria for designating an Undergraduate Research (R) course, indicated by an “R” in the course schedule. Undergraduate Research is considered a High Impact Educational Practice by the American Association of Colleges and Universities, and has been shown to improve deep learning and persistence in undergraduate students. See Appendix A for further research on benefits of research experiences to students.

The R designation already exists in the scheduling system, and at this time is not required by university, campus, or unit curricula. Having a well-defined R designation serves a number of purposes:

* Signaling to students which courses include research experiences.
* Allowing for assessment of undergraduate research opportunities, including equitable access for students.
* Providing guidance for faculty interested in incorporating research in their courses.
* Creating a mechanism for identifying R courses and potential resources to support them.

**R Designated Course Guidelines**

To qualify for an R designation, significant and sustained effort in the course must be dedicated to “authentic research/scholarship”.

The heart of “authentic undergraduate research” centers on the criterion of “an original intellectual or creative contribution to the discipline.” *Original intellectual or creative contribution* can be understood as:

* encountering/uncovering new data which is incorporated into existing frameworks
* discovering new insights or new data that alter the boundaries and/or contours of the field
* drawing novel comparisons or making heretofore unrecognized connections within the field
* making new assessments of current knowledge/interpretations based on disciplinary standards
* creating new visions or interpretive structures that re-integrate/reconfigure what is already known or accepted
* applying existing interpretive structures in a new way or in new contexts in order to unfold distinctive integrations/configurations within the field (McNary-Zak & Todd Peters 2013)

*Undergraduate Research Learning Objectives*

For an R designation *a majority of the skills listed below* should be incorporated in the authentic research portion of the course/curriculum. This list is heavily modified from Singer and Zimmerman (2012) and tailored to UWT.

1. Communication (written or verbal) in discipline-specific formats
2. Creativity: builds new insights, approaches problems from different perspectives, combines information in new ways, effectively connects multiple ideas/approaches
3. Professional Process: engages in iterative critique and revision, present the work in a public display of competence.
4. Practice and process of inquiry: formulates a research question within or across disciplines, identifies and incorporates appropriate sources of evidence, demonstrates understanding of how knowledge is created in the discipline and what counts as an argument within or across disciplines.
5. Scholarly context: demonstrates knowledge of scholarly conversation and how researcher’s argument fits into it.
6. Critical thinking: challenges established thinking when appropriate; recognizes logical fallacies and assumptions in existing arguments.
7. Reflection: Explains one’s thinking and learning process as part of the research experience and its implications for future learning.
8. Ethical conduct in research.

**Implementation**

Each individual academic unit can develop its own policy pertaining to undergraduate research. The material provided in this document are intended to aid in this process.

Units should work with existing faculty curriculum bodies to identify courses that meet the R designation requirements and submit an initial list to the APCC in the 2018-19 academic year for review and coordination. This list should be submitted with any additional unit-specific rubrics or criteria. After this initial list, new or existing courses can receive an R designation through the regular course approval or change process.

The list of R designated courses will be maintained by units and the designation will be added to the time schedule system at the time of scheduling. It is recommended that courses (rather than individual sections of courses) are given the R designation to provide consistency for students.

**Process**

These guidelines were developed by a Community of Practice consisting of faculty and staff from across campus who came together in the summer of 2018 as part of a High Impact Practice initiative of the Student Success Council. Their full report can be found in Appendix A.

**Appendix A**

**Undergraduate Research Communities of Practice**

**Summer 2018 Report to High Impact Practices Workgroup**

Creating a Culture of Undergraduate Research, Scholarship, and Creative Work at UW Tacoma

Undergraduate students who participate in research experience many benefits, including greater retention, gains in student learning, access to mentorship, enhanced critical thinking, and growth in academic self-confidence. Authentic research / scholarship as a high-impact practice is clearly critical for student success, and is an expectation for many students as they advance in their coursework, prepare= for employment in their field, and apply for post-graduate education. Though UW Tacoma has several endeavors to promote undergraduate student research, proper commitment to authentic undergraduate research and scholarship is resource-intensive for the students, faculty, and institution alike.

The following report, drafted by the Undergraduate Research Community of Practice, provides practical guidelines for curriculum review of authentic research experiences, and outlines best practices for creating a culture of undergraduate research at UW Tacoma (UWT), and positioning the campus as a national leader in this high-impact practice. The report provides a definition for authentic undergraduate research and criteria for R-designated courses. Our justification outlines the benefits and challenges of undergraduate research for students and faculty, and recommends additional program support structures necessary to provide a framework for successful undergraduate research. Best practices for effective recruiting and mentoring of diverse students are also highlighted. We reviewed scholarly and popular sources to gather ideas, best practices, and proven approaches for creating a culture of undergraduate research at UWT.

This report was composed by Leighann Chaffee, Jim Gawel, Ruth Vanderpool, Anna Groat Carmona, Emma Rose, Cindy Schaarschmidt, Peter Selkin, Mark Pendras, Alaina Bull, Kara Luckey, Margaret Lundberg, Nicole Blair, Chris Marriott, and Rebecca Disrud as part of Undergraduate Research Community of Practice.

# Definition & Student Learning Outcomes

## Definition:

To quality for an R designation, significant and sustained effort in the course must be dedicated to “authentic research/scholarship”.

The heart of “authentic undergraduate research” centers on the criterion of “an original intellectual or creative contribution to the discipline.” *Original intellectual or creative contribution* can be understood as:

* encountering/uncovering new data which is incorporated into existing frameworks
* discovering new insights or new data that alter the boundaries and/or contours of the field
* drawing novel comparisons or making heretofore unrecognized connections within the field
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* creating new visions or interpretive structures that re-integrate/reconfigure what is already known or accepted
* applying existing interpretive structures in a new way or in new contexts in order to unfold distinctive integrations/configurations within the field (McNary-Zak & Todd Peters 2013)

# R Course Student Learning Outcomes:

To assist faculty and the APCC when considering a course for an R designation we note that a majority of the skills listed below should be incorporated in the authentic research portion of the course/curriculum. This list is heavily modified from Singer and Zimmerman (2012) and tailored to UWT.

1. Communication (written or verbal) in discipline-specific formats
2. Creativity: builds new insights, approaches problems from different perspectives, combines information in new ways, effectively connects multiple ideas/approaches
3. Professional Process: engage in iterative critique and revision, present the work in a public display of competence.
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6. Critical thinking: challenges established thinking when appropriate; recognizes logical fallacies and assumptions in existing arguments.
7. Reflection: Explains one’s thinking and learning process as part of the research experience and its implications for future learning.
8. Ethical conduct in research.

# Undergraduate Research Experience Curricular Models

## Course-based research experiences (CREs) / course-embedded research.

Student-faculty collaboration on research serves as a high-impact practice, though participation levels vary by major and discipline (AACU, 2013). Course-based research experiences improve student access to research experiences, bringing the benefits from the select group of students who work one-on-one with faculty to larger groups (Hati & Bhattacharyya, 2018; Karukstis & Elgren, 2007). Notably, these benefits include improved confidence and thus persistence for students across majors (Staub et al., 2016), as well as improved skills such as critical thinking. Despite the remarkable potential of these courses, they can also serve as a hurdle to both faculty and students if not properly supported.

At UW Tacoma and other institutions, course-embedded research takes several formats.

* Traditional classroom course with substantial research project, either set by the instructor or student-hypothesis driven authentic experience in a traditional sized section.
  + Examples include TPSYCH 309, TSOC 470, and TWRT 350
* Special topics courses with a small class size, including senior thesis and capstone structured within the major (rather than as independent study). Environmental sciences and Biomedical sciences (TESC 495 and TBIOMD 410) provide examples of a single research project conducted by a small group of students with one instructor. Many programs including Mathematics and Global Honors require capstones.
* Course-based undergraduate research experiences (see next paragraph).
* Service-learning courses with a research component, such as practicum courses.
* Independent-study courses, described below.

One strategy is the introduction of Course-Based Undergraduate Research Experiences (CUREs) into undergraduate curricula (Brownell 2012, Howard 2005, Shortlidge 2017, Bradford 2015, Smith 2014). CUREs often have students plan and execute research that is directed at solving a problem, sometimes in direct connection with the research interests of the faculty teaching the course (Auchincloss *et al.* 2014, Shortlidge 2017, Cooper 2017, Rowland 2016, Shaffer 2010, Brame 2008, Jordan 2014). Often, these research projects are a quarter, semester, or year in length and guide students through one or more aspects of a larger research project. In some cases, these experiences can be used to generate both laboratory reagents and data as well as data pertaining to student outcomes resulting from the implementation of CUREs (Jordan 2014, Hynes 2017, Trudel 2017, Adame 2016, Militello 2017). A recent examination of the effectiveness of CUREs, specifically those that include the use of CRISPR-Cas technology, was published (Dahlberg & Groat-Carmona 2018), demonstrating the effectiveness of CUREs in UG research.

## Independent-study research with faculty mentor (curriculum code 499).

Students commonly complete research in a one-on-one or small group setting with faculty members, outside of required courses. These experiences may or may not be completed for credit. The curriculum code 499 is used for faculty-mentored student research, with variable credit options. Two essential considerations include group size and length; models that allow students to conduct research across multiple quarters are documented as high impact. Policy should ease logistics of independent-study research, allowing students to complete multiple-quarter independent-study research without consequence to their student and financial aid status. Units should explore ways to incorporate 499 credits as requirements or electives for majors/minors.

A more formalized model of independent study research that is a promising approach is called the Directed Research Group (see Turns & Ramey 2006, Larson, et al. 2009). This model is in place at UW Seattle and starting to be taken up at UW Tacoma. In this model, students apply to join a research group and earn credit in a cohort model by working for 1 or more quarters on a research project as a team. The topic of research is driven by the a faculty member leading the group and students meet face to face to work on a research project, including designing research, collecting data, analyzing data, and disseminating results. The Directed Research Group model has shown benefits for both students and faculty and is a model that is worthy of more exploration at UW Tacoma.

It is essential to note that faculty commonly mentor undergraduate student research outside of the formal for-credit and course-based options. For instance, course-credit limits and financial pressures may serve as rationale for faculty and students to work together without seeking 499 credit. Summer research programs may also be completed outside of the course credit structure. See Appendix I for summer research programs details.

# Suggested Support Structures

Successful and inclusive authentic research experiences require substantial support beyond the individual course and faculty member. The resources listed below should be contributed by the units to position an R course for success while fostering access for our students. We encourage faculty to consult with their units about these before proposing an R designated course. Additionally, we recommend that the APCC ask about such support when considering course approval to motivate units into action. Note that this list is *not* meant to serve as necessary criteria for R course approval. Rather, the list is intended to support best practices for undergraduate research and is recommended by this report.

1. Student Support:
   1. public presentation/performance opportunity (including online)
   2. opportunity to interact with multiple mentors
   3. opportunity for peer-mentoring
   4. recruiting practices that make UG research accessible to underrepresented minorities
   5. access to unit’s R specific scaffolded structure of the major’s curriculum (which should be in existence)
   6. access to ethics training in discipline
   7. access to funds for poster printing/travel and student participation
   8. access to safe and appropriate facilities for UG research
   9. public visibility or marketing for UG research
2. Faculty Support:
   1. recognition of faculty contribution, time, and effort related to offering R classes (such as…)
      1. Accounting for contributions with UG research in P&T criteria
      2. Monetary compensation
      3. Workload adjustments (such as course release)
   2. faculty development for mentoring UG research (eye toward undergraduate students)
   3. access to refresher on ethical conduct
   4. funding (not necessary direct, but list of appropriate sources)
   5. ability to recruit and mentor UR minorities in research
   6. limiting R course size to be appropriate

# Student Benefits and Support

## Student Benefits

Undergraduate research is recognized as a high-impact educational practice (Kuh, 2008), and its many benefits include gains in student learning (e.g., making use of primary literature, formulating research questions, logical and creative thinking) and personal gains (e.g., increased ability to work independently and greater tolerance for obstacles).

UG students who participate in research programs before graduation often have increased comprehension and self-report higher confidence in their learning (Bangera *et al.* 2014, Auchincloss *et* *al.* 2014, Harrison 2011). Additionally, early participation in UG research programs positively influences student learning (Stanford, Rocheleau, Smith & Mohan 2017; Solar, 2007). Moreover, they often receive focused training in the field of their choice, introductions into the language and culture of their field, and increased access to mentorship (Russell 2007, Hunter 2007, Greerman 1998). Because research opportunities for UG students promote retention (especially in STEM fields) and solidify academic identities, many educators are introducing their own students to scientific research at their home institutions, as UG research is a powerful learning tool for students from traditionally underrepresented groups (Bangera *et al.* 2014; National Academies of Sciences, Engineering, and Medicine 2017).

### Critical thinking skills.

Undergraduate research is a valuable educational resource in that it sharpens critical thinking skills, problem-solving and helps build communication skills (both oral and written). Undergraduate research often requires students to read primary literature and engage in intellectual debate but these experiences are largely subject to the skill of the faculty mentor, which can lead to differences in undergraduate experiences. In constructing assessments for whether students engaged in undergraduate research are developing critical thinking skills, undergraduate mentors should rely on open-ended or real-world situations, like joint-faculty lab meetings/conferences or undergraduate research symposia. These experiences, by their nature, require students to go beyond basic recall and often prohibit students from re-stating previously learned information. In addition to building critical thinking skills, these experiences also help build a student’s personal and professional development, encouraging discussion of possible graduate education, professional programs and even allow for networking opportunities with putative employers.

# Recruiting and Mentoring Needs

## Regular opportunities to present work.

To advance undergraduate research as a true HIP we should provide an opportunity for students to present their research to their peers and to the larger professional community. Although UWT has a plethora of undergraduate research symposia, these are often formal and summative presentations, rather than an opportunity for growth, support, and feedback. There is much less opportunity at UWT for students to present their work in progress, to get wider faculty and peer input, to gain confidence in their abilities, and to connect with other students/faculty with similar demographic backgrounds.

Since undergraduate research at UWT is often considered an independent study and not accounted for in faculty workloads, there is no scheduling or administrative support for working with students. Students often lack the financial support they need to present research at professional or academic conferences. “We believe the greatest limitation to an established undergraduate research curriculum is monetary support” (Petrella & Jung 2008).

An additional avenue for undergraduate research engagement at UWT would be the introduction of an online publication resource, which would provide student opportunity to publish their research and engage their peers, while simultaneously aiding faculty research dissemination. Undergraduate students engaged in summer independent research projects at Haverford College (Philadelphia, PA) have the opportunity to write about their experiences in undergraduate research through the university’s “Speaking of Science” blog. Similarly, students from Tufts University (Medford, CA) created and published a publicly accessible website on the mechanism of CRISPR-Cas modification and DNA repair.

While the Tufts website is not currently maintained, it is a clear example of students synthesizing their knowledge into a reader-friendly format. We should consider utilizing a model similar to those used at Haverford College and Tufts University. This would allow undergraduate students at UWT an opportunity to publish their research findings or experiences in undergraduate research to help promote student engagement and provide perspective to the challenges of engaging in undergraduate research.

## Peer-to-peer mentoring among undergraduate research assistants.

Faculty with only one or a few undergraduate research students may have no network to interact with other students and faculty, thus isolating both faculty and students. It is recommended that undergraduate research at UWT include opportunities for groups of students and faculty to interact more frequently to realize more benefits from the practice of undergraduate research.

UW Seattle (http://www.washington.edu/undergradresearch/students/urls/) and UW Bothell (https://www.uwb.edu/research/undergraduate-research/ambassadors) have programs that connect student researchers - particularly those from backgrounds underrepresented in research/STEM fields - to each other for community and support (STEM BUILD at UMBC; Solar, 2007).

## “Imposter Syndrome” programming.

A primary goal of undergraduate research is to promote within the student a sense of identification as belonging in the society of researchers, and to quell the “imposter syndrome” thinking that often plagues them. This is especially important for underrepresented minorities (URMs), first-generation students, and non-traditional students as they may have limited role models with whom they easily identify (Peteet et al. 2015).

To address the imposter phenomenon, research suggests multiple angles for mentoring/supporting URMs. Peteet et al. (2015) suggests “college counseling centers should work with URMs to promote self-actualized identity development and awareness of the impact of the IP on academic achievement.” Cokley and colleagues (2013) point out: “California Technology and MIT have both instituted programs debunking myths about belonging, helping students identify IP tendencies, and focusing on support programming. In several colleges, imposter programming has become a part of orientation events for undergraduate and graduate students. The offices of student life, academic success, multi-cultural affairs and counseling have worked to develop workshops for all students helping them to define success, identify strengths, deal with failures, understand perfectionism and set more reasonable expectations for themselves.”

It is also important to develop a sense of rapport between faculty and students. Mendoza-Denton et al.

(2018), researching how rapport building exercises affected student performance and feedback from faculty, found “trainees in pairs assigned to the rapport-building task gave better speeches and mentors provided warmer and more helpful feedback than did those in the control group. This held true for both same-race and interracial pairings … Our research suggests that establishing trust could be a key way to boost performance and parity through the ability to value each other.” In general, faculty are not trained how to mentor undergraduate researchers, rather we often model how we were mentored. This often perpetuates “old school” practices that sometimes amount to academic “hazing.” Thus, undergraduate research mentor training is recommended for UWT.

## Ethics training.

There is no single source for ethical conduct in undergraduate research. These guidelines are often defined by government regulations, institutional policies, professional codes of conduct and commonly accepted practices. Examples of such policies are provided below:

* https://policies.mit.edu/policies-procedures
* http://www.onlineethics.org/Topics/RespResearch/ResEssays/cw2.aspx
* https://olaw.nih.gov/resources/tutorial

Many academic institutions have an expectation that undergraduate mentors and their students will conduct research according to the highest ethical and professional standards. Such standards often include openness in sharing research materials, fairness in reviewing proposals, respect for your peers and honesty in reporting research results. At UWT, we should ensure that research-based disciplines include coursework that incorporates ethical conduct in their respective field and students should be required to attend more than one course as part of their graduation requirement. While these requirements are most often associated with graduate programs, there is no reason why these concepts shouldn’t be made available to undergraduate students at UWT.

UWT should consider offering additional ethical training resources for undergraduate students engaged in research, including online resources. For example, UW Bothell offers a summer workshop series, “Summer Research FUNdamentals” ( https://www.uwb.edu/research/undergraduate-research/student-research-opportunities#fundamentals ) with sessions which include a section onon writing abstracts, designing posters, research ethics and scientific culture, and applying to graduate school. MIT offers online research ethics training courses for undergraduate students, which is only required of undergraduate students, graduate students and postdoctoral researchers supported by NSF grants (http://uaap.mit.edu/research-exploration/urop/guidelines/recr ). If UWT adopted a similar program for undergraduate students engaged in research, we could better encourage safe and ethical conduct for students and support similar ethical training programs for faculty mentors.

## Professional preparation.

Not every undergraduate student engaged in research at UWT is destined for a post-graduate education program. In addition to providing additional opportunities for presenting at undergraduate research symposia at UWT, we should consider hosting professional networking conferences for undergraduate students, which would allow students to explore career opportunities outside of academia. In addition to providing opportunity for professional development, such conferences would allow undergraduate students to explore career ambitions, solidify the need for academic success and encourage undergraduate research initiatives as a means of gaining valuable experience in the field.

# Unambiguous Expectations and Guidelines

The role of the faculty research mentor needs to be addressed. Often “the underlying supposition is that the path to success will reveal itself if the student ‘has what it takes’. Lack of direction is often deemed a litmus test for the brilliance of the student... Professors are generally in control of deciding which of their students’ research is nurtured, funded and eventually published. And, like all individuals, professors’ judgements are subject to bias (Mendoza-Denton et al. 2018).” Ambiguous expectations for undergraduate students engaged in research can open the door to bias and double standards, especially for students working with only one faculty member. Without a larger network of undergraduate researchers and faculty to interact with, students will be left with no other reference, with the potential for widely differing expectations, little faculty accountability, and a sense of isolation.

Mendoza-Denton et al. (2018) outline a model based on UC Berkeley’s College of Chemistry for addressing these barriers by focusing on the structure of the research program. Although their study focuses on graduate students, their recommendations are still salient for undergraduate students. They suggest a three-component research program:

* Processes and procedures are clearly defined and systematically applied.
* Student progress is overseen by multiple faculty members.
* There is department-wide agreement about expectations.

Much of UWT’s current undergraduate research program does not adhere to these guidelines. This lack of a broader undergraduate research framework for UWT means that recruitment may inadvertently show bias, and outcomes and professional opportunities may vary widely. We suggest the concrete steps below for faculty to use at a course and major level.

## Major Level Clarity:

Each academic unit interested in supporting undergraduate research should produce/update a curriculum map to indicate how the major has scaffolded research skills into their course structure. Determine what documents you need from which class to accurately assess your unit’s development of research skills and incorporate these into existing assessment plans. Note that there are existing protocols at UWT for faculty to report data on research related skills. Suggested steps for setting up major level assessment are given below.

* Determine *which* existing SLOs involve research directly or build research skills. This step will ensure that research skills become part of the major’s scheduled & ongoing assessment program.
* Build an outline for the map/existing structure in the major that builds towards research experience. Several currlculum map templates are available for modifying at: https://uwf.edu/offices/cutla/supporting-pages/curriculum-maps-guidelines/ ( an example & TMath example )
* Consider incorporation of 499 courses into requirements/electives

Include all faculty in this process and be transparent and honest about what is and what is not done. This step is important and in itself dramatically improves consistency in curriculum and is helpful to new & part time hires (Schneider 51). Note that this process positions faculty well for in-depth conversations about curriculum needs and possible restructuring which might include 499 courses or other authentic research experiences. Additional implementation details are given in Appendix III.

## Course Level Clarity:

* Use a rubric consistent with rubrics used elsewhere in the major. BUT check that each of the above “minimal list of research skills” appears in the rubrics. Examples of such rubrics with elements highlighted: math example , writing example . Note that we are respecting existing rubrics and suggesting only a revision or update.
* Add self-assessment into the course/project for students since this encourages reflection (Singer & Zimmerman, 2012). If possible meet to discuss the students self-assessment.

# Faculty Benefits, Challenges, and Support

This section reports on benefits for faculty engaged in undergraduate research, what challenges they face, and what support they need.

## Faculty Benefits

Engaging and including undergraduate students in research can benefit faculty in a variety of ways. According to Osborn & Karukstis (2009), faculty are motivated to engage undergraduates in research in several areas:

* Mentorship: Create profound and deep learning experiences for students, specifically when working with underrepresented students the benefits of positively impacting students.
* Enhance and invigorate research projects: Bring a fresh perspective to their research projects, advance a research program
* Integrating Scholarship and Teaching: Enhance teaching and more closely align teaching and research.

Most scholarship with a faculty focuses highlight the benefits for the students, their teaching (and integration with teaching and research) and also for the general benefits of supporting interest in research (Osborn & Karukstis 2009). However, there is a lack of detail and scholarship on the impact on faculty. According to a report by the National Academies of Sciences, Engineering, and Medicine on undergraduate research experience (UREs), “There is currently a relative paucity of data with respect to the impact of UREs on faculty beyond the role as mentor.”

For example, there are few specifics when it comes to how faculty engaging undergraduates in research are rewarded by institutions either in ways that financially supports the work, such as salary, professional development, etc., or how it integrates with promotion and tenure criteria. There is a mention of internal/external recognition as a motivator, but what this recognition is or may entail is not covered in detail.

## Faculty Challenges

In addition to the lack of data and best practices on how this work is recognized and supported, there is also a great deal of diversity of how UREs are enacted in practice both in terms of discipline and also in terms of institution. The biggest barriers and challenges for faculty include time, incentives, funding and training/development.

### Diversity in enacting undergraduate research experiences.

The report by the National Academies of Sciences, Engineering, and Medicine on “Undergraduate Research Experiences for STEM Students...” conceptualizes this diversity in a helpful way and refers to it as the teaching research nexus, which is the tension in the relationship between teaching activities and research activities. The relationship between teaching and research is institutionally bound and impacted by the priorities and mission of the institution and the expectation of faculty work. These factors shape choices faculty make when planning and implementing research experiences for undergraduates. They place the nexus on a continuum.

|  |  |
| --- | --- |
| **Research-based program** | **Research-led program** |
| Students as participants | Students as audience |
| Research process and problems | Subject content |
| Cookbook approach - process to teach content | Transmission model |
| Can or cannot support faculty research | Separate from faculty research |

### Lack of recognition and reward in regards to tenure & promotion.

According to the NASEM report, considerable challenges exist regarding incentives for faculty to engage in undergraduate research, specifically in relation to tenure and promotion. While a variety of institutions mention undergraduate research and mentoring as part of the P&T process, very few meaningfully incorporate it as a critical component in review. Providing undergraduate research experiences (UREs) either in summer or during the academic year is often unpaid and seen as voluntary. “This treatment has led faculty to perceive their involvement in UREs as undervalued or even unrecognized (NASEM report, p. 151).” The voluntary nature of this work and that it is not recognized in P&T and the belief that it may detract from research productivity may lead to faculty avoiding working with undergraduate researchers.

### Tensions around productivity.

Relatedly, some faculty perceive that undergrad research may impact research productivity. However, those with course-based undergraduate research experiences (CURE) reported an increase in opportunities for research productivity due to the ability to publish results from domain specific research and also educational research.

### Lack of professional development.

The quality of mentoring in undergraduate research that a student receives from a faculty member can make a substantial difference in that research experience. However, faculty rarely receive or have access to professional development on mentoring students in undergraduate research (NASEM report).

### Getting started and the risks associated with a lack of support.

According to research, the three biggest challenges for faculty in initiating an undergraduate research program include: (1) time needed to invest in making change, (2) a lack of incentives, and (3) a lack of focused training.

Faculty often volunteer their own time and efforts to mentor and work with undergraduate students, lacking appropriate external rewards (such as P&T or financial support). This may lead to faculty choosing to make investments in their time and mentoring by focusing on strong or “high-reward” students, often referred to as the “rising star hypothesis.” This can have the impact of faculty selecting traditionally high performing or outgoing students rather than providing opportunities for students more broadly, especially those from non-traditional or underrepresented backgrounds, to be able to partake in these activities.

### Time.

Time is the biggest barrier for faculty engaging in mentoring undergraduates in research. “Research has shown that the lack of faculty time to develop the research project, training materials, etc., is the most significant barrier when it comes to engaging undergraduates in a research experience” (NASEM report, p 152). While release time and reassigned time are beneficial ways to support faculty, this may not be sustainable in all kinds of institutions. Further as faculty workload continues to grow across all kinds of institutions, without finding additional ways to support faculty to take on new responsibilities and approaches, these efforts will not happen or be sustainable. The NASEM report suggests for faculty to blend roles and multitask including the recommendation to “embed the research experience in the curriculum through the use of independent studies, credit-bearing summer research programs, academic year seminars, and CUREs” However, this strategy also needs the institution to compensate faculty for this work. For example, at UWT (specifically SIAS) independent studies are voluntary and are not compensated. Further, “Embedding student research (into curriculum) may involve significant pedagogical change to an existing course or development of a novel course. Successful models for integrating the experience often require faculty training and development, which may come at an additional cost with respect to faculty time allocation” (NASEM report, p. 156).

## Faculty Support

To further support faculty in engagement in undergraduate research, institutional support needs to address the four barriers: time, incentives, funding and training/development.

### Time.

For faculty to prioritize UREs and/or CUREs, they need to have the ability to make time for these activities. Time meaning course releases, being able to blend research and teaching, being able to leverage expertise of others/best practices, and opportunities for learning.

### P&T criteria.

Consider including mentoring and working with undergraduates part of faculty P&T criteria under both the research and the teaching categories.

### Provide training and faculty development on mentoring undergraduate researchers and working efficiently and effectively with students.

Develop workshop(s) on working with students in a way that benefits both student researchers and their faculty mentors. Help support faculty to understand and develop CUREs

### Support faculty in pursuing external funding to support undergraduate research experiences.

External funding can be transformative in creating sustainable and meaningful opportunities for faculty-led undergraduate research. For example, the NSF Research Experiences for Undergraduates (REU) program (https://www.nsf.gov/funding/pgm\_summ.jsp?pims\_id=5517) offers one avenue. Also, it is important to keep in mind that course-based undergraduate research can be considered a form of active learning and may therefore be attractive to funding sponsors that are interested in improving learning outcomes and retention/graduation through curricular (re)design. Evidence suggests that active learning is particularly effective in bolstering learning among students from underserved backgrounds.

**Consider recognizing faculty for working with undergraduates on research.**

Consider a campus level award, similar to the Research Mentor Award at UWS that can recognize UWT

faculty engaging in working with undergrads in research.

# Institutional Benefits and Challenges

Engaging undergraduates in research provides a variety of benefits and challenges for the institution.

## Institutional Benefits

Institutions benefit from undergraduate research in a variety of ways (Osborn & Karukstis 2009) when that research results in publications (scholarly and creative) and also when these efforts yield additional grant funding. Further, providing deep mentoring relationships between faculty and students benefits the campus community and creates a dynamic intellectual atmosphere. Creating these relationships over time serves all students, especially those from underrepresented backgrounds and helps support retention. Additional institutional benefits include strengthening alumni relationships, creating a shared sense of purpose, engaging with the local community, fostering innovation and cross-disciplinary collaborations (Osborn & Karukstis, 2009). While institutional commitment is crucial to fostering success that yields a variety of benefits, there are not definitive models for institutional support and they will most likely depend on the nature and priorities of the institution.

## Institutional Challenges

According to the 2017 NASEM report “Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities”, the type of institution has an impact on how much opportunity there is to engage undergraduates in research. Based on research, “faculty who worked at liberal arts colleges, historically black colleges and universities, or at more selective institutions were much more likely to be engaging undergraduates in research when compared to their peers at other institution types” (p. 154). When there are perceptions that research and teaching are in competition for faculty time, there tends to be fewer opportunities for undergraduate research.

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# Appendices

## Appendix I: Summer Research Programs

* Summer research-focused options at UWT include study abroad and field courses, special topics courses, small research groups, and larger facilitated research programs (e.g. the Summer Internship Program at Center for Urban Waters)
* Summer research programs developed skills in problem-solving, communication, developing questions and explanations, evaluating data quality, and understanding and applying research methods (Singer and Zimmerman, 2012). The fact that both students and faculty identified an improvement in these skills also suggests that students’ ability to self-assess improved over a summer spent doing research.
* Many of the same design considerations apply to summer undergraduate research programs as to independent study groups and to special topics courses (e.g. TESC 495). For example, group size, curricular scaffolding, and length/depth of the research project are variable.
  + The length of the term can influence the choice of project and the depth at which the project is covered. Summer scheduling options include full summer term, A term, B term, and late summer (August/September). This could potentially make the difference between high- and higher-impact practices by allowing greater depth in the elements of an undergraduate research program (the “wagon wheel” of Staub et al., 2016).
  + Many summer undergraduate research programs include curriculum scaffolding both before and after the summer.
* Summer term research can also allow for greater flexibility in terms of the experts engaged in facilitating the research, allowing for a “Highest-Impact” practice with multiple faculty/expert mentors (IUPUI, 2018). Collaboration with other institutions is possible if the student group is able to travel (as is the case in study abroad programs), or if guests are brought in from other institutions or organizations.
* Payment vs. Credit: For working students (including a substantial number of first-generation students and underrepresented minority students), in-depth summer research may involve a tradeoff between the experience gained through research and the financial security of their current job. Students are often compensated for summer research (This needs a reference; I am still looking for one). Financial aid availability for summer programs also needs to be investigated.
* Case studies (not at UW Tacoma)
  + Keck Geology Consortium: https://keckgeology.org/research-opportunities/prog-overview/
  + UC Berkeley Biology Scholars Program: <http://bsp.berkeley.edu/2018-2019%20Academic%20Year%20Research%20Programs>
  + Undergraduate Studies in Earthquake Information Technology (UseIT) internship: https://www.scec.org/internships/useit

## Appendix II: Other Administration Action Items

### Develop mechanisms to publicize student research opportunities across campus.

Potential mechanisms include a research opportunities database through which students can search for projects that fit their interests, similar to those provided at UW Bothell (https://depts.washington.edu/uwbur/ ) and UW Seattle ( https://expo.uw.edu/opportunities/ ). UW Bothell also hosts a Fall Research Fair in which faculty mentors develop posters about their research and opportunities for student involvement. In order to facilitate a culture of undergraduate research, administrative support for a campus research symposium is required. This would entail a coordinated date on which each unit/department displays their research, allowing students, faculty, staff, and community members to see the breadth of research being done by UWT undergraduate students. Support for this event would require space coordination, resources for displaying research such as easels, or locations to hang displays, budget for refreshments, and marketing.

In conjunction with the above, consider developing mechanisms to help faculty in “matching” students with their research to help facilitate good ‘fits’ between students and faculty mentors.

### Consider Council of Undergraduate Research (CUR) institutional membership; Support faculty engagement in CUR institutes and resources.

The mission of CUR ( https://www.cur.org/ ) is to “support and promote high-quality undergraduate student-faculty collaborative research and scholarship.” UW Seattle and Bothell campuses are currently institutional members of CUR; UW Tacoma is not. Many peer-institutions, particularly predominantly undergraduate institutes, report generating much value from their membership to CUR. CUR offers a wealth of existing resources on the value and practice of undergraduate research, a quarterly peer-reviewed journal, and topically-oriented newsletters. Other resources/benefits include:

* The National Conference on Undergraduate Research (NCUR) in which students from all institutions are invited to present their research
* A biennial conference in even years aimed at faculty and administrators
* Training institutes aimed towards faculty mentors and administrators, including the
* Transforming Research Culture and Curricula (TURCC) workshop ( https://www.cur.org/conferences\_and\_events/institutes/transforming\_undergraduate\_research\_culture\_and\_curricula\_turcc/ )

Perhaps UW Tacoma could coordinate with UW Bothell to understand how its faculty/staff use CUR in an effort to assess the possible benefits of becoming active members.

### Leverage administrative support provided through the UW Seattle Office of Undergraduate Research.

The UW Seattle Office of Research ( http://www.washington.edu/undergradresearch/ ) offers a wealth of resources, some of which UW Tacoma faculty and students may have access.

# Appendix III: Details about Major Assessment

## General Notes

* *Every course* does not need to be utilized in the scaffolding for research experiences (Schneider 51).
* Be aware of which courses are *required* in the major and try not to rely on optional electives.

## Suggested Assignments to Collect for Assessment

* Collect assignments in requires class and be sure to capture instructor marks & comments. Note that particularly in research, evaluation can often only be done by the subject expert who may not be on the assessment committee (Singer & Zimmerman pg 40).
* Collect two assignments to measure growth. One shortly after students declare their major, and one right before graduation (Singer & Zimmerman pg 40).
* Consider a portfolio or rewritten assignments for collection. That is, an assignment that students do during the quarter and are given a chance to redo & improve upon before the end of the class. Note that improvement can be seen during the quarter and revising work is known to be an effective learning practice.
* Keep the number of assignments collected for assessment low. Consider collecting one to two documents for each SLO, or one document to support multiple SLO’s, and cap the number of pages on these. Remember to keep the workload for assessment reasonable so that it can be done!

## Assessment Plan

* Plan to have an assessment group *every year*.
* Provide a rubric for large assignments that instructors can use in all courses with small changes. This familiarizes students and faculty with expectations (Singer & Simmerman pg 40).
* Use the same program assessment rubric every year with minimal changes (Singer & Zimmerman pg 40).
* Create a schedule where each year one to three SLO’s are evaluated. (e.g. the schedule on the bottom of page one on https://docs.google.com/document/d/1gt\_b0S628UwJtABJsdfM1JFvYbxNg7EazkbYWPjaXVc/edit?usp=sharing ).
* Determine which documents are needed for each SLO so that the assessment committee is aware of what documents need to be read and the instructors know they have to assign it! (For example: https://docs.google.com/spreadsheets/d/1q0uhdT4uGbiXHTuPAiO-7BRYRycc6XyAPDeDjnGlGPA/edit?usp=sharing). Notice that the curriculum map can be helpful here as you can enter in which documents would be most helpful like here.