2021-2023 Biennium Internal Budget Proposal Narrative
Division: Engineering & Design

Evaluation Criteria: Proposals will be evaluated on every aspect of this template. It is highly recommended that the narrative portion touch on each area. Proposals forwarded to UPRC by unit leaders will be discussed at UPRC and authors are encouraged to attend so that they may answer questions and provide clarification.

First Year Programs Technician

☐ This is a revised version of a previously submitted budget proposal.
If box is checked please briefly outline any significant changes and/or indicate why it is being resubmitted.

N/A

Statement of Purpose: *(What is the challenge or opportunity being addressed? How does the proposal address this challenge or opportunity? Limit response to 1 page – please link to any existing reports, data, supplemental materials, etc.)*

The First Year Program (FYP) in Engineering & Design is a new departmental program, with the first tenure track position being filled in March 2020. The overarching goal of the FYP is two-fold: 1) improve student preparation for the major and 2) increase student retention, persistence, and success. To complete these goals, the FYP seeks to develop a strong sense of belonging for our pre-major students while providing them with the knowledge, skills, and abilities they need for success in the major with a strong emphasis on supporting underserved students. WWU institutional research data shows that the percent of women-identified, first-generation, Pell-eligible, and underserved students declines from the pre-majors to the major. Furthermore, the data shows there has been a decrease in diversity as the programs have become more competitive [1]. A greater sense of belonging in students leads to increased persistence and student success, especially for underrepresented student populations [2]. We believe that better supporting our pre-major students will lead to increased enrollment of underserved students as well as increased retention rates for all students in engineering.

Curricular Improvements: ENGD First Year Program has recently updated the 100 level pre-major course sequence to include two new courses: ENGR 101: Engineering, Design, & Society and ENGR 115: Innovation in Design. The new course sequence includes a focus on increasing student awareness of the relevance of social justice topics to the engineering profession and the creation of equitable and inclusive learning environments. While ENGR 101 strives to introduce students to social justice, ENGR 115 provides students with the opportunity to engage in a relevant and meaningful project experience that involves design, build, and testing of a microgeneration energy device. In both courses, students explore the impact of engineering on society with focus on creating a more just and equitable society. Access to tools and equipment along with adequate staff and faculty support is essential for success in these courses.

Makerspace: A key component to supporting the pre-major student academic and personal development is providing access to equipment and work spaces where students can develop their problem solving skills, collaborate with other students, develop sense of belonging and gain confidence in their abilities. In Fall 2019, the Engineering & Design department opened a makerspace with the goals of 1) increasing pre-major student access to equipment, tools, and training; 2) supporting co-curricular make-do-build experiences,

and 3) developing an inclusive culture focused on collaboration, creation, and authenticity. The effort to open the makerspace was funded in part through a WWU URSCA grant ($10,000 Winter 2019) followed by Student Technology Fee proposal ($73,000 Fall 2020). The makerspace is critical for pre-major students as it provides equitable and inclusive access to equipment, tools, and training. However, creating a truly inclusive makerspace that creates a social and collaborative atmosphere of learners is not as easy as it sounds. Recent research has shown that many makerspace environments do not readily support diverse populations [3], create tensions between different student groups [4], and can sometimes lead to a work environment that feels exclusive and unwelcoming. A recent ethnographic study revealed the existence of a generally non-inclusive makerspace culture with pervasive, implicit gender bias [5]. It is critical that we adequately support the makerspace to ensure we create an equitable and inclusive workspace that supports all students.

Challenge: The Engineering & Design First Year Program lacks the technical support necessary to meet the goals outlined above. To support pre-major student exploration and development of technical interests, professional technician oversight and guidance is essential. In order to better prepare our pre-major students, we need to increase access to the makerspace and other pre-major support resources. Equipment setup and maintenance, student project support, and makerspace oversight and staffing are currently the responsibility of the one TT FYP faculty member. As more equipment gets added to the makerspace and we anticipate opening the doors to more students for more hours, the time needed to adequately support the makerspace will continue to increase. Furthermore, other department resources, such as the 3D print lab, have recently seen a significant increase in use and maintenance needs since the opening of the makerspace. In order to reach our goals associated with ***advancing inclusive success*** and ***enhancing academic excellence*** for pre-major students, we need instructional support. Proper supervision and well maintained spaces are critical components to developing inclusive workspaces that positively impacting student learning and build social connections [6] [7].

Request: We are request funding for a permanent **1.0 FTE Instructional Classroom Support Technician 3** to support the makerspace, 3D print lab, and FYP related programming. The position is essential to supporting the anticipated growth in FYP efforts.

Anticipated Outcome(s):

The addition of a technician who can oversee the makerspace and other related pre-major resources will result in:

1. Proper supervision and support resulting in increased ability to create an inclusive makerspace culture.
2. Increased student access through additional open hours and individualized student support resulting in an increase in equitable structures for pre-major students.
3. Creation of training opportunities that respond to individual needs by meeting students where they are, resulting in a more equitable learning environment, an increase in belongingness, and an increase in student self-efficacy.
4. Well maintained equipment and a safer work environment for all students.
5. Support for FYP which will allow the TT faculty to develop efforts focused on ensuring equitable access, developing a strong community, and increasing student sense of belonging in the makerspace.

Metrics: *(How will outcomes be measured? Please include current data points and goals. If this proposal will have any impact on the Overall Metrics included in the university's strategic plan, please indicate which specific ones here.)*

The following metrics will be used to assess the anticipated outcomes as noted at the end of each metric.

A. Measure use and access by tracking open hours and number of students served. ***(Outcome 1)***
B. Measure student experience through surveys focused on perceptions and interactions in the makerspace looking specifically at belongingness and inclusion in the context of makerspace work. ***(Outcome 2, 3, 4)***
C. Measure increase in preparedness in the major via quality of program applications and graduation rate (ex: 4 years vs 5 or 6). ***(Outcome 2, 3, 4)***
D. Measure increase in collaborative efforts such as number of grant proposals, research opportunities, professional development opportunities, student/faculty training, and other connected efforts. ***(Outcome 5)***

In terms of Western's Overall Metrics, this proposal will have a positive impact on the following:

- **Advancing Inclusive Success:** Increasing access to the makerspace with a focus on creating an inclusive culture will improve equity which will thereby improve student success for underserved students. Developing a strong sense of belonging and self-efficacy will lead to an increase in persistence and graduation rates in engineering students.
    - 1st to 2nd year retention of underserved and Pell-eligible students
    - Six-year graduation rate of underserved and Pell-eligible students.
- **Increasing Washington Impact:** Increasing access to the makerspace and providing more robust training opportunities will better prepare students for the workforce. By focusing on creating an inclusive work environment, we will better support our underserved students which will lead to increased diversity in engineering. By participating in makerspace activities, students will develop a balanced engineering identity that includes social, professional, and cultural attributes leading to well-rounded, culturally competent engineers who exhibit a strong sense of belonging.
    - Enrollment of underserved students.
    - Number of degrees awarded overall and in Washington State high-need areas.
    - Degrees awarded to underserved students
    - Meeting industry needs of creating culturally competent, well-rounded engineers
- **Enhancing Academic Excellence**: Individualized student support, creation of training opportunities, well maintained equipment, and safer work environment will lead to increased opportunities for students to participate in "make-do-build" experiences including undergraduate research, industry projects, and community collaboration. This will better prepare students for the major and ultimately, the workplace, by providing them with access to tools and equipment earlier in their academic career. In addition, the makerspace creates opportunities for students to work collaborative on projects designed to connect pre-majors to majors and increase sense of belonging in the department.
    - Student retention & persistence (1st to 2nd year; pre-major to major)
    - Increase student sense of belonging

How does this proposal align with your departmental/divisional strategic priorities? *(Please reference specific items from the recently completed departmental/divisional strategic plan and attach a copy.)*

The ENGD Mission Statement is:

> The Engineering & Design department at Western Washington University serves current students, industry, the University, and the citizens of Washington State by developing industry-ready graduates through a combination of creative problem-solving, analytical skills development, and experiential learning. The educational experience that we provide emphasizes critical thinking and an understanding of the impact of design, engineering, and manufacturing solutions in a global, economic, environmental, and societal context. We value and foster teamwork, communication, and a commitment to equity, justice, and the respect for the rights and dignity of others.

This proposal aims to increase access to tools, equipment, and training for pre-major students. By providing increased access to these elements earlier in the academic career, students will receive more a robust technical foundation which will enhance their learning experience (theoretical and experimental) resulting in graduates who can better meet the needs of a dynamic workforce. In addition, the focus on increasing sense of belonging and self-efficacy though the creation of an inclusive makerspace culture aligns with the fundamental qualities of equity, justice, and respect. This proposal aligns with our commitment to providing quality engineering education focused on developing well-rounded, diverse, industry-ready graduates.

The current CSE Strategic Plan (https://cse.wwu.edu/cse-strategic-plan) includes goals associated with diversity, teaching, access, meeting needs, and research. This proposal aligns with the CSE division strategic priorities in the following ways:

- *Diversity*: As previously mentioned, providing equitable access to student "make-do-build" experiences is essential in preparing students for success in the major. This is especially true for underserved student populations. Better supporting underserved students as pre-majors increases their ability to succeed which, in turn, will lead to more diverse engineering workforce. This proposal supports all three of the CSE Diversity objectives, for it 1) helps to actively build a college that values and is reflective of the diverse communities served by WWU, 2) promotes best practices sustaining and supporting equity, inclusivity, and diversity, and 3) represents an investment in a program that supports student success.

- *Teaching*: Funding this position will allow TT faculty to focus on the scholarly efforts associated with the makerspace (measuring student learning; understanding the student experience; determining best practices for more inclusive cultures) rather than the day-to-day technical attributes associated with keeping the space open, equipment maintained, and other related duties. It will also lead to more training opportunities for students (ex: how to 3D print; intro to CAD; using hand tools; lab safety; etc.) and support for co-curricular efforts for pre-majors.

- *Access*: Broadening access to the makerspace will enhance student skills, build experiences focused on enhancing students' sense of belonging and develop their self-efficacy and better prepare students for the major.

- *Meeting Needs*: The makerspace allows staff and faculty to meet students "where they are" in their learning journey. This allows for the creation of more equitable learning environments and fosters optimal growth in ***all*** students. Students come to engineering with a vast array of prior knowledge and the makerspace is essential in providing support to students, especially those unfamiliar with laboratory environments.

- *Research Goals*: Having a staff member support the makerspace will increase the opportunities to explore innovative ways to foster inclusion and equity both within the makerspace itself and within the department.

How does this proposal support the University Mission and Strategic Objectives? *(Please refer to the 2018-2025 Strategic Plan and indicate which core theme(s) this proposal will help achieve.)*

Goal 1: Western will provide a transformational education grounded in the liberal arts and sciences and based on innovative scholarship, research, and creative activity.

#1: Strengthen the liberal arts and sciences foundation to ensure and expand student access to the breadth of our undergraduate, graduate, and professional programs.

- **Increasing access to the makerspace and other related pre-major resources increases the ability for students to successfully navigate the pre-major program, apply to the department, and become engineers.**

#2: Provide tools and experiences for all students to follow their intellectual curiosity, to work across disciplines, and to develop the skills, knowledge, and habits of mind that will enable them to effectively contribute to evolving societal needs.

- **The makerspace provides a space for students to work together on cross-disciplinary projects. By better supporting the makerspace, we will be able to increase these types of opportunities. In addition, this space will better support our student clubs.**

#4: Ensure that all students have access to high quality educational experiences beyond the classroom.

- **Supporting the makerspace will enable the department to provide equitable access to tools and equipment.**
- **Supporting pre-major student exploration and development of technical interests improves their educational experiences.**

#7: Provide technological and other academic infrastructure to support curricular innovation, research, scholarship, and creative activity, civic engagement and social justice.

- **The makerspace is a critical component to supporting student skill development, academic, and engagement experiences including building student connections, supporting ongoing project opportunities, connecting to the greater community, club activities, and more.**
- **With a focus on creating an inclusive culture, the informal social space created by the makerspace will be a place where students can explore and discuss issues related to current news topics, community events, and social justice issues.**

Goal 2: Western will advance a deeper understanding of and engagement with place.

#6: Give all students educational experiences both in and beyond the classroom that help them develop the knowledge, skills, and abilities to nurture and create the conditions for people and planet to thrive.

- **The development of more inclusive and equitable culture in the makerspace will give students the foundational skills, knowledge, and abilities to create conditions for people to thrive.**

#7: Increase engagement between Western and local communities

- **Creating opportunities for working on community-based projects is a current goal for the pre-major program. With proper staffing and support of the makerspace and other pre-major resources, this becomes possible.**

#8: Increase the experiences through which students, staff, and faculty can engage with communities and environments in multiple regions in the world, both inside and beyond the classroom.

- **The makerspace is a place where students can engage in conversations and discussions related to the greater community (local, regional, global).**

Goal 3: Western will foster a caring and supportive environment where all members are respected and treated fairly.

#3: Enhance student services and co-curricular opportunities to foster students' intellectual, personal, and professional development and success.

- **One of the main goals of FYP is to enhance opportunities for engineering and design pre-major students to improve their ability to succeed. A properly staffed and supported makerspace and supported program is critical to this effort as it provides a venue for co-curricular opportunities.**

#4: Improve climate and working conditions for student employees, staff, and faculty at all locations.

- **With a focus on equitable and inclusive culture, the makerspace can help set proper expectations for how students interact and work with one another in a professional setting. This translates to and may work to improve the culture and climate of other work environments.**

#6: Expand networks between students, staff, faculty, and alumni/ae.

- **A goal of the makerspace is to expand networks for engineering and design pre-major students, both among each other to help them develop a better sense of belonging within the department and with students already in the majors to help the pre-major students successfully transition to the majors. With additional open hours and increased access, this goal can be reached.**

Goal 4: Western will pursue justice and equity in its policies, practices, and impacts.

#1: Foster a positive and collaborative campus climate, including the physical environment, that welcomes and affirms the diversity of individuals, groups, cultures, and ideas.

- **Developing a more inclusive and equitable culture in the makerspace for engineering and design pre-major students will help them succeed as students and better prepare them for their careers.**
- **The positive effects will extend to other areas and will help to foster a positive and collaborative campus climate.**

#2: Establish, fund and sustain practices of self-examination and continuous improvement to identify, understand, and remediate structural injustices and inequities at Western.

- **The makerspace breaks down structural injustice and inequities by providing *all* pre-major students with access to the skills and training they need to be successful in the major.**

#3: Recruit, retain, and support more underrepresented and first-generation students at the undergraduate and graduate levels.

- **A properly staffed and supported makerspace will provide opportunities for students to engage in make-do-build experiences designed specifically to increase student sense of belonging and self-efficacy. Studies show that sense of belonging and self-efficacy lead to increased persistence and success of underserved students.**

#5: Increase affordability of and access to high quality undergraduate and graduate education at all Western's locations.

- **By better supporting students to successfully enter and complete engineering programs this proposal will reduce time to graduation and thereby reduce the cost of education.**

#6: Support and strengthen curricula and other programming that engage issues of access, equity, power, and privilege in and across disciplines.

- **This proposal will address these issues directly by integrating best practices of equity and inclusion into the makerspace, as well as providing training and support for these issues through co-curricular activities.**

#8: Expand and support respectful collaborative relationships with community partners and underrepresented groups to advance equity and social justice.

- **By engaging students in meaningful project work and research opportunities, this proposal will aid in the development of collaborative relationships with the community.**
- **A focus on meaningful project work and research opportunities will further advance equity and social justice.**

#9: Pursue just action by taking all appropriate steps to protect survivors and to prevent sexual and other types of violence, discrimination, harassment, and bullying.

- **One goal of the makerspace is to create an inclusive culture that extends to other areas of the engineering program (classrooms, labs, hallways), that are free from discrimination and harassment. Having oversight and supervision of the makerspace will help to create this environment and to address any issues immediately.**

Core Themes:

- **Advancing Inclusive Success:** Increasing access to the makerspace and other pre-major resources with a focus on creating an inclusive culture will improve equity which will thereby improve student success for underserved students. Developing a strong sense of belonging and self-efficacy will lead to an increase in persistence and graduation rates in engineering students.
- **Increasing Washington Impact:** Increasing access to the makerspace and providing more robust training opportunities will better prepare students for the workforce. In addition, focusing on creating an inclusive work environment will better support our underserved students which will lead to increased diversity in engineering. Engineering degrees are high-demand degrees for the State, so increasing the diversity of our engineering graduates, graduating engineers with a better understanding of and ability to act on issues of equity and inclusion, and better preparing students to succeed in the engineering majors will all have a positive Washington impact. By participating in makerspace activities, students will develop a balanced engineering identity that includes social, professional, and cultural attributes leading to well-rounded, culturally competent engineers who exhibit a strong sense of belonging.
- **Enhancing Academic Excellence**: Individualized student support, creation of training opportunities, well maintained equipment, and safer work environment will lead to increased opportunities for students to participate in "make-do-build" experiences including undergraduate research, industry-sponsored projects, and community based collaborations. This will better prepare students for the major and ultimately, the workplace, by providing them with access to tools and equipment earlier in their academic career. Better prepared students are more likely to be involved in activities

which will help to enhance Western's academic excellence. In addition, the makerspace creates opportunities for students to work collaborative on projects designed to connect pre-majors to majors and increase sense of belonging in the department.

What are the consequences of not funding this proposal?

Not funding this proposal will lead to the following:

- Limited open hours of the makerspace
- Decreased likelihood of creating an inclusive culture for pre-major students
- Decrease in equitable access which could potentially lead to decrease in student success, especially for underserved students
- Lack of training opportunities for students, staff, and faculty
- Difficulty monitoring safe lab practices and use of equipment.
- Increased "down time" for equipment needing repair or maintenance
- Strain on other department resources including, but not limited to, staff and faculty.

All of the above has negative impact on the development of student community, sense of belonging, and self-efficacy, all of which have a significant impact on student success.

Not funding this proposal would limit the ability for the Engineering & Design department to live up to its mission of fostering "teamwork, communication, and a commitment to equity, justice, and the respect for the rights and dignity of others" as well as developing and supporting "creative problem-solving, analytical skills development, and experiential learning" opportunities for students. It would also negatively impact the ability for CSE and the University to meet their strategic goals associated with advancing inclusive success. It is essential to fund this proposal if we want to continue to make positive strides towards meeting our goals as a department, a college, and a university.

What alternatives were explored?

Providing adequate support for the makerspace and related pre-major resources is essential. The makerspace project started off as a pilot project supported solely by the FYP faculty member. Soon after opening the space (Fall 2019), it was apparent that additional support was necessary. We hired students to staff open hours. Department technicians were asked to help when issues arose or there was a need for technical expertise however, the technicians do not have enough bandwidth to devote time to makerspace support. Cobbling together enough support through student staffing, faculty oversight, and occasional technician assistance was less than sufficient to adequately support the makerspace during this pilot opening. In addition, other department resources, such as the 3D print lab, have recently seen a significant increase in use and maintenance needs since the opening of the makerspace. Now that new equipment has been acquired and the space will be opened to more students, the need for a technician is immediate and essential.

Which units (departments, colleges, etc.) will be involved?

Primarily Engineering & Design in CSE, though there will be partnership efforts with the Student Technology Center and possibly other departments in CSE, such as Physics, Math, Chemistry, and Computer Science.

Equipment needed:

None! We have all the equipment we need at this time.

For major (>$25k) purchases, please provide the following information.

Item:

Click here to enter text

Purpose:

Click here to enter text

Cost:

Click here to enter text

Anticipated Useful Life:

Click here to enter text

Replacement Cost if any:

Click here to enter text

Human Resources *(Complete the table below adding additional rows if necessary)***:**

Position Title	*Total Headcount*	*Total FTE*	*Salary and Benefits per FTE*	*Total Cost*
Instructional Classroom Support Technician 3	1	1.0	$72,612	$72,612

Table above should match data on budget spreadsheets submitted with this proposal. Complete the spreadsheet to get salary, benefit, and total cost amounts. Contact your division budget officer with questions.

Operating & Maintenance Costs (include service contracts, installation costs, etc.):

None

Space Requirements:

What type of space is needed for this proposal? (e.g., private office, lab space, group work/study space, etc.)

Office for the lab technician

What features must this space have? (e.g., fume hoods, plumbing, 3-phase power, etc.)

No special features

What needs can be accommodated within your existing space?

Nothing

How much new space will be required?

None

References

[1] *WWU Institutional Data, Engineering Department,* 2019.

[2] K. Lewis, J. Stout, N. Finkelstein and T. Ito, "Fitting in or opting out: A review of key social-psychological factors influencing a sense of belonging for women in physics," *American Physical Society,* August 2016.

[3] A. S. Masters, "How Making and Makerspaces have Contributed to Diversity and Inclusion in Engineering: A [non-traditional] Literature Review," in *American Society of Engineering Education CoNECD - The Collaborative Network for Engineering and Computing Diversity*, Crystal City, VA, 2018.

[4] S. Vossoughi and B. Bevan, "Making and tinkering: A review of the literature," Commissioned paper for Successful Out-of-School STEM Learning: A Consensus Study, Board of Science Education, National Research Council, Washington, DC., 2014.

[5] K. Youngmoo, E. Kareem, K. Alderfer and B. Smith, "Making Culture: A National Study of Education Makerspaces.," Drexel University ExCITe Center, 2019.

[6] C. Forest, H. Hashemi, J. Weinmann and U. Lindemann, "Quantitative Survey and Analysis of Five Maker Spaces at Large, Research-Oriented Universities," in *ASEE Annual Conference and Exposition*, New Orleans, Louisiana, 2016.

[7] V. Wilczynski and R. Adrezin, "Higher Education Makerspaces and Engineering Education," in *ASME International Mechanical Engineering Congress and ExpositionVol 5: Education and Globalization*, Houston, TX, 2012.