EDUCATION

Support of the Life Cycle of the Undergraduate Student

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Executive Summary

To further differentiate from peer institutions that offer exceptional academic experiences, SEAS needs its undergraduate students to gain key value-added skills such as communication, teamwork, networking, lateral thinking, and career planning. Higher competency in these skills would further distinguish SEAS graduates in highly technical environments that value individuals' ability to continually learn, work in groups of diverse individuals, and remain resilient in the ever-changing landscape of STEM professions. This is achieved by giving students the right information and exposure to experiences at the right time during their undergraduate life cycle. Allocating resources for enhanced advising and mentoring, along with coordinating efforts in one location to enhance organization and accountability, would be a possible vehicle to address this need. Ideally, student self-reported satisfaction with their SEAS experience would increase, as well as their ability to navigate their choices within WashU while enrolled, along with having confident feelings about pursuing post-graduation endeavors.

Support of the Life Cycle of the Undergraduate Student
Washington University School of Engineering & Applied Science

Contributors: Ron Laue (Chair), Dennis Barbour, Chris Kroeger, Melanie Osborn, Silvia Zhang

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Background

SEAS is privileged to have a sustained admissions pipeline that consistently produces a group of high-achieving undergraduate students with each first-year class. A large percentage of first-year students graduated in the top 10% of their high school class. When these students arrive on campus, they are often motivated to not only to do well academically, but often are eager to follow a set of prescribed guidelines to reach their personal and professional goals.

The current method of advising and communicating to undergraduate students is uncoordinated and often inconsistent. This can lead to dissatisfaction among undergraduates regarding information given (or lack thereof) on crucial issues such as selection of major, research possibilities, opportunities to improve design skills, and career advising. To be sure, a lack of clarity and common understanding often exists among staff and faculty in terms of what students should know and when they should know it.

The diverse student population also influences the effectiveness of the current method of assisting students. Often it is unclear whether the current process of disseminating information and resources will produce the desired results of helping all students equally. Recently, the number of undergraduates who are first-generation college or Pell-eligible students attending WashU has increased. Often these students feel isolated in an environment where so many others originate from a background of higher socio-economic status and greater social capital. Disadvantaged students are consistently not performing as well, as measured by GPA, in their STEM courses as compared to non-disadvantaged students. While disadvantaged students are being retained by WashU, they are less likely to stay retained within their chosen entry Engineering major. There is little diversity and inclusion training for faculty, staff, and students.

Lack of resources and coordination are the leading reasons SEAS falls short in providing undergraduates with key skills and information that help foster overall success. Four-year advisors in SEAS have significantly higher advising loads compared to four-year advisors in Arts & Sciences and Business. Faculty display a high dedication and concern in advising students. Yet teaching and research demands, coupled with a system that provides little incentive for high-impact undergraduate advising, often makes student interactions fragmented. These challenges, along with a lack of a central location to coordinate efforts, makes providing resources to undergraduates disjointed and underwhelming.

Opportunities for Improvements

A better, more coordinated flow of information and opportunities to undergraduates is essential for success. This starts by creating a more robust advising system to ensure undergraduates have all the necessary resources to be successful. Increased attention to initiatives in key areas is a necessary start in coordinating efforts:

- **Academic mentoring:** Students look to faculty for academic mentoring, from choosing the right major that aligns with professional goals, to deciding what elective classes in which to enroll. Faculty need current data, from market trends in a given field to the design and technical skills required of students to be successful. In addition, faculty need to receive communication about curriculum updates and graduation requirements to remain effective during individual undergraduate advising sessions.

- **Developing design skills:** Students desire courses on design and problem-solving earlier in their undergraduate curriculum. Different ways to engage students, from first-year courses to independent design initiatives, should be enhanced.
- **Teaching networking skills:** Engineering students often are taught a step-by-step process to solving a problem. Networking requires a completely different approach, which often necessitates proper coaching for students. From obtaining an internship to finding a full-time job after graduation, good networking skills are essential. Students need to be taught these skills early in their first year to ensure the best chance of gaining prospects in the future.
- **Fostering research opportunities:** Obtaining a research experience is not a linear process. Instead it requires students to engage in lateral through which starts with an evaluation of personal interests and skills. Depending on a student's goals, conducting research is not always necessary or prudent. Motivated students who have resources available to coach the skills necessary to find a meaningful research experience.
- **Enhancing career planning:** Students require better flow of information regarding leadership and internship opportunities. This flow of information must align with the developmental stage in which a student falls within the undergraduate life-cycle (for example, encouraging a first-year student to apply for an internship that requires advanced upper-level courses may not be a good use of time). Faculty and staff must work closely with the Career Center to coordinate efforts.
- **Coaching students on way to be effective in diverse environments:** We live in a global society. Yet historically the field of engineering has been less diverse than most other professions. To be effective, undergraduates need to learn to work and collaborate with those who are different from them. Enhanced diversity and inclusion training would better provide these skills.

Leveraging Unique Advantages

SEAS exists within a prime life sciences university. Proximity to our world-class medical school allows for collaborative initiatives in medicine and Engineering which exist at few other places. This allows for easy access to academic experiences in divisions outside of Engineering. In addition, St. Louis is a city with established entrepreneurial opportunities in technology and health care. Finally, WashU has a top residential experience that includes focused educationally purposeful activities for undergraduates.

Challenges

Despite overwhelming feedback from business and industry on the importance of students obtaining the key skills outlined above, convincing undergraduates (and at times some faculty and staff) proves problematic. Clearly the main mission of a university, as it should be, is to educate students. Soft skills often are considered a secondary bonus. In addition, there is a level of ambiguity that comes with teaching these skills to undergraduates, and measuring outcomes is difficult.

Determining the best use of technology also is a consideration. Students are accustomed to social networks and instant information. There will be a need to determine ways to provide students with the information they need (internship, research, job opportunities) when they need it with the understanding that needs change based on the student's stage in the undergraduate life cycle (high school, first-year, sophomore, junior, senior, graduate).

Advising resources continue to one of the most significant obstacles. There must be an adequate number of advisors available to help students, and the advisors must have the right knowledge to help in the right ways. Staff support will be necessary to coordinate efforts and information, from curriculum changes within departments and across departments.

Coordinated Effort

One example of a vehicle that would address the needs for coordination would be to create a Division of General Engineering. Such a division would be academic in nature, but not a stand-alone department. Instead it would be an entity that could help coordinate efforts between Engineering Student Services, the departments, Engineering IT, and the Dean's Office, while housing courses that are common across all engineering majors.

What Success Looks Like

To achieve the desired outcome, there would need to be an enhanced and comprehensive four-year advisor structure that ensures undergraduates receive regular, pertinent, and consistent information in regards to major selection, course offerings, and long-term planning based on students' goals. To accomplish this, additional four-year advisors are needed, not only to advise students but also to coordinate the efforts of the key initiatives listed above. The result would be for undergraduates to receive information early in their college careers regarding expectations and career opportunities within each major. This change would ideally result in better flow of information (curriculum changes, requirements, etc.) between stakeholders who advise undergraduates. This includes information on internships and career planning.

To achieve success, students would report (as indicated in the COFHE Senior Survey, for example) better satisfaction with co-curricular and extra-curricular experiences related to communication, teamwork, networking, lateral thinking, and career planning. Students would have a high satisfaction with education and resources provided, along with gainful employment or graduate study in a desired field. As a graduate, there would be a sense of citizenship in a global work, along with being a well-informed, contributing member of society.

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[2] Clayson, D. (2009) Student evaluations of teaching: Are they related to what students learn? J. Marketing Education, 31(1), 16-29.

[3] Pascarella, E., & Terenzini, P. (2005). How college affects students: A third decade of research. San Francisco, CA: Jossey Bass.

[4] Wieman, C. & Gilbert, S.L. (2014) The teaching practices inventory: A new tool for characterizing college and university teaching in mathematics and science. CBE-Life Sciences Education, 13, 552-569.

[5] Wieman, C. (2015) A better way to evaluate undergraduate teaching. Change:The Magazine of Higher Learning, 47:1, 6-15.

[6] Wieman, C. (2016) Improving Undergraduate STEM Education at Research Universities: Case Study 1, the Science Education Initiative.