WIP: Building Buy-In for a Campus Wide Interdisciplinary Projects Class

Mr. Benjamin Edward Chaback, Virginia Polytechnic Institute and State University

Benjamin (Ben) Chaback is a Ph.D. student in engineering education at Virginia Tech. He uses modeling and systems architecture to investigate undergraduate engineering education and is working towards creating sustainable systems for student success. Ben is a member of the American Society for Engineering Education, the Council on Undergraduate Research and is a facilitator for the Safe Zone Project and the Center for the Improvement of Mentored Experiences in Research. He is passionate about student success and finding ways to use research experiences to promote student growth, learning, and support.

Dr. Lisa D. McNair, Virginia Polytechnic Institute and State University

Lisa D. McNair is a Professor of Engineering Education at Virginia Tech, where she also serves as Deputy Executive Director of the Institute for Creativity, Arts, and Technology (ICAT).

Dr. David Gray, Virginia Polytechnic Institute and State University

Dr. Gray receieved his B.S. in Electrical and Computer Engineering from Virginia Tech in 2000. He then earned a M.S. and a Ph.D. in Materials Science and Engineering from Virginia Tech in 2002 and 2010, respectively. Much of his graduate education focus

Dr. Mark Vincent Huerta, Virginia Polytechnic Institute and State University

Dr. Huerta is an Assistant Professor in the Department of Engineering Education at Virginia Tech. He earned his PhD in Engineering Education Systems & Design at Arizona State University and has a BS/MS in Biomedical Engineering. His research group explores approaches to building positive and inclusive learning environments that support the professional growth of students and faculty within engineering education contexts. His research interests include graduate student mentorship, faculty development, mental health and well-being, teamwork and group dynamics, and the design of project-based learning classes.

Atlas Vernier, Virginia Polytechnic Institute and State University

Atlas Vernier is an interdisciplinary leader, researcher, and innovator at Virginia Tech. As a technologist in the Institute for Creativity, Arts, and Technology, Atlas specializes in immersive audiovisual environments, emerging modalities of data collection, and large-scale systems integrations for humans and technology. Having completed dual undergraduate degrees in systems engineering and foreign languages, they are now a graduate student in the Grado Department of Industrial & Systems Engineering with a concentration in Human Factors Engineering & Ergonomics.

Mr. Ernesto Adolfo Cuesta Alvear, Virginia Polytechnic Institute and State University

Ernesto Cuesta is a PhD student in the Engineering Education Department at Virginia Polytechnic Institute and State University (Virginia Tech) in Blacksburg, VA. He holds a B.Sc. in Telecommunications Engineering and an M.S. in Project Management. Before beginning his doctoral studies, he spent eight years in the telecommunications industry, leading data-center swaps and managing large-scale network deployments. As a Graduate Teaching Assistant, he supports Virginia Tech's interdisciplinary IDPro course, mentoring students through project-based learning and facilitating teamwork across engineering disciplines. His research interests center on student motivation in experiential learning environments and interdisciplinary collaboration in engineering education.

WIP: Building Buy-In for a Campus Wide Interdisciplinary Projects Class

Abstract

This work-in-progress empirical research paper aims to describe and define the process of engaging stakeholders and gaining buy-in for a new vertically integrated project-based learning class offered at a large mid-Atlantic research university. This course was designed in part to provide undergraduate students the opportunity to engage in hands-on learning at the 2000 and 4000 levels to increase professional competencies, but now also seeks to fill a new "bridge experience" requirement in the students' plan of study. This study addresses the research questions: Who are the stakeholders that need to be considered when working on developing IDPro? What is the relationship between various stakeholders and IDPro?

From a pilot in the 2023-2024 academic year, over eighty students enrolled in this Interdisciplinary Projects course, and most were from the College of Engineering. To scale the class to be truly interdisciplinary, rather than just engineering and science, the research team began to identify stakeholders on the campus using a power-interest grid to determine influence, interest, and needs for each. Stakeholders were identified as belonging to one of four groups in this study which include Student Advisement/Enrollment, Bridge Experience Leadership, Upper University Leadership, and Currently/Previously Enrolled Students. With a wide range of stakeholders identified, the communication styles and interests of each vary dramatically.

So far, the authors have met with advisors from six departments outside of the College of Engineering and secured some buy-in from the engineering departments including some accepting the credit from the course to be applied to their department plans of study. These meetings have taken place in advance of the full Bridge Experience launching in Fall 2025. The authors have also developed stakeholder mappings of the various degrees of current involvement vs interest, with particular attention to the influence of the bridge experience requirement. For the students currently and previously enrolled in IDPro, the team also sought information about the impact of course sequencing, degree requirements, the amount of credit hours needed and available, when the experience took place, and how students learned about enrolling in the course.

As the Bridge Experience is in its first year, the authors intend to continue working closely with the Bridge Experience leadership team to ensure IDPro continues to be an option for the students to fulfill degree requirements. The authors plan to do additional stakeholder mapping and involvement meetings, including student project showcase days, to highlight the diverse experiences happening in the course. Additionally, the authors plan to delve deeper into student academic plans to determine the average course sequencing and where IDPro fits best in different academic schedules and advising.

Keywords: Interdisciplinary, administration, bridge experience, undergraduate, project-based learning

Introduction

Along with the demand of engineers continuing to increase (U.S. Bureau of Labor Statistics 2024), the importance of providing strong skills to these engineers is becoming increasingly relevant (Passow and Passow 2017). One avenue to prepare engineering students for the workplace following their undergraduate program is through active learning experiences, one of which is Project Based Learning (PBL). PBL typically is designed as a project that spans one or more semesters which requires a team of students to collaborate with a stakeholder on solving a real-world challenge within the setting of a classroom.

A specific instance of this PBL experience at a large mid-Atlantic university is IDPro. This course, offered at the 2000 and 4000 levels by the Department of Engineering Education for 1-3 credit hours, enables students to take part in a project where they can see the impact of their learning applied in a real-world setting. This course is designed to foster interdisciplinary collaboration across undergraduate students throughout the university where they get the experience of working with students from different academic and social backgrounds while also getting the experience of working with a project stakeholder on a project with direct applications outside of the classroom.

Due to the positive impacts of experiential learning on students' professional identity and disciplinary skills, Virginia Tech in 2024 began to roll out the Bridge Experience. The Bridge Experience is designed to improve students' access to experiential learning opportunities. This program will ensure that all undergraduate students can engage in at least one such activity during their undergraduate curriculum to help make sure that the Commonwealth of Virginia and the country are rewarded for their investment in higher education at Virginia Tech. One significant gap in the rollout of the Bridge Experience is that direct experiences offered at Virginia Tech that can satisfy the requirements of the Bridge Experience are not yet well defined and often left up to the discretion of department advising committees. This gap is being addressed as the program forms.

To establish IDPro as one of the different courses which can count towards students' Bridge Experience requirements, collaboration and conversations with university stakeholders on the Bridge Experience needed to first take place. By ensuring stakeholders understand what IDPro is, what students get out of the class, and how it aligns with the requirements proposed by the Bridge Experience, the faculty and researchers of IDPro can begin to see how to best align the course with different university and academic program expectations for students and ensure the class stays truly interdisciplinary and serves a large population of students at the university.

To begin to understand the various stakeholders at the university that need to be consulted on the fit of IDPro with the Bridge Experience, the following research questions needed to be answered:

RQ1: Who are the stakeholders that need to be considered when working on developing IDPro?

RQ2: What is the relationship between various stakeholders and IDPro?

Literature Review

Stakeholders are defined as any group or individual who can affect or is affected by the achievement of the organization's objectives (Freeman, 1984). Through an academic lens, stakeholders could include upper-level administrators such as the President and Provost, college level administrators such as the Dean and Associate Deans, department level administrators such as Department Chairs and Assistant Department Heads, and course level administrators such as course monitors (Marshall 2018). Other relevant stakeholders include students taking a course, faculty teaching a course, the academic advisors who suggest which classes students should take, and external companies who lend time, mentoring, support, and sometimes money for students to use in a class (Marshall 2018).

After understanding who stakeholders are, there is an element of understanding what level of involvement different stakeholders will have with a project (Smith 2017), the types of information that are most helpful to share with them (Caputo, Evangelista and Russo 2018), and when to share this information (Caputo, Evangelista and Russo 2018). Stakeholders can often be divided into one of four categories. These include low-interest low-influence, low-interest high-influence, high-interest low-influence, and high-interest high-influence (Smith 2017). Along with these categories that stakeholders could belong to, several categories for different stakeholder groups were established as it pertains to IDPro. These include student advisement/enrollment, bridge experience leadership, upper university leadership, and currently/previously enrolled IDPro students.

While treating stakeholders as supervisors can at times be helpful, a deeper collaboration with them can also be fostered through a partnership lens. These include the practices of boundary spanning (Farrell et al. 2022) and looking at aspects of coordination, cooperation, and collaboration (McNamera 2012). When thinking of the different aspects of stakeholders through the lens of boundary spanning, the research team serves to move across boundaries to help share information on the experience behind the intervention, IDPro, to groups that are historically not aware of it. Additionally, looking at stakeholders through the lenses of coordination, cooperation, and collaboration helps to explore the different ways that stakeholders need to be engaged, the expectations of working with them, and how to approach getting and giving information from and to them (McNamera 2012).

Methodology

A three-prong approach was taken to understand the various stakeholders surrounding the Bridge Experience and its relation to IDPro. This included: 1) attending and presenting IDPro as an avenue for students to satisfy the Bridge Experience requirement, at a meeting with College of Engineering Leadership involving Assistant Department Heads, 2) networking with and meeting with academic program coordinators to see where IDPro can fit in their academic plans for

students, and 3) creating stakeholder maps/diagrams to determine the connections between various stakeholders, IDPro and the Bridge Experience.

One of the components behind understanding how IDPro can fit within the Bridge Experience is by talking to some of the university leadership overseeing both the Bridge Experience and College of Engineering activities more broadly. Every two weeks, the College Academic Affairs Committee (the assistant department heads and select members of the College of Engineering Dean's office) meet to discuss issues at the undergraduate level in the College of Engineering. The Academic Affairs meeting also operates as a vehicle to inform the College of Engineering leadership about upcoming opportunities. For IDPro and fitting within the Bridge Experience, the course was presented at one of these assistant department head meetings where the course model and its early success was discussed as an example of experiential learning that would fit the bridge experience model.

A significant population outside of university leadership to consider when looking at how IDPro fits within the Bridge Experience requirements are academic program coordinators and academic advisors. Two major reasons for consulting this group are that we do not want IDPro to add additional credit obligations to students to satisfy their Bridge Experience requirements but also, we want to make sure that during student advisement, the department knows what students can take IDPro in place of or to get credit for. While it is expected that some students will take IDPro regardless of whether they need the credits or not to be applied towards their graduation requirements, these meetings with academic program coordinators and advisors helps to spread the word about IDPro and how to enable the experience to be a part of students' academic plans.

The third component behind understanding the stakeholders of IDPro and the Bridge Experience was a combination of creating stakeholder maps and diagrams. While it is known that some stakeholders have considerably more influence than others, this activity helped to show who the stakeholders that are known are, their level of influence and connection to IDPro and/or the Bridge Experience, how frequently they need to be updated on the status of IDPro, and what types of information to share with them. By looking at stakeholders through a partnership lens (McNamera 2012), different elements of their relation to the project can be more fully understood and investigated.

Preliminary Results

Throughout the three-prong approach discussed above, several items were learned, and a preliminary sense of the different stakeholders and their involvement levels began to be understood. This includes some initial thoughts and feedback from the College of Engineering Undergraduate Academic Affairs meeting, gaining the support of additional academic programs for how to fit IDPro into their academic plans, and developing two initial stakeholder maps and connection diagrams.

Following the presentation at the College of Engineering Academic Affairs meeting, the IDPro research team was able to respond to some questions concerning the overview of IDPro and its fit with the Bridge Experience. The course was also considered as a vehicle that could include non-credit bridge experiences, such as internships and study abroad.

From being able to meet with different academic program coordinators and academic advisors, IDPro was able to get the buy in from nine different academic programs outside of the College of Engineering that have identified departments where the credits earned by students in IDPro could be applied to their plan of study. These departments include Neuroscience, Plant Sciences, Computational Modeling and Data Analysis, Animal & Poultry Science, Food Science, Physics, Chemistry, Sociology, Psychology, and Criminology, Engineering Education, Aerospace and Ocean Engineering, Biological Systems Engineering, Biomedical Engineering and Mechanics, Chemical Engineering, Civil and Environmental Engineering, Computer Science, Electrical and Computer Engineering, Industrial and Systems Engineering, Materials Science and Engineering, Mechanical Engineering, Mining and Minerals Engineering, and the School of Construction.

When looking at different stakeholder mapping and diagramming activities, two different maps were able to be created. The first is a category mapping where stakeholders belonged to one of four categories based on their level of involvement and the information that needed to be shared with them regarding IDPro. This is shown below in Figure 1.

Figure 1: Stakeholder interest vs influence mapping based on the Stakeholder Engagement Framework (Smith 2017)

High Influence	Provost's Office, President's Office, Registrar's Office, Academic Program Manager, Bridge Experience Leadership	Dean's Suite, Department Head, Academic Advisors, Course Instructors, Industry Partners, Assistant Department Head
Low Influence	University Communications, Students Not in the Course	Course Students, Course Alumni
	Low Interest	**High Interest**

The other stakeholder map created was a preliminary connection diagram. This shows how different stakeholders interact with one another, with IDPro, and the level of influence they have on IDPro overall. This is shown below in Figure 2. It is expected that this connection diagram could be generalizable to other programs in higher education, albeit with likely slightly different titles for admin level roles, due to previous success with diagramming to look at organizational structures, including affinity diagrams (Iqbal, Ashfaq, and Taib 2022), strategy diagrams (De Maria Sanchez Aguirre et al. 2022), and data flow diagrams (Hu, Cleland, and Burt 2019), similar to what has been developed for this paper.

In terms of the development of these diagramming activities, scholars should perform brainstorming sessions to identify different stakeholders, look at the ways in which they communicate with one another, including the frequency and nature of the communication, and consider the level of influence or impact they hold on one another.

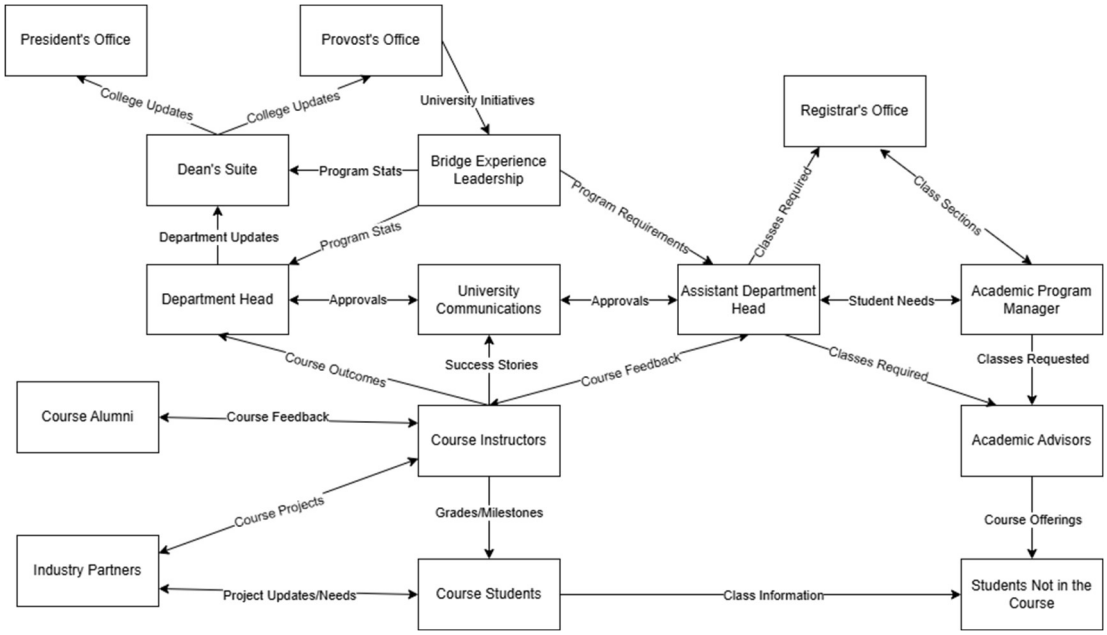

Figure 2: Stakeholder connection diagram for the IDPro stakeholders

Future Steps

While a preliminary idea of the different stakeholders involved in IDPro and the Bridge Experience has been determined, there is more work to be done to continue building and sustaining the influence of stakeholders on how IDPro can help to promote an effective PBL experience for students in alignment with the expectations of the Bridge Experience. Firstly, the team expects to continue and meet with different members of the Bridge Experience leadership team to ensure that as the Bridge Experience develops, IDPro can be an avenue that students are able to satisfy this requirement through.

Similarly, we expect to continue to meet with different academic departments to see how IDPro can fit in different academic plans around the university. Lastly there is an interest in expanding our communications to a more diverse group of stakeholders, particularly high-interest, high-impact groups such as student and industry groups. While much of the work discussed in this paper, and the work to be done, has strong ties to university leadership, staff, and faculty, being able to engage with the students as stakeholders to find their unique needs and where our industry partners see themselves fitting into the Bridge Experience through IDPro serve as additional new lenses through which we can see the impact of both IDPro and the Bridge Experience on student learning and preparation for industry throughout and following their undergrad.

References

Caputo, F., Evangelista, F., & Russo, G. (2018). The role of information sharing and communication strategies for improving stakeholder engagement. In *Business Models for Strategic Innovation* (1st ed., pp. 101–120). essay, Routledge.

De Maria Sanchez Aguirre, F., Ivonne Del Carmen Alcaide-Aranda, L., Luz Castaneda Alvarado, E., Francisco Ludena Gonzalez, G., & Manuel Toledo Quispe, P. (2022). Strategy Diagram of Active Research in Practice and Research in Higher Education Students. *NeuroQuantology* 20(5), 554–560. https://doi.org/10.14704/nq.2022.20.5.NQ22208

Farrell, C. C., Penuel, W. R., Allen, A., Anderson, E. R., Bohannon, A. X., Coburn, C. E., & Brown, S. L. (2022). Learning at the boundaries of Research and Practice: A Framework for Understanding Research–Practice Partnerships. *Educational Researcher*, *51*(3), 197–208. https://doi.org/10.3102/0013189x211069073

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Cambridge University Press.

Hu, M., Cleland, S., & Burt, S. (2019). Build up a constructivist learning environment for teaching first-year students data flow diagrams. *2019 IEEE Frontiers in Education Conference (FIE)*, 1–8. https://doi.org/10.1109/fie43999.2019.9028468

Iqbal, S., Ashfaq, T., & Taib, C. A. B. (2022). A SYSTEMATIC LITERATURE REVIEW ON ORGANIZATION PERFORMANCE IN GLOBAL HIGHER EDUCATION: AN AFFINITY DIAGRAM APPROACH. *Pakistan Journal of Social Research*, *4*(1), 688–701.

Marshall, S. J. (2018). Internal and external stakeholders in Higher Education. *Shaping the University of the Future*, 77–102. https://doi.org/10.1007/978-981-10-7620-6_4

McNamara, M. (2012). Starting to untangle the web of cooperation, coordination, and collaboration: A framework for public managers. *International Journal of Public Administration*, *35*(6), 389–401. https://doi.org/10.1080/01900692.2012.655527

Passow, H. J., & Passow, C. H. (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. *Journal of Engineering Education*, *106*(3), 475-526.

Smith, P. Alan. (2017). Stakeholder engagement framework. *Information & Security: An International Journal*, *38*, 35–45. https://doi.org/10.11610/isij.3802

U.S. Bureau of Labor Statistics. (2024, August 29). *Architecture and Engineering Occupations*. U.S. Bureau of Labor Statistics. https://www.bls.gov/ooh/architecture-and-engineering/