Academic Affairs
Fariborz Maseeh Department of Mathematics and Statistics
Using Technology to Collect and Analyze Data to Answer Key Questions on the Success of Students in STEM at PSU

End-of-Project Report
Project Description
Collected key questions from faculty and units related to improving student success in science, technology, engineering, and mathematics (STEM), then found ways to try to answer those questions in a report on STEM flow at PSU.

Project Outcomes
- Engaged with collaborators (Department of Mathematics and Statistics, Chemistry, Biology, Engineering, Physics, and the Pre-Health Advising Office) to identify and articulate measurable indicators (eg. grades, transfer credits, etc.) and program objectives which define success and identify intermediate variables that correlate to student success.
- Worked with The Office of Institutional Research and Planning (OIRP) to identify available institutional data that will help identify and understand the "leaks" in the pipeline and/or other bottlenecks and leverage points in the pathway.

Project Lead
- Paul Latiolais - Professor, Department of Mathematics and Statistics - College of Liberal Arts & Sciences

Project Team
- Austina Fong - Instructor and Placement Coordinator, Department of Mathematics and Statistics, College of Liberal Arts & Sciences
- Jim Hook - Associate Dean, Maseeh College of Engineering & Computer Science
- Kathi Ketcheson - Director, Office of Institutional Research & Planning
- Sybil Kelley, Assistant Professor, LSE advisor, Educational Leadership and Policy
- Jeremy Parra - Instructor, Environmental Sciences & Management, College of Liberal Arts & Sciences
- Rachel Webb, Statistics Consultant, Department of Mathematics and Statistics
- Melissa Yates - Pre-Health Adviser, College of Liberal Arts & Sciences

Project Sponsor(s)
- Gwen Shusterman - Professor, Chemistry, College of Liberal Arts & Sciences, and STEM Council Liaison
- Drake Mitchell - Associate Dean, College of Liberal Arts & Sciences

Impact of Project
While the long-term impacts of the project are not yet known, the short-term impact is that through this initiative, we brought a dynamic group of people together to begin developing answers to important questions about how to improve student success in STEM. The initial findings described in the project’s report on STEM flow at Portland State University (PSU) are summarized below.

- The most common path to graduation from the Maseeh College of Engineering and Computer Science (MCECS) begins at a community college. The MCECS has numerous initiatives in place to make these pathways clear and well-supported. Nonetheless, it is likely that further
exploration of where students are coming from and how they navigate through PSU and beyond would yield continued positive impacts on student success.

- MCECS student success indicates that underrepresented populations still lag behind their white peers in degree completion rates. Efforts to support underrepresented students have shown positive results; however, these and other efforts should be supported and pursued further in a coherent and more comprehensive manner.

- The analysis of MCECS data pointed to the need to look at disaggregated data related to student success in other STEM degrees and pathways (including non-degree seeking, pre-health pathways). This leads to another key point that emerged through the team’s efforts—obtaining clear, timely, and useful data is often difficult. Tracking pre-health students based on degree completion undercounts these students, and also poses the risk of mis-categorizing students who have been successful in a pre-health pathway as a failure or dropout.

- Despite lower growth in STEM fields in The College of Liberal Arts & Sciences (CLAS) compared to other schools across campus, the Mathematics & Statistics Department has seen a slight increase in Student Credit Hours (SCH), which can wholly be attributed to engineering students taking math and statistics courses.

- Recent changes in math and statistics course structure (e.g. larger class sizes) may be pushing students to community college for lower-level, prerequisite courses.

- The standard, recommended course-taking sequences appear not to be the best sequencing for student success, as indicated by the cluster analysis described in the report.

We have shared our report on STEM flow at PSU across campus. Karen Marrongelle, The Interim Dean of the College of Liberal Arts & Sciences, was given a pre-release version of the report before her State of CLAS Address on September 24th, 2014. While she did not directly address the themes in the report, it seems that the report informed her presentation. John Freeouf, the Department Chair of Physics, contacted us to thank us and promised to talk with us upon further reviewing the report. We are hoping that the report continues to be read and that the findings spur productive conversations and action.

**Project Deliverables**
Research and report on STEM flow at PSU. Please see the project’s webpage ([http://www.pdx.edu/oai/provosts-challenge-projects-161](http://www.pdx.edu/oai/provosts-challenge-projects-161)) for the report.
Project Sustainability
The work will continue, but likely at a slower pace, as we do not have the funds now for faculty or staff to devote to the various studies. The STEM research team convened for this project will likely be part of the STEM Institute, and hopefully this will have a positive impact on our ability to continue researching STEM flow.

The STEM research team will meet to discuss which questions to focus on, where to further disseminate the report, and who to talk to about extending our research. The project team plans to connect with Elena Andresen, Interim Dean for the Proposed OHSU - PSU School of Public Health, Karen Marrongelle, Interim Dean of CLAS, and Leslie McBride, Acting Director, School of Community Health, to discuss next steps and overall project sustainability.

We have no plans to pursue grant funding on our own, but hopefully will have the opportunity to be involved with assessing STEM flow as part of related grant proposals.

Lessons Learned
The lessons we learned throughout the course of this project are summarized below.

- We identified pre-health as a new cohort that CLAS can and should grow. Additional efforts are needed to better identify these students and help map their pathways to success, without reliance on degree completion data. Improved identification of pre-health students at PSU would allow for a more detailed analysis of the many differing pathways through which students are pursuing their goals and the potential obstacles that they are facing.

- Challenges were encountered in conducting our own cluster analysis. Having access to the right data and tools could reduce the chance of similar challenges occurring in the future. In order to effectively handle enrollment management and reduce barriers to student flow, the research group recommends that “end-users” of the data (e.g. faculty, STEM research team, and others) be engaged in discussions about what data is needed, and how to best access such data.

- We learned that MTH Student Credit Hour (SCH) growth was solely attributable to Engineering growth. MTH non-ENG growth in SCH was -2%.

- As measured by DWF rates, we found that students who took the Math Placement test seem to have higher success rates in courses than students who only completed the prerequisite courses required to enroll in a specific course.

- We uncovered new questions to ask about student flow. We hope these questions inform future efforts to improve student flow and success in STEM at PSU.
Organization of Provost’s Challenge

Collaborating with a project manager on this initiative was helpful in successfully executing the project. For example, recurring meetings with the project manager served as useful work sessions that assisted in moving work forward and identifying next steps.