Collaborative Partner: Reedley College

Project #5: Engineering Pathways to the Future - Building Interest, Engagement and Achievement

Pathway(s): Engineering

Project Summary

Reedley College with the Collaborative partners will be executing their proposal (attached) to support the increased number and diversity of students entering engineering-related pathways to obtain skills certification, associate and bachelor's degrees using a Guided Pathways model. This initiative will enhance outreach to our Fresno area schools where up to 83% of students are ethnically diverse, and where up to 56% of community college students are female.

Phase one will focus on integration of regional efforts for STEM outreach and engagement activities in our elementary, middle and high school populations. These outreach efforts will be intentionally designed to increase access by our under-served populations and provide equitable recruitment and support for disproportionately impacted students. Students will be recruited into dual enrollment high school classes where they will experience career exploration within the STEM and engineering fields, be provided with practical experience using role models and industry partners, and learn about engineering disciplines, job skills and salaries.

The following engineering pathways will be developed over 18 months:
- Manufacturing
- Geomatics
- Mechanical
- Electrical
- Civil
- Computer
- Biomedical
- Environmental

Phase two of this proposal will develop an engineering pathway in Geomatics, an emerging engineering field that combines aspects of civil engineering with surveying, geographic information systems (GIS), and drone technology. Reedley College will partner with Fresno

State to offer both lower and upper division courses on the Reedley campus to promote local completion of this baccalaureate degree program.

Phase three will emphasize curriculum alignment resulting in enhanced associate-level transfer degrees in the seven remaining pathways, created in consultation with Fresno State and UC Merced. Preengineering curriculum will be expanded to include additional dual enrollment and concurrent enrollment opportunities, resulting in accelerating student movement through multiple engineering pathways at community colleges within the State Center Community College District. Support for student retention and success within these pathways will come from expansion of success teams, sharing resources across high schools, colleges and universities, including cross-trained counselors, faculty and special services such as tutoring. Student mentors and advisors will be trained and deployed to create high levels of engagement among pathway students. Professional development will be used to cross-train faculty and staff that participate in this program, offering an opportunity to build a common understanding and mission among counselors, faculty and staff, while also providing a Guided Pathways context and re-enforce the principles of culturally responsive pedagogy, and help build an anti-racist framework of education within these pathways.

Facilities will be shared to bring educational programming close to disadvantaged students, including dual enrollment opportunities and support programs at high schools, virtual on-line courses, as well as degree programs offered at college and university campuses, including education centers. Practical training and will include summer internships and participation in other forms of work-based learning at industry partner locations.

Project Progress Report

The Engineering Pathway reviewed our principle tasks and goals and decided to break initially into three work groups (with a forth work group, the Tutoring/Academic Support Group, being initiated just in the last week to support this critical function). The discussions and initial actions of each work group are summarized below.

• Outreach/awareness building Group
• Develop multiple outreach events that might be held virtually or at various locations throughout the region. We envision events that involve multiple partners, e.g. area community colleges, Fresno State, and UC Merced. We would like to implement 2 to 3 such events (most likely virtually) in the spring 2021 semester.

• Develop a predictable number and calendar of activities that will be supported by Fresno State, UC Merced and regional community colleges to increase outreach to and engagement with our K12 student population.

• Schedule a "speaker series" that would encourage students in the pathway to persevere through the many difficult challenges they may face. The plan is to feature professional engineers or advanced engineering students at local colleges that are demographically representative of the students we would like to attract – could be done via Zoom or in person

• Summer bridge or summer "bootcamp" experiences for K-12 students to be held at a college campus or campuses that would integrate our available collective resources to optimize the impact on students

• Regional robotics competitions (or even a robotics league) targeting participation by rural area schools for various levels of age and experience – VROP is working to identify participating schools for this task and procuring some supplies/materials

• Starting in fall 2021, offer a two-semester dual enrollment sequence of courses at Reedley College to provide engineering pathway students with an introduction to design utilizing SOLIDWORKS software (in the first semester) and then, in the second semester, learning how to fabricate the widget they designed, using CNC or similar technology (with a heavy dose of safety and skill building on the use of various tooling machinery)

• "Guided Pathways" Group

• Jobs for the Future (JFF) has met with the pathway leaders to determine the scope of work in providing horizontal integration and shared resources, such as counselors and other personnel that can provide seamless wrap-around services to students in the engineering pathway, including K12 districts, community colleges, and universities involved in this pilot project

• Design Principles – we had extensive discussion about what design principles are, how to develop them, how they can be used in our build out of all K16 activities We asked for input from partners to create/finish design principles – the draft we have shared at RC is what we shared with the K16 team

- Recommended that an integration workgroup be established to help with intersegmental collaboration
- Cross intersegmental training in K12 especially teachers, counselors
- There was strong support for establishing parent workshops

• Career Exploration was discussed extensively; the team agreed that starting these activities earlier in middle school is important

• Group members were presented with sample activities and design principles (see attached documents) at the most recent meeting. Members are to return with feedback about what activities to keep and any other activities that need to be added particularly from the K12 side.

• Assess how "success teams," comprised of discipline faculty, embedded counselors, peer advisors, tutors, data coaches and other support staff, might be deployed across systems in

STEM. Would some aspects of this team be advantageous for students prior to their completion of high school? How might that be structured?

• Create "just-in-time" supports for struggling students, whether delivered in-person by tutors or by computer-based support solutions.

• Create a shared dashboard to represent the status of students in the pathway (probably utilizing CCGI as a common, cross-system data source)

• Tutoring/Academic Support Group (this is a newly differentiated workgroup [had been included in the "Guided Pathways" group] formed in recognition of the importance of tutoring for student success in math and STEM courses from middle school through the baccalaureate degree)

• Develop a sustainable projection for the number of mentors and tutors required to support the K16 engineering pathway. At present, we are thinking 5-10 student tutors from each community college and from Fresno State, with additional tutors from participating high schools, as appropriate

• Develop, train and assign a pool of tutors to support students in STEM courses, especially math courses. This could include high school students that tutor middle schoolers, and CC and Fresno State students that could tutor at the college and high school levels.

• Extend tutoring to other pathway STEM-related courses to support broader student success and completion.

☐ Standards will need to be developed for the ratio of students to mentors and tutors
☐ Work with partners to standardize tutor training
☐ Tutor scheduling and deployment will be coordinated through Fresno State

• Curriculum Group

• Firm up/implement the draft dual admissions agreement between Fresno State and each community college

☐ Define the privileges associated with dual admissions which may include:
Student access to 4-year institution library and software. Affording other "special privileges" should also be considered.

• The Collaborative may want to provide an "engineering grade" lap top for those entering the pathway.

• Financial assistance for engineering pathway students

• Deploy Canvas as the learning management system in all classes in the engineering pathway at any level, since students in this field will likely need access to the same Learning Management System currently utilized by all of the post-secondary institutions in the region.

• Document proficiency standards and top ten best practices used to develop effective K12 engineering pathways to allow for replication and scaling

• Modify the existing curriculum maps to use generic course descriptions not linked to any particular college's numbering system

• Extend existing curriculum maps further "upstream" to account for middle school math and science classes

• If necessary, expand pathway curriculum maps to the region to encompass feeder high schools in western Fresno, Kings, Tulare, and Madera counties

• Create dual enrollment arrangements between high schools and CCs, high schools and Fresno State/UC Merced and CCs and Fresno State/UC Merced

• Assess whether Fresno State/UC Merced want to offer engineering courses at partner CCs to increase access and serve to transition students to their institutions

• Reedley has met with Fresno State's Geomatics department to discuss mutual interests in enhancing offerings associated with this pathway. Faculty also discussed the technology needed to bring Reedley's current surveying classes (offered in Natural Resources) up to date, including new GPS units and more modern "home" stations for surveying

• In addition to degree programs, related certificate programs (engineering technology, fabrication, maintenance, and related fields) will be described and publicized to enhance understanding of how such programs relate to degree programs and how existing or newly created certificates can serve students with strong "hands on" skills.