Increasing STEM Student Success and Engagement by Addressing Critical Junctures for

Applying a Framework of Self-Authorship and the Learning Partnerships Model

Self-authorship is a model that can explain identity development and becoming a controller of one’s destiny (Baxter Magolda, 1998). This framework serves as a lens to understand the level of STEM students’ progress in developing identities consistent with those of STEM professionals and is associated with student success. The advancement of STEM student professional-identity development may be fundamental to undergraduate STEM student professional-identity development. Our work seeks to identify STEM students’ level of self-authorship/professional identity, observe the existence of LPM principles, and assess the relationship between the two.


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LEARNING ASSISTANTS AS LEARNING PARTNERSHIPS

The Learning Assistant Program engages peer leaders to facilitate study sessions in critical juncture courses for STEM majors (Calculus, Chemistry, Physics, Statics, Biology, and more). The LA program:

- is adapted from the University of Colorado Boulder model
- Researches the impact of the LA role on professional identity development; a majority of peer leaders exhibited mastery goal orientation and internal motivation
- Encouraged faculty to consider how peer leaders can facilitate learning via other pedagogical strategies
- Conducted extensive surveys of students and identified key barriers to attendance
- Improved selection, training, and supervision of LAs, resulting in a 57% increase in participation in three semesters

\[ y^2 = 75.9, df = 1, p = 0.001; t = -11.9, df = 1, p = 0.001 \]

Pass: Participants = attended 3 or more sessions

INTERDISCIPLINARITY — SUMMER RESEARCH COMMUNITY ACCELERATES SCIENTIFIC AND PROFESSIONAL DEVELOPMENT

In a partnership among NSF student research programs (REU, EPSCoR, LSAMP, Noyce, see back page) and other undergraduate research cohorts (McNair, NIH, NASA), STEM CENTRAL STATION instigated a multidisciplinary summer research community to engage students and faculty together in a range of professional development, social, and networking activities to augment their research experience. In summer 2013, 152 students and 68 faculty/staff participated.

In a preliminary REU study*, researchers observed that pushing students to explain their research across disciplines highly complemented disciplinary resources for success by 1) making researchers rethink their work, 2) finding novel connections for their issues, and 3) professionalizing students by enabling them to speak across their own variegated disciplines.

* excerpted from unpublished research by Dr. Arthur Scarritt, Sociology, and Dr. Dan Warner, Chemistry

INTERDISCIPLINARY FACULTY COMMUNITIES SUPPORT TEACHING AND EDUCATION RESEARCH

Boise State STEM Education Research Scholars Program is a year-long, interdisciplinary faculty learning community to increase STEM-discipline faculty understanding of, and participation in, education research. A study of impact on faculty expertise has been conducted. To date there have been:

- 7 faculty/research staff learning communities
- 56 total participants
- 18 departments/units

Campus seminars, workshops, invited speakers, consultations, and conferences create conditions for collaboration across departments. At the campus-wide Great Ideas in STEM Education Research Poster Session in January 2014, 35 teams and 112 participants shared results and ideas. See stem.boisestate.edu/faculty-research

A MODEL OF A TRANSFORMING UNIVERSITY

Blending Top-Down and Bottom-Up strategies:

- STRATEGIC PLAN. STEM is a specific priority in the university plan 2012-2017.
- CHANGE MODEL. WIDER program applies a change model to propagate evidence-based instructional practices across STEM foundational courses.
- PROGRAM TRANSFORMATION. Internal grants have funded major projects in engineering, science, mathematics, and mechanical and biomedical engineering.
- COMMUNITY CONNECTIONS. Partnerships such as a Science Friday broadcast and collaborations with Discovery Center of Idaho build STEM community.
- UNIVERSITY SYSTEMS. Orientation, block registration, advising, data sets and other systems support STEM students and departments.
- NEW CURRICULA. Graduate Certificate in College Teaching and STEM Service-Learning courses are among the new curricula developed.

RESEARCH AND PUBLICATIONS. STEM CENTRAL STATION team and collaborators are conducting research and scholarly work on the following topics and more.

- Professional identity and the Learning Partnerships model
- Learning Partnerships Observation Protocol (LPOP)
- Professional identity among Learning Assistants
- Interdisciplinarity in a summer research community
- Developing an institutional STEM identity
- Institutional transformation in STEM
- Trust in science and individual science usefulness
- Integrating teaching and research
- Service-learning in elementary mathematics
- Developing educational research expertise among STEM faculty

See more at stem.boisestate.edu/about-us/publications

STEM INSTRUMENTS. Developed in collaboration with Metiri Group, Jody Brittan, Ph.D.
- STEM instructional Practices Survey
- STEM Student Engagement Survey

FACULTY ENGAGEMENT: (see graph at right) Other STEM education research initiatives have also grown significantly, and include Idaho and U.S. Department of Education, NASA, Micron Technology Foundation, National Institutes of Health, Idaho National Laboratory, and additional public and private partners.

STEM CENTRAL STATION CREATES EFFICIENCIES AND CATALYZES COLLABORATION AND GOAL ATTAINMENT AMONG A CONSORTIUM OF NSF STEM EDUCATION INITIATIVES.