The STREAMS Experience in Improving Student Success in STEM at Bridgewater State University

Thomas P. Kling¹, Jennifer Mendell², Matthew Salomone³, Joshua Twomey⁴, Stephen Waratuke⁵, Jeffrey Williams¹
Departments of Physics¹, Biology², Mathematics³, Institutional Research⁴ & Chemistry⁵, Bridgewater State University, MA 02325

Abstract
STREAMS, an NSF-STEP grant held by Bridgewater State University, implements best-practice approaches to increasing the number of STEM graduates. STREAMS interventions include a summer bridge program, a mentoring program, curricular changes promoting inquiry-based teaching, Structured Learning Assistance in gateway courses, a Residential Learning Community, and better transfer student advising and articulation. Here, we focus on the assessment strategies that encourage curricular change and evidence of increased student success in science and math at Bridgewater.

Data Promoting Institutional Change – Project Compass
Bridgewater State University’s Project Compass Grant from the Nellie Mae Foundation led to a deeper, institution-wide study of the success rates of all students, but first generation, low-income, and minority students in particular. The initial ideas for STREAMS grew out of sharing Project Compass data, and further analyses used to support the grant also were done as part of the Project Compass work.

STREAMS Initiatives
A best practices approach to STEM student success based on STEM and multi-cultural literature – focus on group work, inquiry, increased student support and advising.

1. Course Development Grants – encouraging group work & inquiry particularly in gateway courses
2. Structured Learning Assistance – all STEM gateway courses, mandatory for all students
3. Summer Bridge Program – residential, undergrad research focus for 16 students
4. Residential Learning Community – for STEM majors, multi-year community
5. Increased Transfer Coordination – articulation, advising, course development at Cape Cod and Massasoit Community Colleges
6. Networking / Mentoring – for new native and transfer students with reflective e-portfolios

Grant activities began Summer 2010. We are in grant year 2 of a 5 year grant.

Structured Learning Assistance
1. Small group, inquiry based work added or integrated into introductory biology, calculus, chemistry, computer science, and physics courses.
2. Based on the idea that an advanced student peer leader can elicit greater student interaction with the material (more honest questions, open discussion).
3. Strong inquiry / discovery aspects to designs – with faculty from each department creating their own models.
4. Fully implemented in Biology 121 in Fall 2010 – with positive results!
6. Fully implemented in calculus and physics, strong chemistry presence in Fall 2011.

Structured Learning Assistance
1. Student D, F, W, and I grades in gateway STEM courses were
2. Diff Maj - Not STEM Total STEM Major Diff Maj - Not STEM Total STEM Major
3. Majors
4. Seniors (all)
5. Soph-Junior
6. Freshman-Sophomore retention is the percentage of students in the initial cohort who continued in a STEM discipline the following fall semester.
7. The historical DFWI rate has been in excess of 30% for many years, but the STREAMS sponsored SLA reduced the DFWI rate to under 15%.

Summer Bridge Program
1. 15 students in Summer 2010, 16 students in Summer 2011
2. Residential, 3-week program
3. Students complete 2 college-level courses
4. Physics 199: Scientists at Work, a writing intensive Core Curriculum course
5. Math 125: Integrated Science and Math, an introduction to pre-calculus and calculus
6. Students work in groups of 4 in a research lab for 30 hours – mentored by a peer (senior undergrad) and faculty member

Overall GPA, STEM Courses GPA, and STEM Credits Earned during the 2010-2011 academic year for 2010 summer bridge participants and declared STEM majors. There were no statistical differences in gender, ethnicity, income-status, first-generation status, Math SAT, high school GPA between the two groups. Only the STEM Credits Earned comparison is statistically significant (p=0.05) at p = 0.016.

Retention data combined for all BSU STEM majors.
Retention data combined for biology majors. The same was discussed with all other STEM majors.

More info: tkling@bridgew.edu
www.bridgew.edu/streams