

Summary Report:

Developing and Implementing a Faculty Learning Community for Improving Learning and Retention in High-Failure-Rate Courses

North Carolina A&T State University

Project Dates: May, 2007 through May, 2008

Project Director: Scott Simkins, Director, Academy for Teaching and Learning

Overview

From May, 2007 through May, 2008 the Academy for Teaching and Learning (ATL) led a year-long faculty learning community (FLC) focusing on improving student learning and retention in high-failure-rate courses. The project focused on a small set of courses in Mathematics and Chemistry with persistently high rates of F-W-I grades (30% or higher) and included five mathematics and three chemistry faculty members, who worked in discipline-based teams throughout the project. Each faculty member was provided a \$4,000 stipend (\$3,500 salary stipend, \$500 travel stipend) to compensate them for their effort, which was in addition to their normal course load.

The goal of the project was to better understand the factors leading to high student failure rates in the selected courses and to reduce the D-F-W rate in these courses through intentional and systematic changes in course design, pedagogical practice, and learning assessment processes based on classroom research, disciplinary best practices, and personal experience. The entire FLC met periodically throughout the summer of 2007 to develop action plans for the fall, 2007 semester, and once or twice a semester during the 2007-2008 academic year to provide project updates. FLC teams were also asked to develop mid-term and final reports on their projects. In addition, FLC members presented their projects at the North Carolina A&T State University ATL Teaching Showcase in March, 2008. A video interview of one of the FLC members [Alex Williamson (Chemistry)] discussing the impact of teaching innovations on student learning resulting from the FLC project is available at: <http://ncsotl.ning.com/video/mar-31-2008-atl-teaching-day>. The mathematics team also led a presentation on their teaching/learning innovations at the 2008 Lilly Conference on College and University Teaching in February, 2008 (Greensboro, NC).

Outcomes: Mathematics Team

This team focused on two courses, MATH 101 (College Algebra and Trigonometry) and MATH 131 (Calculus I). Both experience high D-F-W-I rates and are critical gateway courses, especially for students considering science, technology, engineering, and math (STEM)-related majors. A number of innovations were implemented in this course during the fall, 2007 and spring, 2008 semesters, including the following:

- Beginning of course surveys assessing students' math backgrounds (to better understand students' starting knowledge)
- Synchronization of course syllabi and content across sections (to ensure consistent coverage of information)
- Increased frequency of assessment (to break up content into smaller chunks and provide timely performance feedback to students)
- Increased use of collaborative work in class
- Supplemental online homework practice via CourseCompass

There is some evidence that these innovations are helping students learn but there has been no marked change in the percentage of students passing MATH 101 or MATH 131 with a grade of C or better. One of the most successful innovations has been the systematic implementation of collaborative work in class through weekly “lab groups”. The instructors report that students participating in these in-class groups have begun to also study together out of class. In addition, more frequent in-class assessment has increased student motivation in the courses by breaking up the content into smaller chunks and providing more frequent opportunities for feedback on student progress to both instructors and students.

In spring, 2008 the Center for Academic Excellence organized Supplemental Instruction (SI) sessions for the MATH 101 and MATH 131 courses. These sessions were voluntary for students. As a result, they suffered from poor student attendance and had little impact on student performance. The instructors in the mathematics FLC believe that a department-based Math Assistance Lab would lead to better results and closer connections with students.

Outcomes: Chemistry Team

This team focused on the CHEM 100 (Physical Science) and CHEM 106/107 (General Chemistry) courses. Like MATH 101 and MATH 131, these chemistry courses also experience high D-F-W-I rates and are critical gateway courses. A variety of innovations were implemented in these courses during the fall, 2007 and spring, 2008 semesters, and varied by faculty member. For example:

One faculty member in the group (Alex Williamson) implemented a pedagogical technique, problem-based team learning (PBTL) in his CHEM 106 course to encourage greater student engagement in the learning process and daily practice with course ideas and concepts. PBTL involves a pre-class reading assignment, a related quiz at the beginning of class, taken first individually and then as a group, a brief mini-lecture, and a follow-up in-class set of related problems to be worked on in groups. Students receive immediate feedback on their quizzes and next-class feedback on the in-class problems. This helps students better manage their workload, keep up with course material, work collaboratively to build important critical thinking skills, and maintain active engagement in the learning process. As the video presentation linked above illustrates, use of PBTL has helped to reduce F-W rates in this course from an average of 45% to around 20-25%.

Another faculty member in the group (Etta Gravely) used an “inverted classroom” teaching strategy in her CHEM 100 course to promote hands-on learning activities and collaborative learning in the classroom. The “inverted classroom” refers to the process of asking students to gain an understanding of course material prior to class by reading their textbooks or other resources (things typically covered in class lectures), freeing up class time for more hands-on, collaborative, applied activities (things which often are done outside of class) with immediate feedback from the instructor. This instructor did not present formal evidence of improvements in student learning outcomes but reports anecdotal improvements in student engagement and learning.

The final member of this group (Jothi Kumar) made a number of changes in her CHEM 106 (fall, 2007) and CHEM 107 sections (spring, 2008), including:

- Random pop-quizzes and student solutions of chemistry problems in class (to improve class attendance and motivation).
- Group-based pre- and post-test on each chapter (to encourage peer learning and regular textbook reading)

- Use of top students in class as tutors (for Honors credit); tutorials were available each day of the week during morning and afternoon hours (to provide additional supplemental practice and instruction)
- Practice exams prior to major hour exams – implemented in spring, 2008 but not in fall, 2007 (providing additional practice for students)

Exam scores in spring, 2008 indicated that the teaching innovations implemented resulted in greater student learning. The most effective innovations, according to the instructor, were peer tutoring and practice exams. As a result of the pre-tests students showed increased preparation (relative to prior semesters) in reading the textbook prior to class coverage of topics. Use of practice tests helped students better understand chemistry concepts and practice problem-solving methods prior to major course exams. The instructor planned to continue use of these teaching practices in her courses.