Learning Communities across the Foundation Coalition

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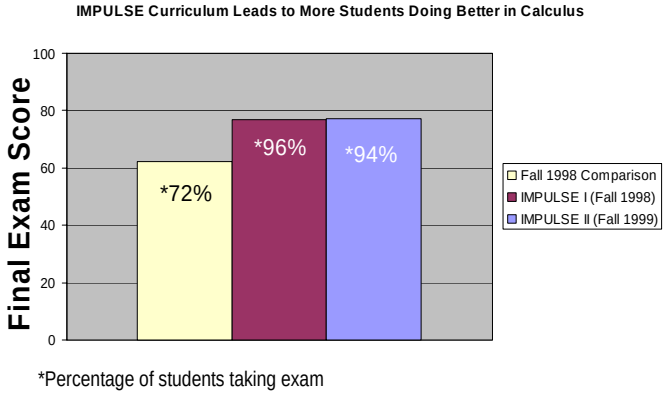
Introduction

Gabelnick et al define a learning community as "any one of a variety of curricular structures that link together several existing courses—or actually restructure the curricular material entirely—so that students have opportunities for deeper understanding and integration of the material they are learning and more interaction with one another and their teachers as fellow participants in the learning enterprise" [1]. As illustrated by the National Learning Communities Project many different types of learning communities have been created. In the Foundation Coalition (FC) partner institutions discovered that their efforts to build integrated curricula have created learning communities around clustered courses. The four short narratives below highlight innovative learning communities in engineering at four FC institutions and their effects on student learning and progress. They illustrate the potential available through learning communities: improved learning outcomes—linking across subjects, better retention, and faster progress toward completion. These examples fit into a larger national effort to create more student learning communities.

When students who were participating in learning communities across the FC were interviewed, they cited several benefits. First, they learned to work in teams. While "all of them spoke of the difficulties involved, they also talked at length about how they've learned to deal with those problems" [2]. They saw how working in teams helped their learning and they recognized the value of team experiences for their careers [2]. Second, they begin to discover their learning styles and "how they learn best" [2]. "All recognize that memorization alone is not a useful strategy and that they learned through application of concepts" [2]. Third, students in FC learning communities sought help in a clear order: first, peers, either within the team or cohort, or from among their other friends; second, TAs or tutors; "if they still have questions, they go to their professors" [2]. "Another dimension of student learning is related to surviving in college. Most of the students were shocked at how much more challenging college is than high school, and they all talked about basic things they've had to learn in order to make it. Highest on their list is developing self-discipline and learning time management skills. Finally, when discussing how they're learning to master the material, the students talked at some length about learning how to think like engineers. What this means to them is understanding how and why a particular concept works, and developing the skills of critical analysis that will enable them to understand the problem and explore possible solutions from multiple angles" [2].

IMPULSE Curriculum at University of Massachusetts Dartmouth Leads to Better Performance for More Students in Calculus

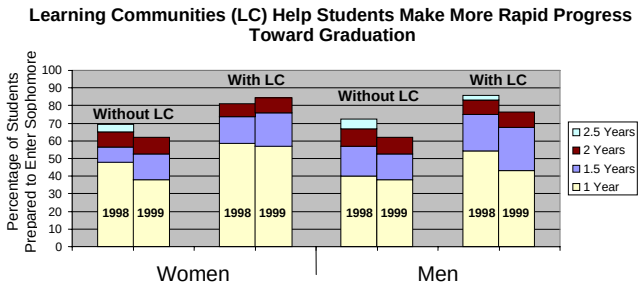
The University of Massachusetts Dartmouth (UMD) began a successful, integrated, first-year engineering curriculum (Integrated Mathematics, Physics, Undergraduate Laboratory Science, and Engineering—IMPULSE) in September 1998. This new program dramatically changed the freshman year. In the graph below, the group of bars on shows scores on the eighteen common questions of the first-semester calculus final. It shows that students in the prototype group (IMPULSE I) and students in the institutionalized implementation (IMPULSE II) scored significantly higher than students in the pre-IMPULSE curriculum (fall 1998 Comparison). The numbers demonstrate that almost all of the IMPULSE students (96%, 94%) took the final exam, compared with 72% of the students in the comparison group. [3–5]



*Percentage of students taking exam

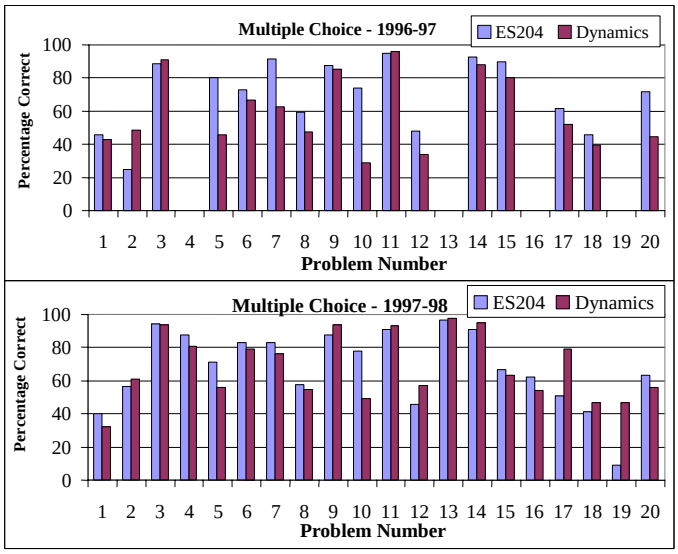
First-year Engineering Learning Communities Improve Rate of Progress toward Graduation at Texas A&M University

The graph below shows the percentage of the students prepared to enter sophomore engineering courses after completing a set of required first-year courses. At every point in time after the students entered Texas A&M University (TAMU), the percentage of students who participated in learning communities (With LC) is greater than the percentage of students who did not participate in learning communities (Without LC). At TAMU, the restructured, college-wide first-year program was implemented in 1998. Learning communities in which students take two or more of their required first-year science, engineering, and mathematics courses together (in groups of one hundred) are a feature that built on the experiences of the first-year FC prototype curricula. Learning communities value diversity, are accessible to all interested individuals, and bring real-world situations into the engineering classroom. Based on its pilot curricula and the experiences since institutionalization, TAMU administrators believe that learning communities offer a superior educational experience for engineering students. [6–8]



Students at Rose-Hulman Institute of Technology in an Interdisciplinary Engineering Science Pilot Curriculum Show Better Scores on Dynamics Final Exam

Rose-Hulman Institute of Technology has offered the Sophomore Engineering Curriculum (SEC) since 1995–96. It is currently required for all students majoring in mechanical, electrical, or computer engineering. SEC is organized around a systems, accounting, and modeling approach to engineering science that provides a common framework for presenting, interpreting, and applying the basic physical principles. The graphs below show scores on the common multiple-choice portion of the final examination given in both a traditional dynamics course and in ES204 Mechanical Systems, one of the five new engineering science courses in the SEC. The average score of the students in ES204 was approximately the same or better, on most of the multiple-choice questions. References also show impressive differences in common workout problems [9–11].

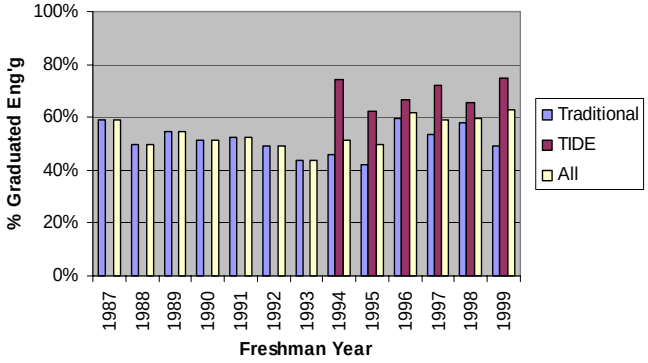


Innovative First-year Engineering Programs at the University of Alabama Improve Graduation Rates

Faculty from the departments of chemistry, mathematics, mechanical engineering, and physics at the University of Alabama (UA) developed the Teaming, Integration, Design, and Engineering (TIDE) first-year curriculum during the 1993–94 academic year and offered it to volunteer students in 1994–95. The primary goal of the faculty developing the curriculum was to improve student learning. Toward this end,

- Course topics were substantially rearranged to achieve better integration between chemistry, mathematics, and physics,
- Students worked in four-person teams in the new courses, and
- All courses (except labs) were taught in new computer-equipped classrooms.

The graph below shows the percentage of engineering students who graduated from its traditional and TIDE first-year programs, as well as the graduation rate for all engineering students. The graph indicates the improvement in graduation rates for students who participated in the first-year curriculum, as well as increases in the college-wide graduation rate since the inception of the first-year program [12–14].



References for Further Information

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Whether you're just getting started or looking for additional ideas, the Foundation Coalition would like to help you incorporate learning communities into your engineering curricula through workshops, Web sites, lesson plans, and reading materials. For suggestions on where to start, see our Web site at <http://www.foundationcoalition.org> or contact Jeffrey Froyd at froyd@ee.tamu.edu or 979-845-7574.