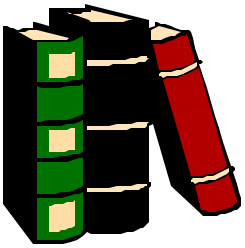

Interdisciplinary Culture

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Interdisciplinary Culture Group Overview

The state of our academic environment, in particular the Interdisciplinary Culture is of great concern. Progress in understanding, developing, broadening our students is restricted by the barriers between departments and lack of communication between faculty. The workshop group on Interdisciplinary Culture took on the issues of breaking down barriers, establishing partnerships, and improving core mathematics programs to serve partner disciplines in the development of core students.

The implementation of interdisciplinary cooperation into curriculums is seen as a goal of growing importance, yet one that faces numerous roadblocks. Tom Berger's suggestion to view curriculum through outcome goals places a strong value on societal demands. Several of these demands underscore the need and value of interdisciplinary cooperation. For example, preparing students for a diversity of careers in a rapidly changing business climate involves making explicit connections between disciplines. Gary Krahn views the interdisciplinary cooperation as being important in developing reasoning and critical thinking skills. He writes "double movement of induction-deduction, expanding-contracting, generalization-specialization, interdisciplinary-disciplinary: reflects the processes we want students to assimilate. Jim Dally views modeling and problem solving across disciplinary lines as an effective way to develop critical thinking skills. He stresses the importance of incorporating physics and engineering applications in calculus courses.

Brian Winkel notes that "we are moving (ever slowly) toward a culture that accepts interdisciplinary approaches to teaching what has been traditionally disciplinary material," however there is an array of obstacles in the way. Some samples are: system inertia, fiefs and turfs, publish or perish syndromes focused on narrow results, entrenched attitudes, and lack of a reward system. John Grubbs places time at the forefront of this list. Developing interdisciplinary cooperation involves a great deal of time, time that many people do not have in their overloaded schedules. Thus developing interdisciplinary cooperation requires rethinking our priorities and interests in order to "make time" by reducing or eliminating some present activities.

Mathematics is not well integrated into college or university curriculums today. There are local exceptions and there is increasing amounts of discussion on the future (interdisciplinary) role of mathematics in the curriculum. Brian Winkel suggests that dialogue is the key to successfully integrating mathematics across disciplines. Jim Dally argues that "small groups of faculty need to join together to offer interdisciplinary courses with markedly different content." Reforming mathematics instruction to emphasize the process of reasoning is the basis on which Gary Krahn and Tom Berger would build interdisciplinary cooperation. Bob Fuller addresses developing interdisciplinary cooperation by posing the question: "What metaphor should we use to most adequately convey the goals and intentions of the mathematics across the curriculum movement?" How faculty, particularly in partner disciplines, describe mathematics has a significant influence on how students view mathematics. Consider, for example, what messages these metaphors convey: "The rest is just mathematics…",

“Mathematics is a tool to…”, “Mathematics is a language for…” convey to students (and faculty)?

The future role of the traditional approach to calculus is in question because of its narrow focus. Brian Winkel suggests replacing calculus with a modeling course in which rates of change and accumulation are the themes. Gary Krahn agrees with the modeling suggestion and argues against teaching the traditional calculus course because of its emphasis on topics over process. Tom Berger expresses similar views saying “Understanding how the calculus tells us about the economic, social, living, and physical world around us broadens students’ understanding of mathematics itself and provides a basis for making mathematics useful.” James Dally suggests a resequencing of topics in order to better align the calculus, chemistry, and physics courses. He strongly advocates the mathematics program start with data analysis and then arrives at relations that represent useful functions. He writes “When dealing with real data, engineers find the content in a statistics course to be more valuable than much of the content in the typical coverage of calculus.”