

To: Members of the UTC Faculty Senate, the Mathematics Department, and interested faculty
From: Betsy Darken, Mathematics Professor
Date: January 17, 2011
Cc: An assortment of administrators and staff

This memo is a minority report on a Mathematics curriculum proposal (Math 12-035) that I and others believe will have a significant negative effect on the university. It is being presented before the Faculty Senate this Thursday, January 19 (3:10 pm, Signal Mountain Room UC).

Two Issues: Elimination of Developmental Math and SACS Assessment Requirements

Two developments are having a major impact on UTC and other Tennessee public universities. First, the Tennessee legislature is eliminating developmental courses at its universities as of this coming fall. Second, our accrediting agency (SACS) now requires much greater assessment of student learning in various areas, including the use of mathematics to solve problems and make decisions. We are now being held accountable for what our students know about quantitative matters, but we are losing one of our tools for improving our students' quantitative knowledge. We believe that there are better courses of action to be taken than that contained in Math 12-035, at least some of which can be implemented by Fall.

Actions Taken by Other Tennessee Universities and Within Other UTC Disciplines

Most other Tennessee public universities are addressing these issues from two directions. First, they are re-examining the question of what quantitative skills their graduates should possess, not in terms of courses but of competencies to be achieved. This is part of a national trend to include quantitative reasoning as an integral part of a university's curriculum, typically with heavy emphasis placed on applying mathematics to real-world situations. Standards on quantitative reasoning have been developed at institutions ranging from Harvard University to regional and metropolitan universities. For Tennessee public universities, the elimination of developmental courses that were addressing, at least in part, the basic quantitative skills that we expect to build *from* can certainly affect what we can build *to*. This situation requires very careful examination.

Second, almost all public Tennessee universities are or will soon be providing substantial and well-structured learning supports for weaker students, within the constraints imposed by the legislature. (UTK is the exception.) Actions taken or planned range from having community colleges teach developmental courses on university campuses to providing "enhanced sections" of entry-level courses that include more contact hours, built-in tutoring, and regular deadlines. Our own UTC English Department is taking the latter approach. The Statistics Group of the UTC General Education Committee has also recommended that enhanced sections of statistics courses be created for weaker students.

The UTC Mathematics Proposal

The Mathematics proposal about to be presented before the Faculty Senate removes all prerequisites from its entry-level courses for non-math-related majors, including Math 1010 (Math for the Modern World), Math 2150 (math for teachers), and Math 2100 (basic statistics). The Department also "strongly advises" weaker students to take an online math review, with free tutorial support available. Be aware that a number of department heads who originally checked "Approve" have changed to "Disapprove" since signatures were first gathered, once they learned more about other options available within the constraints imposed by the state.

This Math proposal is problematic for several reasons. First, there is compelling research and experiential evidence that the methods being implemented by our peer Tennessee universities for providing learning supports for weaker students are much more likely to be effective than the optional reviews suggested in this proposal. Most students are simply not going to complete optional work such as online reviews. The failure to provide adequate learning supports for weaker math students is not a minor matter at UTC, where in Fall 2011, 47% of freshmen placed into developmental math. In Fall 2012, some of these former developmental students will take a new USTU 1999 review course for majors requiring calculus. However, many if not most of these students can be expected to enroll directly into Math 1010, 2100, or 2150 without completing any reviews. Some may do well enough, since these courses are not algebra-intensive. However, many will be

quite unprepared, especially those who would formerly have enrolled in Math 1005, the developmental arithmetic review and basic algebra course. The latter comprise around 25% of our entering freshmen. These students need extra learning supports beyond what the Mathematics Department is proposing. Here are some options that fall within the constraints placed by the state:

- (1) Enhanced sections of Math 1010, 2150, and 2100 could be offered. These seem to be working relatively well at MTSU and the University of Memphis, as well as within our own English Department. The Statistics Group of the General Education Committee has also proposed this course of action. At a minimum, the Mathematics Department could run a pilot program involving enhanced sections for weaker students, just as the English Department did in 2010-2011.
- (2) University Studies 1999 courses reviewing relevant mathematics for these three courses could be developed. Such a course is already in the works for weaker UTC students needing college algebra and precalculus.
- (3) Arrangements could be made for Chattanooga State to teach developmental courses on the UTC campus. Such arrangements have been made at Tennessee Tech.

The rationale provided in the Mathematics proposal for eliminating prerequisites and advising weaker students to take an optional review is that "[The Mathematics Department] can no longer offer developmental courses." This does not explain why UTC cannot pursue one or more of the above options. Instead this proposed course of action (or lack thereof) is similar to that taken by UT-Knoxville, not MTSU or other universities in the state to which UTC is much more comparable. The fact of the matter is that most institutions of higher education in this country, ranging from Berkeley to Tennessee State, have weaker students (with "weaker" defined in varying ways) for whom the institution works to provide effective learning supports. UTC needs to do the same.

The Math proposal is problematic for a second major reason. It does not address what this university should expect of its graduates with regard to mathematical knowledge and skills or, more generally, quantitative reasoning. With the loss of developmental mathematics, along with the recent expansion of SACS assessment requirements, this issue needs to be re-examined. Not only the Mathematics Department but all the faculty need to decide what we want our graduates to know and be able to do quantitatively. *All* graduates will encounter numerous quantitative situations as professionals, citizens, taxpayers, medical patients, consumers, check-out clerks, etc. Studies have shown that even many college-educated adults Americans have major gaps in their mathematical understandings and have major problems applying what they do know to solving problems and making informed decisions.¹⁴ As so many universities across the country are doing, including other Tennessee universities, UTC needs to seriously address this problem. Unfortunately, the proposal presented by the Mathematics Department could easily become a step backwards. Many key mathematical skills and concepts that were included in the developmental courses are not included and/or reinforced in Math 1010 or 2150/2160. There are also many objectives for developing quantitative reasoning that may or may not be included in these math courses. In addition, with the removal of prerequisites for Math 1010 and 2150, it is quite possible that large numbers of weaker students will enroll directly into these courses and drive down instructors' expectations. This is the wrong direction to be going!

What to Do?

The proposal before the Senate must be defeated, or modified in the ways suggested above, so that work can begin anew on improving the quantitative reasoning of *all* UTC students. UTC is at a crossroads, and the signposts are written in numbers. We can go down a familiar road, in which large numbers of students fail or drop out of math courses. We can go another easy route, where many students scrape through a single math course but do not have the quantitative literacy needed for their professions, responsible citizenship, or informed everyday decision-making. Or we can go a third way, admittedly a more difficult way, in which we work out what we believe is important for all of our students to know about numbers and quantities and variables, and teach them how to use this knowledge to deal effectively with our quantitative world. In the process we can also figure out ways to help our weaker students.

Thank you for your time and consideration. If you wish to obtain more complete information about actions taken by other universities, national developments regarding quantitative reasoning, and research on effective online courses, please email betsy-darken@utc.edu.

¹⁴ <http://www.utc.edu/Administration/Records/documents/12-035UGapproved.pdf>

¹⁵ http://www.air.org/files/The20Literacy20of20Americas20College20Students_final20report.pdf