

TO: UGEC

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SUBJECT: General Education Science Requirement

This document is issued in reference to recent discussions within the UGEC regarding the establishment of criteria for the courses which should count towards the ACU general education science requirement. As representatives of the science faculty on this committee we take this charge very seriously. As a result, we decided a reasonable first step would be to review best practices in the area as well as among our competitors.

Our general findings are as follows:

- In terms of hours, our general education science requirement is on the low end of institutions observed.
- Approximately half of the required general education science hours observed at other institutions are satisfied through courses with laboratory experiences.
- According to Baylor University's transfer requirements for a general education science, *"Elementary science courses without laboratory will not be accepted for transfer."* Similarly worded transfer requirements exist at several other institutions.

WHAT ARE OUR COMPETITORS DOING?

For the purposes of this study we define as our geographical competitors: Baylor, TCU, Texas A&M, Texas Tech, and Texas. In addition to these universities we also looked at our heritage competitors: Oklahoma Christian, Harding, and Lipscomb. Finally, we examined a few schools in our Large Master's Institution Comparison Group: Belmont University, Bethel University, and Mercer University. The results are organized in the table below.

Institution	Req. Hrs	Req. Type	BA	BS
Abilene Christian	6	(S) ¹	--	--
Baylor	4/12/28	(L) ²	12(L)	8(L)+20(O) ³
Belmont	4/7-8/10-12	(L)	4(L)+3-4(O)	4(L)+6-8(O)
Bethel	4+3 ⁴	(L)+(O)	--	--
Harding	6	(D) ⁵	--	--
Lipscomb	3+3	(L)+(D)	--	--

¹ (S) represents a general science class requirement selected from a menu of courses. This is not an explicit requirement of department designation or lab experience.

² (L) represents a four hour lab course requirement.

³ (O) represents a selection of hours that may be fulfilled with lab sciences or general science courses.

⁴ Bethel University requires a 4 hour laboratory science and an additional 3 hour science, technology, and society credit which addresses the linkage of science and technology with other aspects of contemporary society and the natural environment.

⁵ (D) represents a general science requirement selected from courses with BIOL, CHEM or PHYS designations only.

Mercer	4+3	(L)+SCIE100	--	--
Oklahoma Christian	6	Varies ⁶	--	--
Texas	6+3	(D)+(S)	--	--
Texas A&M	8	(L)+(S)	--	--
Texas Christian	6	(S)	--	--
Texas Tech	8+3 ⁷	(L)+(S)	--	--

HOW DO OTHERS DEFINE A COURSE IN THE NATURAL SCIENCES?

For reference purposes we have included, where possible, descriptions of the natural sciences and learning outcomes of the sciences, from our competing institutions.

- “Scientific advances touch our lives daily. Today’s science culture is interdisciplinary, collaborative and evidence-based. These two courses (SCI 1003, SCI 1013) provide students (non-science majors) with a general education science option that integrates several disciplines (i.e., biology, chemistry, physics, nutrition, and environmental science) through an **experiential approach to learning via field and laboratory investigations.**” -Lipscomb
- Lab Science – Category of Courses: “Introduces the process and concepts of modern science by focusing on one specific discipline. Provides a broad perspective on scientifically acquired knowledge, inductive methods, and experimental procedures. **Laboratory forms a central experiential component of each course, and the analytical procedures used there build and reinforce the student’s mathematical competence.** Provides a basis for considering implications for Christian stewardship of the natural world.” – Bethel Science Pillar (There are other courses within many majors requirements as well as other core requirements at Bethel that list their general education laboratory requirement as a prerequisite.)
- “In the laboratory science requirement, student will: (Pepperdine Lab Science Requirement)
 - Understand that the scientific method is a system of inquiry that requires curiosity, skepticism, tolerance for ambiguity, openness to new ideas, and ultimately, the communication and sharing of knowledge.
 - Discover that scientific understanding is tentative, limited, and subject to revision.
 - Participate in a laboratory experience that involves data collection and careful observation.
 - Employ those mathematical and statistical concepts that are required to explain scientific phenomena.
 - Investigate the distinctive roles that faith and science play in answering questions about how the world works.
- “Knowledge and appreciation of science as a significant human activity, rather than merely a listing of results or collection of data, is acquired only by engaging in the activities of science. [The natural sciences are defined as those courses which] deal with fundamental principles and in which critical evaluation and analysis of data and processes are required. **Non-technical courses are specifically excluded:** -- Texas A&M University

⁶ Students have two options: Option 1 is a 6 hr sequence in BIOL or GNSC (general science), or Option 2 is 6 hours with a lab requirement.

⁷ Students take 8 hours of science with lab requirements, and a 3 hour technology and applied science requirement.

- “The objective of the study of the natural sciences component of a core curriculum is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the bases for building and testing these theories. The natural sciences investigate the phenomena of the physical world.” -- Texas Tech Natural Sciences
- “The objective of the study of technology and applied science component of a core curriculum is to enable the student to understand how profoundly scientific and technological developments affect society and the environment. Human nutrition, the world’s environment, and energy problems are all viewed as critical to one’s understanding of and interactions with today’s world.” – Texas Tech Technology and Applied Science

The NSF (National Science Foundation), an independent federal agency charged with promotion of the sciences, and provider of approximately 20% of all federally funded university-level research defines the sciences in a recent report on Science and Engineering (S&E) indicators as “a set of methods designed to describe and interpret observed and inferred phenomena, past or present, and aimed at building a testable body of knowledge open to rejection or confirmation.” This in direct opposition to a pseudoscience which offers “claims presented so that they appear scientific even though they lack supporting evidence and plausibility.”⁸

WHY IS THIS IMPORTANT?

As the outlined in the 21st century vision, ACU endeavors to “strengthen our students learning experiences”, by “enhance[ing] or build[ing] facilities related to the sciences, technology ...”, “make academic programs more relevant in addressing 21st century challenges and the demands of graduate programs and employers”, and “create highly attractive academic programs that set the university apart”.

Simply put, the time is now for the sciences. As we make plans for the future of the sciences on this campus, we must be very explicit in our intentions, both in the short term and long term, for the continued growth and strengthening of our general education science requirement. We need to think long and hard about questions of rigor and best practices, and lay a groundwork to inform future growth considerations of available facility and faculty requirements going forward.

Thank you for your continued support of the sciences and your willingness to wrestle with the difficult decisions the university faces.

⁸ NSF quoted Michael Shermer’s 1997 definition of science and pseudoscience in Shermer, M. (1997) *Why People Believe Weird Things: Pseudoscience, Superstition, and Other Confusions of Our Time*.