

Proposal and rationale for CLAS BA Laboratory or Field Experience Requirement

Proposed wording:

CLAS BA students will complete a laboratory or field experience in the natural, social, or behavioral sciences. Students must meet this requirement by taking either i) a combined lecture-laboratory course, ii) a laboratory course or field experience of at least one credit hour, or iii) an approved independent study of at least one credit hour. An appropriate laboratory or field experience must fulfill the requirements listed below.

A laboratory or field experience should involve all of the following:

- i) analysis and interpretation of data obtained by observation and/or measurement using appropriate scientific methods;
- ii) the use of established scientific theories and models to develop and critically evaluate conclusions drawn from data analysis;
- iii) understanding and identifying sources of error and uncertainty in experimental results.

Such experiences could be hypothesis driven, aim to fill a gap in knowledge, or serve to reinforce a scientific phenomenon or law in the subject area.

Intent of the requirement

Currently, the College requires a laboratory science as part of the BA. CUSA has suggested expanding the definition of “laboratory” to allow a larger net of courses to be included while still encouraging the development of observational and/or experimental skills in the context of developing literacy in scientific methodologies. An understanding of experimentation and observation as the basis of scientific knowledge is a critical component of basic scientific literacy. Successful laboratory courses or field experiences enable students to learn and implement experimental procedures to collect data and analyze these data to formulate scientific knowledge. Moreover, these experiences introduce science as an active process and integrate thinking,

The goal of coursework in the sciences is not simply to learn specific content, but to develop empirical skills and understand the foundation on which scientific knowledge rests. While lecture courses can successfully convey scientific information to students, laboratory and field experiences allow students to engage experimental and observational methods, presenting science as an active process. Consequently, these experiences play a unique role in advancing scientific literacy. The aim of the laboratory or field experience requirement is not solely to have students acquire specific skills in experimentation, observation, and data analysis but also to place the acquisition of scientific knowledge in a new, active context and develop a conceptual understanding of the experimental process and its central role in the sciences.

As noted in the context of other proposed requirements, the Bachelor of Arts degree is unique among all degrees offered at the University of Kansas in its commitment to both breadth and depth of knowledge. It is intended to give graduates the greatest flexibility and choice in future study or career. With this in mind, students should be familiar with a range of methods and approaches to knowledge. Consequently, while the new KU Core Curriculum does not have a specific laboratory requirement, the addition of this requirement for the BA degree is in keeping with the spirit of this degree.

Background

The Curriculum subcommittee of CUSA examined several peer institutions. Specifically, twelve peer universities (defined as public, research-intensive universities) were examined. The majority (nine¹ out of twelve) of those incorporated a laboratory requirement into their science requirements. Our speculation is that the presence of a lab requirement for a BA degree at other universities is likely related to the specific admissions requirements of those institutions. The specific admissions requirements at KU, the mediocre performance of 12th grade students with regards to science proficiency,² and the importance of laboratory and field experiences in science education together serve as a compelling rationale for the proposed laboratory or field experience requirement as part of the BA degree at KU.

¹ *The University of Indiana is included as having a lab requirement, but this is only for students taking one 5 credit-hour course instead of two. The current requirement for the BA degree at KU is only one natural science course, thus it is difficult to directly compare the requirements in this case.*

² *In a 2009 study by the National Science Board (National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01); <http://www.nsf.gov/statistics/seind12/start.htm>), 21% of 12th grade students performed at or above the proficient level in science. Unfortunately, to the best of our knowledge, specific information for high school students in Kansas was unavailable at the time of the National Science Board report.*

Goals for the Laboratory or Field Experience Requirement

Upon successful completion of this requirement, students should be able to do the following:

- 1. Demonstrate an understanding of the intent, importance, and context of a laboratory or field experience**
 - a. Convey the intent and design of laboratory or field studies
 - b. Articulate, using relevant theories and methods, the importance of the studies
 - c. Use established scientific theories to frame a hypothesis or predict possible outcomes of the experiments or observational studies

2. **Successfully implement the experimental protocols and analyze the resulting data using appropriate methods**
 - a. Collect data using standard techniques, being cognizant to minimize error
 - b. Understand and minimize exposure to any hazards inherent in the experiments
 - c. Analyze data sets using appropriate numerical models and/or statistical methods

3. **Develop and articulate valid conclusions based on the outcomes of the studies**
 - a. Organize experimental results in a fashion that readily demonstrates trends in the data
 - b. Defend one interpretation of the results against competing explanations
 - c. Discuss or present the conclusions within the broad context of the scientific field; for example, if the experiments were “hypothesis-driven”, explain the results in relationship to the hypothesis
 - d. Propose additional experiments or observation studies aimed at testing the proposed model or a new hypothesis