

UNIVERSITY OF CALIFORNIA, ACADEMIC SENATE

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May 28, 2015

**PROFESSOR STEVEN FILLING, CHAIR
INTERSEGMENTAL COMMITTEE OF ACADEMIC SENATES**

Re: ICAS Statement of Competencies in the Natural Sciences Expected of Entering Freshmen

Dear Steven,

I asked the University Committee on Educational Policy (UCEP) and the Board of Admissions and Relations with Schools (BOARS) to review the draft ICAS "Statement of Competencies in the Natural Sciences Expected of Entering Freshmen" on behalf of the UC Senate.

UCEP and BOARS have made a few suggestions for improving the content and clarity of the Statement. Their comments are appended to this letter. In particular, BOARS is concerned that the Statement does not align with all of the new content areas in the Next Generation Science Standards (NGSS), and could be stronger if it more clearly mapped a way to potential changes in area "d" needed to align with NGSS concepts and science education practices. Academic Council encourages the authors to review the comments and incorporate them into the next draft.

On behalf of the Academic Council, I also want to express my appreciation to all those who contributed to the drafting of this statement, which is sure to become an important and valuable resource for educators across the state.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in cursive script that reads "Mary C. Gilly".

Mary Gilly, Chair
Academic Council

Encl.

Cc: Academic Council
BOARS Chair Aldredge
UCEP Chair Larrabee
Senate Executive Director Baxter



UNIVERSITY COMMITTEE ON EDUCATIONAL POLICY (UCEP)
Tracy Larrabee, Chair
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April 9, 2015

Mary Gilly, CHAIR
ACADEMIC SENATE

RE: ICAS REVISED NATURAL SCIENCES COMPETENCY STATEMENT

Dear Mary,

While UCEP is comfortable with much of the language and approach in the document, we have some concerns that:

- 1) Aspirational sentiments have made their way into a document that should be science based. For instance, learning outcome goals in the section addressing sustainability and global climate change present lofty goals that are beyond the capacity or appropriate expectations for the age group.
- 2) The language of the aspirational goals in these sections could be interpreted by as encompassing specific political goals or specific policy goals in addition to the science and learning goals that are expressly the mission of the statement.
- 3) We are concerned about goals that require students to study simulation results in the literature and then construct possible societal outcomes from them. Students may be better served by being encouraged and educated on how to analyze and solve simpler problems, ones that are appropriate to their level of sophistication.

Sincerely,

A handwritten signature in black ink that reads 'Tracy Larrabee'.

Tracy Larrabee, Chair
UCEP



BOARD OF ADMISSIONS AND RELATIONS WITH SCHOOLS (BOARS)

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May 8, 2015

MARY GILLY, CHAIR
ACADEMIC COUNCIL

Re: ICAS Statement of Competencies in the Natural Sciences

Dear Mary,

The Intersegmental Committee of Academic Senates (ICAS) asked faculty from each higher education segment to review a draft “Statement of Competencies in the Natural Sciences Expected of Entering Freshmen.” You asked BOARS to review the statement on behalf of the UC Senate. The document updates a 1988 ICAS statement to reflect the State’s adoption of the Next Generation Science Standards (NGSS).

BOARS has several concerns about the statement and believes that it falls short of the progressive vision the three segments of California higher education should support for K-12 science education outlined in the NGSS.

BOARS asked Arnold Bloom and Terry Nathan, two Davis professors who are UC’s representatives to the ICAS work group that wrote the Statement, to address questions about the intent of the statement to help inform BOARS’ discussion. The professors noted that the Statement authors want to emphasize that California high school students should ideally take four years of science; however, they avoided suggesting a mandate for four years because they recognize that many schools lack the resources to meet it, and that high schools will use a variety of approaches to incorporate the expectations of the NGSS into their curricula. They also note that it is unclear whether Earth and Space Sciences (ESS) can satisfy the area “d” subject requirement (laboratory science) as it stands and suggested that UC should wait to consider changes to area “d” until it becomes clearer how high schools will modify their science curriculum to implement the NGSS.

Area “d” currently requires two, and recommends three, years of courses in Biology, Chemistry, and Physics; although the majority of students admitted to UC already take four science courses.

Last year, a faculty work group revised the [area “d” course criteria](#) to *reference* the NGSS standards, and some are now urging BOARS to revise the area “d” subject requirement itself to *align with* the NGSS. A central question is whether area “d” will continue to identify the three core laboratory science disciplines as Biology, Chemistry, and Physics, or change to reflect the four core NGSS categories—Physical Sciences, Life Sciences, Earth and Space Sciences, and Engineering, Technology and Applications of Science—and broaden the scope beyond only “laboratory

sciences”. The ICAS statement reflects NGSS by introducing Earth and Space Sciences alongside Chemistry, Life Sciences, and Physics as disciplines in which UC entering students should have competence (see p. 6 of ICAS statement). This has potential implications for the definition of area “d.” The current area “d” focus on Biology, Chemistry, and Physics is justified in the following way:

The requirement emphasizes biology/life sciences, chemistry and physics because these subjects are preparatory to university-level study in all science-based disciplines. However, coverage of these foundational subjects in suitable breadth and depth can potentially be found in a wide range of science courses, including those with an interdisciplinary, engineering or a career technical education focus.ⁱ

A case could be made that Earth and Space Sciences fit under the current area “d” criteria to the extent that UCOP’s language invokes “a wide range of science courses” that include biology, chemistry, and/or physics content. However, there may be good reasons to broaden area “d” now that there are national and state science standards that include Earth and Space Sciences. There is concern that California high schools will now be developing science curricula that cover the four new content areas identified under the NGSS, while the current language of area “d” is based on an older curricular framework. It would be helpful for ICAS to explicitly consider in their statement whether there are any fundamental aspects of method, reasoning, and knowledge integral to Earth and Space Sciences in which our students should be versed beyond Biology, Chemistry, and Physics that would warrant broadening the area “d” subject requirement. For example, the discussion of Earth and Space Sciences begs the question in our view as to whether language referring to “field sciences” should be included in area “d” alongside “laboratory” science.

BOARS is also concerned that the ICAS Statement does not align with all of the new NGSS content areas. As the Statement notes on page 3, NGSS include Engineering, Technology, and Applications (ETA) of Science. However, ICAS does not give separate consideration to ETA.

As a result of the lack of explicit consideration of the implications of its statement for area “d,” it is unclear that the new ICAS statement allows UC continued flexibility in defining area “d” and may inadvertently steer UC in the direction of keeping the requirement as is. The Statement could be stronger if it more clearly mapped a way to potential changes in area “d”. The “a-g” requirements have a significant influence on what courses California schools choose to design and teach, so it is best for UC to be proactive and as supportive as possible, to help ensure that high schools teach science according to NGSS concepts and practices.

Sincerely,

Ralph Aldredge
BOARS Chair

Encl.

cc: BOARS
Senate Executive Director Hilary Baxter

ⁱ UCOP, ‘A-G Guide,’ <http://www.ucop.edu/agguide/a-g-requirements/d-lab-science/index.html>