

To: The University Community
From: The SST GE Committee
Re: Response to the Proposed GE Path
Date: 30 April 2004

As faculty in the School of Science and Technology (SST), we fully support the incorporation of a comprehensive general education experience for all Sonoma State students. Further, we applaud the efforts of the GE Subcommittee for the development of the proposed GE reforms.

In this document we address the effect of the proposed GE path on the School of Science and Technology (SST). We present both proposals for enhancing the role of SST in the GE path and concerns regarding integrating the path within science students' major requirements.

We feel that SST has much to offer to the GE path. SSU has achieved distinction for its science major programs. Graduates in several science majors have won national awards and recognition. Several of the programs at SSU are much larger, in proportion to the size of the university, than others in the CSU. For example, there has been a larger proportion of undergrads majoring in physics at SSU than at 21 of the other 22 CSU campuses.

In particular, we address four components of the proposed GE path:

The GE Freshman Year Experience

Quality science major programs require a lot of units. This was recognized recently when B.S. programs were permitted to stay at 124-126 units while B.A. programs were reduced to 120 units. Additionally, upper level science courses frequently require a number of prerequisites and to complete the course work in 4 years, majors typically begin taking major courses in their freshman year. The attached document addresses our concerns regarding the impact of the First Year Experience on our majors.

The GE Mid-Level Experience

Currently SST GE courses fit into the category B requirements specified by Executive Order 595. The attached document proposes a new structuring of the category B requirements to increase both the breadth and depth of a student's science GE experience.

The GE Capstone Experience

Several of the major programs in SST currently include a required capstone experience and other majors are considering inclusion of a capstone requirement. We would like to see the major capstone requirement integrated with the GE capstone experience. In the attached document, a possible format for the integrated experience is described.

Writing Across the Curriculum

Recognizing that well qualified scientists must be able to communicate effectively, SST fully supports the inclusion of Writing Across the Curriculum in the proposed GE path. The attached document expresses our concerns and wishes for the WAC component of the GE path.

Response to GE Freshman Year Proposal.

The Vertical Major Problem. Majors in the School of Science and Technology (SST) have a high number of lower division courses that need to be taken in a particular order so that students have the knowledge base for their upper division major courses. If a student is forced to delay taking some of those courses to take a freshman year experience package, they will most likely have to delay graduation. We have taken a close look at those lower division major requirements, and find no way to rearrange those courses. Our majors are structured in a very standard way that is mirrored by science and mathematics programs around the country.

The following table details these requirements. The two columns for each semester are the units required from the major department (Major) and the units required from other departments in the School (Required science). As you can see, there are at most 7 units of other courses that SST students should be required to take in their Freshman year, assuming a 32 unit load for the first year. We recommend that any new general education package not burden these students with any extra units.

Science & Technology Major & Associated Requirements in 1st and 2nd Year					
Department	Year 1		Year 1		Total Year 1
	Fall	Required	Spring	Required	
	Major	Science	Major	Science	
Astronomy (see Physics)					
Biology	4	9	4	5	22
Chemistry	5	4	5	10	24
Computer Science	4	0	3	3	10
Engineering Science	1	13	0	11	25
Geology	3	5	3	5	16
Kinesiology	0	8	0	5	13
Mathematics	4	0	6	4	14
Nursing (BS)	0	12	0	8	20
Nursing (BS+RN)	9	3	9	0	21
Physics	1	9	5	9	24
			Year 2		
	Fall	Required	Spring	Required	Total Year 2
	Major	Science	Major	Science	
Astronomy (see Physics)					
Biology	4	5	7	0	16
Chemistry	9	9	5	9	32
Computer Science	3	4	3	4	14
Engineering Science	4	10	8	4	26
Geology	7	4	4	2	17
Kinesiology	0	7	0	3	10
Mathematics	7	0	7	0	14
Nursing (BS)	12	0	13	0	25
Nursing (BS+RN)	4	0	7	0	11
Physics	5	4	7	4	20

Questions, Issues, and Suggestions surrounding the “Passion”. Our response to this issue is based on the original document that sets out the idea that a student’s passion lie completely outside the major. This may not now be the Path’s intent, but in case the GE committee is still undecided, we would like to express our worries about that definition in the form of a few questions.

1. What happens if a student changes their major after having taken a substantial number of passion courses. If the major is changed to something within the passion, will the student have to take more courses simply to have enough for the “new” passion?
2. It does not seem that the passion comes out of a single existing area. If it doesn’t, how do students know which courses “fit” their passion? How is advising done? Will a student be prevented from graduating if they don’t have enough passion courses? Who checks and how?

Suggestion. Have the major fit inside the student’s passion. This is a more natural definition of passion anyway. It seems likely that a student chooses a major based on some passion, not just chosen randomly out of a hat. In this case, students would take extra courses outside their major (but that relate) and can see how their major fits into a broader world of learning. These courses might transfer more easily to a new major and passion sequence if courses in the passion do not exclude major courses. Also, a student’s major advisor may be in a better position to do advising for these passion courses.

The idea that a student base some portion of his/her general education around a passion is one that the Science and Technology GE committee generally supports. The word choice reflects the philosophy that general education courses promote life long learning, and are not just taken to fulfill some mysterious graduation requirement.

Unit Load not Relating to Vertical Majors. The number of units totaled for the freshman year in the path does not add to 23, it adds to 22. Thus the total number of GE units projected by the path is 50 not the current 51. In addition, the three classes from Area A have been upped from 3 units to 4 units each. This extra three units combined with the two new units from adding a freshman seminar into the GE pattern gives an extra 5 units to the GE pattern in total. Thus overall, this path contains a total of 6 fewer GE units than in the current pattern. Which traditional areas will not be covered then?

Freshman Area B Courses. The path recommends that students take either a B1 or B2 course in their Freshman year. (Why was Area B singled out anyway??) For several of our physical sciences, computer sciences and mathematics majors, taking B4 in their freshman year is critical. In fact, all students would be well served by taking their B4 class in their first semester before they have forgotten too much of the mathematics they learned in high school. Mathematics knowledge seems particularly vulnerable to being lost through disuse.

The Freshman Seminar Component. It would be wonderful to have all students enrolled in a seminar that tracks the courses the students are taking, providing extra assistance in skills building (such as note-taking, study skills, writing, problem-solving, library and research skills, ethics). All other non-academic topics that admittedly are necessary for our incoming freshman should be handled in the residence halls or through workshops presented by peer mentors. In addition the freshman seminar could be a place where students are introduced to disciplines and “passions” through lecture series presented by various faculty. This course is probably not suitable in a “one size fits all” format. Seminars geared towards each area or school would give more direct and relevant instruction tailored towards a student’s major or passion.

Response to GE Mid Level Experience Proposal.

Goal: To provide an experience in S&T that offers both breadth and depth

In this proposal we suggest modifying the B section of the GE package to provide a breadth of experience in the Sciences and Technology and depth in one particular area in Science and Technology (outside of the students' major). This change is made to reflect the spirit of the proposed GE path and, hopefully, to make administration of the GE B category easier. In particular, sections B1, B2, and B4 are designed to give a student an introduction to a variety of science disciplines while B3 is designed to encourage depth.. This is not a completed proposal – simply a first try at creating a new plan.

B1: For the B1 requirement we propose that each student take an entry level S&T course that does not satisfy either the B2 or B4 requirement. Some courses that would satisfy this requirement are listed below. For science majors, this course may satisfy one of the students' major requirements.

ASTR 100	GEO 102	PHYS 100
CH 115AB	GEO 105	PHYS 102
CS 101*	GEO 205	PHYS 114
CS 110	GEO 303	
CS 115	KIN 301	

B2: As required by Executive Order 595, Life Science is included in the S&T GE requirements. Several courses that satisfy this requirement are listed below. For some science majors, this course may satisfy one of their major requirements.

BIO 110* (L)	BIO 115*	BIO 122
	BIO 121	BIO 123

B3: For the B3 requirement we propose that each student take a second level S&T course. This course must have as a prerequisite a course that satisfies the B1, B2, or B4 requirement. The goal of this set of courses is to provide some depth within a branch of S&T outside of the students' major. A sample list of courses that would satisfy this requirement is listed below; it is envisioned that there would be course from each of the departments in S&T included in this list.

ASTR 303	BIO 312	MA 211
ASTR 305	BIO 314	MA 265
ASTR 350	CS 215	PHYS 300
BIO 309	MA 161	PHYS 342

B4: As required by Executive Order 595, Mathematics is included in the S&T GE requirements. Several courses that satisfy this requirement are listed below. For some science majors, this course may satisfy one of their major requirements.

MA 103	MA 107	MA 150
MA 104	MA 111	MA 161
MA 105	MA 141	MA 165

GE Capstone Experience

Goal: Place the major within the larger context of today's society and provide an integrated experience.

Structure:

- 3 units senior research experience within the major
- 6 units taken as modules from different areas

Most students with a major in the School of SS&T have to complete an upper division research project. Such a project typically requires the student to conduct research within his/her field of study and to write a comprehensive report outlining and explaining his/her findings. Some departments also require a presentation in a seminar setting.

In addition, we propose to create a course that would put scientific/science research and the job of a science researcher into a larger context. This course would consist of modules covering topics such as:

ethics:	What are the ethical responsibilities of scientists?
business:	How does a company make business decisions? <ul style="list-style-type: none">• Basics of fundraising• Making a budget for a grant proposal• Team management• Marketing
statistics:	Data analysis
psychology:	Team management
	Public relations
journalism:	Science writing
	Researching sources
politics:	Politics of grants (?????)
	Science and politics
general:	Research methods (dangers of using the web, checking your sources)

Since this is envisioned as an interdisciplinary and the expertise on the listed topics lies in a variety of different areas, these modules would be taught by faculty from appropriate departments throughout the university. Six faculty members could join in teaching six sections of this course over two semesters. Each instructor would spend 5 weeks with each section.

It would be very interesting to use a case study model to teach this course. Students would be presented with a quite general problem to solve. Investigating the problem would require different approaches and viewing the problem from different points of view. Students would work in teams to find a solution and give a presentation at the of the class or in the format of a mini conference.

Example 1: A group of students is presented with the case of a small business that has trouble paying its loans. Should the bank foreclose on the loan or extend the line of credit?

Example 2: You want to open your own small business. Find a product or service you want to sell. Come up with a business plan. Find funding sources to get started.

Example 3: A group of students writes a grant for a specific research project. They have to identify appropriate funding sources such as NSF or private grants and clearly describe their objectives, methods, and their budget.

The six unit module course could be used as a model for capstone experiences in other schools. Many of the suggested modules are not restricted to a science & technology student or could be varied slightly to make them more applicable to students from other areas.

Writing Across the Curriculum

S&T Supports writing across the curriculum

One of the key characteristics of a well-qualified scientist is the ability to communicate effectively, orally and in writing. For this reason, the School of Science and Technology strongly supports the concept of Writing Across the Curriculum (WAC) at Sonoma State University.

S&T expects students to learn WAC skills in all courses

We expect all our majors to learn these communication skills not only in specific courses designed to teach written and oral communication, but also in other courses, including, but not limited to, Science and Technology major courses and Science and Technology GE courses.

Examples of WAC courses in S&T

All the School's GE courses, at both lower and upper division levels, require writing of some sort, and often oral communication of results and analyses as well. For example, the Physics department makes huge efforts to grade written essays in all its GE courses. The Mathematics department similarly has writing requirements in all its GE courses, as well as most of its major and elective courses, as well as formal requirements for oral presentations in and outside class. Other departments also have such courses.

Definition of WAC Courses unclear

It seems to the faculty of the school that many of our courses qualify as WAC courses. We are eager to contribute to the accurate definition of such courses, and urge the inclusion of many of our courses as not only appropriate for our majors, but also for non-Science majors.

Importance of Science in a liberal education

At a time in the US when states across the country are excising "evolution" from the Biology curriculum, and sloppy logic and thinking are foisted on an increasingly innumerate and unquestioning public, we are sure that we as scientists have a lot to contribute in counteracting this trend. One method of doing this is our fostering of effective writing in our disciplines and in our GE courses. Harvard University is considering revisions of its GE courses to include more depth in science courses.

A second method is to encourage more students to take science and mathematics courses, so that they can understand the errors being propagated, and counteract them effectively by communicating their arguments effectively.

Importance of adequate and structured funding

Increasingly, however, the faculty of our school and university are being told to go in two opposing directions. One is to move to large lecture and laboratory classes, to maintain FTES numbers and to reduce costs of hiring faculty; the other is to spread skills such as WAC more widely, which of course requires more resources and smaller classes. We are eager to move forward in the second direction, but are even more eager to find out what resources will become available to us to assist us in these new endeavors.

We think that the SSU Writing Center will need science-based experts in writing skills, as well as training in data analysis.

Support for WASC recommendations

We believe there are WASC recommendations for the funding of a permanent faculty GE administrator, as well as for funding of GE initiatives. We support these.

Maximum class enrollment limit

In our opinion, a WAC class should have a maximum enrollment of 30, to encourage appropriate faculty/student interaction

Importance of faculty training

We see that faculty training will be necessary, as will increased faculty support for the more time-intensive grading required in WAC courses.

Our eagerness to contribute

We are happy to contribute our expertise in WAC and our enthusiasm for our subjects to this important debate.