

Program Review Evaluation Team Report

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Executive Summary

Overall the review team was very impressed by the **strength** of the program in terms of dedicated faculty and their extensive career advice provided students, the enthusiasm of the students towards the faculty and program, the laboratory facilities, and the class content and laboratory instruction. The significant progress made by the program since the last external review was extensive and covered a number of topics. These included the addition of biochemistry bachelor's degree, curriculum changes to meet new ACS standards, and new laboratory facilities. Additional program strengths are the qualifications of the staff which include exceptional new hires, a detailed and thoughtful set of learning outcomes associated with each of the specific student populations they service through various degree programs, very knowledgeable support staff members, and excellent relationships with external communities. There are a number of faculty who are engaged in using active pedagogies in their courses. This is a real strength.

Interviews of faculty and staff identified that the servicing of the lower division and introductory courses are a clear **challenge** to the department. The number of students in these courses represents a significant demand on resources within the department. Numerous faculty members identified this as an issue and suggested that resources seemed to be inverted within the department in that not enough resources were given to the lower division courses. Additionally, the committee sees further support and expansion of the recent curriculum changes to be a challenge. Laboratory teaching support is also challenging since the current undergraduate teaching assistants require significant support from faculty taking away faculty's time from other important activities. The labor expended in the advising of students does not appear to be acknowledged in any workload calculation. The contact hours for the faculty are also high.

The committee did not identify any **weaknesses** to the curriculum in the various degree programs related to the specific curriculum standards outlined in the program review. However, several areas of weakness were identified that should be strengthened in the future. The self-study did not demonstrate clear acceptable performance thresholds associated with the learning outcome being measured to the level of detail usually employed by academic departments outside of the chemistry field. Additionally, without better definitions of performance thresholds the committee found it more difficult to determine if the program is meeting these learning outcomes. There was little evidence in the self-study that assessment tools were being used to regularly evaluate the program in a defined rigorous process to drive new changes outside of the exit interview. The primary weakness of the advising system as it exists is that it only offers its strengths to those proactive students who actually go to the effort of aligning their advisor with their interests. Less proactive students, while still having an advisor that clearly cares about their success, have an advisor with a full workload that knows far less about the desired future of their advisees. Another weakness is that the system as it is actually used demands a great deal of unofficial communication between students about who is and who is not a good advisor. Any

students that sit outside the traditional power structures of the student body face the real possibility of worse outcomes based on nothing more than their demographics as they enter the program. The department is weak in its demographic diversity. Not all faculty are engaged in using active pedagogies in their courses. Students are not thriving in the courses where improvements with active pedagogies are not being made. There are too few laboratory staff for the number of students serviced by the department.

Recommendations for change include:

- 1) Hire additional personnel to support teaching laboratories, especially in the lower division and general education courses. Alternatively, the support of the laboratories could also be achieved through the addition of a faculty member to help share the teaching load. This faculty member could also help bolster the new biochemistry program if they possess the proper training and expertise. There is a need for an additional faculty member to support students interested in biochemistry as the major has become quite popular.
- 2) The committee feels that most of the information required to perform adequate assessment of learning outcomes is present and being recorded by the department but not adequately communicated in the self-study documentation. The committee recommends using clear and defined thresholds for assessing student success, such as a minimum score on the ACS exams or other measured competency that relates to the learning outcomes. Also, the committee advises the collection of these measurements at least on a yearly basis and that the results of those assessments are shared with the department. The assessments can then be used to improve or make changes to the curriculum. This approach allows for continuous quality improvement of the programs offered by the department and can be a crucial tool after undergoing substantial curriculum changes, such as those seen in the department over the past five years.
- 3) It is recommended to formalize the “advisor change” procedure so that all students can reap the benefit of the advisor/advisee alignment. Another recommendation is to connect the labor of advising to the workload that is assigned to faculty. It is far easier to assess and reward behaviors that are officially part of the faculty workload.
- 4) We do recommend building strength in research to give research opportunities to undergraduate students and to consider succession planning to maintain current strengths in the area of chemical technology.
- 5) The department should have a robust plan and strong commitment towards its approach for future hires to increase diversity of the faculty. It is especially critical to have options to reduce the teaching load for new hires so that they can establish their research programs.
- 6) Increase the adoption of active learning methods with consideration of the literature that offers insight into how best to support student learning and develop the talents of all students. The department has not mandated research-based course improvements. It should mandate reasonable course improvements by providing support to faculty and setting clear and achievable goals for each time that the course is offered. There are two instructors. One teaches the general education course, and the other teaches both lecture and lab for the introductory chemistry course for non-

majors. We recommend that both should be encouraged to and supported in adapting their courses towards active pedagogies.

Additional recommendations include items that were missing from the requested format for the Self Study Guide:

- 1) A summary of the processes be provided in the Mission Statement according to the format requested in this evaluation form.
- 2) Relationships with external communities should have a clearly defined role and evidence of their contribution to the program (curriculum, equipment, faculty, budget, etc.) should be demonstrated. The contributions to the program are presented qualitatively in the self-study guide and cover most, if not all of the sub-elements listed. It is recommended to provide additional details if they are available in the “Relationships with the External Communities” Standard. In addition, a sub-section entitled “Community and Graduate Success” has no accompanying text. Details in this section would also strengthen the evidence of the contribution of relationships with external communities to the program.
- 3) The effects of implemented recommendations were addressed in detail in other sections of the report. It is recommended to add the impact of these changes on the program to “Results from Previous Program Reviews” Standard.

INDIVIDUAL AREAS

A. Mission Statement

Program Strengths: The mission statement does an excellent job of capturing the overall mission of the department and then breaking the mission into different topics. The mission statement clearly defines the educational program in terms of degrees offered, education focus, research opportunities, and the objectives of the educational program for the different groups at the university who participate in the program. The mission statement succinctly captures the mission of the department as applied to the department’s majors, other departments’ students, and the local community.

Program Weaknesses: The committee did not identify any weaknesses in the mission statement related to the specific mission statement standards outlined in the program review.

Program Challenges/Recommendations for Change: The mission statement is silent towards the process by which its accomplishments are determined and periodically assessed based upon the constituencies served by the program. However, other portions of the self-study do an excellent job of detailing the different aspects of this process. It is recommended that a summary of the processes be provided in the mission statement according to the format requested in this evaluation form.

B. Curriculum

Program Strengths: The Department of Chemistry and Biochemistry has undergone substantial curriculum development over the past five years. Most notable the development of a biochemistry bachelor's degree and curriculum changes to meet new ACS standards. The department also offers a stacked degree path for chemistry majors that allows students to earn credentials that translate into employment and meets the needs of local industry (Curriculum Standard Elements a & b). The department has rearranged course offerings and expanded course availability to better suit student success and progression towards graduation (Curriculum Standard Element d). The various interviews with faculty and students demonstrate that the department offers an excellent and comprehensive curriculum and that the faculty are invested in student success and teaching. The students raved about their professors and the knowledge they received while progressing through the various programs. They were genuinely excited by the new curriculum offerings, like medicinal chemistry, and feel they are well prepared for careers in the chemical sciences.

Program Challenges: Interviews of faculty and staff identified that the servicing of the lower division and introductory courses are a clear challenge to the department. The number of students in these courses represents a significant demand on resources within the department. Numerous faculty members identified this as an issue and suggested that resources seemed to be inverted within the department in that not enough resources were given to the lower division courses (Curriculum Standard Element c). Additionally, the committee sees further support and expansion of the recent curriculum changes to be a challenge. The interviews with the faculty identified a few areas of need or enhanced support. Some faculty felt it would be preferable to have more support teaching laboratories either through more teaching assistants or the addition of dedicated laboratory instructors. The faculty suggested that this increase of laboratory teaching support would allow for smaller laboratory sections and improved student outcomes, especially in lower division courses. The faculty also expressed a desire to enhance their undergraduate research programs in the department, which meets the university goal of a high-impact practices. Further supporting laboratory teaching would allow faculty more time to participate and support undergraduate research projects.

Program Weaknesses: The committee did not identify any weaknesses to the curriculum in the various degree programs related to the specific curriculum standards outlined in the program review.

Recommendations for Change: The committee recommends the hiring of additional personnel to support teaching laboratories, especially in the lower division and general education courses. This would allow for improved connection and educational experiences of the students as well as freeing time for faculty to participate in undergraduate research. The support of the laboratories could also be achieved through the addition of a faculty member to help share the teaching load. This faculty member could also help bolster the new biochemistry program if they possess the proper training and expertise.

C. Student Learning Outcomes and Assessment

Program Strengths: The department has demonstrated a detailed and thoughtful set of learning outcomes associated with each of the specific student populations they service through various degree programs. The outcomes listed give a good description of the knowledge, skills, and behaviors that each student is expected to achieve upon completion of the course or program (Student Learning Outcomes Standard Element a). The outcomes align well with the department, college, and university educational goals and meet university standards, such as the general education learning outcomes (Student Learning Outcomes Standard Element b). The core program learning outcomes are covered in varying degrees across the departments curriculum and this is documented well in self-study curriculum map, although none of the other learning outcomes were documented in this way the committee assumes these are being assessed by the appropriate university committees, for example the general education learning outcomes (Student Learning Outcomes Standard c). The department utilizes multiple measurements to assess each learning outcome and these are delivered at the individual course and program levels (Assessment Standard a & b). Graduating students undergo an extensive exit interview with the department chair which serves to gain information regarding specific areas of improvement and to gauge the students' perceptions of the program outcomes (Assessment Standard c, d, & e). The department uses standardized ACS examinations in a variety of courses to assess student learning and they report good success of their students compared to national averages.

Program Challenges:

The self-study did not demonstrate clear acceptable performance thresholds associated with the learning outcome being measured to the level of detail usually employed by academic departments outside of the chemistry field (Assessment Standard b). Additionally, without better definitions of performance thresholds the committee found it more difficult to determine if the program is meeting these learning outcomes (Assessment Standard c & d). There was little evidence in the self-study that assessment tools were being used to regularly evaluate the program in a defined rigorous process to drive new changes outside of the exit interview (Assessment Standard d & e). The committee feels that relying on the exit interview and perceptions of students who are graduating as the main assessment tool for student learning outcomes is less than ideal and that additional tools be utilized, or at least documented in future self-studies. The faculty interviews also identified assessment as a potential weakness of the department and that expanded program assessment would be beneficial.

The self-study did not demonstrate clear acceptable performance thresholds associated with the learning outcome being measured (Assessment Standard b). Additionally, without clear acceptable performance thresholds the committee found it difficult to determine if the program is meeting these learning outcomes (Assessment Standard c & d). There was little evidence in the self-study that assessment tools were being used to regularly evaluate the program and drive new changes outside of the exit interview (Assessment Standard d & e). The committee feels that relying on the exit interview and perceptions of students who are graduating as the main assessment tool for student learning outcomes is less than ideal and that additional tools be utilized, or at least documented in future self-studies. The faculty interviews also identified assessment as a potential weakness of the department and that expanded program assessment would be beneficial.

Program Weaknesses: The committee did not identify any weaknesses in student learning outcomes and assessment as related to the specific standards outlined in the program review.

Recommendations for Change: The committee feels that most of the information required to perform adequate assessment of learning outcomes is present and being recorded by the department but not adequately communicated in the self-study documentation. The committee recommends using clear and defined thresholds for assessing student success, such as a minimum score on the ACS exams or other measured competency that relates to the learning outcomes. Also, the committee advises the collection of these measurements at least on a yearly basis and that the results of those assessments are shared with the department. The assessments can then be used to improve or make changes to the curriculum. This approach allows for continuous quality improvement of the programs offered by the department and can be a crucial tool after undergoing substantial curriculum changes, such as those seen in the department over the past five years.

D. Academic Advising

Existing System: The existing system of student is that each incoming chemistry major is assigned an advisor based on their name. This advisor is one of the existing faculty members in the chemistry department. Specialty programs (such as the pre-med program) have advising help that is offered to the students. Many students informally change advisors later in their program in order to receive advice from someone perceived to be more in tune with their interests.

Program Strengths: The faculty clearly care for the students that they are advising. Faculty said this directly in their interviews and students implied as much in their meeting with the committee. This is clearly a strength of the system. The other main strength of the system, in using the system as it is, is that chemistry majors can get advised by someone with an intimate knowledge of the desired field of the advisee.

Program Challenges: The first challenge is that the labor expended in the advising of students does not appear to be acknowledged in any workload calculation. As the chemistry department continues to grow, a potential pitfall might be that advising labor is expended less and less as formal assessment and evaluation of the faculty drives faculty effort towards areas that are judged and (presumably) compensated.

Program Weaknesses: The primary weakness of the advising system as it exists is that it only offers its strengths to those proactive students who actually go to the effort of aligning their advisor with their interests. Less proactive students, while still having an advisor that clearly cares about their success, have an advisor with a full workload that knows far less about the desired future of their advisees. Another weakness is that the system as it is actually used demands a great deal of unofficial communication between students about who is and who is not a good advisor. Any students that sit outside the traditional power structures of the student body face the real possibility of worse outcomes based on nothing more than their own bad luck as they enter the program.

Recommendations for Change: Formalize the “advisor change” procedure so that all students can reap the benefit of the advisor/advisee alignment. Another recommendation is to connect the labor of advising to the workload that is assigned to faculty. It is far easier to assess and reward behaviors that are officially part of the faculty workload.

E. Faculty: Weber State has eleven tenure-track faculty and two instructors.

Program Strengths: The core of faculty in the chemistry department at Weber State is strong. They are qualified and they are clearly committed to the success of their students. The degree options and certificate supported by these faculty and instructors is appropriately broad and appropriately strong because of the efforts of these people. The newer faculty are especially noteworthy; it is clear that Weber State hires well. Several faculty, both newer and older, have developed strong courses guided by active pedagogies and evidence-based practices.

Program Challenges: There are several challenges facing the chemistry faculty and instructors. The biochemistry program has become very popular and it strains the faculty in that area and also strains the program generally. The challenge here is one of dealing with success and expanding something already popular within the confines of an overall program. A second challenge lies within the demographics of the faculty. The demographic breadth and proportionality of the faculty and instructors is narrower than the demographic breadth of the community and does not reflect the demographic proportionality of the Weber State community. There are challenges in attracting underrepresented faculty to schools in Utah, and that is the challenge the chemistry department faces. A third challenge for the faculty of the chemistry department is in the development of their research programs. These are challenges of resources and time—and are challenges not unique to Weber State. But they are challenges nonetheless. Faculty need time to develop research programs appropriate to the resources and student body. Faculty need resources to develop research programs appropriate to the time available and the student body. And the student body needs the faculty to develop research programs appropriate to the time and resources available. A fourth challenge exists for the chemistry department. While several members of the department have developed classes that appropriately use active pedagogies and evidence-based practices, many do not. The department needs to figure out how to reward those that already use these pedagogies and to encourage those that do not.

Program Weaknesses: The diversity of the chemistry department is weak. The contact hours for the faculty and instructors are very high.

Recommendations for Change: (1) An additional faculty member or instructor is needed in biochemistry to accommodate the popularity of the program. (2) The department needs to build support for and opportunities in research for their students. (3) The department needs to develop a plan to systematically improve the representation of underrepresented minorities in the chemistry department. (4) The department needs to develop a plan to systematically increase the usage of evidence-based pedagogical practices including active pedagogies. This plan needs to reward its existing usage and to provide the resources for those not currently using evidence-based teaching practices.

F. Support

Existing System: The chemistry department currently has two support staff. One staff member performs all the clerical support for the department (as well as interacting with students as a receptionist of sorts). The other staff member supports all the laboratory (and demonstration equipment) needs of the department.

Program Strengths: With such a small contingent of staff members, those staff know the workings of the chemistry department inside and out.

Program Weaknesses: The primary weakness of the staff support system is that it is too small. The lab support particularly is overworked. In meeting with the committee the clerical staff did not suggest that she was overworked. The committee will take her at her (lack of) word. But the laboratory support staff member is clearly stretched too thin.

Recommendations for Change: Increase the number of staff. The obvious point to begin is by adding another lab manager. Comparable schools have three lab managers (general, organic, upper level) at the least as well as other more-specialized staff members. It defies believability that the department is as well-served by their staff as they could be if their staff were not so overworked. The department had another staff member once but lost them in a cost-cutting move. Restoring that staff line is a simple fix.

G. Relationships with the External Communities

Program Strengths: The self-study guide clearly articulates the formal relationships with external communities of interest. These include site visits, internships of students at external laboratories, donation of laboratory equipment to the department, and contracted services provided by the department when its instrumentation is needed by external organizations. The reviewer is a member of the external advisory committee and has participated in the regularly scheduled meetings. The minutes for the latest meeting (late 2018) are included in the self-study guide.

Program Challenges: The committee did not identify any challenges in relationships with the external communities as related to the specific standards outlined in the program review

Program Weaknesses: The committee did not identify any weaknesses in relationships with the external communities as related to the specific standards outlined in the program review.

Recommendations for Change: External community relationships should have a clearly defined role and evidence of their contribution to the program (curriculum, equipment, faculty, budget, etc.) should be demonstrated in the Self Study Guide. The contributions to the program are presented qualitatively in the self-study guide and cover most, if not all of the sub-elements listed. It is recommended to provide additional details if they are available. In addition, a sub-section entitled "Community and Graduate Success" has no accompanying text. Details in this section would also strengthen the evidence of the contribution of relationships with external communities to the program.

H. Results of Previous Program Reviews

Program Strengths/Program Challenges/Recommendations for Change: All recommendations from the previous review were addressed and almost all were successfully implemented. The appointment of a new analytical chemistry faculty position, and increase in funding to support faculty research (and decrease teaching loads) were not accomplished due to budgetary constraints. The effects of implemented recommendations were addressed in detail in other sections of the report. It is recommended to add the impact of these changes on the program to this Standard.

Program Weaknesses: The committee did not identify any weaknesses in results of previous program reviews as related to the specific standards outlined in the program review.