

# Department of Earth and Environmental Sciences, Weber State University

## Program Review

**Review Date:** February 13-14, 2020

### Review Committee:

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### Overview

The review committee visited The Department of Earth and Environmental Sciences (EES) at WSU on February 13, and again the morning of February 14. Prior to the site visit, the committee reviewed the full and executive summaries of the department's five-year self-review, as well as information that summarized the responsibilities of the committee, the review process, and WSU's self-study format and standards guidelines. During the visit, the committee met informally with nearly the entire department and a representative of the Dean's Office over breakfast, followed by separate ~ one hour meetings with the Department Chair (Rick Ford); tenure-track faculty (Liz Balgord, Carie Frantz, Ryan Frazier, and Caty Tems); EES staff (Marianne Bischoff and Sara Summers); majors in department programs (approximately 20-30 students); tenured faculty (Michael Hernandez, Dave Matty, and Adolph Yonkee); several senior majors over lunch (Brooklyn Smout, Analeah Vaughn, Adam Lieberman, and Jackson Smith); two members of the EES external Advisory Council (Jessica Castleton, Utah Geological Survey and John Diamond, Kleinfelder); and the College of Science Dean (Andrea Easter-Pilcher). The committee also toured the departmental facilities, guided by Dave Matty and Adolph Yonkee. Some members of the committee also attended an informal dinner with some EES faculty. The following day, the team met for two to four hours primarily to review, summarize, and interpret their observations of the previous day and to organize compilation of this report.

During the site visit meetings and department tour, the committee asked many questions related to the review and to which they received candid and informative answers. The committee believes that the documentation and site visit provided very good information from which to conduct the review. Overall, the department meets or exceeds expectations; it has produced outstanding outcomes in areas such as engaging students in mentored research and obtaining external funding; has excellent initiatives underway involving curriculum and supporting faculty; and it has reacted extremely well to the most recent previous external review. The committee has identified areas for potential improvement and recommendations that we hope can help the department improve even further. The committee's report on specific strengths, areas for improvement, and recommendations for Standards A-H is below.

**Standard A-- Mission Statement:**

- a. The outcomes of the program are well defined
- b. Student accomplishments are assessed by stakeholders
- c. Educational program is clearly defined
- d. The department's mission supports the college's mission statement

*Strengths:* The program outcomes for the Department of Earth and Environmental Sciences (EES) at Weber State University are very clearly defined. There are nine specific program learning outcomes (PLOs) which are mapped to the key courses that all undergraduate majors complete and the map defines where these skills are introduced, reinforced, and assessed (See Standard C). There is a strong emphasis on hands-on learning and experiential learning which is achieved through high impact educational experiences (HIEEs) such as required class field trips, course-based undergraduate research experiences (CURES), and a robust undergraduate research program. These HIEEs clearly align with the University's mission to "provide excellent educational experiences for students through extensive personal contact among faculty, staff and students in and out of the classroom."

*Areas for Improvement:* The PLOs are being assessed in classes ranging from introductory GE to the upper level courses including the Geology field camp. PLO assessments from these classes were not reported in the self-study and leave the question of how they are being assessed. The department mission is similar to the University mission with a strong commitment to creating relationships between students, staff, and faculty. One way the department supports this part of the mission is through HIEEs which include many opportunities for undergraduate research. In fact, when the team spoke to students, we heard again and again how grateful students were for these experiences- whether or not they planned to continue on to graduate school. Students found the research experiences and field work led to deeper understanding of material and concepts learned in the classroom. However, junior faculty are showing signs of burnout due to the high teaching load and high expectations to conduct and produce research with students (HIEEs). Students expressed concern for faculty members saying they often felt faculty members were spread too thin. The review team recognizes that excellent teaching is at the core of both the EES and University missions, however we believe that Weber State needs to examine their desire to increase HIEEs and reconcile that with time and effort that those HIEEs require from faculty members.

*Recommendations:* The review team recommends that the EES program have a unified way to assess program learning outcomes. Given that 5 of the 9 PLOs are assessed twice in the curriculum and the others are only assessed once, we recommend that all PLOs be assessed twice within the curriculum (see Standard C). This will allow the EES department to see the effectiveness of the reinforcement on these PLOs throughout the curriculum.

The review team recommends that the EES department develop a comprehensive assessment of the impact of undergraduate research experiences. This HIEE is very well developed in the EES department

and the lack of assessment is a lost opportunity. This assessment likely can be part of the exit interviews and can be a few additional questions or a pre-interview survey.

The EES department mission statement is very clear, and the university's and the college's faculty evaluation policies are also very comprehensive. However, additional expectations are not always clearly and uniformly communicated to junior faculty, which may be contributing to confusion and faculty burnout. The review team recommends that the EES department review their mission statement as it may be too ambitious given the required teaching load of the faculty. In addition, the department chair may want to review the university's and the college's faculty evaluation policies with junior faculty members and evaluation committee chairs, to ensure that there is a common understanding of the expectations.

#### **Standard B Curriculum:**

- a. There is evidence of thoughtful curriculum planning and review
- b. The curriculum is consistent with the department's and the university's mission
- c. Additional resources are needed to support the program
- d. Most courses are offered in a timely manner

*Strengths:* The EES department curriculum for majors is robust and teaches students the skills needed to succeed in their careers. A recent report from the National Association of State Boards of Geologists (ASBOG) provided detailed information about the success of WSU students on the Fundamentals of Geology exam (93% pass rate for students from 1990-2016). The College of Science just proposed an interdisciplinary Environmental Science BS degree, and it was passed by the Faculty Senate during our site visit. EES will be a key participant in offering courses, advising, and facilitating HIEEs for students in the new program. Other recent curriculum initiatives included a requirement for all Geology and Applied Environmental Geoscience majors to complete a course that requires course-based undergraduate research. This revision expands the reach of HIEEs to most students in the department and strongly supports the department's and the university's mission statements. The department chairperson and faculty participated in campus-wide efforts for GE course revitalization and were early adopters of the "Big Question" and "Signature Assignments" components of the general education courses. The entire department has met to brainstorm and share ideas for these BQ and SA components of the Earth Science GE classes. Faculty members share their materials for GE classes to support one another and to ensure consistency across the various faculty teaching GE classes.

*Areas for Improvement:* The review team heard from a large group of students during the site visit. Several students expressed a concern that the curriculum does not require calculus (and therefore does not require calculus-based physics). When asked, all students present ( $n \approx 20$ ) indicated they wanted calculus to be part of the curriculum. The main desire for the calculus path seemed to be students' concern that graduate schools require calculus. On the other hand, the Advisory Board maintained that it is important to keep a degree option that does not require calculus, and said that students would not

have their careers hindered by the lack of calculus. One member remarked that they “would not have gone through this route if I had to take calculus.”

Students also reported challenges with the sequencing and timing of required courses. Major courses have time conflicts with required support classes (chemistry and physics) causing student to miss the first 20 minutes of their major courses. Students also reported a “stacking” of time-intensive courses required in their final semester (spring, senior year) leading them to feel overwhelmed with the work load.

*Recommendations:* The review team commends the EES department on their work with students and curriculum to align their program to national standards and break down barriers to participation and completion of a geoscience degree. We recommend the department explore adding calculus to the BS degree for students targeting graduate school, and keep the BA degree as a non-calculus option for workforce-oriented students. If the department and Advisory Board do not see the benefit in that, we recommend the department in conjunction with College Advisors/ Counselors develop clear pathways for students to understand whether or not they will need calculus for their future academic path.

Another recommendation is for the department to continue its work on developing the Associates of Applied Science in physical science (in conjunction with other departments in the College of Science). This degree could increase completion rates for geoscience majors as it would ensure completion of the major requirements (chemistry, physics, math) before students start in their respective major classes. Another idea is for the department to explore the feasibility of developing a Certificate or an Associate Degree in Geotechnical Careers made up of lower division classes for the major and technique courses. This additional option will enable students to complete a workforce-oriented degree in the event that they do not have four years to complete a BA/BS or encounter unexpected circumstances in their lives that prevent them from do so. The Advisory Council indicated that if a Certificate or AS degree was heavy in GIS, remote sensing, sample collection, soil analysis, and field surveying, there is an entry level career path into geoscience consulting with that certificate or degree.

Based on conversations with the Advisory Council members, the review team recommends the department explore a curriculum track within the existing BA/BS for students interested in industry, which would include classes in soils, geotechnical tests (including how to collect and run samples), and engineering geology. These skills are crucial in industry and would set graduates up for increased success in industry.

To address the impact of timing and scheduling of required classes, the review team recommends that the EES department explores the possibility of informing students that they can complete some of their course requirements (chemistry, math, physics) at neighboring institutions such as Salt Lake Community College in order to remain on track for time to graduation.

The review team recommends that the EES department and the University measure the time and effort required for the HIEEs that faculty are adopting. These HIEEs are very successful at teaching and engaging students but they come at a high cost to faculty, especially when there is no additional staff or institutional support for the time and money they require.

Our final recommendation is for the EES department and the broader Weber State University to reexamine the Signature Assignments for the GE classes. Although faculty are told that the assignments are not tied to their tenure evaluation and they have flexibility in developing the assignments, the students' work is evaluated with a standardized rubric which heavily favors an essay assignment. These assignments contribute to faculty burnout and it is not entirely clear how these assignments are positively impacting student learning.

### **Standard C. Student Learning Outcomes & Assessments**

- a. Learning outcomes should reflect expected skills and behaviors achieved by graduation
- b. Learning outcomes support goals of program
- c. Learning outcomes linked to curriculum (with matrix)

*Strengths:* The curriculum learning outcomes for the program were recently revised in light of the Future of Undergraduate Geoscience Education initiative sponsored by the National Science Foundation. The department is commended for the amount of time and effort that were dedicated to this endeavor in the form of participating in geoscience curriculum workshops, department meetings, and assessment planning. A new curriculum map was prepared for Core Courses with alignments to nine learning outcomes (three for basic skills and six for earth science skills). The map indicates in which core courses the outcomes are introduced, emphasized, or reinforced as well as when they are comprehensively assessed. The department reports on assessment of the learning outcomes on a biennial (formerly annual) basis to the university's Office of Institutional Effectiveness. An exit interview with graduates provides an indirect measure of mastery of the learning outcomes. While not all graduates of department programs pursue licensure as a professional geologist, those who do take the Fundamentals of Geology licensure exam have a 93% pass rate. The department participates in assessment of general education, and two of the faculty were among the early adopters who piloted the assessment components (Big Questions and Signature Assignments) during the university's General Education Revitalization initiative. The department has identified the need for an assessment tool for high impact educational experiences (HIEEs).

*Areas for Improvement:* There is some variation in the planned comprehensive assessment of the learning outcomes as a whole and also across the various degree programs in the department. Four of the nine learning outcomes are comprehensively assessed once throughout the Core Courses, while the other five are comprehensively assessed twice. Furthermore, the Core Courses are mapped at the department level and not at the level of the individual degree programs. As a consequence, only students who complete the Geology BS take every Core Course and therefore encounter every comprehensive assessment point. Students who complete the Geology BA are comprehensively assessed once for six of the learning outcomes and not at all for the remaining three. Applied Environmental Geosciences majors fall in between these two extremes. Part of the ongoing review of the new curriculum program should include looking at making the number of assessments of student learning uniform across the degree programs. Additionally, there is no indication of how the learning outcomes will be assessed. This is a particularly critical consideration for the comprehensive

assessments. As the department noted, there is a need for suitable assessment of HIEEs, including CUREs, mentored undergraduate research, and internships. The department is also interested in knowing the impact of an undergraduate research experience on the likelihood that a student will attend graduate school as a department goal is to see more of their alumni complete graduate programs for career advancement.

*Recommendations:* We commend the department for the careful and deliberate approach taken for the revision of the curriculum and program learning outcomes. We also commend them for identifying future elements to work on with regard to assessment. We therefore recommend that the department proceed with their goal of developing or adopting an assessment instrument for HIEEs. Additionally, we encourage the department to develop a mechanism for tracking student participation in undergraduate research, whether CUREs or mentored, as part of the department's interest in determining which undergraduate experiences correlate with EES graduates attending graduate school. We also recommend that the department review the quality and quantity of the information that they are getting from their new assessment grid, and then make appropriate adjustments to ensure that they are getting sufficient and comprehensive information on the learning of all of their graduates. This data collection could also provide the department with additional information about the preparation of students who continue on to graduate school. Finally, at the department level, the role and value of the addition of Big Questions and Signature Assignments to general education assessment is not clear. There is also concern that eventually student outcomes on Big Questions and Signature Assignments will be used as a component of faculty teaching evaluation. These issues need to be addressed by the university as a whole.

#### **Standard D. Academic Advising**

- a. Clearly defined strategy of advising
- b. Students receive appropriate assistance in planning course of study
- c. Students receive appropriate assistance in planning career

*Strengths:* Since their last program review, the department moved from a decentralized system in which all faculty were involved in advising to a centralized system for formal advising. This change provides consistent messaging to students. Advising is currently done by three members of the senior faculty, and this gives the junior faculty time to become familiar with the EES curriculum and university degree requirements before they are called on to be formal advisors. The department's advising strategy is proactive in bringing advising to the students. The department initiated a weekly newsletter to keep students up to date on department events and opportunities and a yearly Town Hall to deliver critical information and advising to freshmen and sophomores as a group. Informal advising is also robust. The students who met with the Program Review Team all commented positively on the interactions that they have had with the faculty and find them very approachable for advice on careers, internships, and projects. During their exit interviews, graduates of the department have indicated that they are very satisfied with the quality of the advising they have received.

Areas for Improvement: We suggest that the department consider providing reassigned time for advising as it will now be centered on mostly one person rather than dispersed among the faculty.

Recommendations: The department is commended for the proactive and comprehensive approach that the faculty take towards advising. The work of the department administrative assistant in preparing and distributing the newsletter as well as maintaining a file on each student in an EES program is also applauded. The department's self-study pointed out that they "plan to centralize departmental advising even further" with only one senior faculty becoming "the primary advisor for the new inter-departmental Environmental Science degree and ... all EES degrees and minors, with the exception of the geospatial certificate and minor." Given this upcoming change to student advising and the increase in workload for the one senior faculty member, we recommend that the department keep a close watch over student and faculty feedback and adjust this new advising system if necessary. In particular, they might find it necessary to provide reassigned time for advising if it is assigned to one person. In the meantime, we recommend that the department keep up their solid work in advising, and devise a plan for bringing junior faculty into the formal aspects of advising in the future.

#### **Standard E: Faculty**

- a. Faculty size, expertise, professional development are aligned with mission
- b. Programs has core faculty required to maintain quality program
- c. Adjunct faculty are qualified
- d. Program strives to achieve diversity among faculty
- e. Plan in place for mentoring new faculty
- f. Plan in place to assign teaching and service loads
- g. Teaching is monitored to assess effectiveness
- h. Have formal periodic review process for faculty

Strengths: The faculty of the Department of Earth and Environmental Science is excellent overall, and deserves commendation in several notable areas. It is evident from the faculty's curriculum vitae, feedback from students, and the Committee's interviews that the faculty as a whole are extremely dedicated to their educational mission, their students, their research, and WSU. We note in particular that students - despite a few specific concerns - were extremely positive about the attention, availability, and approachability of their professors, and the terrific mentoring of undergraduate research. The department's current level of external funding is outstanding, particularly for a program primarily focused on undergraduates (a PUI). Recent and ongoing efforts by the faculty to improve their programs through better assessment, curriculum, and pedagogy (e.g., HIEEs) is also commendable. The department has made several excellent hires in recent years, and the gender diversity of the faculty is very good. The gender diversity may be positively affecting diversity of program majors, which is outstanding. To repeat, the Committee believes that overall EES has an outstanding faculty.

Areas for Improvement: The Committee ascertained that there is some concern within the faculty and among students that current productivity levels may be difficult to maintain, and that the large number of initiatives (e.g., new curriculum, pedagogy, assessment, and seeking and implementing external funding) may be adversely impacting student mentoring and may be putting too much stress on the

faculty. New faculty in particular potentially face a tremendous amount of work and there is concern whether they can sustain the perceived workload needs. The committee shares these concerns. However, efforts are taking place – in part under the new Dean – to mitigate these issues. A push to include release/reassigned time in proposals for external funding, and an effort to modify the method for calculating workload credit-hour-equivalents have the potential to alleviate some time stress on the faculty, if successful and done well. The Committee was informed that the outstanding levels of external funding currently enjoyed by senior faculty are not required for tenure. It is likely that continued, improved communication and mentoring of new faculty could improve morale and aid the professional development of tenure-track faculty.

The new Tracy Hall Science Center has provided much needed and excellent new facilities for EES. At the same time, the set-up, management, and maintenance of the new laboratory and computing facilities and other changes requires significant time investment by faculty. The Committee feels that the faculty need additional support for managing and maintaining equipment, software licenses, and facilities, most likely in the form of an instrumentation specialist and maintenance contracts.

Assessment of regular faculty appears to be robust. Review of adjuncts is not as strong and is an opportunity for improvement, although the Committee recognizes that employment rules and limits on adjunct pay and/or hours worked may create challenges for adjunct assessment.

The in-progress revision of the College of Science tenure policy has promise to fulfil an important opportunity for improvement. The Committee noted that communication between faculty and Department Chair and Dean seemed very good on this issue and others.

*Recommendations:* The Committee feels the current initiatives to modify workload (via the workload calculator and release/reassigned time) should be pushed forward. The modification of the workload calculator in particular is bold and a good step towards a more appropriate workload for the Department's tremendously productive faculty. The Committee hopes that the contact-hour-equivalent calculation method and any revision to workload requirements (e.g., TCE per term) will enable the faculty to put the needed time into high impact teaching practices such as class-based research projects, field trips, internships, and mentored student research. The Committee encourages the Department and College to continue to improve support for junior faculty, and to clearly communicate evaluation guidelines and in particular expectations for successfully obtaining tenure.

The Committee encourages the Department to seek better assessment and offer teaching feedback (and/ or mentoring) for adjunct faculty. Adjunct teaching is a significant component of the Department's total teaching, and as such, students are likely to benefit from improvements that may be had from such an effort. This could be done through classroom observations, use of student evaluations, and promotion of professional development opportunities offered by the College or the University.

#### **Standard F. Program Support**

- a. Number and capabilities of staff adequate to support mission and objectives
- b. Administrative support available to assist students and staff
- c. Facilities, equipment, and library capable of supporting program mission and vision



*Strengths:* The department's administrative specialist, Marianne Bischoff, and the lab manager, Sara Summers are an integral part of the Earth and Environmental Sciences department. The review team was impressed by the range of duties performed by Marianne and Sara.

Marianne's duties include helping students and visitors at the front desk, processing faculty travel claims, preparing hiring paperwork for student workers, assisting with equipment and office supply purchases, creating and distributing the department's eNewsletter and outreach flyers, entering data for the class schedule, working with the department chair to declare students' majors in CatTracks, maintaining records of the department's budget, and mentoring other administrative specialists as necessary. Marianne is proactive at helping the department and university, for example, with her work on the eNewsletter and sharing information and support among administrative staff. Sara's duties include preparing and organizing rock samples and mineral collections needed by many geology lab courses, assisting with field courses and field trips as needed, performing community outreach, assisting users with the department's equipment, leading safety training, supervising student workers, and teaching introductory level geoscience courses. Sara is relatively new to the department but appears to have integrated well and to be contributing significantly to program and student success. Anecdotally, her teaching is very well received by students.

*Areas for Improvement:* As evident in the description above, Marianne performs a wide range of duties that are crucial to the day-to-day operation of the department. However, Marianne is currently only hired at the 0.75 FTE level, which will likely become insufficient as the diversity and volume of her workload increase due to the expansion of the department and new initiatives/programs undertaken by the department (e.g. interdisciplinary environmental science degree program, increase in outreach and grant-related travels). Similarly, Sara is performing a variety of tasks involving instruction and lab maintenance. Since Sara only began work in January 2019, the department acknowledges that it is "still experimenting with her specific work assignments to find the best model in terms of providing broad support for the department's students and faculty." From the review team's observations, it is clear that the limited resources and time allocated to her position is insufficient for her to fulfill the department's instructional and lab maintenance needs simultaneously. In other words, as she devotes more of her time to teaching introductory labs and general education courses, she will have less time to maintain lab equipment and train students in their operations, and vice versa. This can potentially result in the underutilization or lack of access to the equipment (e.g. microwave digestion system, rock saw, fume hoods) in the best-case scenario, or result in bodily harm or costly repairs due to improper maintenance or insufficient training in the worst-case scenario. In fact, in the team's conversation with students, some geology students remarked that the department's ICP-OES machine has not been functioning properly, but they were not able to find anyone to repair the machine even though it is affecting their research. Thus, while the EES department and its programs are already outstanding even in the absence of some of the college's specialized equipment, we believe that the lack of access to equipment due to insufficient supervision and maintenance is potentially a missed opportunity and can hinder advancement in student and faculty research, which may in turn make it difficult for the department to fulfill its vision of being "the premier undergraduate Earth and environmental science program in Utah and the Intermountain West."

Another area for potential improvement is the department's operating budget. The committee was informed that the budget had not increased for several years (long enough that anecdotally people could not recall when it last changed). However, the department has recently added significantly to its number of majors, has made faculty hires, has incorporated HIEEs into the curriculum, and inflation has occurred. All of these activities require funding support.

Recommendations: The review team is cognizant of the limited resources available to the College of Science and the EES department. We applaud the development office's and the administration's ongoing efforts to secure funds from donors and explore industry partnerships to offset the cost of service contracts. However, given the school's emphasis on expanding HIEEs such as undergraduate research, internships, and field trips, the administrative and material support allocated to the department should keep pace with the growth in these initiatives. Firstly, the college and department may consider funding some student positions to help Marianne and Sara with routine tasks such as data entry, making copies, cleaning lab ware, and checking rock samples and mineral collections. This will enable Marianne and Sara to focus on more complex tasks (budget development, department equipment maintenance, teaching). Secondly, we encourage the college's departments to prioritize the significance of the college's high-end equipment (ICP-MS, XRF, ICP-OES, etc...) based on their frequency of use. Subsequently, the college administration and the departments should hire a dedicated college-wide instrument specialist who is responsible not only for maintaining, but also training and assisting students and faculty in the use of the frequently used equipment. This specialist would also oversee safety in these sophisticated laboratories, which is a crucial need. Thirdly, the college should work with other science departments and other colleges to explore the feasibility of other interdisciplinary support personnel who may be able to help with the EES department's emerging needs due to program expansion. For example, the EES department may share a technician with the Computer Science department who will be responsible for administering the geospatial analysis program's software licenses and server. As another example, the EES department may share a technician with the Engineering department who will be responsible for cleaning, maintaining, and troubleshooting the EES department's drones and surveying equipment. By delegating these routine tasks to technicians, students will have more access to equipment that can enhance their learning and research, while faculty members will have more time to focus on teaching, program development, research, and advising their students. Finally, the department is encouraged to seek an increase in their operational budget to offset increased costs from growth in the number of majors, faculty hires, implementation of HIEEs, inflation, and other factors.

#### **Standard G. Relationships with External Communities**

- a. Formal relationships with external communities of interest
- b. Roles and contributions are clearly defined
- c. External advisory committees meet and communicate regularly

Strengths: The EES department has an active departmental advisory council (EESAC) that meets twice a year. Some of its members also serve on the College of Science's advisory council. The EESAC provides

feedback on the quality of the EES graduates (which were extremely positive), offers recommendations regarding proposed curriculum and program changes, offers career advice to students and reviews their resumes, and informs students of employment, internship, and professional networking opportunities. In fact, one member of the EESAC commented that her organization is currently hosting nine student interns from the EES department. Students mentioned that the department's eNewsletter and interactions with faculty helped them in finding and securing internships. The review team's conversations with the EESAC yielded invaluable information about the region's labor market demand, as well as positive assessments of the department's program development efforts.

Areas for Improvement: The EESAC is an important source of internships for students who are interested in HIEEs. However, the department acknowledged that it has yet to develop a systematic way to assess HIEEs such as internships. The review team hopes that these assessment tools will eventually allow internship supervisors to provide quantitative feedback on the quality of the department's students.

Recommendations: Develop a systematic assessment plan for HIEEs such as internships. Aside from internships, the department may consider providing additional opportunities for students to interact with employers by planning events such as Earth Science Career Day (EES is already planning this), inviting industry guest speaker to present in classes, departmental seminars, or on special occasions (Earth Science Week).

## **Standard H: Program Summary**

- a. Program showed it implemented recommendations from previous review

Strengths: The most recent review of EES provided ten recommendations for improvement. The department has responded very well to the recommendations, and gave detailed documentation of the response in the current review. Several of the recommendations involved space and facilities. These needs have been met, in large part with the department's move to the excellent new Tracy Hall Science Center. The Center has modern, well-equipped classrooms, student workspaces, and lab facilities. It was recommended that the department include funds for course-release in external grants, and it appears this is now becoming standard practice. It was recommended that the department hire a lab manager, which has been done. The previous review recommended consideration of an AS degree related to Earth Science, which the department is now doing. This effort is perhaps a bit belated, but A.S. degrees at B.S. – granting institutions need to be implemented carefully. The department has thoroughly reviewed and modified its curriculum, which was recommended by the previous review committee. It was recommended that efforts be made to help majors complete their chemistry and physics requirements sooner. The department has made efforts in this area, but does still struggle with it – as do other institutions with similar entrance requirements and similar student bodies. This is a major challenge, and it is very positive that the department is aware of and acting to mitigate it. The review committee recommended using student majors as TAs and/or graders, which it is now doing within budget constraints. Lastly, the College has hired a new CSME director as was recommended.

Areas for Improvement: As stated in the introduction to this review and noted in the list of program summary strengths, overall the EES Department is outstanding and it has made many substantive improvements in the past several years. This Committee notes that some faculty still struggle with workload demands, which indicates that additional funding for reassigned time in external grants, a new lab manager, and use of TAs has only been partially successful at supporting the faculty. The Committee feels that the department's highly productive faculty would benefit from additional support in the way of reassigned time and help with laboratories, computing facilities, and analytical equipment. The new lab manager spends a great deal of time teaching and consequently has limited time to manage laboratory facilities. In addition, the ability of majors to complete math, chemistry, and physics requirements in a timely fashion is an ongoing problem that deserves continued attention both by the department and the College.

Recommendations: The Committee recommends that the Department hire an instrumentation specialist, perhaps in collaboration with other departments in the College or with other Colleges at WSU. As an alternative, the existing lab manager's workload could be re-structured to allow more time for laboratory support; however, this is likely to be less successful than hiring an instrumentation specialist due to the technical expertise and time required to maintain analytical equipment. It is also recommended that the College continue to pursue modification of the credit-hour-equivalent calculator so that it more accurately reflects the time the faculty spend teaching and implementing high-impact practices. However, it is noted that for this to have a positive impact, it must be structured correctly. Lastly, it is recommended that the department continue to seek options to help students complete math, physics, and chemistry requirements quickly, while at the same time ensuring their students' background in those subjects (in particular math) properly prepares them for their B.S. coursework and post-graduate career paths.