

Responses to 2017 EPEAB recommendations

The sections below contain the relevant sections from the 2017 EPEAB report (in *italic*), followed by the responses and/or updates from the local Engineering Physics Program Committee.

Budget Erosion

Issue 1 (general budget erosion): As discussed at last year's EPEAB, budget pressures at NMSU continue to be a major impediment to EP Program growth. The faculty is now performing most administrative support functions within the Department of Physics. In last-year's recommendations, EP coordination funding by University administration was explicitly called out as important to the EP Program's future. Nevertheless, this support does not seem likely in the near future. The status of student internships is also unchanged from last year. Internships, where students gain research experience in areas of relevance to their professional interests, are definitely correlated with employment potential and performance. This is a key element of experiential learning, and is important to ABET accreditation. The impetus here clearly rests with the faculty through professional contacts, their research grants, etc. This ties back to major points of discussion at last year's EPEAB and the discussion this year on Responses to the 2016 EPEAB recommendations. Specifically, enhancing research revenues in support of faculty and students.

Response 1:

With support from Provost Howard and optimistic budget outlooks at NMSU (i.e. no cuts next year), the NMSU budget committee has approved to fill the frozen administrative assistant line in the Department of Physics, and the department was able to hire Marisela Chavez starting on April 23, 2018. The new admin will remove significant clerical and administrative burdens from the physics faculty and the department head. Unfortunately, at this time, there is not much hope to fill yet another staff line, for a program coordinator for engineering physics.

The department head served on a faculty senate task force over the summer 2017 with the goal of institutionalizing the many forms of experiential learning that are happening on campus. His viewpoint was that we needed a taxonomy of experiential learning and a university-wide database, where students' advisors in CAASS can enter experiential learning completed by students. The draft from this taskforce was passed on to the Faculty Senate and the central administration, but it is not clear if such a central database to track experiential learning (such as internships, undergraduate research, etc) will be implemented or when. The task force also described examples of experiential learning and defined the term. It is not clear if this definition and the examples meet the approval of the Regents, who may have a different definition in mind.

Enhancing research opportunities on campus for NMSU students (especially undergraduates majoring in engineering physics) requires new faculty lines and significant start-up to build laboratories in Gardiner Hall. The department requested three faculty lines (nuclear physics, applied physics, geophysics) in the spring of 2017, but none was approved. The Department resubmitted the same faculty-line requests in the spring of 2018, but there has not yet been a decision on which requests may be approved, if any (as of 4/25/2018).

Increasing Research Revenue

Recommendations: As discussed last year, there are several avenues available to increase research revenue: **First**, increasing success at competing for government or private industry

research grants. **Second**, forming strategic partnerships with New Mexico government and industrial research institutions. **Third**, increasing competitiveness among EP students for nationally sponsored scholarships and fellowships. These avenues have a higher probability of success when the effort is shared with an engaged administration. With respect to the former, professors in Physics, as in the Engineering Departments, are putting significant effort into grant writing with demonstrated successes. How the “success rate” for grant proposals could be increased should be a strategic discussion among the Department Faculty. The “hit-rate” for success can always be improved by coordinated red-teaming reviews, for example. For the second point, regarding the government sector, the two largest National Laboratories in the US are in New Mexico. While there presently exists several examples of collaboration between Los Alamos and Sandia research staff and NMSU faculty, continued effort must be devoted to developing additional strategic alliances. Both Los Alamos and Sandia face staff demographics where approximately 25% of the work force will have to be replaced over the next 5 years (e.g. 2000 employees at Los Alamos). Significant hiring across all Laboratory functionalities (technical staff, support staff, etc.) will require significant recruiting. As noted last year, NMSU, specifically the EP Program, should position itself as an important skilled labor source for this purpose. This effort must be initiated at all levels of NMSU leadership – at the Department level, the College level, and especially from the Vice President for Research.

Regarding the third point, most of the National Laboratories, military research laboratories, and NASA centers sponsor scholarships and fellowships, some of which lead to co-op opportunities and/or permanent employment with the sponsoring agency. EP faculty would be well served to become fully aware of these opportunities and coordinate with one another and with stellar EP students for timely and well written application packages, recommendation letters, etc.

Response 2:

1. Unless additional faculty lines are approved (see above), it is not completely clear to how the success rate for proposals and the amount of research expenditures per tenure-track faculty member can be improved. In some fields, such as DoE Nuclear/High-Energy Physics, it is common to have only one funding source as part of a larger collaboration at a level determined by the agency. Increased funding in other areas likely would require significant investments by the institution, especially for infrastructure. The loss of EPSCoR status for New Mexico will be an additional impediment in the future. On the other hand, some of the funding agencies, i.e. DoE and DoD, saw significant increases (10% or more) in the latest federal budgets, but it is too early to determine what areas of research will benefit from those increases.
2. The department is actively seeking partnerships with the three federal labs in New Mexico, and also with similar labs elsewhere. Three faculty members (Fohntung, Cooper, Nakotte) have strong ties with Los Alamos; Vasiliev spent his sabbatical at Sandia; Zollner has applied for sabbatical funding at AFRL in Albuquerque. (The alliances for Zollner and Vasiliev are new.) Pate and Papavassiliou have grants based at Brookhaven and Fermilab, and they are actively looking for new alliances beyond PHENIX/RHIC. Our theorists in nuclear/high-energy physics (Burkardt, Engelhardt, Schlegel) are heavily engaged with the physics case for the new electron collider at JLab. Despite these connections and new partnerships, funding from these labs to NMSU is very limited, especially for our diverse group of international students who cannot work on many projects of interest to these labs and cannot fill their employment pipeline. Bringing more domestic graduate students to NMSU would

strengthen our ties with the labs, but this would require an institutional investment in the form of tuition waivers for graduate assistants, which are common at most of our peer institutions.

3. Single-PI proposals from NMSU tend to be less competitive due to a lack of research infrastructure. Therefore, many of our materials-science faculty (Kiefer, Nakotte, Fohtung, Vasiliev, Zollner) have recently formed strategic partnership with colleagues from other NMSU departments and/or other institutions in large-scale multi-million dollar research or educational proposals. Kiefer is a co-PI on a recently submitted \$16M DoE Energy Frontier Research Center (EFRC) on Topological Insulators (Lead Institution: UNM); Zollner and Kiefer are co-PIs on a \$2.5M DoE Advanced Manufacturing & Work Force Development proposal (Lead Institution: ASU); Nakotte and Fohtung are co-PIs on a \$3M NSSA collaborative research grant on the Catalytic Properties in Dichalcogenides (Lead Institution: UTEP); Kiefer, Nakotte, Fohtung and Vasiliev are co-PIs in the NMSU-led \$4.2M NSF Partnership for Research and Education (PREM) with the University of Nebraska – Lincoln Materials Research Science and Engineering Center (MRSEC); moreover, there have been multiple white papers involving the above mentioned faculty members. It should be noted, however, that funding rates for such collaborative research and education grants are often low.
4. To increase the competitiveness of our EP majors for national scholarships and fellowships (presumably that means to enter graduate school) would require more research experience and more competitive GRE scores. Many of our EP students apply for summer internships at national labs and/or Research Experience for Undergraduates (REUs) at other institutions, but only few of those have had success. Moreover, our undergraduates sometimes apply for national fellowships (like SMART from DoD), but the department is not always aware where such an application was successful, even by an occasional outstanding student. Since there is no recent example of a successful application, the motivation for students to submit such types of applications seems low. In a previous year, Zollner offered a course geared toward training students to be more competitive (including GRE prep, CV writing etc), but there was virtually no interest from students in such courses. Presumably, this is due to the fact the EP curriculum is already full, leaving little time and/or incentive to enroll in additional courses that are not part of the core curriculum.

Strategic Partnerships

There was notable disappointment on the waning of previous partnerships at Los Alamos and Sandia. These partnerships offer valuable student research opportunities, but are very “personality driven” and success in future partnerships will depend strongly on individual professors developing collaborations with scientific staff and groups within the National Laboratories. This can start as an application for research time at a NM-based National user facility like the Los Alamos Neutron Science Center (LANSCE) or the Center for Integrated Nanotechnologies (CINT) and then evolve from there.

Recommendation 1: A second avenue for an NMSU Strategic Alliance with Los Alamos is through the contract re-competition process slated to begin in 2018. Here, the NMSU administration should seek a strategic partnership with Los Alamos by exploring opportunities with the National Nuclear Security Administration (NNSA), and with New Mexico’s congressional delegation towards National Laboratory support of New Mexico institutions of

higher education through research and teaching partnerships. These, or similar institutional activities, are somewhat beyond EP Program or departmental responsibility, needing advocacy at the Vice President for Research level. Additionally, the department chairs can advocate for this within their colleges and at broader faculty forums.

Response 3:

Cooper, Nakotte and Fohtung have guest-scientist agreements with LANL. Moreover, Nakotte and Fohtung have successfully competed for research time at all three LANL user facilities, LANSCE, CINT and NHMFL. On occasion, their personal contacts with LANL researchers has led to occasional support for NMSU students, albeit typically only for graduate students with very few exceptions. As pointed out by the EPEAB, internships or other support for undergraduate students at the national labs requires a strategic partnership that is initiated at a higher administrative level.

The contract re-competition at Sandia and LANL is something that is handled by the Office of the Vice President of Research (VPR), and it is not a departmental matter. The past VPR was probably engaged in such discussions, just not in successful ones. NMSU has recently hired a new VPR with Dr. Luis A. Cifuentes, who had been Vice President for Research, Commercialization and Outreach at Texas A&M University, Corpus Christi. He has strong credentials, and there is optimism that he may be able to negotiate more favorable conditions for partnership contracts between NMSU and LANL or Sandia.

Recommendation 2: Identify ways to improve the tracking and reporting of student research opportunities offered and taken. Finally, one response from last-year's EPEAB report stood out: "The [National] labs tend to hire from institutions that have a stronger research infrastructure ... our students and faculty have a difficult time competing with prestigious out-of-state universities." It would be worthwhile for future EPEAB committees or Department of Physics advisory committees to consider this issue. From the EPEAB members own experiences at Los Alamos, Sandia, AFRL and NASA, there were many research venues where NMSU faculty or students provided a level of competence and value that was unsurpassed.

Response 4:

There have been some changes in committee assignments and it is possible that new personnel will be more proactive in tracking undergraduate research and similar experiences. It is disappointing, however, that the institution has not acted to implement a central database, where such information can be tracked. For the time being, the EP advisors will continue to keep records on research internship experiences of our students by asking them about such during the advising sessions at the end of each semester. We are well aware of the great benefits provided by research experiences at national labs or similar.

Administrative support burden

Recommendation: The EPEAB again recommends that the University administration recognize the return on investment afforded by the EP Program and find additional resources to improve EP Program coordination.

Response 5:

As outlined in Response 1, the hiring of Marisela Chavez as the new admin assistant should help to reduce some of the current administrative support burden for faculty. The issue of finding

support for an EP program coordinator had not been recently raised with the Colleges and/or the Provost's Office, because filling the frozen administrative assistant position was of higher priority. The university is expecting a budget increase for the upcoming year and we consider exploring possible options for a program coordinator after the ABET site visit.

Centralized Advising

Issue 2: A possible change to centralized campus-wide advising is underway at NMSU. While there are identified benefits for this centralization, the downside for the complex Engineering Efforts are underway to define faculty points of contact (POC) between students and centralized advisement.

Recommendation: These POC positions will retain important perspectives for student course scheduling, and their role should be formally recognized and defined as part of the University's centralized advisement rollout. A key aspect of this is for in-department academic advisors to retain the ability to place academic registrations holds on students to ensure they are on the right track. The best solution may be to retain academic advising for EP students within the EP Program Faculty. In short, while the EPEAB is not opposed to centralized academic advising for EP students, it should not be seen as a substitute for in-department advising.

Response 6:

The Center for Academic Advising and Student Support (CAASS) is in charge of centralized advising of all undergraduate students at NMSU. The Director of CAASS is Dr. Jennifer Hodges, who is very open to ideas on how to streamline and optimize the process. Upon start of its operations, CAASS initially attempted to adopt all of the advising previously done in departments. However, that backfired for the more complex curriculum program, such as EP, where CAASS personnel seemed overwhelmed. After such initial problems, Jennifer Hodges made the decision that individual programs can pose a departmental advising hold, therefore requiring students to be advised their departmental advisors and even removes the advising holds themselves, except for incoming freshman, student athletes and students on academic probation. EP is one of the programs with a departmental advising hold, and the Department Head (and the new admin) can remove these holds, except for the cases mentioned above where students will have only a hold by CAASS. Zollner, Pate and Nakotte serve as unofficial points-of-contacts (POCs) with CAASS. If a student has an advising hold by CAASS, the POCs can update CAASS personnel on course schedule proposed by the departmental advisors. CAASS does provide additional advising concerning financial aid, scholarship opportunities and similar. In general, the currently practiced process seems to work well for our EP students. However, there have been some isolated cases, where EP students went directly to CAASS and their departmental advising hold was removed (or never implemented) by CAASS personnel, without them ever talking to any of our departmental advisors, and those students were typically wrongly advised about what courses to take next.

Push for 120-credit hours

Issue: A proposal is under consideration requiring reduction in the minimum number of credit hours required for graduation for all programs at NMSU (and other NM Universities). The current EP requirement is 128 credits, which is proposed to be reduced to 120. This one-size-fits-all proposition is purportedly directed toward making any degree achievable in four years.

Recommendation: As this situation continues to work itself out, the EPEAB continues to strongly recommend against deleting any core engineering or science requirements from the curricula for the various Engineering Physics disciplines.

Response 7:

As for most engineering disciplines, a reduction to 120 credits for EP for any of the concentrations cannot be accomplished without endangering program accreditation and program quality as long the state-wide GenEd and the NMSU Viewing the Wider World (VWW) requirements remain the same. There are university- and state-wide task forces that are charged to explore how these requirements should be changed, but there is no plan of action so far. We will continue to resist attempts to delete or change any of the EP core curriculum for the sole purpose of reducing credit requirements for graduation.

Upcoming ABET re-accreditation

Issue: The EP Program will be audited for regular re-accreditation in the Fall of 2018.

Overall, the EPEAB feels that the NMSU EP Program is well positioned for success in the upcoming re-accreditation audit. In addition to addressing the specific threats and opportunities highlighted above, the EPEAB offers the following minor observations that will help with the upcoming re-accreditation effort.

1. Course designations: Ensure that for all EP tracks, that course designations are clear to ABET prior to the audit. In some cases, it is not always clear when a specific course is a physics course or an engineering course. One example of this is the accounting of PHYS 451 (which employs a classic physics textbook) as an engineering course.

2. Experiential Learning: Experiential Learning is a strategic focus at NMSU. ABET outcomes are strongly linked to elements of experiential learning. An especially effective component of undergraduate experiential learning that is valued by prospective employers is student participation in internships. Ensure that this element is highlighted with examples in the ABET self-study report. Also, continue to find means to expand, support, enable, and track EP student internship opportunities.

3. Readiness for change to ABET outcomes: In 2019, ABET will change its outcomes assessment process, moving from the list of 11 items (a. through k.) to seven focus areas. Careful attention will be paid to outcomes definitions. Ensure that the current crosswalk of how each element is currently met is consistent with the new focus areas, and that records are kept to demonstrate those outcomes.

Response 8:

Program Outcomes Assessment. As part of the preparation, the EP Program Committee re-evaluated the Program Outcomes Assessment matrix and the assessment tools used in different courses, as well as whether courses should be designated as science or engineering courses. Details on those changes will be provided at the 2018 EPEAB meeting.

Experiential Learning / Capstones. We plan to add a section on capstone experiences into our Self Study Report (SSR), once we get information on capstones with EP-student involvement from our engineering colleagues. As aside, a more recent concern is that there is some discussion within the university whether all of the engineering capstone would qualify for ‘experiential learning’ that is strongly promoted by the university. Some faculty and administrators have

argued that ‘experiential learning’ shouldn’t be administered as a course but has to be outside of the curriculum (obviously, this would increase the load for students).

Change of ABET Outcomes. ABET has not yet officially published a new Program Outcomes matrix, although some drafts have been floated. Since the SSR is due with ABET on July 1, 2018, it is very unlikely that our SSR will need to provide a discussion on correlations between ‘old’ and ‘new’ Program Outcomes.

The Engineering Physics (EP) Program Committee is confident that we will be ready for ABET re-accreditation in Fall of 2018.