

Eight-Year Program Review IBHE Report Summary: see attached Resources page and the EIU report archive: <https://www.eiu.edu/assess/archivepr.php>

PROGRAM REVIEW REPORT SUMMARY

1. **Reporting Institution: Eastern Illinois University**

2. **Program Reviewed** B.S. Biochemistry

3. **Date** August 10, 2026

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5. **OVERVIEW**

The overall mission of EIU's Biochemistry BS program is to prepare graduates with a comprehensive background in biochemistry, sufficient to prepare them for pursuit of higher degrees (including professional health programs) and/or employment fields of chemistry, biochemistry, or health professions. This mission reflects that of EIU's, where students refine their abilities to reason and communicate, learn methods of rigorous inquiry, and engage in faculty scholarship. In IL, EIU numbers 1 of 53 institutions with BS Biochemistry programs, but only 1 of 10 public institutions (and 1 of 6 without a PhD program). EIU's program stands out for its communication component (including a seminar series), as well as equally strong emphases on teaching and research at a high levels. Six faculty have been recognized with teaching awards, and currently four (57%) have significant external grants (totaling over \$800K). Of majors during this review, 91% did at least 1 semester of research, 52% have presented their work at a state, regional, or national meeting, and 20% of majors are co-authors on a peer-reviewed publication. Student learning objectives include (1) understanding the fundamental principles and applications in all subdisciplines of chemistry, (2) executing experiments in chemistry, (3) critically analyzing data, (4,5) utilizing computer applications and chemical databases, (6) generating new knowledge and data in the field, (7) communicating effectively in speaking and writing, and (8) awareness / practice in working safely in labs. Our students seek to have a impactful careers in the chemistry or biomedical realm, either directly or after pursuing a MS, PhD, MD, PharmD, DVM, or OD. Significant changes to the program include, in 2019, splitting off a separate BS Biochemistry degree (as opposed to a concentration of the BS Chemistry degree) and creation of an accelerated BS/MS track. More recently, in AY24-25, wide-scale curricular revision included redesign of the year-long physical chemistry course (as an introductory and advanced sequence as opposed to a thermodynamics/kinetics and quantum chemistry course), relaxation of the math and physics co-requirements, and design of health sciences biochemistry degree. Significant changes in students include an increased percentage of transfer students (70% of total), a decline in math / critical thinking abilities, increased rates of noncompletion of assignments / nonengagement in classes, and increased behavioral and mental difficulties. Recent participation of CHM 1310 in EIU's DFW initiative hopefully will promote increased student success. Plans for a new science building (to host chemistry and biology departments) are at the bidding stage.

6. MAJOR FINDINGS AND RECOMMENDATIONS

a. Description and assessment of any major changes in the program:

(1) Changes in the overall discipline or field. In 2023, the American Chemical Society's Committee on Professional Training (CPT) revised their ACS-accreditation guidelines, which EIU's BS Biochemistry, Biochemistry concentration seeks to adhere to. Major changes included more freedom in course work; emphasis on polymers, macro-molecules, and nanoscience (MSN); and 3 levels of compliance. The latter makes it possible to reduce some of the required co-courses - the second math course does not need to be Calculus II but can be Statistics or Data Science, and algebra-based physics is acceptable. The field continues to become more interdisciplinary as well as becoming increasingly focused on special topics, such as chemical biology, metabolomics, and single cell functional studies. Additional changes include the increased number of open-access journals, use of AI and technology in all aspects, and increased regulations and consolidation within the chemistry industry (especially in the pharmaceutical sector). The continued rise of biomolecules as medicines (over traditional small-molecules), as well as genetic engineering CRISPR technology, and focus on mitochondrial therapy, increases the need for biochemists. In fact, 3 of the past 7 Nobel prizes in Chemistry have gone to biochemists.

(2) Student demand. While EIU's undergraduate enrollment has grown modestly (by ~13%) over the 8 year period (with a dip in the middle), the overall percentage of all EIU students taking chemistry classes remains around 13%. And while the number of majors in all chemistry programs has decreased from a peak in Fall 2019, the average percentage pursuing biochemistry has increased from 24% to 36%. Student participation in chemistry research has been increasing, and to some degree not all biochemistry majors can be accommodated into a biochemistry research group, especially as these groups also attract biology majors more than the other 4 subdisciplines.

(3) Societal needs. As mentioned in item 1, medicinal diagnostics and treatments are increasingly focusing on biochemical avenues, so that the need for researchers and lab personnel is increasing as well. The Bureau of Labor Statistics predicts growth of 6% from 2024-2034 for biochemists and biophysicists, and Vision Research Reports suggests a 12% growth rate for the US biotech sector from 2023 to 2033. The demand for Health Professionals is also predicted to continue to increase.

(4) Institutional context for offering the degree. Biochemistry is a central and integral part of EIU's teaching mission, for not only providing biochemistry majors, but also in preparing many pre-health profession tracks (PreMed, PreVet, PrePharm, PrePA, PreOpt). Courses in the biochemistry program continue to contribute to all the University learning goals, in the areas of critical thinking (gathering, presenting, and interpreting data; proposing, testing, and defending hypotheses); writing and critical reading; speaking and listening; quantitative reasoning; and responsible citizenship. The biochemistry program continues to be one of the most active and productive (in terms of external grants, scholarship, and student presentation of research) units in both the College and University, especially with the hire of a prolific biochemistry faculty member who has now attained tenure.

(5) Other elements appropriate to the discipline in question. While tenure/tenure-track faculty numbers have decreased from 11 to 7, the Department now has had at least one faculty member in each of the 5 standard subdisciplines for the past two years, and had 4 successful hires in this review period (though one moved on). The percentage of majors presenting their research in the past 4 years has increased to 70%, and each year the new biochemistry faculty member takes his entire research group to the ACS National Meeting (biggest meeting in our discipline), as well as both biochemists sending individual students to present at the American Society of Biochemistry and Molecular Biology annual meetings. In 2022, the ACS CPT re-accredited the BS degree in the department, citing as strengths increased skills development in CHM 3500 Introduction to Chemistry Research (a required course for the major), tracking of graduates, and appropriate MSN coverage, while noting as items needing attention including faculty numbers, resources, and aging instrumentation. A significant internal change was the merging of the College of Sciences (11 departments) with the College of Arts and Humanities (9 departments) to

give a new College of Liberal Arts and Sciences. While the new structure meant there was only 1 dean for the College, 2 associate deans were kept, one for each of the previous colleges. Overall this change has not significantly impacted the operation of or delivery of the curriculum of the Dept, though with revenue situations the University administration is more strongly adhering to courses meeting established enrollment minima to run, which is likely to result in some upper level courses being offered on a more limited basis (once every other year, instead of annually, such as CHM 3455 biochemistry lab). A second round of reorganization did not affect this Department. Rising subscription cost have led to the cancellation of nearly all chemistry journal subscriptions except for the ACS package, but this is offset somewhat by a markable improvement in interlibrary loan efficiency. Also offsetting the decrease in journal subscription is the continued subscription to SciFinder, as well the ability to provide ChemDraw access to active EIU students, though the increasing price of the latter is becoming problematic.

b. Description of major findings and recommendations, including evidence of learning outcomes and identification of opportunities for program improvement:

Over the 8 year review period, a total of 21 students matriculated with a degree in biochemistry (11 with the BS Biochemistry degree) - with an average of 2.6 students graduating per academic year. AY23-24 showed a new peak in these numbers, with 6 students matriculating. Most incoming freshmen were able to complete their studies in 8 semesters, and transfer students usually complete the degree in about 2 years. There is still significant attrition of majors within the freshman and sophomore years, in part due to struggles with the math in general chemistry and the conceptual nature of organic chemistry. In 2023, the Dept implemented administration of a MUST (Math-Up Skills Test) exam on the first day of CHM1310 General Chemistry I. While the test results were not used to administratively remove students from the course, students did receive their score as well as data on the success rates based on scorings, with the advice to take either CHM 1040G World of Chemistry or MAT 1271 College, or both, if their scores were low. Additionally a university-wide DFW initiative, targeting general education courses with significant DFW ratios, was implemented for AY24-25, which hopes to identify challenges encountered by students in these courses as well as strategies to improve completion rates.

With respect to learning outcomes for the degree, data suggests the students did well at learning the fundamental principles and applications, as evidenced by between 40-60% of the students taking the MFT scoring at or above the 50th percentile in the 4 subdisciplines, and 70% scoring at or above the 50th percentile overall. (The lowest areas were inorganic, which the biochemistry concentration only took one course in, and organic, which was typically the most distant course taken (in sophomore year) with respect to when they took the test). Additionally the average student response when asked about this item, on a 5pt scale where 5= strongly agree and 1=strongly disagree, was 4.5 on the exit survey and 4.0 on alumni surveys (sent out at 3 and 8year periods). Average scores of 4.0 or higher were achieved for the remaining 6 learning objectives, with utilization of information sources the highest (4.7) and communication the lowest (3.9). The individual course-related benchmarks had at least 60% of the students achieving the desired outcome, with it going to over 90% in some cases.

19 of the students (over 90%) participated in at least one semester of research, with the average student doing 2.3 semesters of research, increasing to an average of 2.7 semesters over the past 2 years. This is directly attributable to the three newer faculty members who have established active research groups of large size for EIU (>5 students), as well as their ability to strongly recruit students they interact with. 50% of BS matriculates presented at least once at a regional/national chemistry meeting, and 20% were co-authors on a peer-reviewed journal article. The low number of the latter is somewhat reflective of newer faculty taking a bit longer to get their research group to the point of publication.

Of the matriculates, 33% went on to pursue a MS degree at EIU, 29% went directly into the workforce in a biochemical field, 14% went to pursue a PhD in the field (at Universities of Washington, Georgia, and Washington University in St. Louis), and 14% went to pursue a MD degree. At this point,

all matriculates are either still in their program/position, or have successfully completed their degree.

c. Description of actions taken since the last review, including instructional resources and practices, and curricular changes:

The BS Biochemistry assessment plan was introduced in 2020, with new items added to specifically address students participating in research and presenting/publishing their work, and awareness/practice in chemical safety (as applies to working in lab). In addition, 9 courses in the major had one or more benchmarks specifically tied into the plan (so for instance, each student in CHM3915 Physical Chem lab was evaluated on their ability to critically analyze data; utilize computer applications in a spreadsheet / plotting program, in a word processing software, and in a computational chemistry package; and their communicate effectively in writing). In 2022, the form was revised to include the raw data (individual scores listed per student), to better track within a degree program.

As mentioned above, the BS Biochemistry curriculum was recently adjusted in response to laxer ACS CPT guidelines. This should help with retention and recruitment to the major, especially as Calculus II is no longer absolutely required (which also will help attract vs the Biology major, which only requires Calculus I). CHM 3915 Physical Chemistry lab is also not specifically required (can count as an elective).

Due to COVID, we introduced a computational experiment into both CHM1315 and CHM1415 Gen Chem I & II labs (we kept part of the in-person lab experience, with students alternating a week in the lab and a week doing an online experiment); we have kept these post-pandemic to give students an earlier exposure to this increasingly important area. In addition, CHM 3780 Instrumental Analysis and CHM 3915 Physical Chemistry Lab introduced coding and additional computational / machine learning experiments. Additional curricular changes include greater emphasis on current issues in the biochemistry courses (for instance, vaccines and RNA viruses related to COVID), more inclusion of CURE (Course-based Undergraduate Research Experience) experiments in CHM 3455 Biochemistry lab; and the removal of CHM 3460 Biochemistry I as a pre-requisite for CHM 4860 Advanced Biochem, as well as relaxing the CHM 2840 Organic II requirement to be pre- or co-requisite. The last will help with student completion issues. Additionally the physical chemistry year-long sequence was adjusted from a thermodynamics & kinetics 1st semester course followed by quantum in the 2nd semester, to be a Foundations course and then an Advanced course. This will ensure that BS Biochem majors who only take 1 physical chemistry course will now have exposure to all areas of the field.

The new Health Sciences concentration of the major implicitly includes the courses required for admission to pre-health schools, and reduces the amount of required chemistry courses (only 1 course each in analytical, inorganic, and physical, along with 6hrs of electives which could be chemistry or biology), and has "Health" in the degree title. We believe this should significantly attract new majors and thus boost the number of overall majors.

d. Description of actions to be taken as a result of this review, including instructional resources and practices, and curricular changes.

The majority of the curricular changes will be made to take advantage of the flexibility of the ACS CPT guidelines, as well as to make a pathway for students without a full BS chemistry degree to enter into our MS program. These changes include (1) removing the CHM 4900 Inorganic II pre-requisite for CHM 4915 Advanced Lab; (2) and giving the option of taking that MAT 2250 Elementary Statistics or CSM 2170 Computer Science I in place of MAT 2442 Calculus II, 1. Additionally increased coverage of polymers will be introduced throughout the discipline. A second change will be reducing the frequency of certain upper-level course offerings (eg, CHM 4900, 3920, etc) to once every other year (instead of once a year), due to low courses enrollment issues. The same low enrollment issue means it is likely that CHM 3450 Biochem I will no longer be offered in the summer, but this should not impact our Biochem majors as significantly as it does the non-CHM pre-health students (who delay their chemistry).

Comments from the College Dean:

The BS in Biochemistry major continues to be a successful program at EIU. Enrollment in the program has increased since the short progress report of 2021 and has averaged around 15 majors per year. At the state and national levels, demand for students with training in biochemistry remains strong and the Bureau of Labor Statistics predicts continued growth in the field. In addition to serving Biochemistry majors, the program's coursework also contributes to student preparation in EIU's pre-Health profession tracks. The department continues to use assessment and enrollment data to inform curricular decisions. This has resulted in several changes since the 2021 report that are designed to improve student progress towards graduation. The department has also responded to ACS CPT guidelines leading to modifications in course sequencing. The program has also added a multi-disciplinary Health Sciences concentration that includes courses required for admission to pre-Health schools. Biochemistry continues with a strong focus on student research: the percentage of majors presenting their research at local, statewide, and national venues in the past four years has increased to 70%.

We recommend a decision of **Program in Good Standing**.

VPAA Decision:

- ☒ Program in good standing
- ☐ Program flagged for priority review
- ☐ Program enrollment suspended

VPAA Explanation:

Biochemistry BS (400501)

The summary above describes a B.S. in Biochemistry program that continually adapts to student needs. Following the significant changes in requirements prescribed by the American Chemical Society's Committee on Professional Training, the program has removed potential barriers to entry and completion of the degree. The program attracts a wide range of students who plan to pursue research in industry, academic research, biomedicine, medicine, biotech, and careers in healthcare that are projected to be in increasingly high demand. Assessment of the major has taken shape around concerted efforts to improve the readiness in math for majors, modernized course offerings emphasizing computational and machine learning, and very high participation rates in mentored undergraduate research, with 90% of students conducting at least a semester of research and half of students presenting at a regional or national conference. The new Health Sciences option in the major increases the visibility and accessibility of the biochemistry major for the many students who are pre-healthcare.