

1. **Reporting Institution:** Eastern Illinois University
2. **Program Reviewed:** B.S. in Clinical Laboratory Science, Category 51.001
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5. **Overview**

The B.S. in Clinical Laboratory Science (CLS) is a 4-year major at Eastern Illinois University (EIU) that is in its 20th year since its inception. Beginning in Fall 1998, required coursework for the B.S. degree includes courses in the general education core as well as coursework in Biology, Chemistry, and Physics. Students fulfill their clinical component during their final year at one of our five affiliated hospitals. The Pre-Health Professions Advisor typically serves as the Program Director in coordinating this affiliation. In the absence of the Pre-Health Professions Advisor, the Chair appoints a faculty member to coordinate this program. This allows program costs to be held at a minimum while still fulfilling the academic requirements of students in the CLS major.

CLS mission and Relationship to EIU mission and mission of graduate education

The mission of the CLS program is to provide a superior educational experience for our undergraduate students. The program prepares students for the clinical environment by providing them with the ability to reason and to communicate clearly, to perform laboratory skills, and obtain analytical skills. The students are guided by EIU faculty, known for excellence in teaching and research. The CLS program is committed to diversity and utilizes applied learning to lead students to their academic goals.

This mission dovetails with both the mission statement of Eastern Illinois University and of the hospital affiliates where students complete their degree requirements. The EIU mission states the following: Eastern Illinois University is a public comprehensive university that offers superior, accessible undergraduate and graduate education. Students learn the methods and results of free and rigorous inquiry in the arts, humanities, sciences, and professions, guided by a faculty known for its excellence in teaching, research, creative activity, and service. The University community is committed to diversity and inclusion and fosters opportunities for student-faculty scholarship and applied learning experiences within a student-centered campus culture. Throughout their education, students refine their abilities to reason and to communicate clearly so as to become responsible citizens and leaders.

Similar programs in Illinois and how do we distinguish them from EIU

There are four other universities in the state of Illinois that provide a baccalaureate degree in Clinical Laboratory Science: Illinois State University, University of Illinois-Springfield, Northern Illinois University and Western Illinois University. All utilize in the 3+1 format and have similar course requirements. Illinois State University and Northern Illinois University are NAACLS affiliates and provide all classroom educational components on their campuses followed by students completing the laboratory component during a final semester at hospital affiliates. This differs from the Eastern educational modality in which

we provide general and basic science education, followed by our students obtaining their clinical training along with their laboratory component at a hospital affiliate.

Hospital affiliates for both Illinois State University and the University of Illinois – Springfield are centrally located in Illinois. Northern Illinois University in contrast utilizes primarily Chicago and northern Illinois clinical sites. At EIU we have developed agreements with affiliate hospitals at sites throughout Illinois (Peoria, Hines, Chicago, and Springfield) as well as in Vincennes, Indiana.

Plans for the future

We are anticipating modifying the current title of the program, Clinical Laboratory Science, to Medical Laboratory Science to acknowledge the changes made at the national level.

The university initiated a re-vitalization program in AY17, and pre-health (including CLS) is anticipated to play a large role in this process. Information about pre-health options is currently buried in the Biological Sciences website. We are hoping that all pre-health programs, including CLS, will have a larger presence as a result of this process. This program is currently highlighted on the Biological Sciences homepage with the byline” “Students who graduate from the Clinical Laboratory Science program have a 95% placement rate”.

We are currently in talks the local hospital (Sarah Bush Lincoln) about developing a CLS program that could be used to expand our program. We are currently in the cost assessment phase, with money being sought by the hospital to determine feasibility of such a program. This would greatly enhance our ability to train clinical laboratory scientists.

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

1. Changes in overall discipline or field- The field of clinical laboratory science continues to implement new technologies to diagnose physiological imbalances faster and more accurately. There continues to be a deficit in the number of trained clinical laboratory scientists to meet the demand (described below).

2. Student demand/societal needs- Student demand still lags behind societal needs. Employment in the field has remained near 100%, Hence, there is a need to increase the number of CLS majors to meet the demand. At EIU, the number of CLS majors has increased 2-fold since our last review, even while overall enrollment has fallen by greater than 2-fold during this period.

3. Enrollments and Degree production- Enrollment in the CLS program at EIU increased from 18 to 31 between in AY10 and AY16. However, the number of students completing our program has remained constant (see chart below). This discrepancy is due to 2 factors: 1) less qualified students are joining the program but fail to be accepted by affiliate hospitals and 2) EIU experienced a rise in international student populations, whom affiliate hospitals do not accept.

As expected, the cost of a CLS degree has increased for all institutions since 2010, but EIU currently has the least expensive tuition costs (see item #4 below).

4. AY16 enrollment, degrees conferred and program costs for Illinois institutions offering CLS degrees

Program	Enrollment	Degrees conferred	Dollars/Credit Hrs	Inst/Total
Eastern Illinois	31 (18)*	5 (5)*	283	1.0
Illinois State	112 (96)	28 (29)	394	1.23
Northern Illinois	59 (43)	27 (27)	308	1.16
U of I Springfield	41 (34)	13 (8)	313	1.11
Western Illinois	11(12)	0 (1)	294	1.03

*number in parenthesis are AY16 enrollment/ degree conferred numbers

5. Occupational projections

According to the 2016-2017 Occupational Outlook Handbook by the Bureau of labor Statistics <https://www.bls.gov/ooh/>, clinical laboratory scientist positions are expected to grow 13% between 2016 and 2026 (projected increase of 47K positions from the current 335K positions) due to an increase in the aging population and a greater need to diagnose medical conditions, such as cancer or type 2 diabetes, through laboratory procedures. Current median yearly salary is \$61K.

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

Several assessment tools were developed to assess our CLS program. Some of these tools were used alternate years and others every year.

The addition of several assessment tools has allowed us to measure student understanding of critical content important for the field of clinical laboratory science, especially in the areas of molecular biology and immunology. These also allowed assessment of use of critical thinking to analyze data. The CLS majors tended to do well in these assessments. Student surveys of graduating seniors indicate that 100% believe that they have good to very good understanding of molecular biology. The national certification exam pass rate of 100% suggest the quality of the program. All graduating seniors find jobs in the field immediately upon graduation, often with several job offers and/or sign-on bonuses. Therefore, the CLS major remains one that produces highly qualified individuals that easily meld into the work force.

Summary of assessment:

- 100% of CLS students (35/35) accepted into affiliate hospitals passed the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) exam since 2010
- 100% (24/24) of CLS students assessed received a C or better in BIO3120 Molecular and Cellular Biology
- In the last 10 years ~35 students out of 40 (88%) accepted to affiliate hospitals have successfully completed degrees.
- 95% (22/23) received at least a C in BIO3210 Immunology
- 100% (14/14) demonstrated the quantitative and analytical skills to analyze data sets generated by biological experiments and surveys
- 100% (17/17) graduating seniors agree or strongly agree that they have an understanding of molecular and cell biology

- In the last 10 years, 88% (35/40) of students accepted into an affiliate hospital completed the program and degree. Two of these students withdrew for personal reasons, and 2 were unable to pass coursework.
- 89% (31/35) were able to satisfactorily identify different experimental approaches and were able to extract some information from descriptive passages and present results
- 100% of graduating seniors agree or strongly agree that the program enhanced their critical thinking skills
- 86% (6/7) of students indicated that they had an acceptable to superior range of demonstrated writing skills
- Writing skills of CLS students assessed by required writing sample submissions each year while at EIU were consistently above of the University or Biological Sciences average. For examples, in AY17 (9 CLS submissions): CLS students= 3.6/4.0 EIU= 3.44, BIO= 3.46.
- Club involvement is low, with only 2 of 11 students polled indicating club membership since 2016.

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

Since the last programmatic review in FY10, we have expanded our number of hospital affiliates, introduced several curricular changes, and emphasized assessment tools to evaluate program success.

Hospital affiliates:

FY12, EIU partnered with a fifth hospital, St. Margaret Mercy Hospital in Hammond, Indiana, to expand opportunities for hospital training by students.

Curricular changes:

- **Introductory biology course sequence expanded in content:** Prior to FA17, CLS students were required to complete an introductory biology course sequence that included one semester of a majors general biology course (BIO1100) and an animal diversity course (BIO1300G). Due to a restructuring of coursework offered in the BIO major, the animal diversity course was replaced by an animal/plant diversity course (BIO1550G), providing a broader overview of biological diversity.
- **Molecular and Cellular Biology-** In FY11, the Biological Sciences Department merged and modified the Molecular and Cell Biology lecture and lab courses (BIO 3100 and BIO 3101) into one course (BIO 3120) to provide more cohesiveness and to allow experiments and lecture to be interwoven.
- **Anatomy and physiology** options expanded: Prior to FY15, CLS students were required to complete either Animal Physiology (BIO3520) or Human Physiology (BIO2001G) to fulfill the physiology component in the core course sequence. In FY15, our Human Anatomy (BIO2200) course was phased out, and replaced with a two-semester sequence of Anatomy and Physiology I and II (BIO2210 and BIO2220). CLS students now have the option of taking Animal Physiology (BIO3520) or Human Physiology (BIO2001G) or the A&P and II sequence (with the second semester counting toward electives). Most CLS students now take the A&P sequence, which provide them with a holistic view of the human body.

Assessment:

Program assessment was emphasized since our last program review. In FY10, an assessment rubric was developed and implemented for achievement of learning goals by CLS students enrolled in the required Molecular and Cellular Biology (BIO 3120) course. In FY11, a second rubric was developed and implemented for our Immunology (BIO 3210) course. In FY13, a laboratory technique rubric was included to assess students' ability to perform basic techniques. This rubric was designed to assess quantitative and analytical skills to analyze data sets generated by biological experiments and surveys. In FY15, additional assessment tools were added: assessment of global citizenship and demonstrate ethical behavior.

Program coordination:

The Pre-Health Professions Advisor/CLS Program Coordinator was hired in Fall 2007, which provided the goals of allowing faculty members to devote time to teaching, research and service as well as providing a resource for students to more easily access information on health. This advisor served as a point person for the Clinical Laboratory Science program to bring hospital laboratory directors to EIU's campus and advise students in coursework, promote the CLS program, provide guidance for applying to hospitals, and maintain interactions with students while away at their clinical rotations. However, due to budget issues at EIU stemming from reduced enrollment and uncertain state funding, the individual in this position was not replaced upon retirement in FY16 and remains unfilled. The CLS coordinator position has been assigned to faculty members to assure that the goals of the program continue to be met, including communications with affiliate hospitals.

Program recruitment:

As of FY16, the CLS program has been highlighted in BIO1150 Biology Forum (~140 students /yr), a course required for Biology majors, to attract BIO major students to this field. This has served to generate interest from students each semester.

6.d. Description of actions to be taken because of this review, including instructional resource and practices, and curricular changes.

Unfortunately, increase numbers of CLS majors at EIU over the past 8 years did not result in more students being accepted into hospital programs. This was apparently due to more students in the program with lower academic credentials, rather than reaching saturation with affiliate hospitals. Based on this analysis, current students the CLS major are warned during advising sessions that a GPA of 3.2 or higher is needed to be competitive for hospital placement.

It was noted that few students engage in club activities, a marker of engagement in the EIU community. In response, an effort is made to encourage students to engage in departmental/university/community activities while on EIU's campus.

In response to this issue, we have ramped up our profile at EIU to attract more students into the program by including a description of this field in our required majors course Biology Forum, highlighted EIU's high CLS job placement rate and include this field in discussions with students when considering pre-health options.

7 Responses to Institution – Assigned Issues

7.1 What strategies has the department implemented that will support the Integrative Learning Experience at EIU?

The Clinical Laboratory Science program has built-in components that integrate classroom scientific techniques needed to be utilized in the clinical laboratory rotation. Coursework in biology incorporates knowledge in biology, chemistry and mathematics in nearly all courses taken by the CLS students. All ten required science courses (and nearly all elective science courses) also have laboratory components in which students learn techniques and skills to understand not only the theoretical background of experiments, but also the practical use of equipment and procedures. In the Molecular & Cellular Biology and Immunology coursework, students learn micropipetting, protein analysis, DNA and RNA purification, cell culture techniques, gel electrophoresis, cloning, polymerase chain reaction, and production and testing of antibodies in mice.

7.2 What one unique, noteworthy activity is the department involved in that will enable the IBHE to distinguish its program from other similar programs in the state?

EIU delivers a high quality program with a nearly 100% job placement immediately post-graduation rate a cost lower than that of sister Illinois institutions. The full year of training at hospital affiliates (instead of a single semester as with some sister institutions) provides strong on-the-job training and credentials. Our program offers the greatest diversity of hospital affiliates with opportunities to the north, south, east and west.

7.3 How is the program integrated with the biological sciences and other related health professions areas?

Students in the Clinical Laboratory Science program share the same Pre-Health Professions Advisor as well as a significant number of classes with biology students in the coursework(see below). Importantly, all courses are taken (required or as electives) by other Bio majors, making the cost to run the program minimal.

- BIO 1500 General Biology I
- BIO 1550 General Biology II
- *BIO 2210 Anatomy and Physiology I
- *BIO 2220 Anatomy and Physiology II
- BIO 3120 Molecular and Cellular Biology
- BIO 3210 Immunology
- BIO 3300 General Microbiology
- *BIO 3520 Animal Physiology
- BIO 3200 Genetics
- *BIO 3624 Histology
- BIO 3700 Parasitology
- *BIO 4836 Pathogenic Microbiology
- CHM 1310 General Chemistry I Lecture
- CHM 1315 General Chemistry I Lab
- CHM 1410 General Chemistry II Lecture
- CHM 1415 General Chemistry II Lab
- CHM 2430 Organic Chemistry I Lecture
- CHM 2435 Organic Chemistry I Lab
- CHM 2440 Organic Chemistry II Lecture
- CHM 2445 Organic Chemistry II Lab
- MAT 1271 College Algebra
- MAT 2250 Statistics

PHY 1151 Physics I Lecture
PHY 1152 Physics I Lab
PHY 1161 Physics II Lecture
PHY 1162 Physics II Lab

* Elective course (2-3 courses required)

In addition to the courses stated above, clinical laboratory science students are required to adhere to the same general education classes required by Eastern Illinois University students.

7.4 How is the program affected by changes in the health care industry that impact cooperating hospital and their agreements with EIU's CLS program?

As mentioned earlier, there will continue to be a strong need for future Clinical Laboratory Scientists. Our post-graduation placement rate in the job market is currently 95%, with frequent stories from graduating students describing multiple offers and signing bonuses. This need is a result of a variety of factors including: the aging of America, population growth, and increased need and complexity of laboratory tests. Also, contributing to the need for additional clinical scientists is the projection that approximately 25% of the current clinical scientists are expected to retire in the next 10 years. There is a desire on behalf of our students to pursue Clinical Laboratory Science and a real need for them in the work force.

7.5 How does the program ensure that the students continue to identify with EIU and work toward the academic goals of EIU during their clinical year?

The Department of Biological Sciences makes efforts to include CLS student in the EIU community during their year at affiliate hospitals. Students have full access to privileges provided to all EIU students, including library access with the ability to obtain books and research articles through affiliate universities without charge, and discount tickets to university sponsored events. The Department of Biological Sciences included all CLS students on announcements regarding seminars and special events in the department. Grades earned from clinical rotations at affiliate hospitals are transcribed into coursework at EIU and are included on each student's EIU transcript. Directors from all five affiliate hospitals visit EIU on a date arranged through the CLS coordinator so that students can explore this career as well as meet with directors to gain insight the application process. Finally, students typically are not finished until mid-summer with their clinical rotation, yet many participate in the May commencement ceremonies.

Dean's Comments

This is a highly successful program, and because its curriculum overlaps that of other majors it is cost-effective from the institutional point of view. The growing demand in all health related areas is prompting EIU to emphasize programs such as Clinical Laboratory Science, and I anticipate growth in this major over the new few years. As funding allows we will fill the Health Advisor position which will add additional recruitment focus for the program.

Provost's Comments

While the observed enrollments in the program are below the IBHE guidelines, the program and its enrollment are consistent with expectations of accreditors, program rigor, and placement availability. For this reason, the Office of Academic Affairs submitted a formal justification to the IBHE in Fall 2017. Additionally, the program's core curriculum are situated, or embedded, in related STEM fields and as such the program is efficient. Further, the program attracts high performing pre-professional first-time full-time students who migrate to other STEM majors and these students benefit other majors and the state. Finally, demand exists in the region to support the local healthcare industry—as referenced above.

For all of the the above reasons, the program is central to EIU's mission and the region. In terms of the report, the summary is comprehensive and the program's attention to assessment and quality outcomes is duly noted. Likewise, I note demand for CLS professionals is significant which translates into high placement rates and outstanding career outcomes.

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Provost & VPAA
2/28/18