

**PROGRAM REVIEW**  
**Fairmont State Board of Governors**

Program with Special Accreditation     Program without Special Accreditation

Date Submitted February 18, 2013

Program B.S. Biology

Degree and Title

**INSTITUTIONAL RECOMMENDATION**

The institution is obligated to recommend continuance or discontinuance of a program and to provide a brief rationale for its recommendation:

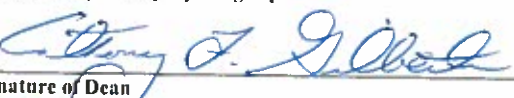
- X   1. Continuation of the program at the current level of activity;
- 2. Continuation of program with corrective action (for example, reducing the range of optional tracks or merging programs);
- 3. Identification of the program for further development (for example, providing additional institutional commitment);
- 4. Development of a cooperative program with another institution, or sharing courses, facilities, faculty, and the like;
- 5. Discontinuation of the Program

**Rationale for Recommendation:**

The faculty associated with the B.S. Biology degree has been making curriculum improvements in an attempt to redefine their curriculum area. The curriculum improvements have been structured to improve student test scores and competencies. As an area of study, biology students have many different career paths available to them. Among these career choices is further preparation via graduate study. The data reported indicates that the biology faculty is successful in the preparation of students for both gainful employment or for further education via graduate school. However, the tracking of students has been problematic for Fairmont State University, and this can be viewed in the submitted report. Overall, the faculty of this program of study is committed to improving student success as measured by student outcomes. An outside review has suggested possible areas of improvement, and these will be examined in more detail in the coming months.

  
Signature of person preparing report:

2/18/2013  
Date

  
Signature of Dean

2/18/13  
Date

  
Signature of Provost and Vice President for Academic Affairs:

4-18-13  
Date

*Maria C. Roe*

Signature of President:

*Ron L. Tumber*

Signature of Chair, Board of Governors:

*5-13-13*

Date

*5-16-13*

Date

# Executive Summary for Program Review

(not to be more than 2-3 pages)

## **Name and degree level of program:**

B.S. Degree in Biology, College of Science and Technology

## **External reviewer:**

John G. Hancox, M.D.

## **Synopses of significant findings, including findings of external reviewer:**

Dr. Hancox has provided a very thorough and positive review of the Biology program. Among the strengths of our program he counted the student to faculty ratio, low tuition costs, local off-campus resources, opportunities for undergraduate research, and the information that is available in print and online. Included in our weaknesses were scores on the ETS Major Field Test, the retention rates (which are low but also within national norms), and the lack of an upper level human anatomy course. Dr. Hancox agreed with our plans to improve the program by making the ETS exam part of a course grade, continuing with our efforts to examine the scientific literature, developing a seminar series, offering assistance with preparation for professional school entrance exams, and the development of an internship or shadowing program. Also mentioned were the needs for better institutional research to track our recruits/graduates and the pursuit of special scholarships to attract better students.

## **Plans for program improvement, including timeline:**

The Biology Program has been planning and working on a new curriculum and will continue this process through the 2013-2014 academic year. We are currently outlining the introductory 1105-1106 series to better align with the NCATE guidelines, in addition to an upper-level cell biology course. All other courses are going to be evaluated and realigned with each other to allow for a more cohesive curriculum. This will also allow instructors to have a better understanding of the content, skills, and major laboratory activities that will be an integral part of each course. We are planning to develop a new seminar series and perhaps attach requirements to participate into at least one course each semester. Our target date for implementation of the new curriculum is set for Fall 2014.

## **Identification of weaknesses or deficiencies from the previous review and the status of improvements implemented or accomplished:**

An objective was to enhance students' performance on Educational Testing Service [ETS] examinations in cell biology. A programmatic initiative was taken to increase the coverage of cell biology topics in the introductory course BIOL 1106 .

A goal was to enhance undergraduate research. Initiatives were taken to finance increases in undergraduate research by successfully obtaining SURE and NIH funding.

An aim was to improve student performance on National admission tests.

In addition to having students take evaluative ETS examinations we have completely revamped our liberal studies program so that it is interfaced with the sciences thus promoting knowledge and test taking skills that students are apt to require on National admission tests.

With regard to the poor retention in the introductory courses BIOL 1105 and 1106, the Dean of the College of Science and Technology has obtained significant funding through a Title III grant to address this problem. Within the Title III proposal there are a number of approaches that are designed to ameliorate the problem, which include: student peer mentoring, a Science Technology/Engineering/Mathematics Coordinator, lecture capturing, and technologically smart classrooms.

### **Five-year trend data on graduates and majors enrolled**

The number of graduates and the number of biology major's has increased over the past five years. The number of majors (see Table 1) has increased from 53 in the fall of 2008 to 72 in the spring of 2012. The number of graduates from the biology program has increased from 8 in 2008 to 17 in 2012. See Table 2.

### **Summary of assessment model and how results are used for program improvement**

Assessment for the biology program is currently limited to three specific measures: performance on a national ETS exam, scores on written reports, and scores on oral reports. Performance on the oral and written reports has been at or above the target of 70% on these graded assignments. Clearly defined expectations and the use of published rubrics has undoubtedly assisted in the success of students. Our goal of having students place at or above the national average on the ETS test has been slightly more problematic. While a few individual students regularly place above the 50<sup>th</sup> percentile on the composite score and/or individual sub-scores, our institutional average is seldom at that mark. We have been working on revising the biology curriculum to meet some of these deficiencies, particularly in cell biology. We will continue to keep a close eye on these scores and make changes that will benefit our students and help make them competitive with students from across the country.

### **Data on student placement (for example, number of students employed in positions related to the field of study or pursuing advanced degrees)**

Of the students which we are able to track, 31% are employed in their field of study. Eighteen percent are in graduate study programs working on Masters and Ph.D. level degrees and 22% are in professional schools pursuing degrees as dentists, medical doctors, and doctors of osteopathic medicine. This accounts for a total of approximately 71% of our graduates working in their field of study, or seeking higher degrees. Some 8% of our students are employed out of their field of study. This may indicate that our program is offering a broad enough educational experience that students are able apply what they have learned and their experiences within the department to other fields of endeavor. We are not able to track 20% of our students and this is an area in which we are attempting to increase using social media and online surveys.

**Final recommendations approved by governing board:**

# PROGRAM REVIEW

FAIRMONT STATE UNIVERSITY OR PIERPONT COMMUNITY AND TECHNICAL COLLEGE	
Program:	Biology
School:	College of Science and Technology
Date:	January 2013

## Program Catalog Description:

Biology, the study of life, is a wide-ranging and rapidly growing discipline. Understanding biology requires a working knowledge of all the sciences, especially chemistry and mathematics. The biology program at FSU strives to provide students with a broad-based education in all fields of biology as well as a fundamental knowledge of chemistry and mathematics. Students are required to complete basic courses in biology designed to provide a comprehensive understanding of living organisms. Electives allow students the flexibility to gain additional knowledge in an area of interest. No minor is required for biology majors.

A four-year B.S. degree in biology will prepare students to compete for entry level jobs such as lab technician, wildlife biologist, research scientist or naturalist, among others. While a bachelor's degree in biology will help students get a job, many careers require additional education beyond the B.S. degree. Many of our best students compete successfully for admission to graduate study at institutions across the country. A biology degree will also provide pre-professional training required by fields such as dentistry, medicine, pharmacy, and veterinary medicine.

Students who major in biology select one of the following degree programs:

- 1.) the B.S. in Biology degree as preparation for employment, professional school or graduate study
- 2.) the B.S. in Biology degree with an emphasis in biotechnology as preparation for employment, professional school, or graduate study
- 3.) the B.A. in Education degree with a specialization in biology, as preparation for teaching biology in grades 9-Adult. All courses must be completed prior to admission to Secondary Student Teaching/Clinical III.

In addition to meeting the graduation requirements listed for the B.S. in Biology or B.A. in Education degree, students must also:

- 1.) obtain a grade of "C" or better in BIOL 1105, 1106, 2202, and 2203
- 2.) successfully complete an assessment exam the semester before applying for graduation

## VIABILITY (§ 4.1.3.1)

### Enrollments

#### Applicants, graduates

There are no specific program requirements for students to declare a major in biology. Any student admitted to the university can declare a major in biology. Enrollment in the first year biology course requires an ACT science reasoning score of 21 or better (or equivalent). Students who do not meet this requirement can still declare their major as biology but need to complete remedial courses before beginning the curriculum.

By looking at two different datasets, we were able to gather information about our enrollment, retention and graduation. Numbers from these two different sources didn't always correlate, making interpretation difficult.

Biology majors during the fall and spring semesters of the academic years of 2008 – 2012 averaged 63.8 students, with the trend of increasing enrollment during this five year period. The minimum number (52) occurred in spring 2008 and the maximum (73) in the fall of 2010 and 2011 (Refer to Table 1).

Data for graduation rates for the 5 year review 2004 – 2008 is not complete, addressing only the 2004 - 2006 cohorts. This data showed an increasing trend in graduation rates for these cohorts from 7.7% in the 2004 cohort to 16.7 percent for the 2006 cohort.

Graduation numbers during this same time period have ranged from 17 in 2012 to 6 in 2010 (mean  $10 \pm 4.2$ ) (Refer to Table 2). Graduates are reported by academic year (Fall 2011 graduates are reported in the 2012 year). Table 2 shows an increase in graduates in the recent years. The cause of this likely based on increased in number of biology majors during the 2008-2012 reporting period.

We have compiled a list of all recent graduates and to the best of our knowledge, their current employment or continuing education status (Refer to Table 6). The biology program has no formal mechanism for tracking graduates so the information in this table is obtained from faculty memory, Fairmont State Biology Facebook page, Survey Monkey, and contacts faculty may have with former students. A summary of what graduates are doing is given below. Of the graduates we have knowledge of, 70% are either employed in a biologically related field (which we define as an area which did not require any additional education beyond the biology degree) or are enrolled in graduate or professional school this is up from 66% in the previous 5 year review.

#### Education and/or Employment Status of Recent Graduates of the Biology Program

Category	Graduates	
	Number	Percent
Unknown	10	20%
Employed in Field	15	31%
Employed out of field	4	8%
Graduate school	9	18%
Professional school	11	22%
Total	49	

The biology program revised an alumni survey during the Christmas break of 2012-2013. More complete results are included in Appendix 2. As of January 28, 2013, 25 alumni had responded to the

survey. (The survey is still open, and we are expecting a few more responses to be collected.) Some summary stats:

- Sixteen of the students graduated between 2008 and 2012, seven graduated before the current review period, and one will graduate in 2013. One student did not graduate.
- Of the nineteen students who graduated with a degree in biology, six also minored in chemistry. Four students received degrees in education with a specialization in biology. One student received a minor in biology.
- There were at least 17 female and 7 male respondents.
- Thirteen students are currently employed full-time and an additional four are currently employed part-time. Fifteen of these positions are either directly or somewhat related to their studies in biology.
- Eight of the students are currently (or have been in the past 6 years) enrolled in graduate studies.

**Positive aspects of the FSU Biology Program:**

- The majority of students rated our core courses individually as being “above average” or “excellent.”
- With regard to their “development and preparedness for life after FSU,” the majority of students responded with “above average” or “excellent” in the following categories:
  - Effective writing skills
  - Effective oral communication skills
  - Understanding written information
  - Understanding social, ethical and professional aspects related to biology
  - Effective laboratory/field skills
  - Defining and solving work-related problems
  - Effective teamwork skills
  - Effective knowledge of fundamental biological science concepts
  - Knowledge of advanced topics in the field (molecular biology, genetics, research skills, etc.)
  - Proficiency in scientific principles
  - Proficiency in applying relevant mathematics
  - Ability to learn new techniques, protocols, procedures, applications
  - Ability to lead and guide others
- “Small classes, approachable Profs.”
- “Faculty excellence.”
- “Undergraduate research, close interaction with professors.”
- “The resources to do undergraduate research, the small class sizes, and the open door policy of professors.”
- Ten students applied and got into the school of their choice: Medical, Pharmacy, Graduate, or Physical Therapy. (No response from the other fifteen.)
- All 25 students would recommend other students to major in Biology at FSU.
- Fifteen of sixteen respondents indicated that their education in the biology program was good preparation for graduate and professional school.

**Areas that will strengthen our Biology Program:**

- As it might be expected, the majority of students rated the support courses of chemistry and physics a bit lower than the biology classes. Two students took organic chemistry at WVU. Anything that these programs can do to increase retention and relate more directly to biology courses will benefit our students.

There were some thoughtful responses indicating areas that could be strengthened. Those points are listed below, followed by our plan to address each one.

- “I think the genetics course could be updated to include more technology both in the class room and especially in the lab. Some PCR, cloning, transforming, maybe sequencing? I feel this class



could really be improved with a face lift in material. Also I think that offering an immunology class would be beneficial to the program as a whole.”

- Some of these techniques do not fit well within a 3-hour time block for lab. We also have a policy of not allowing students unattended in lab. We are not currently equipped to carry out the sequencing ourselves, but could outsource this process to Marshall for a fee.
  - We are currently revising our curriculum and have considered converting our molecular course to an elective with two labs per week and moving some of the lecture material into a new cell biology course.
  - If our department continues to grow, both in the number of faculty and students, it would be more feasible to offer additional electives such as immunology.
- “I am not sure how such items have changed since I attended FSU, but at the time I would have liked to see better library (journal) resources and additional (internal) research opportunities, the latter of which I am positive has increased since my time at FSU. I think the program would benefit from having outside "experts" periodically visit campus to discuss current topics, careers, guest lecture, etc. A "crash" course in the business of biology would have been immensely useful, too.”
    - We think the FSU library is probably much stronger now than it was. Most journals are available online and have 24-hour access.
    - The department could investigate the possibility of a business of biology course. Our most immediate reaction would be to suggest Business Department courses in economics, accounting, and business.
    - There were 5 guest lecturers in the Advanced Botany course last fall plus visits from two professional schools: Marshall Medical School and UAB Optometry School. In addition, three former students came to FSU to speak with our students about their research, graduate school, and dental school. There are also a few other professional schools that regularly visit campus.
    - It would probably be beneficial to establish a more formal seminar series, which could be tied to at least one course each fall and spring. We can invite former graduates, leaders in local industry, and recruiters from regional graduate and professional schools.
    - Some of the professional schools are interested in giving presentations in addition to just meeting and speaking with students individually. It would be ideal if the recruiters would bring FSU graduates who are currently enrolled in their graduate/professional school.
  - “If anything needs improvement in the biology program it would have to involve things outside the classroom, like better career services for biology students, and more specialized help with pre-professional preparation. Inside the classroom, I believe courses were well planned and carried out. The science programs made me work harder than I ever thought I could.”
    - We are exploring additional opportunities for internships with regional corporations. Perhaps better interaction with the FSU Career Services Office would be of benefit to our students.
  - “Students should be encouraged, maybe even required, to participate in undergraduate research to ensure that they are ready for graduate schools or employment in research fields.”
    - We have made strides in recent years getting more students to conduct research projects and present them at the WV Academy of Science. Most years, this is a requirement for the Plant Physiology course. In 2013, the Senior Seminar course will also have this requirement.

## **Program courses**

For the reporting period (2008-2012) students majoring in Biology complete nine core biology courses (Refer to Appendix 1 – B.S. Degree in Biology – Compliance with the Degree Definition Program). In addition students are required to complete three electives from a field of eight courses, five

chemistry courses, one semester of Calculus and the University liberal studies requirements. Students are required to complete the first four biology courses (BIOL 1105, 1106, 2202, and 2203) with a grade of C or better to continue in the program. Students pursuing a biology certification for their education degree complete eight core courses. They do not take BIOL 3390 – Molecular Biotechnology, nor are they required to take any electives. They are not required to take organic chemistry.

For the future, the biology program of study has been modified to achieve compliance with the HEPC directive to reduce program hours to 120 and to incorporate the new general studies program at Fairmont state. This program is described in Appendix 1 and, pending approval, will be effective for students entering Fairmont State in the fall of 2013.

Enrollments in courses for the biology major are provided in Table 3. Table 3 shows a significant difference in the number of students enrolled in BIOL 1105 and BIOL 1106 as compared to the upper-level courses. At first glance this might be considered a retention issue (retention is discussed in the Graduation/retention section). However BIOL 1105 and 1106 are also service courses because other program require these courses, but not necessarily the upper-level courses; for example: Exercise Physiology, Forensic Science, biotechnology area of emphasis, and many pre-professional areas of study.

### Service courses

Demand for service courses remains high, but the courses that we offer through the biology program have changed over the past five years. Beginning Fall 2003 a new course prefix, SCIE, was created so that new courses that meet the liberal studies scientific discovery requirement would all be located in the same section of the catalog. A number of other SCIE courses have been created, many of which are taught by biology program faculty. Many sections of these courses are taught by adjuncts, but the goal of the college is to have at least one full time faculty member teaching a section of these courses every term. This faculty member serves as a point of contact for adjunct instructors. Data SCIE course enrollments was not provided and we were told that we did not need to include data from SCIE courses in this program review. The service courses, both Bio and SCIE are listed here, however.

- **BIOL 1104 – Biosphere:** This course is the first in a three course science content sequence for elementary education majors. It also satisfies 4 hours of the liberal studies scientific discovery requirement. It has been offered every semester; enrollment has dropped slightly in recent years. We believe the primary reason for this is higher elementary education admission requirements. To be admitted to the elementary education program students must now pass the PPST exam. While students may enroll in BIOL 1104 prior to passing this exam, they must pass the exam and earn a C in this course to continue in the elementary education curriculum. We suspect that some students are waiting until they pass this exam before beginning the elementary education course sequence.
- **BIOL 1170 – Anatomy and Physiology:** This course has changed to HLCA 1170 and 1171 and is now owned by the Community and Technical College which schedules it, staffs it, and purchases supplies. The course is listed in this narrative because the course was listed in the Fairmont State University catalog as BIOL 1170 until only recently. This course is offered to fulfill requirements of many programs, the largest being nursing and veterinary technology. Full time biology program taught this course for the community college in summer school both as BIOL 1170 and HLCA 1170-1 during the past five years.
- **BIOL 2205 – Technical Microbiology:** This course is a requirement in several allied health programs, primarily the nursing and veterinary technology programs. Other programs/majors also recommend/require the course. These include respiratory therapy, medical laboratory technology, and pre-pharmacy, among others. BIOL 2205 also qualifies as an optional course for

biology minors. Since these programs are growing, demand has increased for this course. The wait list for this course which was long and cumbersome has been discontinued. Since the wait list was approaching 75 students, the course offerings have expanded. While Biol 2205 had primarily been offered in the spring semester, enrollment pressures made it necessary to further expand the seats offered in the fall. This reduced the number of students being added to the wait list and eased the enrollment pressure. The wait list was only recently discontinued. As of spring 2012, the enrollment became approximately 175 yearly. This course is taught by full time faculty.

- **SCIE 1000 – Human Biology:** The course is now taught as SCIE 1100. This is currently one of the “workhorse” SCIE courses (those courses that enroll the most students). Enrollment in the course has been relatively constant and is one of the courses a majority of students take to satisfy half of their liberal studies scientific discovery requirement. Biology majors may also take human biology if they do not have the prerequisites for the first biology major course.
- **SCIE 1103 – Science that Matters I:** This course uses learning modules that were originally developed at the University of South Florida. Fairmont State was one of the first institutions to implement these modules. This course is also very popular and almost always has a waiting list. This is due to positive reputation, the interdisciplinary nature of the course, and the fact that the course meets four hours a week (as opposed to Human Biology which meets five hours a week, for the same credit).
- **SCIE 1105 – Environmental Science:** This course is offered spring semester each year and is used to fill liberal studies science credit. It has maintained an enrollment of 25 students through its history and typically has a waiting list to get into the course. It meets twice a week, with the course divided into lecture and activity components. It is taught by a full time instructor.
- **SCIE 1107 – Geographic Information Systems (GIS):** This course may be used to fulfill liberal studies science credits, and is a required course for a degree in the Population Studies Program. The course meets twice per week and for four hours credit which also makes it popular with students.
- **SCIE 1110 – Chemistry of Life:** This course is offered each semester. Enrollment has remained steady, and it is taught by full time instructors. This course is one of many courses that students take to meet their liberal studies science courses, as well as, other allied health program requirements.

### Success rates Service Courses

Service course success rates are provided in Table 5. In this table “success” is defined as the percentage of students who received a grade of A, B, C or AU (audit) compared to all students who received a grade (A,B,C,D,F,W) for the course. Students who dropped the course prior to the drop deadline are not included. Overall the success rate in service courses ranges from 65% to 100%. The 100% success rates tend to happen in a small capstone course or in honors sections. The average success rate is 85.6% (median 87.5%).

### Extended education / off campus Courses

None of the science courses for biology majors are taught off of the main campus. Only the service course 1170 Anatomy and Physiology is being taught in other locations. During this review period, at least one full-time biology faculty member taught this class, but this course is now being offered by Pierpont C&TC. Given this caveat, Table 7 lists all courses taught on and off campus. Of the courses listed, 83.37% of the students are instructed on the main campus.

## Cost/student credit hour

We don't have access to specific cost for the biology program. Alternatively, presented below are the costs for our College of Science and Technology compared to other Schools and Colleges at FSU. As Figures 1 and 2 illustrate, our cost per credit hour are at the average for the institution and the costs per Student FTE Major are second highest, but far below the School of Fine Arts.

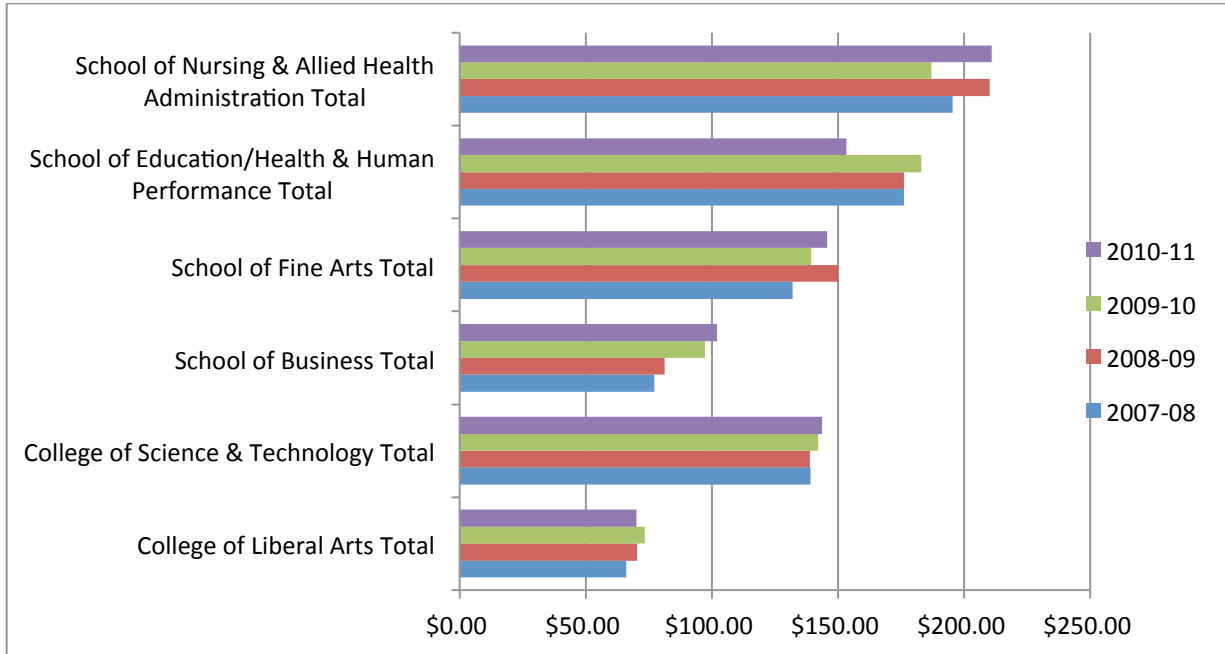


Figure 1: Direct cost per instructional credit hour by School/College for 07-08, 08-09, 09-10, and 10-11.

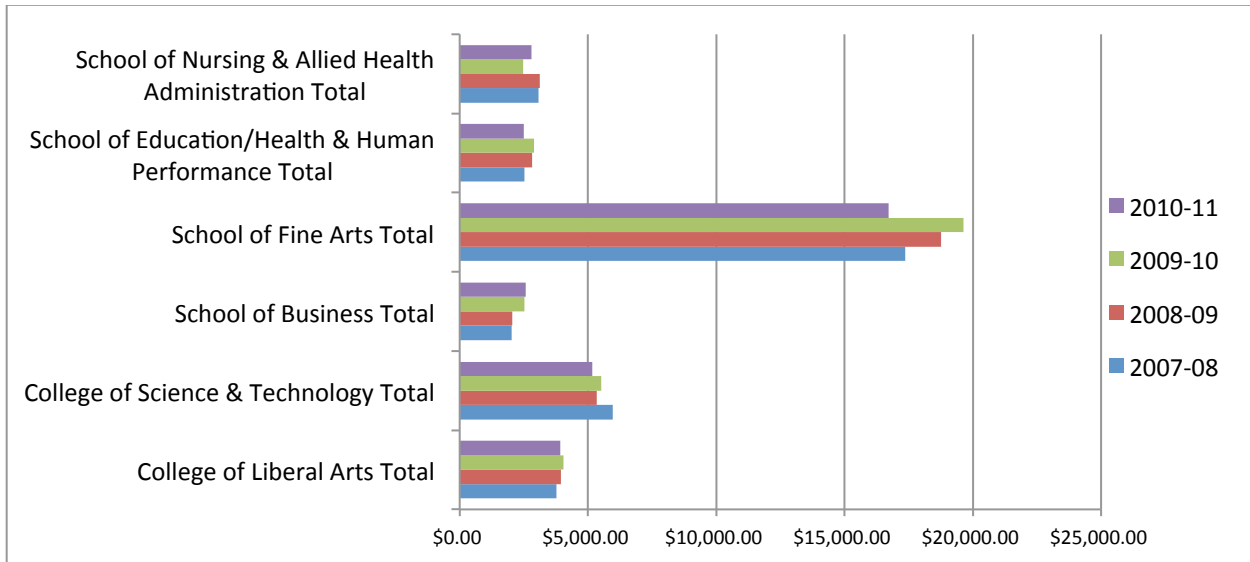


Figure 1: Direct cost per Student FTE Major by School/College for 07-08, 08-09, 09-10, and 10-11.

## Liberal Studies Requirements Met

The biology program is in compliance with the former Fairmont State Degree definition. (Refer to Appendix 1 – B.S. Degree in Biology – Compliance with Degree Definition Policy.) During the Fall of 2012, the biology program formulated a new 120 hour proposal as mandated by the HEPC and to apply the requirements of the new general studies program at FSU. That proposal is currently under review and is included as Appendix 2.

## Assessment Requirements

Over the past 5 years we have attempted to increase our student's ability to read, critically assess, and write scientific papers. This has included exercises to introduce scientific papers to students breaking them in to their different segments (Title, Introduction, Methods and Materials, Results Discussion Conclusions, and References). We have also supplied writing guidelines, and library exercises so students can critically assess information. We have assessed this effort by looking at group laboratory reports in three courses (Biology 1105, 1106, and 4485).

The results for the written portion of the assessment (Figure 3, below) indicate that in 2008 for Biology 1106, students did not reach the 70% mark on the papers they submitted, but thereafter were in the 70 – 80% range for their submissions for Biology 1105, 1106. Presentations (Figure 4, below) were below 70% only in 2012 for Biology 1106 when they were at 69%.

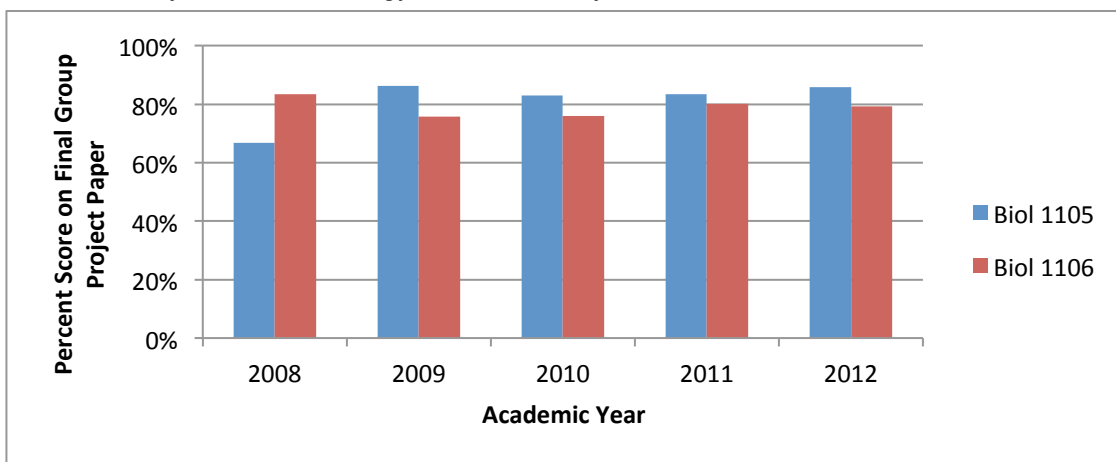


Figure 3: Biology 1105, 1106, and 4485 percent scores on final group project papers at Fairmont State, 2008 – 2012.

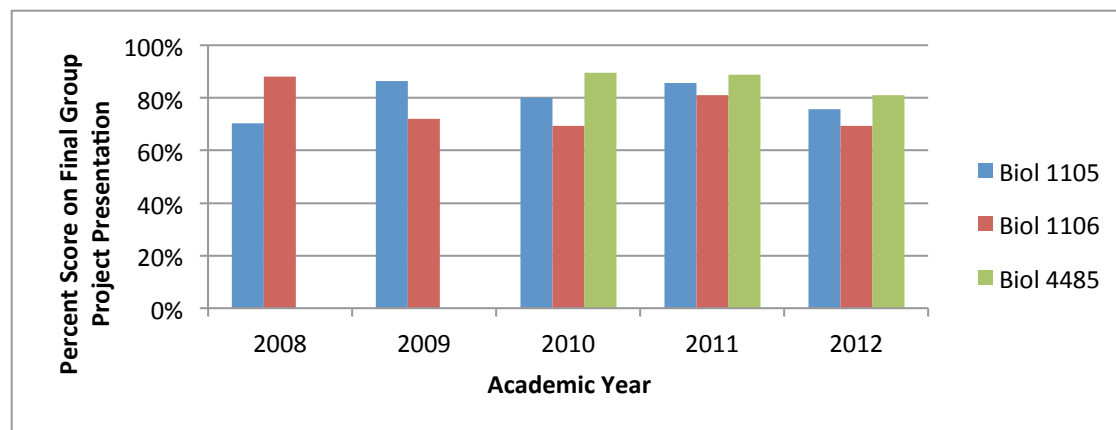


Figure 4: Biology 1105 and 1106 percent scores on final group project presentation at Fairmont State, 2008 – 2012.

The Biology program has given the Educational Testing Service Major Field Test in Biology to graduating seniors since 1999. Detailed analysis of this data was not begun until 2007 with the development of the Biology program outcomes, direct measures, and satisfactory performance standards (Refer to Table 8).

Average scores for our students are presented in Table 9. National averages are presented for two different time periods, 2005-2009 and 2010-June 2012. Recent scores for our students falling within one standard deviation below the national average are highlighted in light green while scores beyond one standard deviation are highlighted in dark green.

Compared to the national institutional data, only the 2009 cohort scored above average for the total score. This is our goal every year, as stated in Table 8. In 2008, our scores for two categories, organismal and population/ecology/evolution, were above the national average. In 2009, the cell biology and organismal categories were the only sub-scores above average. All other sub-scores were below the national average (Table 9).

In 2012, a few individual students were very successful on the ETS test overall and in specific categories. One student received an overall score of 159, which was in the 64<sup>th</sup> percentile nationally. Three students had high scores of 57 in the cell biology category, ranking each in the 56<sup>th</sup> percentile. Two students received high scores of 62 in the molecular biology and genetics section, ranking each at the 71<sup>st</sup> percentile. One student had a score of 68 in the organismal category, ranked in the 84<sup>th</sup> percentile. Two students had scores of 61 in the population biology, evolution and ecology category, ranking them in the 68<sup>th</sup> percentile. Two of 19 students scored above the national average in 2012 (Table 9).

Unfortunately, we also had students who performed poorly. As noted in our 2007 program review, there are still students who do not seem to be putting much time or effort into the ETS exam. Perhaps the results of the test could be used to determine a portion of their grade for an existing course such as Senior Seminar or it could determine their entire grade for a new 0 or 1 credit hour course created specifically for this purpose. In 2012, the lowest overall score for one of our students was 129, which ranked in the 3<sup>rd</sup> percentile. Low scores and percentiles for the subcategories were as follows: cell, 30, 3%; molecular and genetics, 35, 5%; organismal, 26, 1%, and population biology evolution, and ecology, 30, 5%.

To help address the scores, the department is going through a programmatic course review and modification based on the National Council for Teacher Accreditation (NCATE) standards and Education Testing Service (ETS) content. These modifications will help to align course content with national standards and hopefully help our students perform better on the standardized tests.

The first two courses to be considered are Principles of Biology I and II (Biology 1105 and 1106). Biology 1105 address ecology and organismal biology and 1106, cell biology and biochemistry. Both organismal and cell biology are areas where our students need added content as assessed by ETS scores.

## **Adjunct use**

Table 10 lists enrollments in biology courses taught over the last five years by individual faculty members (full time vs. part time). Of the total enrollment, 87.14% of the students in courses with a biology prefix are taught by full-time faculty. [Full-time faculty taught courses with an enrollment total of 4879, while part-time faculty had a total of 720.  $4879/5599 = 87.14\%$ .] These numbers include both lecture and lab sections.

Not all of the 9-12 month, full time faculty in Table 10 are members of the biology department. Dr. Gilberti, Dean of the College of Science and Technology, is listed at the instructor of record for Bio 4998, but the biology faculty members actually advise these students on their research projects.

Likewise, Dr. J. Robert Baker, Director of the Honors Program, sometimes has his name on courses we teach for that program. Dr. Andreas Baur and James Weekly are full-time members of the chemistry program and routinely help teach our biochemistry course. Dr. Sarah Dodson, a valued former member of our department, left us a few years ago to raise her family. Similarly, Dr. Angela McKeen was a valued former member of the geoscience program and taught several sections of the Biosphere course for our science education majors.

Several of our full-time faculty members also teach courses with other prefixes, including SCIE (Human Biology, Science That Matters, and Chemistry of Life) and INTR (Forensic Science classes, Environmental Science, and Geographical Information Systems). These courses are not included in Table 10 or 11. Many adjuncts are required to help offer the SCIE non-majors, general studies courses.

Also listed in Table 10 are the individuals who have served the department as part-time instructors. Karen Yarnell is our full-time Academic Lab Manager in Biology who also helps us by teaching some 1105/1106 and technical microbiology labs. The remainder of the individuals on the list have a diverse background in the sciences and help primarily with the 1105/1106 labs.

## **Graduation/Retention Rates**

See Graduation rates in the Enrollment Section on page 2. Retention rates are extremely difficult to determine with the data provided. At this point we can postulate many exit points from the program other than graduation (for example: change majors, transfer to another institution, acceptance into professional school, dropping out), and a detailed examination of the retention rate would require an analysis of each individual student's progress through the curriculum. Currently it is very laborious to get this information from the University and in some cases the information is simply not available (for example we may not be able to determine if a student transferred or dropped out. All we know is that they did not register for classes in a given semester.

Also, the pre-professional students (especially students focused toward pharmacy or dentistry school) are accepted early into the professional program. In the last two years we have had two junior undergraduate biology majors enroll in WVU dental school and have not completed their Fairmont State degree. Recently we have noticed an increasing number of students beginning their educational career at Fairmont State with the intent of transferring to another institution (usually WVU) after one or two years. Both of these situations negatively affect our retention and graduation rate, but as far as these particular students are concerned, their time at Fairmont State has been a success and has helped them move toward their professional goal. It is not clear how to measure these students, but counting them as retention or graduation losses does not seem reasonable.

Retention rate for full time students was 55.8% for FSU and 52.6% for students who transferred into the university. The data from which these numbers were generated appear to only include individual with their primary major as Biology. Excluded are dual majors, and all pre-professional majors. This under represents the true number of Biology majors as many of these individuals will change their major to biology in order to graduate with a Biology degree, as they cannot graduate with a pre-professional degree (it does not exist). This can be seen in the enrollments in Biology 1105/1106 (Table 3). This is also complicated by the lack of identification of students so their status can be followed through time. These retention rates, although seemingly low, reflect national trends where failure rates in introductory STEM course range from 30 to 85% (Faculty Focus, 28 Sep 2012).

## Previous Program Review Results

Upon completion of the Biology Program students are expected to have an understanding of major biological concepts and awareness of how these are connected within various areas of the biological and physical sciences. This expectation is dependent upon students having a working knowledge of programmatic learning outcomes. There have been a number of programmatic weaknesses that have been identified which include:

- Testing scores below the National average on Educational Testing Service [ETS] examinations in the areas of cell biology and molecular genetics.
- Less than desirable numbers of students engaged in undergraduate research
- Lower than required scores on entrance examinations for post-baccalaureate advanced degree programs.
- Poor retention of biology students in entrance level biology courses, particularly BIOL 1105 and 1106.

Listed below is a description of a number of changes that were implemented to correct these identified weaknesses.

### *PERFORMANCE OF STUDENTS ON NATIONAL TESTING IN THE DISCIPLINES OF CELL AND MOLECULAR/GENETICS*

As aforementioned, one weakness identified from the previous review was that students' performance on ETS examinations was below the National average in the areas of cell biology and molecular/genetics. It was attempted to improve the performance of our students on these examinations by increasing the coverage of cell biology topics in the introductory course BIOL 1106. This initiative did not meet our expectations in that it did not improve the testing performance of the students. A current initiative is to continue with an emphasis of cell structure and function in the course BIOL 1106, but institute an additional 300 level course solely dedicated to cell biology. In addition to reinforcing concepts covered in BIOL 1106, this newly instituted 300 level cell biology course will be cutting edge in that it will cover advanced topics and sophisticated laboratory techniques. Also, this course will be interfaced with genetics and molecular biology, which we expect will concomitantly and synergistically enhance students' understanding in all three disciplines. Student performance on National exams with regard to the disciplines of cell, genetics and molecular biology will be closely monitored.

### *ENHANCING UNDERGRADUATE RESEARCH ACTIVITIES*

A goal of the Biology Program over this review period was to enhance undergraduate research activities both as programmatic courses and as independent research projects. It has become increasingly clear that mentored undergraduate research projects promote the growth and development of students while providing opportunities for those students who wish to pursue terminal degrees. It is also understood that a commitment by faculty to engage in competitive scientific research is an integral and necessary part of satisfying the student's desire to participate in undergraduate research projects. Thus, efforts have been made to promote faculty involvement in basic research. In addition to mentoring and developing students, faculty involvement in basic research inherently sustains faculty growth and development by enabling them to keep abreast of their field. It is realized that when faculty are engaged with students performing undergraduate research there is no boundary between teaching and scientific exploration. Students engaged in research have the opportunity to present their work at scientific meetings and defend their work in a public forum thus promoting specific skills such as organizing their thoughts and justifying their data. In essence, it provides a bridge between the two activities of publication and teaching at the undergraduate level.



Initiatives were taken to secure funding in support of undergraduate research. These initiatives include: the Summer Undergraduate Research Program [SURE] and NIH funding. In addition, there are opportunities for specialized funding provided by Fairmont State University to be dedicated to undergraduate research. This has resulted in an increase of students engaged in undergraduate research during the academic year as part of the curriculum and as summer independent study projects. The experience of undergraduate research along with presentations and publications has enhanced the participating students' curriculum vitae, thus supporting their opportunity to gain acceptance to quality institutions of graduate education. Most of our students who go on for terminal degrees are those students who have engaged in undergraduate research. We will continue this initiative in the belief that increased research activity assists the students in meeting their purposes in life and puts them on the path of obtaining the level of significance that one gains through commitment to excellence in their chosen profession.

#### *PERFORMANCE ON ENTRANCE EXAMINATIONS TO GRADUATE SCHOOLS*

Upon completion of the baccalaureate degree, Biology majors have a number of professions in which they can pursue advanced terminal degrees. For example, these degrees could include: PhD, MD, DO, DVM, JD, LLD, SJD, DMD and DDS. In the interest of increasing the number of students accepted to graduate schools, it is desirable to raise students' performance on National graduate entrance exams such as GRE, MCAT, DAT, LSAT, etc. There is an increasing trend in National entrance exams to test student's performance with regard to the concepts that tomorrow's professionals will need. Traditionally, the natural sciences sections of entrance exams reflect the basic scientific concepts that assist students in their graduate education. Currently, there are additions to the entrance examinations emphasizing the behavioral sciences, particularly the importance of socio-cultural and behavioral determinants of health and health outcomes, as well as new critical analysis and reasoning skills, which reflects the fact that graduate schools want well-rounded applicants from a variety of backgrounds.

With this understanding, a goal was to improve student performance on National admission tests by supplementing the expectation that students have a working knowledge of the following scientific programmatic learning outcomes:

- the basic chemistry of life,
- cell structure and function,
- classical and molecular genetics,
- the mechanisms of evolution,
- organismal diversity,
- plant and animal structure and function,
- ecology and environmental science,

It is realized that a high performance on graduate entrance exams is dependent upon students having the proficiency in the areas of natural sciences listed above, in addition to being exposed to a quality liberal studies education. We have provided students the option to take liberal studies courses that enhance reading comprehension and reasoning skills along with courses that cover psychological, historical, socio-cultural and behavioral determinants. Thus, we have completely revamped our liberal studies program so that it is interfaced with the sciences that students are programmatically required to take. In light of changes that are being made on post-baccalaureate entrance exams, the updating of liberal studies requirements was done to enhance student performance on these exams. In addition, the updated liberal studies program will have the added benefit of enhancing the students' education and assist them in their lifelong learning endeavors.

#### *INCREASING STUDENT RETENTION IN BIOL 1105 AND 1106*

With regard to the poor retention in the introductory courses BIOL 1105 and 1106, the Dean of the College of Science and Technology has obtained significant funding through a Title III grant to address this problem. Within the proposal there are a number of approaches that are designed to ameliorate the problem, which include: student peer mentoring, a Science

Technology/Engineering/Mathematics Coordinator, lecture capturing and technologically smart classrooms.

Improved retention in these introductory courses is important to the overall success of the Biology Program. Enhancing student performance and retention will have the effect of decreasing the number of years to graduate and sustaining the critical number of students needed in upper level courses. This increase in the number of students in later semesters of the Biology Program will enable a variety of upper level electives to be offered. This will also address the current weakness of a limited number of choices of biology electives which do not necessarily meet the professional interests of the students.

### **ADEQUACY (§ 4.2.4.2)**

<b>Program Requirements:</b>			
	Allowed Range 2008-2012	Biology Program In Current Catalog	120 Hour Proposal: awaiting approval.
General Studies	32 – 42 hours	37 hours	35 hours
Major	32 – 65 hours	63 hours	58 hours
Electives	Minimum 21 hours	28 hours	27 hours
TOTAL		128 hours	120 hours
Programs not meeting the above requirements must request a continuation of their exception with a justification below:			

At all times during the review period, the biology program was in compliance with the degree definition requirements. Additionally, we have proposed a plan to meet the new 120 hour HEPC requirements beginning Fall of 2013. This plan is currently under review and is included as Appendix 1.

### **Faculty Data**

Biology courses taught by full time faculty are summarized in Table 11. As mentioned previously, a few of these individuals are former faculty members and a few are faculty members in other departments. This table does not present the complete teaching load of each faculty member, as some individuals teach courses with a prefix of SCIE or INTR.

Full Time Faculty Data sheets are attached. We currently have 7 full-time biology faculty members: Dr. Mark Flood, Dr. Pamela Huggins, Dr. Albert Magro, Dr. Tony Morris, Dr. Steven Roof, Dr. Donald Trisel, and Dr. Phillip Yeager.

### **Accreditation / national standards**

There is no national body that specifically accredits biology programs. There is not a national consensus regarding standards for undergraduate general biology programs.

## **NECESSITY (§ 4.1.3.3)**

### **Placement – Similar Programs in WV**

In the north-central area of West Virginia, there are B.S. degree programs in biology offered at WVU, Salem International University, WV Wesleyan, and Alderson Broaddus College. The latter three are private schools with significantly higher tuition than Fairmont State. Compared to WVU, we offer smaller classes and full-time faculty that teach all lecture and lab sections. Many lower division courses at WVU are taught by graduate teaching assistants. Our smaller class size allows us to offer more personal attention in the lecture and more hands-on experience in the laboratory, both in the field and in the laboratory.

## **CONSISTENCY WITH MISSION (§ 4.1.3.4)**

Explain how this program fits into the mission of the institution. Identify the relationship of this program to other programs at the institution, especially in terms of mutual support (e.g., shared faculty, shared facilities, shared course requirements for external program accreditation).

The Biology program supports the mission of Fairmont State by offering students with a comprehensive biology curriculum that provides an excellent preparation for a variety of careers, including those requiring advanced degrees. Program faculty are committed to high-quality classroom instruction and meaningful collaborations between students and faculty in performance of original research. Further support of the mission is obtained by the fostering of initiative and independence within the students thereby promoting lifelong learning while in the process of mastering the techniques and principles of biology. Reflection and synthesis of biological concepts is encouraged to increase the students' critical understanding of the discipline and thus advance their ability to apply its concepts. Members of the program faculty also provide instruction that meets the goals of the Scientific Discovery component of Fairmont State's General (Liberal) studies curriculum.

Student clubs (for example Students Taking Action in Nature's Defense (STAND) and Tri-beta Biology Honorary) along with many independent undergraduate research opportunities provide students (both Biology majors and Non-majors) with opportunities to engage the wider community and develop lifelong learning skills.

**Table 1**  
**Biology Program Majors – Number by Term**

Primary Major	Term	Freshman	Sophomore	Junior	Senior	Total
Biology	Fall Semester 2007	9	8	12	24	53
	Spring Semester 2008	5	8	15	24	52
	Summer Semester 2008	4	3	1	2	10
	Fall Semester 2008	28	17	6	17	68
	Spring Semester 2009	10	19	12	19	60
	Summer Semester 2009	1	6	4	1	12
	Fall Semester 2009	13	13	17	17	60
	Spring Semester 2010	10	9	18	24	61
	Summer Semester 2010	1	3	2	5	11
	Fall Semester 2010	26	15	13	19	73
	Spring Semester 2011	17	15	15	19	66
	Summer Semester 2011	3	3	4	6	16
	Fall Semester 2011	22	16	10	25	73
	Spring Semester 2012	13	17	17	25	72
	Summer Semester 2012	1	5	5	4	15
Education With Biology Certification	Fall Semester 2007				2	2
	Spring Semester 2008				2	2
	Fall Semester 2008			1		1
	Fall Semester 2009		1		1	2
	Spring Semester 2010		1	1	2	4
	Summer Semester 2010				1	1
	Fall Semester 2010			1	2	3
	Spring Semester 2011				3	3
	Summer Semester 2011				1	1
	Fall Semester 2011				1	1
Spring Semester 2012				1	1	

**Table 2**  
**Biology Graduates – Number by Year**

Academic Year	Biology	Education with Biology Certification	Total
2008	6	2	8
2009	9		9
2010	6		6
2011	9	1	10
2012	16	1	17
Grand Total	46	4	50