

**Biology B.S. (BBS) and B.A. (BBA)
Program Learning Outcomes, F2022-S2023**

Learning Outcome: PLO#1

Demonstrate an understanding of the process of science and of the concepts and theories of biology across a broad range of organizational levels: cellular, molecular, organismal, and ecological (population, community, ecosystem).

Outcome Measure: ETS Major Field Test in Biology.

Criteria for Success: The overall group mean on the ETS exam will be \geq 75th percentile and at least 50% of our students will have an overall score \geq 60th percentile. Additionally, the same criteria established for the overall ETS score will be applied to each of the 4 sub-disciplines, which are 1) Cell, 2) Genetic & Molecular, 3) Organismal, and 4) Population, Ecological, & Evolutionary Biology.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning, and
5. Civic and Global Learning

Longitudinal Data:

	2023, n=44	2022, n=44	2021, n=50	2018, n=27	2017, n=34	2016, n=30
Overall group mean	70 th %ile	52 nd %ile	82 nd %ile	61 st %ile	83 rd %ile	92 nd %ile
% above 60 th %ile	52 %	34%	64%	44%	68%	80%
Cell Biology mean	74 th %ile	50 th %ile	82 nd %ile	55 th %ile	76 th %ile	85 th %ile
% above 60 th %ile	50 %	32%	52%	41%	50%	60%
Genetics/Molecular mean	67 th %ile	49 th %ile	68 th %ile	53 rd %ile	83 rd %ile	83 rd %ile
% above 60 th %ile	48 %	39%	42%	33%	59%	53%
Organismal mean	60 th %ile	41 st %ile	88 th %ile	59 th %ile	86 th %ile	90 th %ile
% above 60 th %ile	50 %	32%	56%	44%	65%	70%
Pop/Eco/Evol. Biol. mean	76 th %ile	69 th %ile	79 th %ile	70 th %ile	87 th %ile	93 rd %ile
% above 60 th %ile	45 %	41%	56%	44%	62%	77%

Conclusions Drawn from Data:

In 2023, some criteria were met. (Gray numbers indicate criteria not met.) Interestingly, approximately 50% of the students in every category scored above the 60th percentile, but the group means were lower than the goal of the 75th percentile. Seven students scored below the

20th percentile, which is pulling the group means down. Five of these seven students had a major GPA below 3.0.

In 2022, none of the criteria were met. In 2021, all criteria were met except in the category of Genetics & Molecular Biology. In 2019 and 2020, the exam was not administered due to various complications. Since 2018, the data have been so variable that it is difficult to predict whether this is a concerning trend or whether there is another effect, e.g. COVID. From 2015-2017, all criteria were met.

Changes to be Made Based on Data: We are considering the use of an alternative exam, as the ETS exam is heavily weighted on content knowledge rather than on critical thinking and scientific process skills.

Rubric Used: ETS Comparative Data Guides – MFT for Biology

Learning Outcome: PLO#2

Participate in the life of the department in Biology/Chemistry clubs or in various positions of responsibility such as graders, tutors, and teaching assistants.

Outcome Measure: Self-reported data of participation.

Criteria for Success: At least 80% of our students will participate in one of these positions during their time at PLNU.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

	Number of students responding of total	% participated in life of dept	Criteria met?	Notes
Sp 2023	37 of 41	90%	Yes	For those who reported no participation, some factors mentioned were finances (need for a job), sports, family, lack of motivation, and ROTC.
Sp 2022	39 of 41	85%	Yes	For those who reported no participation, some factors mentioned were outside jobs, sports, and commuting.
Sp 2021	51 of 51	84%	Yes	
Sp 2020	44 of 49	77%	Almost	For those who reported no participation, some factors mentioned were outside jobs and involvement in sports.
Sp 2019	31 of 41	80%	Yes	
Sp 2018	NA	NA	NA	Survey not given
Sp 2017	30 of 32	93%	Yes	
Sp 2016	25 of 30	83%	Yes	
Sp 2015	18 of 24	76%	Almost	

Conclusions Drawn from Data:

The BBS/BBA majors are generally participating in the life of the department.

Changes to be Made Based on Data:

No changes to the program.

Rubric Used: Not applicable to self-reported data.

Learning Outcome: PLO#3

Develop a rationally defensible integration of science and faith.

Outcome Measure: During their senior year, students will defend the integration of their faith with various scientific topics via a written essay.

Criteria for Success: At least 80% of our students will achieve a level of 3 or higher on each area of the science/faith integration essay rubric, which considers both science/faith integration and critical thinking.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

	Number of students	% scoring 3 or above	Criteria met?
Sp 2023	44	95%	Yes
Sp 2022	41	83%	Yes
Sp 2021	45	93%	Yes
Sp 2020	32	94%	Yes
Sp 2019	41	96%	Yes
Sp 2018	25	96%	Yes
Sp 2017	33	85%	Yes

Conclusions Drawn from Data:

The BBS/BBA majors are able to develop a rationally defensible integration of science and faith.

Changes to be Made Based on Data:

No changes to the program.

Rubric Used: See attached.

BIO 4097 Grading Rubric for *Integration of Science & Faith* annotated bibliography (Info Literacy Assign #2) (25 points)

Grading aspect	Capstone 4	Milestones 3	Milestones 2	Benchmark 1
Number of references 0 – 10 points	<input type="checkbox"/> At least 5 references <input type="checkbox"/> At least 3 references are journal articles or books.	<input type="checkbox"/> 3-4 references <input type="checkbox"/> 2 or fewer references are journal articles or books.	<input type="checkbox"/> 2 or fewer references, <input type="checkbox"/> No references are journal articles or books	<input type="checkbox"/> No references
Choice of references 0 – 15 points	<input type="checkbox"/> Annotated bibliography includes 1 – 2 sentences describing choice, use, and purpose of each reference (including bias) <input type="checkbox"/> Particular aspects (chapter, pages, figures) of each source are indicated for which the student anticipates using. <input type="checkbox"/> Sources are of more than one type such as websites, books, and journal articles. <input type="checkbox"/> Credibility of the author is verified <input type="checkbox"/> References are properly formatted <input type="checkbox"/> Includes at least one source from an alternate viewpoint, <u>written</u> by an author that holds that viewpoint.	<input type="checkbox"/> Missing 2 of the details	<input type="checkbox"/> Missing 3 of the details	<input type="checkbox"/> Little evidence of thought and consideration towards the use, purpose, and ideas derived from each source.

BIO 4097 Grading Rubric for *Integration of Science & Faith* outline (25 points)

Grading aspect	Capstone 4	Milestones 3	Milestones 2	Benchmark 1
Thesis and direction of the paper 0 – 15 points	<input type="checkbox"/> Thesis is clear <input type="checkbox"/> The outline reflects a clear organization of the paragraphs with supporting ideas, as well as reference to how each source will be used.	<input type="checkbox"/> Thesis is somewhat clear <input type="checkbox"/> Overall organization of outline is somewhat clear	<input type="checkbox"/> Thesis is unclear <input type="checkbox"/> No real indication of any thought towards organization of the ideas and supporting evidence within the paper.	<input type="checkbox"/> No outline
Ideas and organization of the individual supporting paragraphs 0 – 10 points	<input type="checkbox"/> Thoughtful and organized flow of ideas <input type="checkbox"/> Sub-bullets for each main paragraph / supporting idea show evidence of deep thought about the paper <input type="checkbox"/> Mention of multiple concepts from PLNU courses that have influenced position	<input type="checkbox"/> Evidence of overall structure, but student has not yet thought deeply about how to put the main ideas together <input type="checkbox"/> Outline has main ideas, but has few sub-bullets <input type="checkbox"/> Mention of 1-2 concepts from PLNU courses that have influenced position.	<input type="checkbox"/> Very little evidence of thought towards organization, main ideas, and structure for the paper. <input type="checkbox"/> Outline is highly incomplete. <input type="checkbox"/> No mention of how PLNU courses have influenced position.	<input type="checkbox"/> No outline

BIO 4097 Grading Rubric for *Integration of Science & Faith* Essay (100 points)

Grading aspect	Capstone 4	Milestone 3	Milestone 2	Benchmark 1
Integration of science and faith (evolution or creation care) 0 -20 points	<input type="checkbox"/> Deep personal reflection is evident <input type="checkbox"/> Question for this assignment was <u>clearly answered</u> <input type="checkbox"/> Clear statement of position. <input type="checkbox"/> Well-defended position that merges faith and scientific reasoning (note: the exact position is not important, but rather the evidence of reflection, understanding, and ability to defend that position)	Meets 3 of the criteria for a Capstone 4. Comments:	Meets 2 of the criteria for a Capstone 4. Comments:	Meets 1 or none of the criteria for Capstone 4 Comments:
Critical Thinking 0 – 20 points	<input type="checkbox"/> Issue is stated clearly & position is well-supported with evidence & sources. <input type="checkbox"/> Alternate position(s) is/are clearly addressed in a manner that flows well with the author’s argument <input type="checkbox"/> Clear arguments against these alternate positions using personal reflection and scientific information <input type="checkbox"/> Evaluation of altering position(s) demonstrate(s) grace and understanding	Meets 3 of the criteria for a Capstone 4. Comments:	Meets 2 of the criteria for a Capstone 4. Comments:	Meets 1 or none of the criteria for Capstone 4 Comments:
Incorporation of concepts discussed in PLNU classes 0 – 20 points	<input type="checkbox"/> Specific concepts from specific PLNU classes, including science and/or religion classes, are included as part of reflection and defense of position. <input type="checkbox"/> Includes a clear reflection of how the position has changed while at PLNU. If his/her position has not changed, essay still includes a clear explanation of why it did not change, that demonstrates personal reflection.	Meets 1 of the criteria for a Capstone 4. Comments:		Meets none of the criteria for a Capstone 4. Comments:
Written Communication 0 – 20 points	<input type="checkbox"/> No, or very few, grammatical and spelling errors. <input type="checkbox"/> Essay flow is excellent with a clear introduction, argumentative reasoning, and a strong conclusion. <input type="checkbox"/> Writing effectively communicates with a coll. sci. audience. <input type="checkbox"/> Sufficient length to make a good, complete defense (1200 – 1600 words)	Meets 3 of the criteria for a Capstone 4. Comments:	Meets 2 of the criteria for a Capstone 4. Comments:	Meets 1 or none of the criteria for Capstone 4 Comments:
Information Literacy 0 – 20 points	<input type="checkbox"/> Sources are current, authoritative, and relevant to the topic <input type="checkbox"/> Communicates, organizes and synthesizes information from sources to achieve a specific purpose, with clarity and depth <input type="checkbox"/> Use of in-text citations as well as the annotated bibliography <input type="checkbox"/> Excellent choice of paraphrasing, summarizing, or quoting to enhance the essay and support the author’s argument <input type="checkbox"/> Distinguishes between common knowledge and ideas requiring attribution <input type="checkbox"/> Source for the alternate view actually holds that viewpoint	Meets 3 of the criteria for a Capstone 4. Comments:	Meets 2 of the criteria for a Capstone 4. Comments:	Meets 1 or none of the criteria for Capstone 4 Comments:

Learning Outcome: PLO#4

Be prepared for post-graduate studies or science-related careers.

Outcome Measure: After graduation, alumni will be tracked and data regarding their postgraduate education and profession will be recorded.

Criteria for Success: Success rates for alumni who apply for graduate or professional schools will be > 75% and the percentage of graduates who obtain jobs in science-related occupations will be >70%.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

- 1) The success rate for alumni who apply to graduate or professional schools has been well over 90% for at least 20 years.
- 2) In addition, an alumni survey is conducted by the Office of Institutional Research at PLNU every year. This survey is sent to alumni who graduated 5 years previously. These data are not disaggregated by specific degree, but are applicable to all Biology Department majors..

Year of Summary	2022
Population Surveyed	262
Response Rate	44%
Year of Graduation	2012-2016
Employed Full-Time OR Currently in Graduate School Full-Time	85%
Went to graduate school and graduated (of those who are employed full-time)	55%
Satisfied or Very Satisfied with PLNU Education	94% ± 6%(SD)

Conclusions Drawn from Data:

The Biology Department majors are successful at obtaining jobs and entering graduate/professional schools. They also seem to be highly satisfied with their PLNU education.

Changes to be Made Based on Data:

No changes to program but we continue to reach out to local biotech companies in order to establish relationships and allow our students to get jobs.

Rubric Used: Not applicable to self-reported data.