Biology-Chemistry B.S. (BCHM)
Program Learning Outcomes, F2021-S2022

Learning Outcome: PLO1
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, and organismal.

Outcome Measure: ETS Major Field Test in Biology

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

Longitudinal Data:

	2022, n=11	2021, n=15	2018, n=17	2017, n=21	2016, n=12
Overall group mean	81st %ile	70th %ile	70th %ile	83rd %ile	95th %ile
% above 60th %ile	55%	76%	53%	67%	83%
Cell Biology mean	90th %ile	47th %ile	77th %ile	82nd %ile	96th %ile
% above 60th %ile	64%	59%	41%	67%	67%
Genetics/Molecular mean	62nd %ile	68th %ile	63rd %ile	86th %ile	95th %ile
% above 60th %ile	45%	47%	47%	57%	75%
Organismal mean	85th %ile	79th %ile	65th %ile	80th %ile	93rd %ile
% above 60th %ile	27%	71%	47%	57%	75%

Conclusions Drawn from Data: In 2021 and 2022, most criteria were met or were close to being met. (Gray numbers indicate criteria not met.) In 2021, although the overall mean percentile was lower than expected for several areas, 50% or more of the students often scored above the 60th percentile. This suggests that some lower scores are pulling down the group means.

In 2019, this exam was not given due to a mishap with the new computer lab, and in 2020, due to COVID-19.

From 2016-17, all criteria were met. Interestingly, few of the criteria were met in 2018, but were close. As was the case for the BBA/BBS majors, one student in this group had a GPA less than 2.5 and also a very low score on the ETS exam, which pulled the group averages down.

Changes to be Made Based on Data: No changes to the program.

Rubric Used: ETS Comparative Data Guides – MFT for Biology

Learning Outcome: PLO2
Apply key concepts and principles in quantitative analysis, biochemistry, bioinorganic chemistry, organic chemistry, and physical chemistry (thermodynamics and kinetics).

Outcome Measure: ETS Major Field Test in Chemistry and Senior Exit Survey

Criteria for Success: The overall group mean on each subsection of the ETS exam (Analytical, Biochemistry, Inorganic, Organic, Physical) will be at or above the 50th percentile. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

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:

ETS – MFT Chemistry	2022 n = 13	2021, n= 8	2019, n=12	2018, n=17	2017, n=20	2016, n=11	2015, n=7**
Overall group mean	25th %ile	70th %ile	47th %ile	59th %ile	65th %ile	75th %ile	87th %ile
Analytical mean	33rd %ile	58th %ile	49th %ile	54th %ile	56th %ile	78th %ile	81st %ile
Biochemistry mean	55th %ile	53th %ile	52nd %ile	52nd %ile	64th %ile	52nd %ile	45th %ile
Inorganic mean	37th %ile	68th %ile	40th %ile	55th %ile	52nd %ile	75th %ile	85th %ile
Organic mean	18th %ile	72nd %ile	44th %ile	64th %ile	60th %ile	71st %ile	83rd %ile
Physical mean	25th %ile	67th %ile	52nd %ile	58th %ile	70th %ile	78th %ile	91st %ile

*ETS-MFT not administered in spring 2020 due to COVID-19.
**Only includes BCHM majors who took Chemistry Senior Seminar.

Senior Exit Survey*	2022 n= 11	2021 n=5	2019 n=8	2017 n=11	2016 n=7	2015 n=7
% feel prepared or better in quantitative analysis	90.9%	100%	100%	100%	100%	100%
% feel prepared or better in biochemistry	81.8%	100%	100%	100%	100%	86%
% feel prepared or better in bioinorganic chemistry	63.6%	100%	100%	100%	100%	100%
% feel prepared or better in organic chemistry	63.6%	100%	100%	100%	86%	100%
% feel prepared or better in physical chemistry (thermodynamics and kinetics)	36.4%	80%	100%	100%	57%	86%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 and spring 2020 (COVID-19).

Conclusions Drawn from Data: When looking at the data we see that in 2022 our students did not meet the criteria for success (50th percentile) in any subdiscipline of chemistry except in biochemistry. This is quite concerning given that the numbers are the lowest they have ever been

since we started assessing our majors. It is worth noting that a few students did really poorly on the ETS MFT exam perhaps indicating that they did not take it seriously. Moreover, we question whether having taken online classes during COVID may have affected how our students learned the concepts. We will continue to monitor this closely.

The student survey yielded mixed results. Our students met the criteria for success in quantitative analysis and biochemistry which is encouraging. Since Bioinorganic chemistry is not required for the biology-chemistry major anymore, it is not surprising that the criteria for success was not met. We will have to remove it from our survey. With regards to Organic chemistry, the students did not meet the criteria for success and we believe they may have not felt prepared due to having taken this course online in the Fall 2020 and in a hybrid format in the Spring 2021. Finally, in Physical chemistry, the students did not meet the criteria for success which can be attributed to having an inexperienced adjunct teach the course.

Changes to be Made Based on Data: There are no substantial changes that need to be made at this point even though this year students obtained particularly low scores. However, while we have tried to offer the ETS MFT exam at a time where students take it seriously, it appears as if that is not always the case which brings into question the validity of the information collected.

Rubric Used: ETS Comparative Data Guides – MFT for Chemistry

Learning Outcome: PLO3
Use standard instrumentation and laboratory equipment to conduct scientific experiments and perform chemical characterization and analyses.

Outcome Measure: Faculty laboratory instructors' observation of students' use of various standard instruments in different courses (see below) and Senior Exit Survey.

GC: Chemistry 2096 (Organic Chemistry II, formerly CHE 304)
IR: Chemistry 2096 (Organic Chemistry II, formerly CHE 304)
UV-vis: CHE3025 (Physical Chemistry I)

Criteria for Success: At least 80% of students will be able to use each of the various instruments with little or no guidance. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

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:

% students able to use instrument with little or no guidance	2021-2022	2020-2021	2019-2020	2018-2019	2017-2018	2016-2017	2015-2016
GC CHE2096	Not assessed	COVID-19	COVID-19	100% (n=18)	96.6% (n=29)	100.0% (n=16)	93.8% (n=16)
IR CHE2096	Not assessed	COVID-19	COVID-19	57.9% (n=19)	96.6% (n=29)	93.8% (n=16)	88.9% (n=18)
UV-vis CHE325	100% (n=13)	100% (n=16)	COVID-19	91.7% (n=12)	100% (n=22)	100% (n=21)	100% (n=11)

Senior Exit Survey*	2022, n= 11	2021, n=5	2019, n=8	2017, n=11	2016, n=11	2015, n=7
% feel prepared or better	81.8%	100%	100%	100%	100%	100%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 and spring 2020 (COVID-19).

Conclusions Drawn from Data: We made some substantial changes in CHE 2096 by adding a more research focused 3-week experiment which did not allow us to directly assess our students' ability to use the instruments listed above. We hope to find a way to incorporate this important assessment next year. With regards to UV-vis, our students easily met the criteria for success. Finally, 81.8% of our students felt prepared to use various instrumentation according to our senior exit survey which is above the criteria for success. This is very important because more and more of our students find jobs in biotech upon graduation and these skills are highly sought after by employers.

Changes to be Made Based on Data: We need to assess these skills in the Spring 2023 in order to decide if changes are needed. We will also be discussing more systematic ways to assess these skills and make sure they are done every year.

Rubric Used: The following scale will be used.

Instrument	**4**	**3**	**2**	**1**
GC (CHE2096)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
IR (CHE2096)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
UV-vis (CHE3025)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.

Learning Outcome: PLO4
Participate in the life of the Biology and/or Chemistry Department by involvement in one or more of the following areas: research, biology and/or chemistry clubs, and/or various positions of responsibility serving as graders, tutors, stockroom workers and/or teaching assistants.

Outcome Measure: Self-reported data of participation and Senior Exit Survey

Criteria for Success: At least 80% of our students will participate in one or more department related activities (research, science clubs, positions of responsibility) during their time at PLNU. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

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 2022	7 of 8	100%	Yes	
Sp 2021	7 of 7	85%	Yes	
Sp 2020	NA	NA	NA	Survey not given (Covid)
Sp 2019	8 of 9	89%	Yes	
Sp 2018	NA	NA	NA	Survey not given
Sp 2017	20 of 20	100%	Yes	
Sp 2016	9 of 12	75%	Almost	
Sp 2015	15 of 16	94%	Yes	

Senior Exit Survey*	2022, n=11	2021, n=5	2019, n=8	2017, n=11	2016, n=11
% feel prepared or better	81.8%	100%	100%	100%	100%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 and spring 2020 (COVID-19).

Conclusions Drawn from Data: The BCHM majors are participating in the life of the department. Our criteria for success has been met.

Changes to be Made Based on Data: No changes to the program.

Rubric Used: Not applicable to self-reported data.

Learning Outcome: PLO5
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?	Notes
SP 2022	8	100%	Yes	
SP 2021	4	100%	Yes	
Sp 2020	9	100%	Yes	
Sp 2019	8	100%	Yes	
Sp 2018	9	100%	Yes	
Sp 2017	8	75%	Almost	criteria met within statistical bounds

Conclusions Drawn from Data: The BCHM 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	☐ At least 5 references ☐ At least 3 references are journal articles or books.	☐ 3-4 references ☐ 2 or fewer references are journal articles or books.	☐ 2 or fewer references, ☐ No references are journal articles or books	☐ No references
Choice of references 0 – 15 points	☐ Annotated bibliography includes 1 – 2 sentences describing choice, use, and purpose of each reference (including bias) ☐ Particular aspects (chapter, pages, figures) of each source are indicated for which the student anticipates using. ☐ Sources are of more than one type such as websites, books, and journal articles. ☐ Credibility of the author is verified ☐ References are properly formatted ☐ Includes at least one source from an alternate viewpoint, written by an author that holds that viewpoint.	☐ Missing 2 of the details	☐ Missing 3 of the details	☐ 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	☐ Thesis is clear ☐ The outline reflects a clear organization of the paragraphs with supporting ideas, as well as reference to how each source will be used.	☐ Thesis is somewhat clear ☐ Overall organization of outline is somewhat clear	☐ Thesis is unclear ☐ No real indication of any thought towards organization of the ideas and supporting evidence within the paper.	☐ No outline
Ideas and organization of the individual supporting paragraphs 0 – 10 points	☐ Thoughtful and organized flow of ideas ☐ Sub-bullets for each main paragraph / supporting idea show evidence of deep thought about the paper ☐ Mention of multiple concepts from PLNU courses that have influenced position	☐ Evidence of overall structure, but student has not yet thought deeply about how to put the main ideas together ☐ Outline has main ideas, but has few sub-bullets ☐ Mention of 1-2 concepts from PLNU courses that have influenced position.	☐ Very little evidence of thought towards organization, main ideas, and structure for the paper. ☐ Outline is highly incomplete. ☐ No mention of how PLNU courses have influenced position.	☐ 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**	☐ Deep personal reflection is evident ☐ Question for this assignment was clearly answered ☐ Clear statement of position. ☐ 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**	☐ Issue is stated clearly & position is well-supported with evidence & sources. ☐ Alternate position(s) is/are clearly addressed in a manner that flows well with the author's argument ☐ Clear arguments against these alternate positions using personal reflection and scientific information ☐ 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**	☐ Specific concepts from specific PLNU classes, including science and/or religion classes, are included as part of reflection and defense of position. ☐ 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**	☐ No, or very few, grammatical and spelling errors. ☐ Essay flow is excellent with a clear introduction, argumentative reasoning, and a strong conclusion. ☐ Writing effectively communicates with a coll. sci. audience. ☐ 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**	☐ Sources are current, authoritative, and relevant to the topic ☐ Communicates, organizes and synthesizes information from sources to achieve a specific purpose, with clarity and depth ☐ Use of in-text citations as well as the annotated bibliography ☐ Excellent choice of paraphrasing, summarizing, or quoting to enhance the essay and support the author's argument ☐ Distinguishes between common knowledge and ideas requiring attribution ☐ 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: PLO6
Be prepared for post graduate studies or a science-related career.

Outcome Measure: Tracking of alumni data regarding their postgraduate education and profession along with Senior Exit Survey.

Criteria for Success (if applicable): 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%. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

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: (These data are collected every 5 years. Due to the complications of COVID, we will have not yet collected these data again.) The success rate for alumni who apply to graduate or professional schools has been well over 90% for at least 20 years. For dental, medical, optometry, pharmacy, and veterinary schools, there have been 166 acceptances out of 181 applicants (91.7%) between 2004 – 2014.

1) An alumni survey was conducted by the Biology and Chemistry Departments in January 2015 that included graduates from 2004 – 2014. 408 alumni were emailed and 115 responded (28% response rate). The lowest response rate was from the class of 2007 (7%). All other classes had a response rate of 21 – 42%, which is fairly typical of alumni surveys.
2) 32 BCHM majors responded (27% response). Of these alumni, 97% are employed or attending school in a Biology or STEM-related field (**criteria met**). 1 is applying to medical school.

Senior Exit Survey*	2022, n=11	2021, n=5	2019, n=8	2017, n=11	2016, n=11
% feel prepared or better	100%	100%	100%	100%	100%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 and spring 2020 (COVID-19).

Conclusions Drawn from Data: The BCHM majors are successful at obtaining jobs and entering graduate/professional schools. In fact, in 2022, most of our majors obtained a job right before or within one month of their graduation from PLNU. This program was recently nominated to be preferred provider for life science talent by the Economic Development Corporation and we hope this will open even more job opportunities for our seniors in the future.

Changes to be Made Based on Data: No changes to program but we hope to 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. Survey instrument is attached.

Chemistry Seminar Exit Survey 2021 (Biology-Chemistry Major)

1) What is your current career goal?
- a) Professor
- b) Teacher
- c) Health professional – please specify
- d) Biotechnology or pharmaceutical industry
- e) Academic or government lab
- f) Graduate student – please specify field or specialty
- g) Other – please specify

2) Rank how well prepared you were to meet the following program learning outcomes (goals) that were set for your major.

I. Students will demonstrate an understanding of the process of science, and of the concepts and theories of biology across a broad range of organizational levels: molecular, cellular, and organismal.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

II. Students will apply key concepts and principles in quantitative analysis.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

III. Students will apply key concepts and principles in biochemistry.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

IV. Students will apply key concepts and principles in bioinorganic chemistry.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

V. Students will apply key concepts and principles in organic chemistry.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VI. Students will apply key concepts and principles in physical chemistry (thermodynamics and kinetics).
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VII. Students will use standard instrumentation and laboratory equipment to conduct scientific experiments and perform chemical characterization and analyses.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VIII. Students will participate in the life of the Biology and/or Chemistry Department by involvement in one or more of the following areas: research, biology and/or chemistry clubs, and/or various positions of responsibility serving as graders, tutors, stockroom workers and/or teaching assistants.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

IX. Students will develop a rationally defensible integration of science and faith.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

X. Students will be prepared for post graduate studies or a science-related career.
unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

3) Were you involved in the PLNU chemistry summer research program?

a) Yes – describe what role this experience played in your learning of chemistry
b) No – describe why not

4) Do you have any suggestions related to the summer research program?

5) What were one or two aspects of the chemistry curriculum that might have been improved?

6) Do you feel prepared to take the next step academically?
a) Yes – describe what experiences (classes) helped you to get there
b) No – describe what additional or different experiences would have helped

7) If you were starting over as a freshman next fall, would you make any different decisions about your major, or about elective course choices, etc.?

8) Are there chemistry courses that PLNU does not offer that you would have liked to take?

9) Do you feel like you are a part of the chemistry department community? Why or why not?

Alumni Survey 2015

The Biology and Chemistry Departments are doing an extensive Program Review. We would greatly appreciate your feedback as a PLNU alum on your experience as a Biology or Chemistry major. This 15-question survey should take about 15 minutes to complete. If you provide your email address, we will also enter you into a drawing for one of three $100 Amazon cards as a thank you for your time!

1) What year did you graduate from PLNU?

2) What was your major?
   a) Biology-BA
   b) Biology-BS
   c) Chemistry
   d) Biology-Chemistry
   e) Environmental Science

3) What is your highest degree earned?
   a) BA/BS
   b) MA/MS
   c) PhD
   d) MD/DO
   e) PA
   f) DDS
   g) DVM
   h) OD
   i) PharmD
   j) Other – please specify

4) What is your current professional situation?
   a) Professor
   b) Teacher
   c) Health professional
   d) Biotechnology or pharmaceutical industry
   e) Academic or government lab
   f) Graduate student – please specify field or specialty
   g) Other – please specify

5) Rank how well we prepared you to meet the following goals that were set for your major. (Only PLOs for specified major selected in #2 will appear.)
   a) Unprepared
   b) Somewhat unprepared
   c) Prepared
   d) Well prepared
   e) Extremely well prepared

6) Were you involved in the PLNU biology or chemistry summer research programs?

a) Yes – describe how this experience is impacting your career.
b) No

7) Which classes or experiences do you appreciate more now as opposed to when you had just graduated?

8) Is there any course, topic, or skill you've repeatedly encountered that you wish you had been taught at PLNU? Please explain.

9) If you are pursuing a career in environmental science, do you wish you had substituted an internship experience for a science elective while you were at PLNU?
   a) I am not pursuing a career in environmental science.
   b) I did an internship.
   c) Yes, I wish I had done an internship while at PLNU.
   d) No, I did not need to do an internship while at PLNU.

   Comments?

10) Do you wish you had taken any of the following options at PLNU?
   a) BIO130/140 (Human Anatomy & Physiology)
   b) Upper-division anatomy class
   c) No, I didn't need an Anatomy class

   Comments?

11) What were one or two aspects of the biology curriculum that might have been improved to better prepare you for your profession or for further studies?

12) What were one or two aspects of the chemistry curriculum that might have been improved to better prepare you for your profession or for further studies?

13) Have you done any of the following? Check all that apply.
   a) Recommended PLNU to a prospective student
   b) Promoted PLNU to another person
   c) Been involved with the alumni association
   d) Donated to Research Associates
   e) Other – please specify.

14) Since you left PLNU, have you ever had a conversation in which you had to integrate Christian faith with scientific knowledge? Did you feel prepared scientifically? Did you feel prepared theologically? Check all that apply. Please describe the situation and your feelings about your preparation.
   a) I've never had such a conversation.
   b) I felt prepared scientifically.
   c) I didn't feel prepared scientifically.
   d) I felt prepared theologically.
   e) I didn't feel prepared theologically.

15) Since you left PLNU, have you made any decisions that were influenced by your knowledge of creation care and sustainability? If so, did you feel prepared to make those decisions from a scientific understanding of sustainability?
    a) I do not tend to make decisions based on sustainability considerations.
    b) I often feel unprepared to make those decisions as it is rarely clear to me which options would best benefit the planet.
    c) I usually feel prepared to make those decisions as I am generally confident in my understanding of how my choices affect, and which options are best for, the planet.
    d) I feel very comfortable in my scientific knowledge of how various decisions will affect the earth, either negatively or positively.

16) Please provide your email address to be entered into the drawing for an Amazon gift card. Your email address will not be associated with your responses on this survey.