

Annual Assessment Report of Student Learning Outcomes

Biology Major

2017-2018

I. Program Assessment Meetings

March 22, 2018 (1 hour)- The NMS faculty met to appoint point people for assessing each of the majors in the division; Professor Schmidt agreed to assess the Biological major.

May, 2018 - Meetings were held via email between Professors Schmidt, Schnurr and Elliot.

II. & III. Closing the Loop and Examination of Assessment Data

For AY 2017-2018, we focused on Program Goal 3 and both of its objectives:

Goal 3: Students will communicate scientific work in a clear, coherent manner in both written and oral form.

Objective 3.1: *Students demonstrate effective written communication.*

Learning Outcomes: Students use, evaluate, and appropriately cite the scientific literature to communicate the results of scientific investigations in papers and posters.

Objective 3.2: *Students demonstrate effective oral communication.*

Learning Outcomes: Students orally present the results of their scientific studies to their peers and the public.

We evaluated the outcomes for the following assignments/activities in the major that involved written and/or oral communication to determine if this goal being successfully met. Our criteria for success was that at least 70% of the students received a C or higher on the assignment/activity.

Based on these criteria, objective 3.1 was not successfully met in either of our 100-level courses, but was met in all of our upper-level courses. Both BIOL 119L and BIOL 130L are taken by both majors and non-majors, and the increased success in upper-level courses may reflect a higher proportion of majors taking the course. Objective 3.2 was successfully met by every assignment/activity that we assessed.

Objective 3.1

Class: assignment/activity	Measurement Tool	Success (% received a C or higher)	Data Location
BIOL 119L/ lab reports	Rubric	67.5%	Faculty files
BIOL 130L / lab reports	Rubric	61%	Faculty files
BIOL 304L / Species papers	Rubric	91%	Faculty files
BIOL 309L / Independent project Introduction	Rubric	83%	Faculty files
BIOL 363/ Final paper	Rubric	81.4%	Faculty files
BCS 403 / Propositional	Rubric	75%	Faculty files

Objective 3.2

Class: assignment/activity	Measurement Tool	Success	Data Location
BIOL 114L / History presentation	Rubric	95%	Faculty files
BIOL 119L/ Hemlock presentations	Rubric	97%	Faculty files
BIOL 304L / Species presentations	Rubric	100%	Faculty files
BIOL 363/ Poster presentations	Rubric	93%	Faculty files
BCS 403 / Propositional presentations	Rubric	95%	Faculty files

IV. Program changes for the upcoming year:

BIOL 114L has been converted to BIOL 214L, which has BIOL 130L as a prerequisite. The first BIOL 214L class will be taught Spring 2019.

V. Action plan for the upcoming year:

We will discuss if there is any value to offering a BA in Biology as we also offer a BS. This may aid in determining whether or not to continue offering the BA.

We will investigate means for improving written communication skills in BIOL 119L and BIOL 130L.

In their reflection essays, several of our seniors mentioned the lack of focus on ethical issues within the sciences. Therefore, we plan to assess how courses in the major are achieving Goal 5 and its objective by assessing the learning outcome of assignments/activities from the following classes: BIOL 119L, BIOL 330, BIOL 214L and BIOL 226L.

Goal 5: Students will think critically and quantitatively about global issues, including the ethics of science, the use and appropriateness of new technologies, and their role as global citizens.

Objective 5.1: Students will demonstrate the ability to analyze ethical considerations in their work.

Learning Outcome: Students consider the ethics of science in society through case studies and real world scenarios that explore different ethical viewpoints.

Specific course assessments:

Ecology and Evolution (Biol 119L) Students will read Mittner and Collins (2005) Why we need an “ecological ethics”, *Frontiers in Ecology and the Environment* 3:332-337, which presents several case studies having ethical considerations. Students will choose one scenario and discuss their views about it and why. A grading rubric (and a written out assignment) will be forthcoming.

Developmental Biology (BIOL 331) As part of their individual research projects, students address ethical issues regarding their topic. For example, the use of gene editing techniques on human embryos. Assignment and grading rubric are included at the end of the report.

Anatomy and Physiology I (BIOL 214L) Lecture includes a discussion on the history of the use of cadavers, and students do a research presentation on a major contributor to the field which includes a discussion on the laws and ethical climate at the time that each contributor did their work. Assignment and grading rubric are included at the end of the report.

Genetics (BIOL 226L) A framework for considering ethical issues is introduced, focusing on identifying the parties involved and their values. Students do a case study on the Haitian cholera outbreak in 2010. New for Spring 2019 will be a longer and more formal written piece on an ethical issue or topic that students choose. The rubric for assessing this will be developed prior to Spring 2019.

Assignments:

BIOL 331 Developmental Biology

Fall 2018

Research Presentations

You will get a chance to delve further into some of the subjects discussed during lecture by researching and presenting your research on assigned topic. You should use at least 3 non-internet sources. Prior to your scheduled presentation day, you will submit a 1-2 page summary of your topic, including citations, via Moodle that everyone can download and read prior to your presentation. Presentations should be in PowerPoint, or similar format, and should a. introduce the topic, providing history if applicable, b. describe current issues or research on your topic, c. address ethical issues or controversies that involve your topic, and d. connect your topic to concepts in Developmental Biology that have been discussed in lecture. Use of pertinent multimedia is encouraged (please ensure that videos and audio function properly prior to the beginning of class). Presentations should be 12 ± 2 minutes; this gives you plenty of time to go into some detail with your topic. Make sure to stay within this timeframe to avoid losing points from your grade. Following your presentation, you will have 3-5 minutes to answer questions from the class.

Organization for this presentation should follow the basic format of a research paper. Use the following outline as a guide:

- Background
- History
- Development of the idea
- Current research/understanding
- Methods
- Applications
- Ethical issues/controversies
- Future directions
- Conclusion

****Concepts from lectures should be integrated throughout your presentation****

Presentations should be shared with Prof Schmidt via Drive prior to the class time that you will be giving your presentation. Late submissions will receive a 10% deduction from the overall grade, with further deductions for every day after that it is late.

Research Topics

CRISPR-Cas9 gene editing

Embryo Teratogenesis Assay – Xenopus (FETAX)

Chimeras (include recent human-animal experiments)

Achondroplasia (Dwarfism)

Thalidomide effects

Fetal Alcohol Syndrome

Holoprosencephaly

Microcephaly and external causes

Lab-grown organs

Albinism and Piebaldism

Klinefelter Syndrome

Turner Syndrome and Triple X

Developmental Biology
BIOL 331
Presentation Evaluation Form

Possible points for each section are indicated in brackets.

Presenter: _____

Topic: _____ Time: _____

_____ [15] Background/History: Was pertinent information discussed? Was a foundation for current understanding/issues clearly established? Were references cited or otherwise acknowledged?

_____ [10] Current issues/research/understanding: Were pertinent topics addressed? Were methods and/or applications clearly explained? Were future directions discussed (if applicable)?

_____ [5] Ethical issues: Were both (or more) sides clearly explained?

_____ [10] Developmental Biology concepts: Were aspects of the topic explicitly connected to dev bio concepts? Were relevant concepts addressed? Were important pathways or processes clearly described? Was a general understanding of developmental biology demonstrated?

_____ [5] Organization & Delivery: Was there a clear organization? Were transitions between sections clear and effective? Did the speaker speak clearly? Did the speaker stay within the designated time frame? Did the speaker appear to be prepared?

_____ [5] Visual Aids: Were visual aids used effectively and appropriately, carefully prepared?

_____ [10] Written Summary: Were key relevant points described? Were citations included in the text? Was a list references provided? Were references and in-text citations in an appropriate format?

Total Points _____ **[out of 60]**

Anatomy & Physiology I BIOL 214L

The History of A&P

We will begin about 2,500 years ago and work our way up through time to explore how we have come to know the inner workings of the human body. You will do a short presentation on a key contributor to the field, in which you introduce your subject, explain what they are known for and how they did it, and why their accomplishments are important for our current understanding of human anatomy and physiology. Warning: some of these will be quite gruesome! Early A&P was not for the faint of heart (there's a pun in there somewhere...).

Guidelines:

5 -7 minutes long

At least 5 slides (PowerPoint)

At least 3 sources (must be cited and/or acknowledged in your presentation)

At least 2 images (1 of your person and 1 example of their work)

Content:

- Biographical info (Name, birth-death, occupation, nationality)
- What they are known for (some of these folks are known for a lot of different things - focus on the anatomy and physiology aspect)
- How they accomplished what they are known for (describe their methods)
- What obstacles did they have to overcome (laws, ethical issues, etc.)
- Why their accomplishments are important to our current understanding of A&P
- An additional fact about your person that you find interesting

Your presentations will be given **in chronological order** in the last three labs of the semester. There will be approximately 6 presentations during each week. Your presentation will be evaluated using the rubric on the next page.

**Presentation Grading Rubric
The History of A&P**

Subject _____ Name _____

Points are indicated in parentheses.

_____ (5) **Biographical information.** _____ Name _____ B-D _____ Nationality _____
Occupation

_____ (10) **'What they're known for.'** Was this clearly explained?

_____ (15) **'How they did it.'** Were their methods described?

_____ (15) **'Why it's important.'** Was the relationship to A&P clearly established?

_____ (10) **'What obstacles did they overcome?'** Were the laws, ethical issues, etc. of the time
clearly explained?

_____ (10) **Interesting fact.**

_____ (10) **2+ images** _____ Image of subject _____ Image of their work

_____ (15) **3+ sources.** Were sources cited/acknowledged?

_____ (5) **Organization and clarity of presentation**

_____ (5) **Did the presentation last for 5-7 minutes, or was it significantly under/over?**
Time _____ Did the presenter seem prepared?

_____ **TOTAL** (out of 100)

Timeline of Key A&P Contributors

- **Alcmaeon of Croton** (c.500 BC, Greece) – Pioneer of anatomical dissection
- **Hippocrates of Kos** (460-370 BC, Greece) – ‘Father of Western Medicine’
- **Aristotle** (384-322 BC, Greece) – Comparative anatomy, developmental biology, humors
- **Herophilus** (aka Herophilos; 335-280 BC, Chalcedon) – ‘The First Anatomist’
- **Aulus Cornelius Celsus** (c.25 BC-50 AD, Rome) – *De Medicina* and dermatology
- **Galen of Pergamon** (aka Galen, Claudius Galenus, Claudius Galen; c.130-210 AD, Rome) – Animal dissections and human physiology, humors, circulatory system
- **Hunayn ibn Ishaq** (809-873 AD, Iraq) – *Book of the Ten Treatises of the Eye*
- **Mondino de Luzzi** (aka Mundinus, c. 1270-1326 AD, Italy) – ‘Restorer of Anatomy’
- **Andreas Vesalius** (aka Andries van Wesel; 1514-1564 AD, Brussels) – ‘Founder of Modern Human Anatomy’
- **Leonardo da Vinci** (1452-1519 AD, Florence) – Anatomical studies and drawings
- **Paracelsus** (1493-1541 AD, Switzerland) – ‘The Father of Toxicology’
- **William Harvey** (1578-1657 AD, England) – systemic circulation, blood and heart
- **Antonie Van Leeuwenhoek** (1632-1723 AD, Netherlands) – ‘Father of Microbiology’
- **Giovanni Battista Morgagni** (1682-1771 AD, Italy) – ‘Father of Modern Anatomical Pathology’
- **Edward Jenner** (1749-1823 AD, England) – ‘Father of Immunology’
- **William Beaumont** (1785-1853 AD, USA) - ‘Father of Gastric Physiology’
- **Johann Friedrich Meckel** (1781-1833 AD, Germany) – Pioneer in teratology
- **Ignaz Semmelweis** (1818-1865 AD, Hungary) – Antiseptic procedures
- **Henry Gray** (1827-1861 AD, England) – *Gray’s Anatomy*
- **Wilhelm Conrad Röntgen** (Roentgen; 1845-1923, Germany) – ‘Father of Diagnostic Radiography’
- **Santiago Ramón y Cajal** (1852-1934 AD, Spain) – ‘Father of Modern Neuroscience’
- **Karl Landsteiner** (1868-1943 AD, Austria) - ‘Father of Transfusion Medicine’
- **Thomas Hunt Morgan** (1866-1945 AD, USA) – Chromosomes and heredity
- **Rosalind Franklin** (1920-1958 AD, England) – DNA structure

BIOL 226L Genetics

Transmitting Cholera to Haiti

Joseph Millum, PhD corresponding author.

Clinical Center Department of Bioethics and Fogarty International Center, National Institutes of Health, Bethesda, MD, USA

Questions

1. Which parties' interests are affected by the cholera outbreak? Which parties might have some responsibility to respond to the outbreak?
2. The U.N.'s Independent Panel of Experts concluded that "the Haiti cholera outbreak was caused by the confluence of circumstances ... and was not the fault of, or deliberate action of, a group or individual." Assume that they are correct about the facts. Does it follow that no one is morally at fault? Explain why or why not.
3. Imagine that you are providing recommendations for compensating the victims of infectious disease outbreaks, like Haiti's. Should individual actors be held accountable, or should a no-fault compensation scheme be put in place? If the latter, who should provide compensation? Explain the reasons for your responses. (Douglas 2009 discusses "no-fault" compensation in another context.)
4. If the Haitian government has neglected its responsibilities to its citizens, does this make any difference to the help that international aid agencies should provide to Haiti? Explain why or why not.
5. One possible concern with seeking compensation for the people who contracted cholera is that it may have a "chilling effect" on international assistance. For example, if aid agencies believe they are at risk of being sued for unintentionally transmitting disease, they may be deterred from working in a country in the first place. Should the Haitian government or the lawyers representing the victims take this concern into account? Why or why not?

Rubric: Students are assessed on the thoughtfulness and depth of answers rather than the content.

3 points = A thoughtful and in-depth response. The answer shows an understanding and appreciation of nuance in the issue at hand. The answer will take into consideration multiple parties involved, and their values or viewpoints.

2 points = The answer only focuses on a single viewpoint or party, or addresses multiple parties but in a brief and/or shallow manner.

1 point = Answer attempts to address the topic but only gives the student's opinion or misunderstands the circumstances of the case. This answer may also result from a misinterpretation or misunderstanding of the question.

0 points = No answer attempted, or the answer does not relate to the question asked, the topic at hand, etc.