Enhancing the Culture of Assessment in the Department of Biological Sciences

Assessment Seminar
Feb 28, 2014
# BS in Biology common curriculum

<table>
<thead>
<tr>
<th>Foundational</th>
<th>2nd level</th>
<th>Specialized</th>
<th>Capstone</th>
<th>Post-grad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculus 1, Gen Bio 1, 2, Gen Chem 1,2, Oral Rhetoric, English 1, 2, University Life, Journey of Trans, His/Aesth/Lit 1,2, Ph/Rel/Eth 1,2, Soc Sci 1, 2</td>
<td>Genetics, Cell biology, Orgo Chem 1,2, Gen Physics 1,2, Stats for Science, Lang/Mult Cul 1,2, Christ &amp; Culture</td>
<td>4 BIOL elects, Eng the World</td>
<td>Sr. Seminar</td>
<td>MS-PhD, MD, DDS, DPT, PA, AT</td>
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**50 crs** | **35 crs** | **17 crs** | **3 crs** |

**Breadth over depth**
- 15 courses at foundational level
- 5-6 specialized courses in last two years
## BS in Biology - proficiencies

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Courses in Bold are proficiency-infused
BS in Biology – assessment

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Courses underlined are being assessed as part of this plan

*ACAT nationally normed assessment test given twice

Assessment of individual courses runs in parallel to program assessment
Curricular Goals of BS in Biology

Goal 1: Educate and empower students in classroom setting, 3 objectives

Goal 2: Educate and empower students in laboratory setting. Specifically, students will develop technological literacy in biology

Goal 3: Apply knowledge and skills of Biological Sciences to the greater good of society
Goal 1: Educate and empower students in classroom setting

Objective 1: Students learn the principles and concepts of biological systems at molecular, cellular and organismal levels. Specifically, students demonstrate understanding of the structure, function and classification of various organisms and biological systems.

Objective 2: Students acquire solid foundation in Chemistry, Biochemistry, Mathematics, and Physics, integrating essential principles in these disciplines into Biological Sciences, and enhance their understanding of various biological disciplines.

Objective 3: Students learn the essential tools to equip them for college life and beyond. Specifically, students demonstrate proficiencies in reading/writing, numeracy, critical thinking, information fluency, and oral communication.
BIOL /CORE 3243  Engaging the World: Ecology and Stewardship

- **Course aims and objectives**: Students examine the interrelationships of organisms with their environment, including the influences of human activities. Through reading, research, class discussion, field experiences, and contemplative exercises, students explore their roles within the Earth community in the context of both the natural sciences and the Catholic tradition of Saint Francis of Assisi and Bernard Lonergan.

- This course is required for students in the BA Biology major, and is an elective for those in the BS Biology major. It meets the requirement for University Core Signature 3: Engaging the World, and is infused with the Core proficiency Information Fluency.
Guiding questions for the course

1. **How does a contemplative ritual contribute to understanding the natural world?**
   Students journal for a semester long project in which they return each week for a 20-minute stay, to a place they have chosen where non-human activity is more dominant than in their usual locales. The exercise is supported by guided meditations during class/lab. The journal records sense experiences and the questions that arise from them, and serves as the foundation for two research essay assignments.

2. **How do you identify, find, understand, evaluate, and use information?**
   - How can new information be incorporated with personal observations and analysis to create a deeper understanding of ecology?
   - What strategies are used in a well-developed research process? Discussion of how information is structured, and what resources are most appropriate for the different stages of the research process.
   - How does practice of Bernard Lonergan’s transcendental principles contribute to insightful learning?

3. **Natural and human interdependencies are related to conservation of biodiversity.**
   - How is the out-of-doors connected with your academic work?
   - How is your ecological footprint related to your goals?
   - How is the biosphere like a family at home?
Guiding questions

4. How is Franciscan eco-theology related to the science of ecology?
   – In what ways is Creation different from Nature?
   – How does belief in Incarnation contribute to understanding ecology?
   – How does contemplation of the wounded Christ provide insight to heal the wounded Earth?

5. What would it mean to follow in the footsteps of Saint Francis today?
   – How do you feel about being a penitent?
   – What is the point of contemplation?

6. Can the crisis of climate change be successfully addressed by technological development, or is religious conversion also necessary?
   – What is the importance of community?
   – What is your judgment about the method of reflective action?
SLOs for each program goal

Goal 1: Educate and empower students in classroom setting
Assessed with 10 content questions on the final exam
2013 ave. score 80%

Goal 2: Educate and empower students in laboratory setting
Students will become more attentive to the natural world, both outdoors and through research.
Assessed through final reflective journal entry and by their two research essays

Goal 3: Apply knowledge and skills of Biological Sciences to the greater good of society
Students will further develop their sense of wonder as a guide to their research in ecology and stewardship.
Assessed by 10 items on the final exam
2013 ave. score 70%
And by the research essays
Generalized Empirical Method (GEM)

Be attentive - sense experience
Be intelligent – ask questions, have insights
Be reasonable – formulate and evaluate theories,
   Is it so?
Be responsible – decide what to do next

* A recursive and reflective process
* evoking wonder
Application of GEM to Ecology and Stewardship

Be attentive to the natural world
Be intelligent – What questions does your mandala raise? What insights come to you?
Be reasonable – Find credible information sources to expand and test your insights
Be responsible – Write your research essay
<table>
<thead>
<tr>
<th>Topic</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of scientific sources</strong></td>
<td>No references cited</td>
<td>no scientific refs but others</td>
<td>at least 1 science ref + others</td>
<td>&gt;=2 scientific ref + others</td>
</tr>
<tr>
<td><strong>For each scientific source</strong></td>
<td>Not relevant to the topic</td>
<td>Relevant but not integrated into the essay</td>
<td>Relevant and integrated, but not cited</td>
<td>Relevant, integrated and cited</td>
</tr>
<tr>
<td><strong>Body: Information properly referenced</strong></td>
<td>No bibliography and no citations in text</td>
<td>No citations in the text OR no biblio</td>
<td>Correctly cited in text</td>
<td>Correctly cited in text and correctly formatted in biblio</td>
</tr>
<tr>
<td><strong>Introduction lays the path from experience to understanding</strong></td>
<td>No introduction</td>
<td>Intro presents their observations</td>
<td>Intro presents observations and questions</td>
<td>presents their observation, question and theory/hypothesis/methodology</td>
</tr>
<tr>
<td><strong>Body engages the topic with sufficient detail, explaining the material</strong></td>
<td>Body not related to question/topic</td>
<td>body is superficial description or report related to the question</td>
<td>body includes detailed description with good evidence of understanding and interpreting the data; AND clearly relevant to question.</td>
<td>body includes detailed description, evidence from multiple perspectives/appreciation of complexity, nuanced understanding of the data and relating to the question.</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>No judgment offered in response to the initial question</td>
<td>Judgment offered without evidence</td>
<td>Judgment offered with incomplete evidence pro and con</td>
<td>Conclusion responds to the initial question and sums up the evidence that addresses it, pro and con, concluding with a judgment</td>
</tr>
<tr>
<td><strong>Creativity</strong></td>
<td>No evidence of creativity</td>
<td>Creative title</td>
<td>Engagingly written w creative title</td>
<td>Elegant and engaging essay w creative title</td>
</tr>
<tr>
<td><strong>Grammar, spelling etc.</strong></td>
<td>paper lacks evidence of proof-reading</td>
<td>Numerous mistakes</td>
<td>Minimal editing needed</td>
<td>No or minimal copy editing needed</td>
</tr>
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A lesson learned from Essay 1

• Students listed the required two or more scientific references, but actually relied heavily on “other sources” (undoubtedly found through Google).

• We gave students a chance to re-write and re-submit for final grade.

• For essay 2 (which required at least 3 scientific references), we added “you cannot cite a source unless you have an author and a date” – and no .com sites! Ouch, painful!

• We had a lot of class discussion about searching for, evaluating, integrating and citing sources!
Essay 2 vs 1

We graded harder on the 2nd essay, and did not offer a chance to revise.
Average score increased from 78% to 84%*

  Improvement was not “across the board”
  15 improved, 8 had lower grades, 3 did not submit

Most improved areas: listing scientific sources and creativity
Least improved: integrating sources

*The difference was not statistically significant on ANOVA repeated measures (F = 3.03, p = 0.095, df = 23).
Nature essay #2 vs. #1.

The bar chart compares the performance of Essay #1 and Essay #2 across different sections:

- **Introduction**: Essay #2 performs better than Essay #1 by approximately 10%.
- **Body**: Essay #2 matches Essay #1 closely, with both having about 90% success.
- **Conclusion**: Essay #2 outperforms Essay #1 by about 20%.
- **Scientific sources**: Essay #2 shows a significant improvement, with about 70% compared to Essay #1's 60%.
- **Referencing**: Essay #2 and Essay #1 are similar, both scoring around 90%.
- **Grammar etc.**: Essay #2 leads by about 10% with 90% compared to Essay #1's 80%.
- **Creativity**: Essay #2 and Essay #1 are close, with Essay #2 at 80% and Essay #1 at 70%.

The chart illustrates the overall improvement in Essay #2 across various aspects of essay writing.
How well did we do?

• We moved from begging / cajoling / threatening students to get off Google and use the library resources to

• Critiquing higher level skills of how to smoothly integrate and cite sources, how to “use your own words” and paraphrase instead of quote.

and

• Being more picky about citation style, spelling, grammar, flow etc. (and grading harder).
Lessons learned about Info Fluency

1. Students (seniors) don’t know how to do research. And many say they’ve never been taught.

2. Many struggle with finding library resources. Even with our “single search box” (EDS) it can be complicated, challenging, frustrating (Google is much easier).

3. Many struggle with scientific articles – find them hard to read and understand (another reason they like Google).

4. Most don’t take in much from one shot library sessions; reinforcement, practice and feedback are crucial.

5. Some “not very good” students wrote the most creative and insightful essays.

6. Lisa: It’s amazing what you discover about students when you become part of their class!
Assessment through the nature journal

Being able to expand on what I saw in my mandala through nature essays was helpful in allowing me to understand how the ecosystem works. I researched squirrels for one of my essays, and when I saw some a few weeks later I knew exactly what they were doing and how they were living in that environment.
By sitting by myself away from interruption and the distractions of our society I was able to gain new insights into ecology as a whole. These insights are ones that no one else can really have because it was so personal being alone in the wild. The topics I chose for my essays are ones that I would never have thought of writing about, ever! Yet, I became so interested with how trees grow and ants that I was able to do research and write about them.
When this exercise was first given I felt a little nervous because I didn’t know if I could commit myself to going to a place for 20 minutes or more during my hectic week.

...  
The day three white butterflies started flying all around me made me realize that I was connecting to Mother Nature.
As time progressed I felt more protective of my mandala.

The time that I spent in my mandala made me actively think about the decisions I make everyday.

Recognizing the beauty that nature has to offer provides a huge incentive to want to preserve and improve on what we have.
Now, reflecting on my last experience in my mandala, I saw how it had become very lifeless and barren compared to that very area in the summer. It is fascinating to think that this process of "death" and rebirth occurs yearly.

The various adaptations that nature makes is almost incomprehensible in terms of creativity.
My favorite part of this experience has to be growth of the “Chicken of the woods” on my tree. Watching it grow and change colors was beautiful, and magical. Although I know that this is a sign of tree decay I learned to accept that everything in nature works together to conserve everything. The tree will not just die and go to waste, a beautiful fungus has grown from it and has morphed into a different kind of life.
The word stewardship means more to me now that just being responsible for something. I was able to find my own meaning of the word through all my reflections. Stewardship in a way means family, it is a way that people and animals are connected to each other ... Through my experience I have now began to understand more and more the beauty that life has to offer as well as the importance it is for us to take care and protect the world.
I had the opportunity to see things in real life and not imagine how it is supposed to be in a classroom. I’ve always known that nature is very important, but I never got to see the “real thing”.
questions
I don't like this stillness in the air. Not a single ant, fly, or ladybug was in sight. During this cold season, it seems as though the world just stops. I agree that this is why the holidays are around this time of year to bring joy to the emptiness that is felt around us.
For observing the lichen and its symbiotic relationship, I have realized that humans and nature share the same bond. Whether other scholars believe that human do not share this bond, after spending weeks with my mandala, I believe that we do. Even now as I am sitting here, I feel a special bond with nature. Certain things have made me happy and certain things have made me sad. I could feel warmth and the cold and sometimes I could even feel if nature is sad. A connection has been made and I know that for a fact.
I usually walked to the mandala from my dorm each week, which gave me a chance to think and clear my head. While sitting in my sit spot I had a chance to step away from the craziness that is my life and relax for a few moments. This helped me to be less stressed which did wonders for my mental health.
I was able to see the transition from summer to autumn to winter, which I would have noticed, but not as closely as I did this semester. For example, without doing this journal I would have never noticed that the birds flew south for the winter or the leaves starting to decay on the ground. I also would not have seen the effect humans have on the environment, not only by building homes and businesses but also by leaving litter almost everywhere.
My second paper taught me a lot about fungi which I only observed one time at my sit spot. This topic in particular taught me so much more than I could have expected and gave me a much better idea of what was going on beneath the ground at my sit spot.