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Drafting an Assessment Plan for Your Instruction Program: Sustainably Assessing Information Literacy in an Undergraduate STEM Course

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Drafting an Assessment Plan for Your Instruction Program: Sustainably Assessing Information Literacy in an Undergraduate STEM Course

Abstract

Assessing student learning across a library instruction program can be infeasible without being strategic, intentional, and realistic. Librarians at a small college will share how they developed a sustainable, 3-year assessment plan for the ACRL Framework and targeted a 100-level biology course-one of the two high-enrollment STEM courses that receive library instruction on their campus each year. The presenters will share their assessment plan, flipped instruction model, workflow-management strategies, and lessons learned for collaborating with STEM faculty to assess information literacy.

Keywords

Information Literacy, assessment, assessment plan, STEM, Biology

Disciplines

Educational Assessment, Evaluation, and Research | Information Literacy | Library and Information Science

Comments

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Drafting an Assessment Plan for Your Instruction Program:

Sustainably Assessing Information Literacy in an Undergraduate STEM Course

Gettysburg College
Musselman Library

Kevin Moore and Clinton Baugess

LOEX 2022 - Ypsilanti, MI – May 5, 2022

2

Who we are

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Welcome! Thank you for starting your LOEX conference with us. I'm Clint Baugess, and this is my colleague, Kevin Moore. We are both from Gettysburg College, in Gettysburg, PA. Kevin is the liaison to Biology and online learning librarian, and I am the instruction coordinator for our information literacy program.

This morning we will be presenting on how we developed a sustainable, 3-year assessment plan and targeted a 100-level Biology course, which is one of the top-enrolled courses at our campus.

We will cover our assessment plan, our instruction model, workflow, and lessons learned for collaborating with STEM faculty to assess information literacy.

3

Materials we will share with you

- These slides
- Programmatic IL assessment plan documentation
- Sample rubrics

http://cupola.gettysburg.edu/librarypubs/160

One of the best parts of LOEX is coming back to work with a lot of ideas and materials to use and adapt.

The slides will be shared on the LOEX site. We will also put the assessment plan documentation, rubrics, and the slide deck on our institutional repository at the link below.

IL Instruction and Assessment at Gettysburg College

4

To get us started, we want to provide institutional context for what we will discuss, which we hope will help you to identify what's realistic, scalable, and sustainable at your own institution.

5

Information Literacy Instruction Program

Gettysburg College

- 4-year, residential liberal arts college
- 2,456 undergraduates
- 40 majors, 40 minors

Library

- 14 librarians
- 5 R&I librarians
- 11 librarians participate in instruction program

Research & Instruction

- 171 class sessions annually
- 109 fall / 61 spring / 1 summer
- In-person and online (synchronous/ asynchronous)
- 1,567 students reached
- 30 avg. sessions annually for R&I librarians

*Instruction numbers reflect 2021-22 academic year

To provide a sense of our library setting, Gettysburg College is a four-year residential liberal arts college with around 2500 undergraduate students and 40 majors and minors.

The library itself is well staffed for a library of our size– 14 total librarians. Kevin and I are part of a team of 5 R&I librarians who provide the majority of instructional support, but 11 other librarians do teach at least 1 session a year with one of their liaison areas – which is quite good to me as instruction coordinator.

In terms of class sessions for the last year, we teach 171 class sessions annually, which are mostly one-shots delivered in person or online – with some flipped sessions like the BIO 111 class we'll describe today.

Likely similar to your own instruction, we see more students in the fall when we're working with first-year seminars and introductory courses. Finally, over the course of the year, we reach a little over 1500 individual students.

6

Mapping Programmatic Assessments

	2017-18	2018-19	2019-20	2020-21	2021-22
Faculty IL Survey	X (Fall)			X (Fall)	
Peer Obs./Teaching Squares	X	X	X	X	X
IL Grants	X				
SLO Coding			X (Fall)	X (Fall)	X (Fall)
HEDS Senior Survey	X	X	X	X	X
BIO 111					X(Fall)
FYS - Rubric		X			

While Kevin and I are going to focus today on what we did specifically with an introductory level Biology course, it's necessary to explain how we got to that point.

During the last few years with COVID-19, our instructional offerings have expanded quite a bit – while we were once all in-person, we are now a mix of in-person and online. With Kevin as the online learning librarian, we spent part of last summer mapping out what we had been accessing and where that data lived, with the idea that this would help us to consider how to map the new shape of our program.

I'm uncertain if this is the nature of your instruction programs or not, but in our case, our assessment practices were somewhat fractured. We assessed different aspects of our program – faculty satisfaction, our own teaching, grant-funded collaborations, formative in-class assessments, and students' perceived knowledge of IL concepts via surveys, but we have not been great at intentionally and directly, or authentically, assessing student learning.

This was the case even with having clearly articulated programmatic student learning outcomes and being great at tracking those for in-person sessions and within our collection of online learning objects. In other words, we knew what we wanted to do and what we thought we were doing, but we had not yet been able to say beyond formative assessments what impact, if any, our time spent with students had on knowledge of information literacy skills and concepts.

As a result, we decided in this academic year to focus on doing a direct assessment of student learning, that had both in-person and online components.

7

Assessment Plan – Core IL Concepts

	Scholarship as a Conversation				Research as Inquiry			Information Creation as a Process		
	Searching as Strategic Exploration				Authority is Constructed and Contextual			Information Has Value		
	2021-2022				2022-23			2023-2024		
	Fall	Spring	Summer		Fall	Spring	Summer	Fall	Spring	Summer
FYS					Collect	Analyze	Report			
100-level	Collect	Analyze	Report							
200-level										
300-level										
400-level										

Adapted from Gammons, R. W., Inge Carpenter, L., & Sly, Jordan S. (2018). *When stars align: Redesigning an instruction and assessment program to align with the Framework for Information Literacy* [Conference presentation]. LOEX 2018 conference, Houston, TX. https://drum.lib.umd.edu/handle/1903/21535

The turning point that really provides the foundation of this project is based on a 2018 LOEX presentation from Gammons, Inge Carpenter, and Sly that described an assessment plan and process at the University of Maryland libraries.

Not everything that worked for them worked for a school the size of Gettysburg, BUT it did provide a helpful and sustainable way to consider assessing student learning in relation to the ACRL Framework in a 3-year cycle.

I don't want to spend a lot of time describing this, but the table here gives you a sense of how you can touch upon all of the frames in different parts of your program and take into account the time required for those assessments.

Last summer, though, Kevin and I did identify that given how much of our fall semester is spent with FYS and 100-level courses this would be a good place for us to try this more intentional approach. Here 100-level is this academic year and the FYS is next year.

8

FRAMES: Searching as Strategic Exploration and Scholarship as Conversation		
Outcome 1: Develop an effective search strategy by identifying key concepts and terms **Outcome 2:** Distinguish among information search tools **Outcome 3:** Employ strategies to broaden/narrow search results **Outcome 4:** Access a source using different retrieval methods		
Course level: 100-level		
Criteria: **How will we know we are successful?**	**Actions:** **What will we do to make this happen?**	**Evidence:** **How will we collect information? What needs to be developed/designed to gather evidence?**
1. 80% of BIO 111 tutorial submissions score higher on post-test responses than pre-test responses	Update tutorial for BIO 111 lab sections in fall 2021 so it includes pre- and post-test questions	Tutorial pre- and post-test data
2. 80% of BIO 111 tutorial submissions correctly locate one peer-reviewed empirical research article	Ensure that BIO 111 tutorial ends by asking students to locate one peer-reviewed empirical research article	Tutorial responses for final slide questions
3. 80% of BIO 111 tutorial submissions that successfully located a peer-reviewed empirical research article demonstrate proficient understanding of the article they selected	Create a rubric for scoring students' tutorial responses about their selected article's content	Tutorial responses for final slide questions and scoring rubric
4. 80% of BIO 111 final lab report samples include a proficient assortment of sources	Speak with lab coordinators about getting copies of final lab reports; create rubric that only evaluates source selections	Students' final lab reports and scoring rubric

For the 100-level targeted assessment, Kevin will go into more detail momentarily about why we decided to focus on BIO 111, but we wanted to share this table which gives you a sense of our overall approach, which could be used for another.

Here we identified our two frames to focus on for the year, the specific outcomes we wanted to measure, and then the more specific criteria, actions, and evidence.

This required us to think ahead about what we considered as success, what we needed to get done during the summer, and what data we needed to collect to know if we had been successful.

I know this looks like a lot, but it's extremely helpful to refer to throughout a project like this to make sure that you stay within the original scope of your assessment. Staying focused is one way to keep all of this manageable.

Why BIO 111?

Now, we'd like to talk through why we selected this particular course for such a time-intensive assessment process.

10

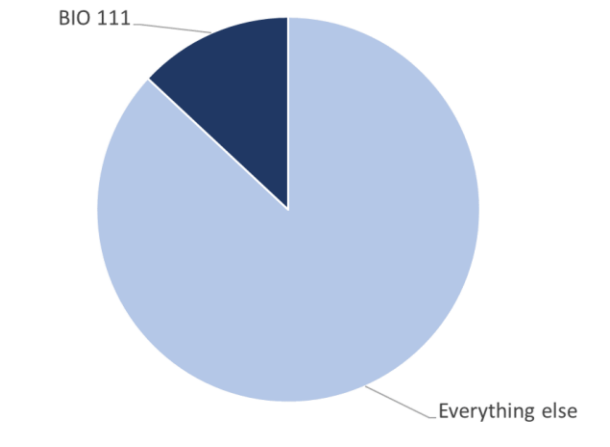
Biology 111: Introduction to Ecology and Evolution

- Introductory lab science
- Core course option for several majors
  - Biology
  - Biochemistry & Molecular Biology
  - Environmental Studies
  - Health Sciences
- Popular with first-year students in particular

At Gettysburg College, BIO 111 is an introductory lab science course (lecture and lab components) offered each fall semester. It isn't strictly required for any major (not even BIO) because the majors tend to offer a lot of choice in the "must take one of these three classes" sense, but it's one of the most popular of the core course options for people who plan to major in one of the disciplines you see listed here. Clint mentioned that our FTE enrollment is around 2,500 at the moment, and BIO 111 enrollment in F21 was 211 students. It's also an extremely popular course for first-year students, which means meeting with BIO 111 labs gives us yet another chance to connect with students in the first semester of their first year at Gettysburg College.

11

Fall 2021 IL Instruction at Musselman Library



13% of all IL sessions taught

13% of total student attendance

19% of unique student attendance

Just in terms of raw instruction numbers, BIO 111 represents a substantial chunk of our instruction load each fall. Of the 107 IL sessions we taught in F21, 14 of them were for BIO 111 labs. Of the 1,535 total students who attended IL sessions in F21, 194 of those were for BIO 111. When we went through the attendance data and deduplicated it in order to account for students who attended multiple library instruction sessions in F21, we found that, of the 1,011 unique students we met with for IL sessions, 194 of them were in a BIO 111 workshop. All of this is to say that BIO 111 traditionally drives more of our fall IL instruction load than any other single course on campus. It also represents our single greatest opportunity to connect with undergraduates early in their STEM studies.

12

Value of IL Instruction for Undergraduates in Introductory Science Courses

- **Increased student confidence** (Brownell et al., 2013; Fuselier et al., 2017; Winterman, 2009)
- **One-shot instruction can be effective for lower-level learning outcomes** (Bryan & Karshmer, 2015; Ferrer-Vinent & Carello, 2008; Ferrer-Vinent & Carello, 2011; Fuselier & Nelson, 2011; Porter et al., 2010)
- **Aspirational goal of analysis instead of summary** (Goodman et al., 2018; Svensson et al., 2022; Thompson & Blankinship, 2015)

Intentional information literacy instruction as part of introductory-level science courses helps improve students' confidence in their ability to locate *and* engage with primary scientific literature. While we can't make information-literate undergraduates with a single workshop, one-shot instruction has been shown to help students with citation practices and with distinguishing between primary and secondary scientific sources. Existing research suggests that the most promising area for targeted improvement is helping students practice making sense of complicated primary research articles and analyze information instead of summarizing it. So, what we ultimately have is a high-volume course that represents a substantial portion of our overall IL instruction and provides us with a great opportunity to connect with aspiring STEM majors early in their undergraduate studies. This is a good recipe for us.

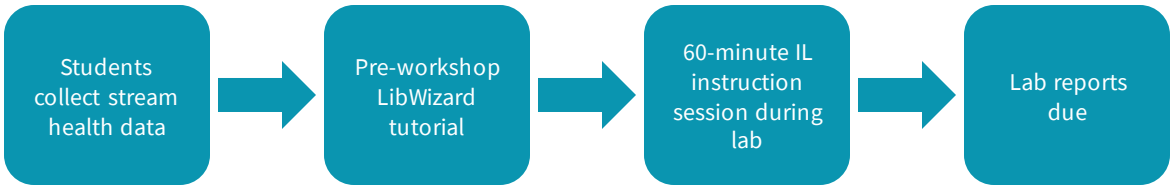
BIO 111 IL Instruction Format

13

To help explain exactly what we hoped to assess, I want to briefly explain what our BIO 111 IL instruction sequence looks like.

14

BIO 111 Sequence



We use a flipped instruction model for our BIO 111 instruction, which accompanies a multi-week lab related to assessing freshwater stream health. Students know they'll need to write a lab report (in pairs) that situates their own work within our larger scientific understanding of the topic, which means they know they'll need to cite at least three articles. The first thing they do, though, is go out into the field and collect their actual data (measure water temperature, dissolved oxygen, etc. and collect macroinvertebrates living in the water) so they can eventually calculate the biotic index for two streams in the Gettysburg area. The flipped instruction model I referenced earlier consists of a pre-workshop LibWizard tutorial students receive nominal participation credit for completing, and it's followed by an in-lab IL workshop with a librarian. Students then apply what they've learned when writing their lab reports, which are typically due a few weeks after the workshop.

15

Information Literacy Instruction

Pre-Lab Tutorial

- Describe strategies for reading scientific research articles strategically
- Perform advanced database searches in order to find scientific research articles
- Locate one good research article to cite for your aquatic ecology lab report

https://gettysburg.libwizard.com/f/bio111

In-Lab Instruction Session

- Summarize the process of publishing original research in order to situate primary scientific literature within the larger information landscape
- Perform advanced searches in Biological Abstracts and Scopus in order to locate articles for their lab reports
- Assess and evaluate database search results in order to identify the most relevant articles for their literature reviews

Before meeting with a librarian, students complete a pre-workshop LibWizard tutorial that reviews the *kinds* of articles they need to find (peer-reviewed empirical research) and defines those terms. The tutorial also provides strategies for reading scientific articles and summarizes some advanced search features in Scopus and Biological Abstracts before asking students to locate and engage with one promising article. We follow up the next week with an IL session in their regular labs where we discuss the process of producing and publishing scientific information so students can see themselves as producers of new knowledge using a dataset they alone have access to. The in-person session also debriefs students' experiences finding and reading a peer-reviewed empirical research article so each lab can collectively learn from the experiences of individual students, and we typically end with independent search time so the librarian and lab instructor can help students begin locating more articles they might eventually use in their final lab reports.

Assessing BIO 111

Because we had these two touchpoints as part of our IL instruction, we knew our assessment plan would need to account for both.

17

Data Collection

Pre-Lab Tutorial

- Pre- and post-test responses
- Source identified
- Engagement with source

182 responses

IL Workshop

- Copies of lab reports

60 lab reports

We took stock of the actual data sources we could use for our assessment. The pre-lab tutorial was relatively straightforward because it already contained a simple pre- and post-test setup and, at the end, it already asked students to identify and engage with one peer-reviewed empirical research article that seemed like it would be a good fit for their topic. They had to give us the title of the article as well as the journal it was published in and then a few sentences each to demonstrate their understanding of the introduction, methods, results, and discussion/conclusion sections. When it came to assessing everything *after* the tutorial, we wanted to get our hands on authentic artifacts, so I worked with BIO 111 lab instructors to secure ungraded lab report copies for as many sections as we could get. We ended up with 182 (of 211 enrolled, 86%) tutorial responses and 60 lab reports (9 of 14 lab sections), all of which I anonymized for our Research & Instruction librarians.

18

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The four things we wanted to learn: 1) Based on pre- and post-test data, did students learn something from the tutorial? 2) When directed to specific databases, can students located a peer-reviewed empirical research article about assessing freshwater stream health? 3) For those students who were able to locate a peer-reviewed empirical research article, how well could they make sense of the article's different sections? 4) In students' final lab reports, how effectively do they present and engage with scientific information?

19

Inspiration for Rubric Development

- Consulted literature for example rubrics (Fagerheim & Shrode, 2009; Goodman et al., 2018) and assessment instruments (Blank et al., 2016; Gormally et al., 2012)
- Reviewed AAC&U VALUE rubrics (2009) on Information Literacy, Inquiry and Analysis, Written Communication, and Critical Thinking
- Sought out practical guidance for this kind of project management (Oakleaf, 2007; Oakleaf, 2009)

Rubrics are hard to write, and even the most intentionally designed rubrics risk falling apart when a department actually tries to implement them. I *tried* to minimize this risk by reviewing example rubrics from the literature and looking at the AAC&U's VALUE rubrics, but I also sought guidance for the kinds of practical, project management tips that would be useful for overseeing something like this.

20

Example Rubric: Source Location

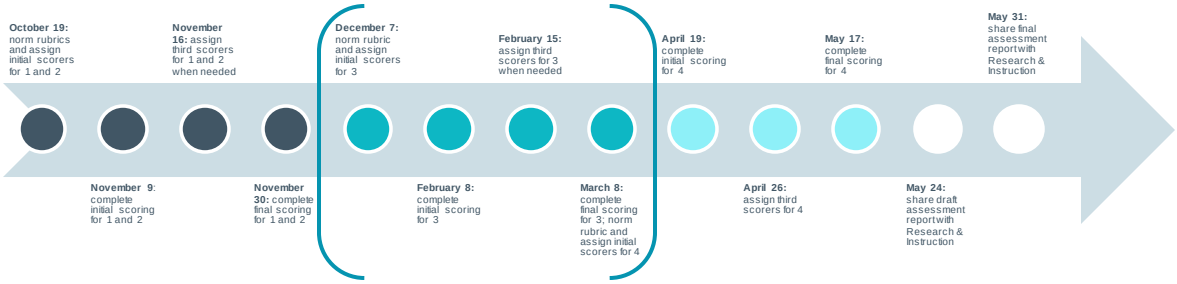
	Beginning (1)	Developing (2)	Proficient (3)	Exemplary (4)
Tutorial Prompt: Your goal is to find one promising article about using macroinvertebrate populations to help assess stream health. **Related Learning Outcome:** Students will be able to assess and evaluate database search results in order to identify the most relevant articles for their literature reviews	Article does not come from a scholarly journal with a peer-review process	Article comes from a scholarly journal with a peer-review process **BUT** it is not an empirical research article (e.g., review article, news, commentary) **OR** the article is not about stream ecology	Article comes from a scholarly journal with a peer-review process **AND** is an empirical research article **BUT** the student lists some other piece of information instead of the journal's name (e.g., the name of the publisher) **OR** the student includes additional information (e.g., volume, issue, page range) along with the journal name	Article comes from a scholarly journal with a peer-review process **AND** is an empirical research article **AND** student correctly lists some version of the journal's name without any additional details (e.g., no volume, issue, or page range)

http://cupola.gettysburg.edu/librarypubs/160

Here's one example of a rubric we developed and implemented. The text is tiny, but I just want to point out that it will eventually live at the repository link we keep showing throughout these slides. Without getting into the specifics of each score, the goal of this rubric was to help us assess to what extent students completing the pre-lab tutorial were successful at locating a peer-reviewed empirical research article about using macroinvertebrate populations and abiotic factors to assess stream health. As part of the tutorial, students just had to identify one promising-sounding article and record the article's title as well as the name of the journal.

21

Assessment Workflow



This slide has a lot of very small text on it, but it's not important that you read the text right now. Instead, just soak in this visualization as a piece of impressionism while I point out a few things on this timeline that represents our BIO 111 assessment workflow. The first is that the date on the far left is October 19 and the date on the far right is May 31, which means we were committed to making this a year-long assessment project for our department. This is a significant time investment, but we committed to this model at the time because of the reasons I provided a few slides ago about how many BIO 111 IL sessions we teach and what percentage of our total IL instruction those sessions represent. The second thing I want to point out is that the four different shades of dots (darker on the left to lighter on the right) represent the four different stages of our assessment plan, which corresponded to the outline I just showed on the previous slide. The last thing is a pattern that doesn't actually make sense unless you can see the text, but each stage has a very similar pattern that looks like this: development and norming of rubric, individual scoring, third scorers assigned where needed, complete final scoring. We went with this pattern because of recommendations posed by folks like Megan Oakleaf in articles about best practices for implementing rubrics in large-scale assessment projects.

Assessment Workflow, contd.

Develop rubric and schedule norming session with department

Assign two scorers to each item being assessed this stage

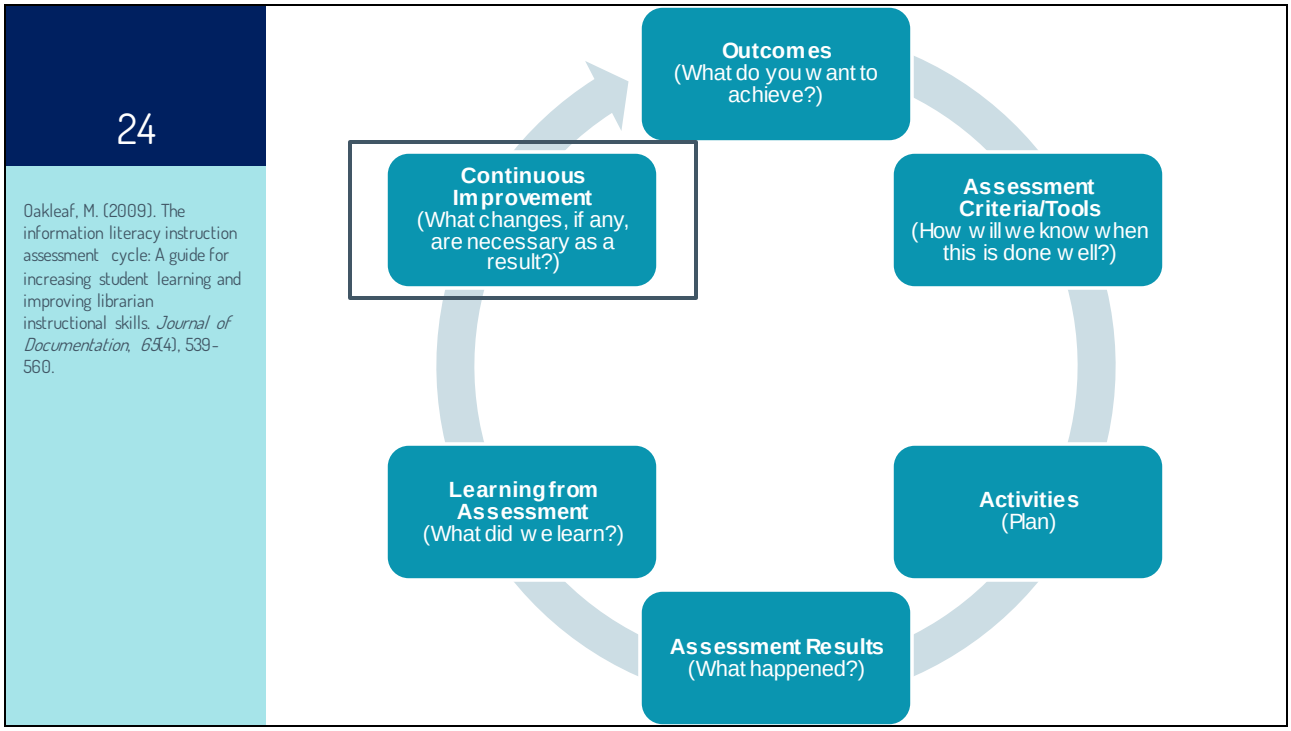
If A = B, then Score = (A+B)/2

If A ≠ B, then Score = (A+B+C)/3

Discuss as a department and prepare for next stage

Next Steps

So where do we go from here after this year-long process?



You've likely seen different models for the assessment cycle. This is one articulated by Megan Oakleaf. Notably, the thing we all often skip as we move onto something else on our to-do list is continuous improvement – what changes, if any, do we want to make as a result?

For us, there are a few:

- ☐ Create final assessment report based on observations and findings
- ☐ Discuss findings as a department and develop recommendations for future instruction
- ☐ Meet with BIO 111 faculty, share findings/recommendations, and request feedback
- ☐ Revisit lesson plan for fall 2022 instruction
    - ☐ For example, we want to discuss how can we effectively use the in-person class time – moving from search strategies to engaging with scientific articles, evaluating their usefulness for a topic/question, and integrating them effectively as evidence into writing
- ☐ Use this is an opportunity for greater collaboration. Based on the findings, do they want to be part of the scoring process? If we change how we use class time, what supplementary materials would be helpful to produce and include with the lab manual or in the LMS?
- ☐ Develop scaled-back BIO 111 assessment plan for future semesters

25

Closing the Loop

1. Create final assessment report
2. Discuss findings as department
3. Discuss with BIO 111 faculty
4. Revisit fall 2022 lesson plan
5. Find opportunity for faculty collaboration
6. Develop scaled-back BIO 111 assessment

Scaled back is key here. We plan to assess our work with our FYS program next year, but how can we continue to improve our teaching as a result of what we've learned?

In the spirit of a sustainable and realistic assessment plan that you can build upon each year. A few of our thoughts right now include:

1. You can keep it as simple as you need. Don't do it all. Target the courses/program that will have the most impact/reach.
2. Similarly, scale appropriately. Some data is better than no data. Do what's realistic for your staff and available time.
3. Programmatically, it's OK if you have a series of small snapshots. If that's what you can do, you still know more than you did before.
4. This will take time and will need to be a priority. If you are going to do an authentic assessment with student work, do not skimp on the key parts of the process. Do the rubric norming. It will save you a lot of time! Hopefully, you'll have a strong rubric, agreement between raters, and avoid needing another round of scoring.
5. Throughout the entire process keeping in mind that assessment data is NOT just for the library. Academic departments and others are interested in learning assessment. Draw them into the process. At first, they may just want to be advised about what you're doing and provide feedback. That was our case. With time, though, that can grow into a collaboration – which ends up resulting in a better assessment and understanding of how librarians are partners in student learning.

Lessons Learned

Let's turn to a few of the things that we learned along the way...

27

Takeaways for Future Assessment Projects

- Look at the courses that will have the most impact/reach
- You don't have to conduct a census just because you can
- Programmatically, data snapshots are OK
- Rubric-norming sessions save time in the long run
- Assessment data is not just for the library

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28

Thank you!

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http://cupola.gettysburg.edu/librarypubs/160

Thank you! Again, our slides will be on the LOEX website, and our institutional repository linked here will have the slides, rubrics, and other documentation.

We've also included three slides with references to sources we've cited here and many others that we consulted.

At this point, we'd like to turn the time over for questions and discussion.

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