# Open Science in Undergraduate Biology Sharon Hanna, Jason Pither, and Mathew Vision bar

## Background

- University-wide strategic project
- Partnership between Library and Biology
- Ensure the scientists of the future practice the best science possible: Make practicing Open Science as

# **Modules**

- OS 101: Principles of Open Science (pilot; complete)
- OS 102: Reproducibility through the Research Cycle (in progress; January to

# **Planning Considerations**

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- Preexisting heavy workload in Biology
- Accessible language and content

- automatic as wearing a lab coat!
- Build a strong foundation in open research and open scholarship
- Integrate Open Science principles and practices into existing undergraduate curriculum

# **Long-Term Goals**

- A nine-module program
- Capstone replication project
- Micro-credential for program completion
- Undergraduate Research Awards requiring Open Science practices

April 2020); critical evaluation of scientific

#### papers

- OS 201: Modularized Lab Reports  $\bullet$
- OS 202: Reproducible Data Management and Analysis
- OS 301: Lab Books and Field Notes:  $\bullet$

Creating a Digital Record

- OS 302: Citizen Science
- OS 303: Advanced Treatment of QRPs:  $\bullet$ Reproducibility through the Research Cycle
- OS 401: Reframing Measures of Impact
- OS 402: Reproducibility Project (Capstone)

- Canadian/local examples
- Large classes with labs
- Lack of direct contact with students
- Many TAs, with varied knowledge and skillsets
- Introducing new ideas in a "low-key" way
- Navigating faculty preconceptions about Open Science
- Assessment of comprehension and attitudes toward Open Science

# **Pilot: OS 101**

**Sept – Dec 2019** 

Online delivery of content

### Screen Shot from OS 101 Unit 3 (Core Values)

From the Canvas (online) learning management platform.

#### SNBX Open Science > Pages > Scientific Integrity

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Grades

People

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## **Assessment &** Feedback

Unit quizzes and an exit survey

- Voluntary (for participation points)
- Introduced in Biology 116 (for Science Majors) and Biology 122 (for non-majors)

#### **Content:**

- The nature of scientific knowledge
- The science-society relationship
- The Replication Crisis
- Core Values
- **Benefits of Open Science**
- Barriers

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Announcements Ø			
Assignments	Scientific Integrity		
Discussions	Scientine integrity		

Though we haven't mentioned the phrase "scientific integrity", we have looked at the critical role it plays in replicability and Open Science. Integrity involves sticking to best practices for research that promote reproducibility through transparency and open access. At the root, this principle springs from a sense of

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In a literal sense, transparency is the property of an object that makes it so clear that you can see through it. But what about when we talk about transparency in government policy, or scientific research? In this context, transparency implies a high degree of disclosure - revealing clearly the exact reasoning and process used in coming to a decision or taking an action. As well, transparency means taking care to disclose important information in a respectful and responsible fashion.

#### Scientific integrity implies several practices:

- basing research conclusions and public policy on solid information and analysis that are clearly evident to everyone;
- evaluating scientific work using fair, rigorous criteria and procedures known to all involved; publishing good science, period (not just flashy science);

responsibility for public welfare and from the honest pursuit of scientific truth.

- fully disclosing studies and methods that don't yield significant results;
- adhering to best practices for creating hypotheses, collecting data, and analyzing results; and
- providing equitable access (see the following two sections on Equity) to all outputs of the research cycle. Library Online As we saw in the last unit, these form key elements of our ideal research ecosystem, where the public trusts science and studies can be tested and repeated. Course Reserves

#### Transparency and Grading

Course Evaluation One case where students want and need transparency is in grading. Most of you probably appreciate knowing how marks were accorded to questions on a Evaluation Reports midterm exam and what criteria the marker used to score each question. This provides you with both a reason for the assigned grade and a means of comparing your grade with those of your classmates. Ultimately, this specific information can help you to fill in gaps in your knowledge and perform better on future assessments (such as the final exam). In the same way, transparency in research allows scientists to improve future studies and add to accumulated knowledge

#### Have an idea on how to improve this content, or see a mistake? Let us know @

Previous

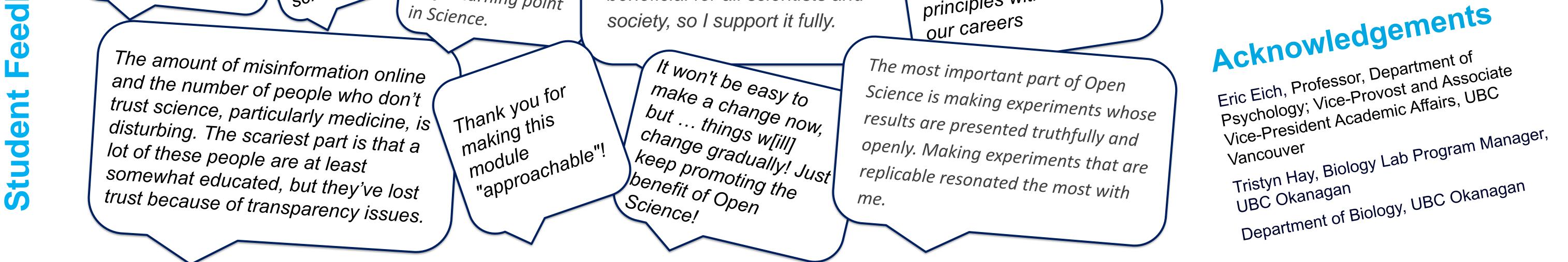
goes against the mainstream competitive nature of the science community, but it is mutually beneficial for all scientists and society, so I support it fully.

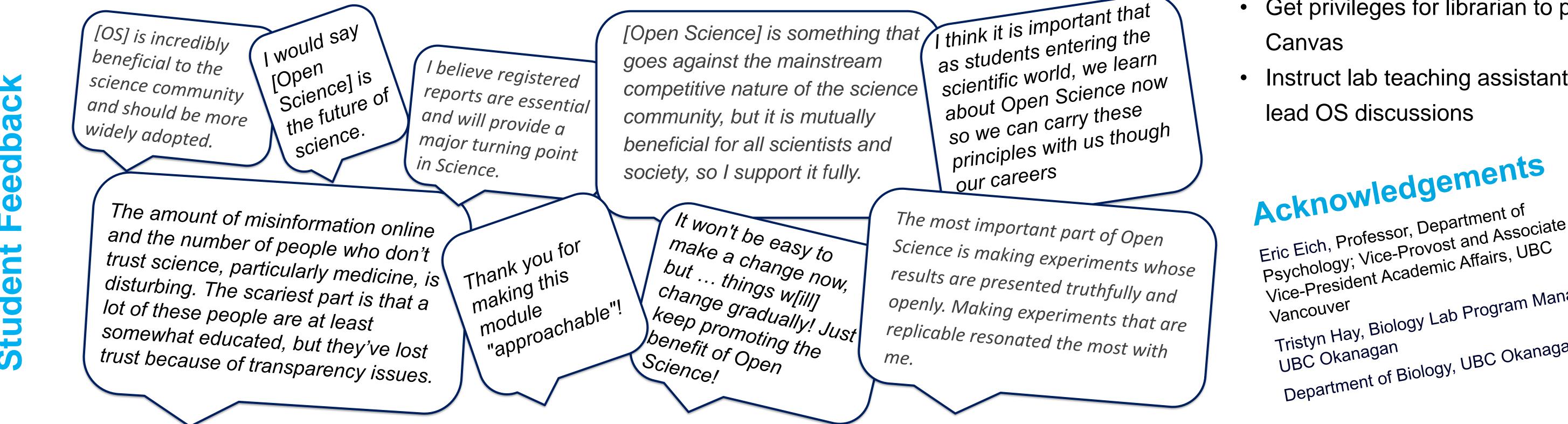
about attitudes toward Open Science

- 328 students participated
- Several students wanted more talk about OS in the classroom
- Survey revealed extremely positive views of Open Science and the course (see below).

# **Next Steps**

- Consult Biology faculty
- Review content and examples
- Get privileges for librarian to post in
- Instruct lab teaching assistants to lead OS discussions





Scientific Culture Change from Above and Below at UBCO: Implementation of a Comprehensive Open Science Library Information Literacy Program for Undergraduates



**Presenter: Sharon Hanna** Open Science Librarian UBC Okanagan, Canada sharon.hanna@ubc.ca



#### THE UNIVERSITY OF BRITISH COLUMBIA

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#### Take a picture to access supplementary materials and presentation slides.

