

# Open Science in Undergraduate Biology

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## 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 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

## Modules

- OS 101: Principles of Open Science (pilot; complete)
- OS 102: Reproducibility through the Research Cycle (in progress; January to April 2020); critical evaluation of scientific papers
- OS 201: Modularized Lab Reports
- OS 202: Reproducible Data Management and Analysis
- OS 301: Lab Books and Field Notes: Creating a Digital Record
- OS 302: Citizen Science
- OS 303: Advanced Treatment of QRPs: Reproducibility through the Research Cycle
- OS 401: Reframing Measures of Impact
- OS 402: Reproducibility Project (Capstone)

## Planning Considerations

- Preexisting heavy workload in Biology
- Accessible language and content
- 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

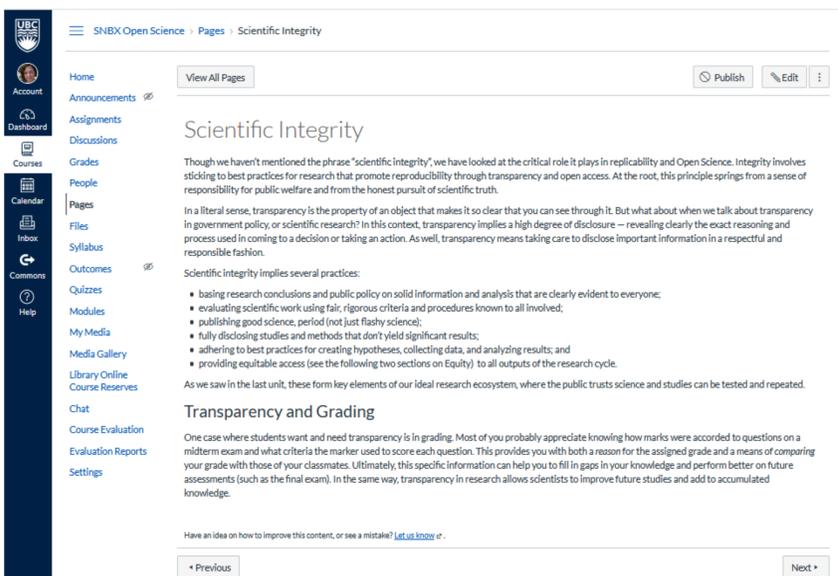
- Online delivery of content
- Voluntary (for participation points)
- Introduced in Biology 116 (for Science Majors) and Biology 122 (for non-majors)

### Content:

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

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

From the Canvas (online) learning management platform.



## Assessment & Feedback

- Unit quizzes and an exit survey 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 Canvas
- Instruct lab teaching assistants to lead OS discussions

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## Student Feedback

[OS] is incredibly beneficial to the science community and should be more widely adopted.

I would say [Open Science] is the future of science.

I believe registered reports are essential and will provide a major turning point in Science.

[Open Science] is something that 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.

I think it is important that as students entering the scientific world, we learn about Open Science now so we can carry these principles with us through our careers

The amount of misinformation online and the number of people who don't trust science, particularly medicine, is disturbing. The scariest part is that a lot of these people are at least somewhat educated, but they've lost trust because of transparency issues.

Thank you for making this module "approachable"!

It won't be easy to make a change now, but ... things w[ill] change gradually! Just keep promoting the benefit of Open Science!

The most important part of Open Science is making experiments whose results are presented truthfully and openly. Making experiments that are replicable resonated the most with me.

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



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