

Scientific and professional literature in undergraduate courses

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What are considerations for incorporating scientific or professional literature into undergraduate courses? This was identified as an important topic by at least 23 EOAS faculty members, and discussed Nov 27<sup>th</sup> by eight.

There are many dimensions that can be considered. Some are outlined in this two page summary, along with examples of courses and strategies being used or developed in EOAS. You will no doubt have other perspectives – so let us know!

### Dimensions of article reading in undergrad courses

### Considerations and/or examples in EOAS

#### Types of literature

- Primary (peer reviewed and new research. Possibly review articles.)
- Secondary (Scientific American, etc.)
- Tertiary (journalistic, website, etc.)
- Professional (Engineering reports, etc. May be proprietary.)

- Are students explicitly introduced to various types?
- Do you/they discuss when or how to use each?
- Eosc212 explicitly refers to 3 types, using secondary to “inspire” more focus obtained using primary articles.
- Eosc329 uses professional reports as part of several labs. Some explicit guidance is provided.

#### Types of scientific thinking

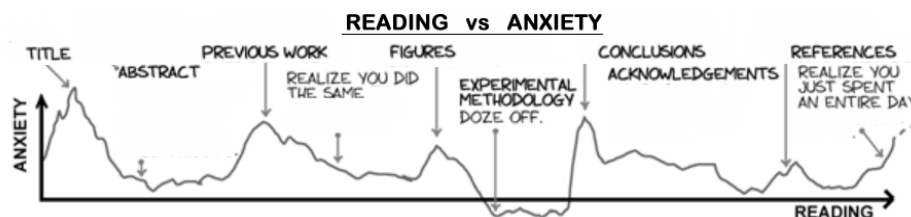
- Exploratory (primarily observational, not necessarily hypothesis driven)
- Development (methods, instruments, procedures)
- Hypothesis driven, focused experimental or observational
- Case history (descriptive with special purpose or context)
- Review article
- Others?

- Are students asked to consider the context of the article or the authors’ intent (e.g. target audience)?
- Do they need background before the article or the author’s purpose(s) will make sense?
- Is the reading used explicitly as an example of a style of writing, presentation or argument?

#### Guidance for students

- Is an article reading framework provided or developed?
- Are synthesis exercises assigned (like “write an abstract”)?
- Is a questions-driven guided reading assignment appropriate?
- Is synthesis or usage expected to be handled well by students?
- Are figures, or other portion only, used with (or by) students?
- Is an intermediate deliverable assigned for assessment and feedback, like a proposal or outline?
- Are articles assigned? Selected from a specified collection? Or researched and selected by students?
- Do you have library staff help teach or develop research skills?
- Do all (some) students read same / different articles?

- EOAS332: instructor offers a demonstration or written outline illustrating the process of reading a paper. This might be done using a video ‘think aloud’.
- When students choose articles, a preliminary deliverable will enable vetting articles choices, and offering feedback on focus or direction. Egs in eosc212, 472, envr300, and no doubt others.
- Env300 & eosc212 unpack the reading process using in-class workshop activities.
- See also the reference at the end of next page.



## Dimensions of article reading in undergrad courses

### Course content from science articles

- Is primary literature an integral part of content in the course (e.g. weekly readings)?
- Is some content self-selected by students based on individual areas of interest?
- Figures from primary lit. is used in many courses. Be sure to make explicit reference to authors, context, impact of the figure/model, etc. and “unpack” the complex, expert thinking that goes into understanding, using, critiquing this content.

### What do students actually do?

- Journal club format presentation on a single reading with discussion. This usually involves summarizing a research article for peers, with subsequent discussion.
- Written summary of article or articles (abstract, summary, etc)
- Synthesis of several articles into a topic summary?
- Is there an element of critique? See notes to the right.
- Oral presentation, poster, essay, other ...?
- Search for specific answers to given situations or questions
- No doubt there are other types of assignments.

### Assessing student work

- Depends most importantly on types of learning goals students have in mind as they do their work. Focus could be on the content itself, on communication skills, or some of each.
- Peer assessment benefits both the assessed and assessor.
- Rubrics are becoming standard practice. They help students AND instructors (& TAs) focus on specific learning goals.
- Feedback is time consuming but crucial. Try writing numbered feedback points separately, then referencing by *number* on individual student’s work. Then return ALL numbered feedback comments to all students.

## Considerations and/or examples in EOAS

- Several 4<sup>th</sup> yr courses use articles as core content. Eg. eos472, eos453, eos478 ... some are weekly, some more or less frequent.
- Eosc212 uses assigned (& self-selected) secondary & primary articles as a principle source of content and subsequent in-class activities addressing model $\leftrightarrow$ data relations.
- Eosc340 uses key figures as part of lectures and in-class activities, including one involving “what’s missing” from a systems oriented figure.
- Eosc220 uses article fragments about minerals & time.
- Critique of articles can be difficult for novices in the discipline, unless articles are carefully chosen as follow up to content learned elsewhere in this or a different course. Include guidance for critique and incorporation of other knowledge.
- Beginners need guidance and practice, so start with small scale or partial assignments.
- Envr300 asks students to articulate how authors supported their conclusion. Asking “how robust are conclusions” is a nice high-level question.
- Analyze carefully exactly how YOU approach articles, AND keep in mind how your expertise plays into the process.
- Courses with rubrics that students see &/or use: eos433, eos212, eos472, eos478, many others. Talk to colleagues!
- Eosc478 runs virtual poster session. Students read articles in groups; develop posters based on a framework developed by Evgeny, post completed posters to a discussion forum; ask questions of other groups; then reply to questions as a group
- Peer assessment is growing in popularity but requires some care. It benefits from a “calibration” step in which students assess good/OK/bad examples & perhaps critique.
- TAs also benefit from calibration at start of term. Consider using consistent good/OK/bad examples.

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Finally – one easy-to-read article worth checking out is Robertson, Katherine. 2012. “A Journal Club Workshop That Teaches Undergraduates a Systematic Method for Reading, Interpreting, and Presenting Primary Literature.” *Journal of College Science Teaching* 41 (6) (August): 25–31. (Nine of Robertson’s 17 refs directly relate to using primary literature in undergraduate courses.)

***This is by no means exhaustive! You will have other perspectives, examples & suggestions. Do please let us know!***<sup>1</sup>

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<sup>1</sup> **Contact EOS-SEI:** Talk about your course(s) or teaching and learning in general! Visit EOS-South 361, or contact Francis ([fjones@eos.ubc.ca](mailto:fjones@eos.ubc.ca)), Brett ([bgilley@eos.ubc.ca](mailto:bgilley@eos.ubc.ca)) or Sara ([sharris@eos.ubc.ca](mailto:sharris@eos.ubc.ca)). See also <http://www.eos.ubc.ca/research/cwsei/>.