

# Students' Reactions to Scientific Readings in a Large 1xx Science Elective; Some Preliminary Results.

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## Context

### Course and project

- **Project funding:** Large TLEF
- **Course:** EOSC114, Natural Disasters
- **Students:** 1500-2000 in eight f2f / DE sections / year
- **Demographics:** 1<sup>st</sup> – 4<sup>th</sup> year, all degrees
- **Seven modules, six instructors** + course Admin.
- **General science elective** ... no pre- or post-requisites

### This TLEF project's objectives

Enable students from ALL disciplines to ...

- ... practice learning from scientific writings
- ... add "depth" to an otherwise breadth-oriented course
- ... enhance scientific reasoning
- ... introduce elements of choice & personal interest
- ... practice peer review
- ... contribution creatively to a class-wide resource

### Course structure

Situating homework assignments in the course:

- 50-min lectures with clickers (3 per week)
- Seven modules (topics)
- Three 2-stage midterms
- 2-stage final

Assignments:	16w1	16w2	17w1	17w2	18w1	18w2
practice quizzes	7					
reading assignments		6	6	6	6	6
map marker project			7	7	5	3
map marker peer review				3	4	3

### Readings: sources, types, focus:

Module	Journal	Framework concepts: P = primary focus; S = secondary				
		Scientific comm'n	Hazardous processes	Forecast	Conseq's	Mitigation
Earth-quakes	New Yorker	P	S		P	S
Volcanoes	Nature Geoscience, JGR <sup>1</sup>	P			P	S
Landslides	Geomorphology (Elsevier)	P	P		S	
Storms	Weather (Royal Met Society)	P	P		S	S
Waves	Consultant reports	S			P	S
Extinctions & Impacts	Wikipedia, NASA, PASSC <sup>2</sup>	S	S	S	P	

### Reading assignments' learning goals Students will ...

- ... demonstrate comprehension of assigned readings.
- ... apply concepts from the reading to situations provided.
- ... appreciate the attention to detail necessary when applying scientific concepts to decision making.
- ... distinguish between authors' intentions & writing styles for the various article types encountered.
- ... recognize types, strengths & limitations of data.
- ... relate *claims* to supporting *arguments* and corresponding *evidence* or *data*.
- ... increase skills at learning effectively from scientific writings.

### Acknowledgements

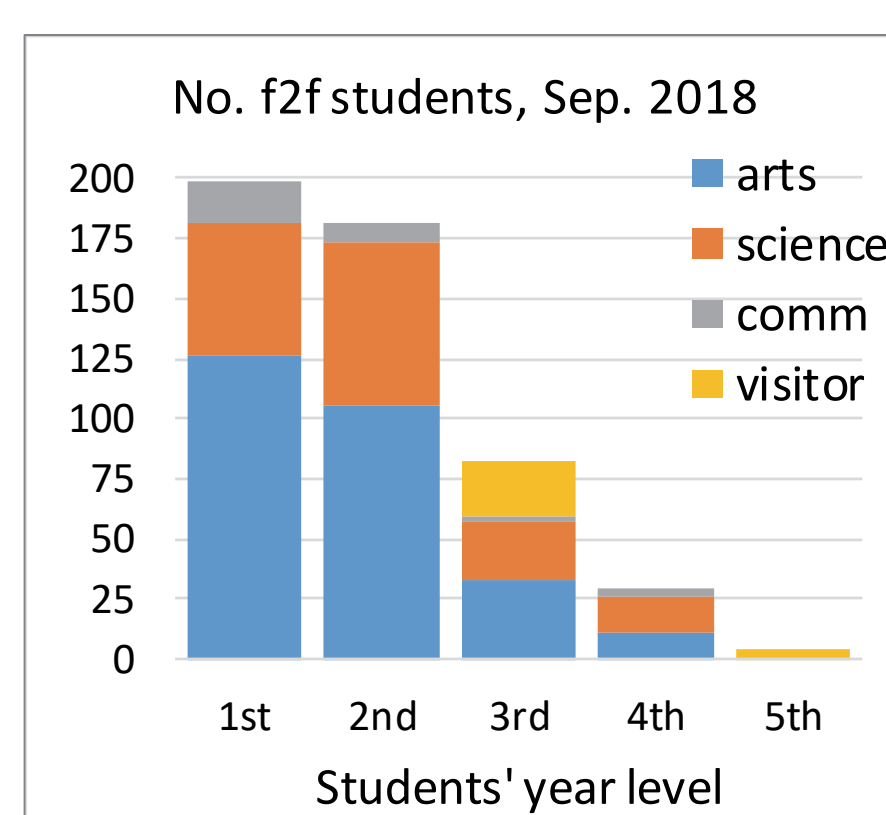
- **L. Porritt, instructor/admin:** support, advise, patience
- **S. Harris, official PI:** ongoing support & encouragement.
- **R. Stull, eosoc114 originator:** advocate & contributor.
- **M. Ver, DE instructor:** willing to pilot in DE.
- **STUDENTS:** for enthusiastic engagement & thoughtful feedback.
- **UBC TLEF fund:** endorsing and funding the project.

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## From students in face-to-face sections, 2018w1

### Who took the course and why?

I took the course because ...	%
Non-sci major; need Earth sci elective.	3%
Sample courses before picking a major.	6%
Some other reason.	12%
Non-sci major; I simply like the subject.	14%
Sci/app sci major; course is required.	15%
An "easy" 3-credits for my degree.	16%
Non-sci major; need any science elective.	34%



### Science reading experience by yr level →

Implications: • very broad demographics • challenging "target" for teaching  
• assignments vary in difficulty but none are "very hard".

### How did students work?

How did you complete the assignments?	%
Wksht questions & online work alone.	52%
Wkshts with colleagues & submitted online alone.	28%
Some qns myself, shared results with colleagues.	8%
Wkshts & online submission with colleagues.	8%
None of these options apply.	4%
Someone else did the wksht qns for me.	0%

### Submit how many days before due-date? Avg of 6 assigns.

Prop'n of submissions	%
1 day	55%
2 days	21%
3 days	8%
4 days	4%
5 days	3%
6 days	2%
7 days	2%
8 days	1%
9 days	1%
10 days	1%
11 days	1%
12 days	1%

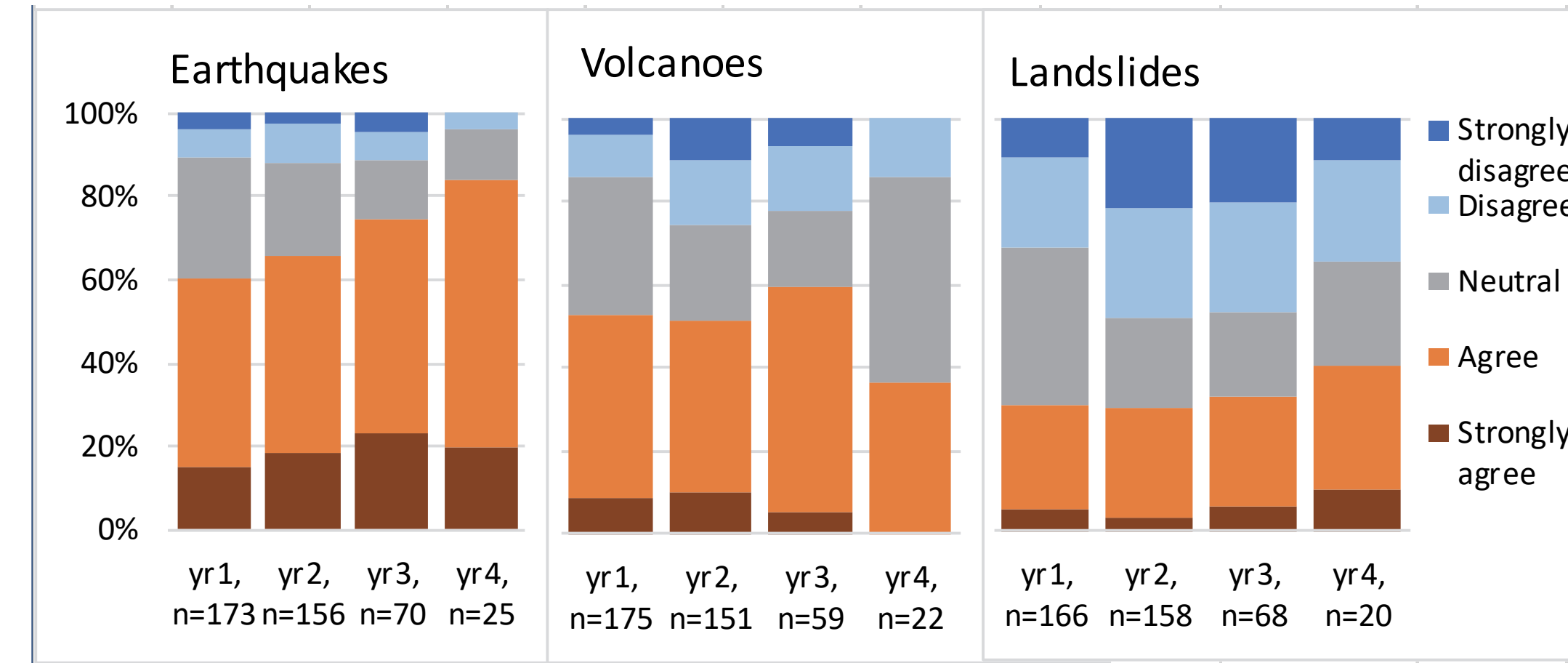
Did you use any past homework?	%
I do not know if earlier wkshts were available.	67%
None of these options apply.	16%
I saw earlier wkshts but they were not helpful.	8%
Earlier wkshts were available but I did not use any.	6%
I saw earlier wkshts & they were helpful.	5%

Most learning in this course was done when?	%
Mostly 2-3 days prior to midterms (MTs).	44%
Evenly during JUST the week prior to MTs.	26%
Some throughout, but most 1-2 days prior to MTs.	20%
Evenly spread throughout each module.	9%

Implications: • students work "last minute" • time-on-task is OK ~3hrs/2wks • a few do see old HW.

## Students' perceptions of relevance and usefulness

### Homework helped make modules more interesting/relevant (by year level)



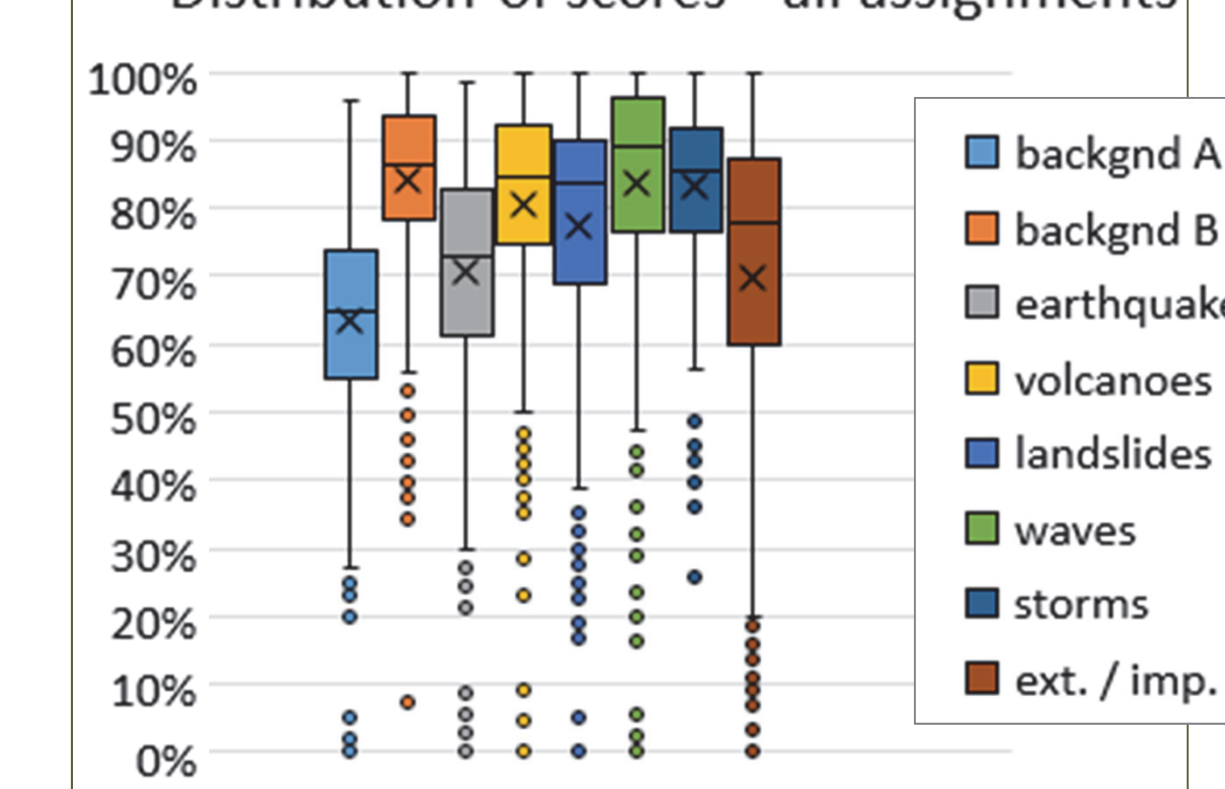
Which assig. was most ...	Challenging	Interesting
Landslides.	29%	7%
Extinctions & impacts.	29%	7%
Waves.	12%	10%
Earthquakes	11%	28%
Volcanoes.	8%	10%
Storms.	7%	29%
None were challenging.	4%	

LS article was	LS assignment was	%
OK	OK	18%
OK	difficult	15%
difficult	OK	21%
difficult	difficult	46%
		33%
		67%

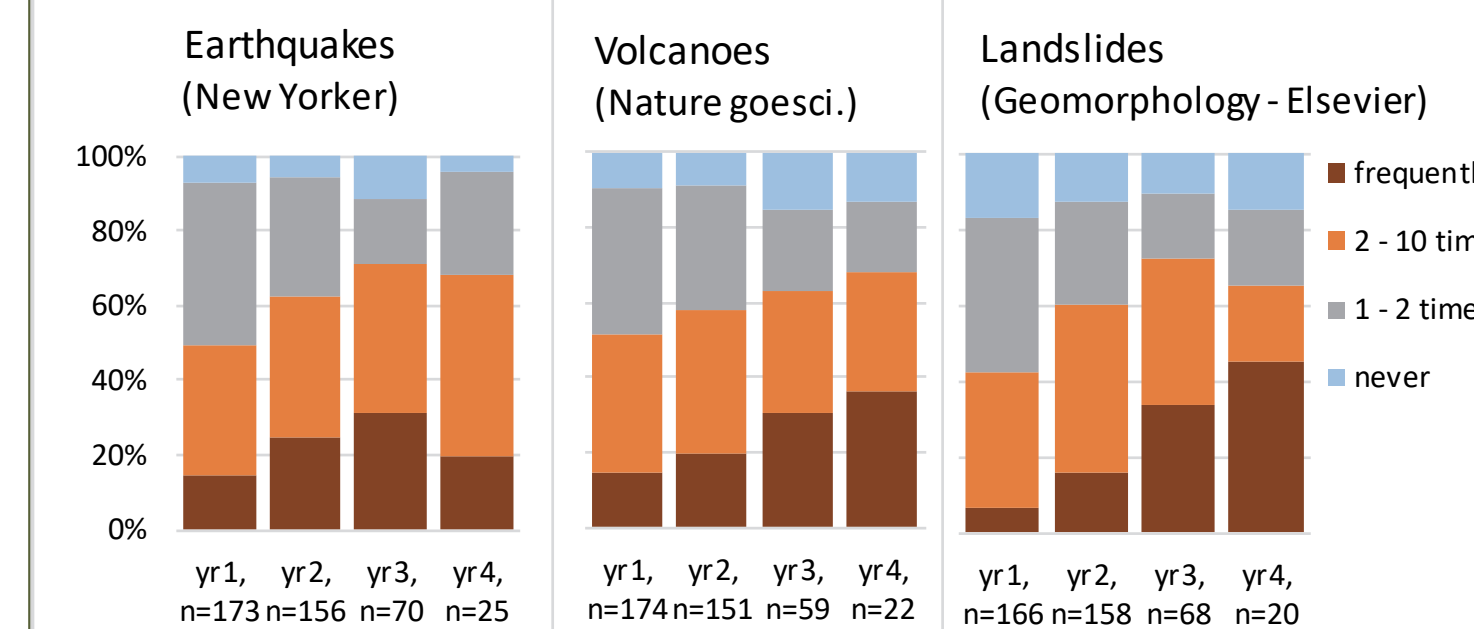
Implications: • Assignments are considered "worth while" • "Worthwhile" is slightly dependent on students' year level & topic.  
• 2 of 3 "longer" assignments are more challenging and less interesting. • Other data sets have yet to be analyzed.

## How did they do?

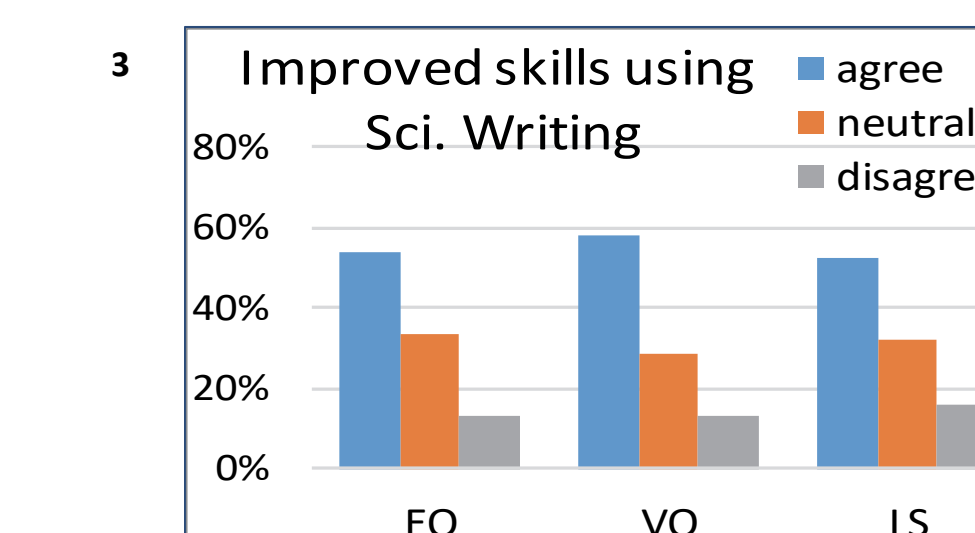
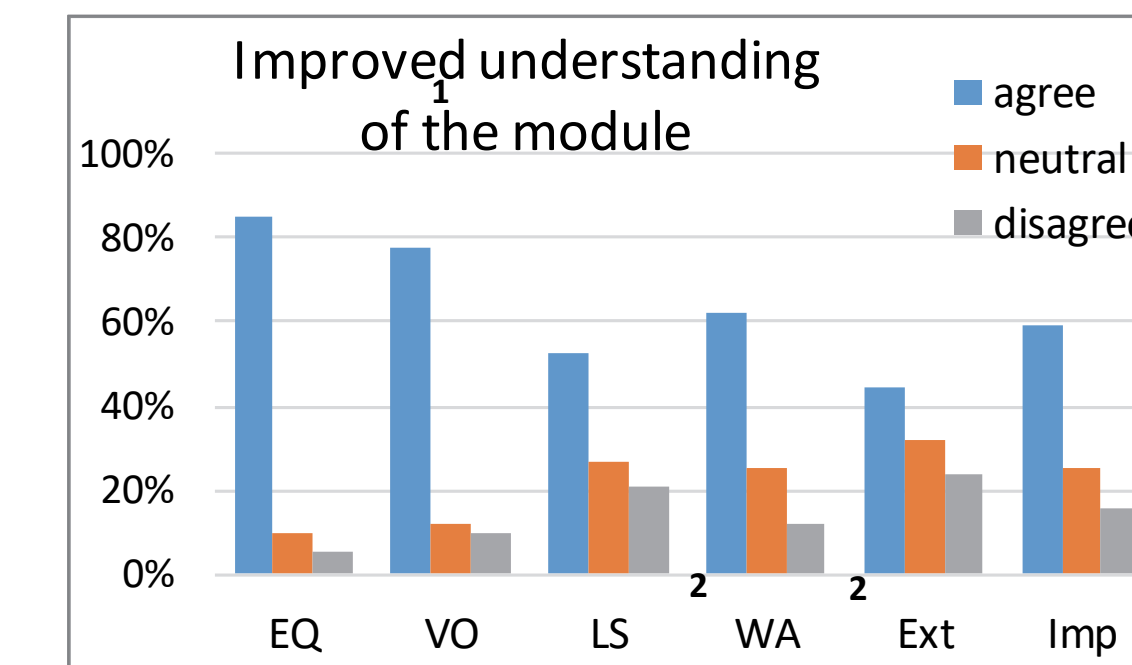
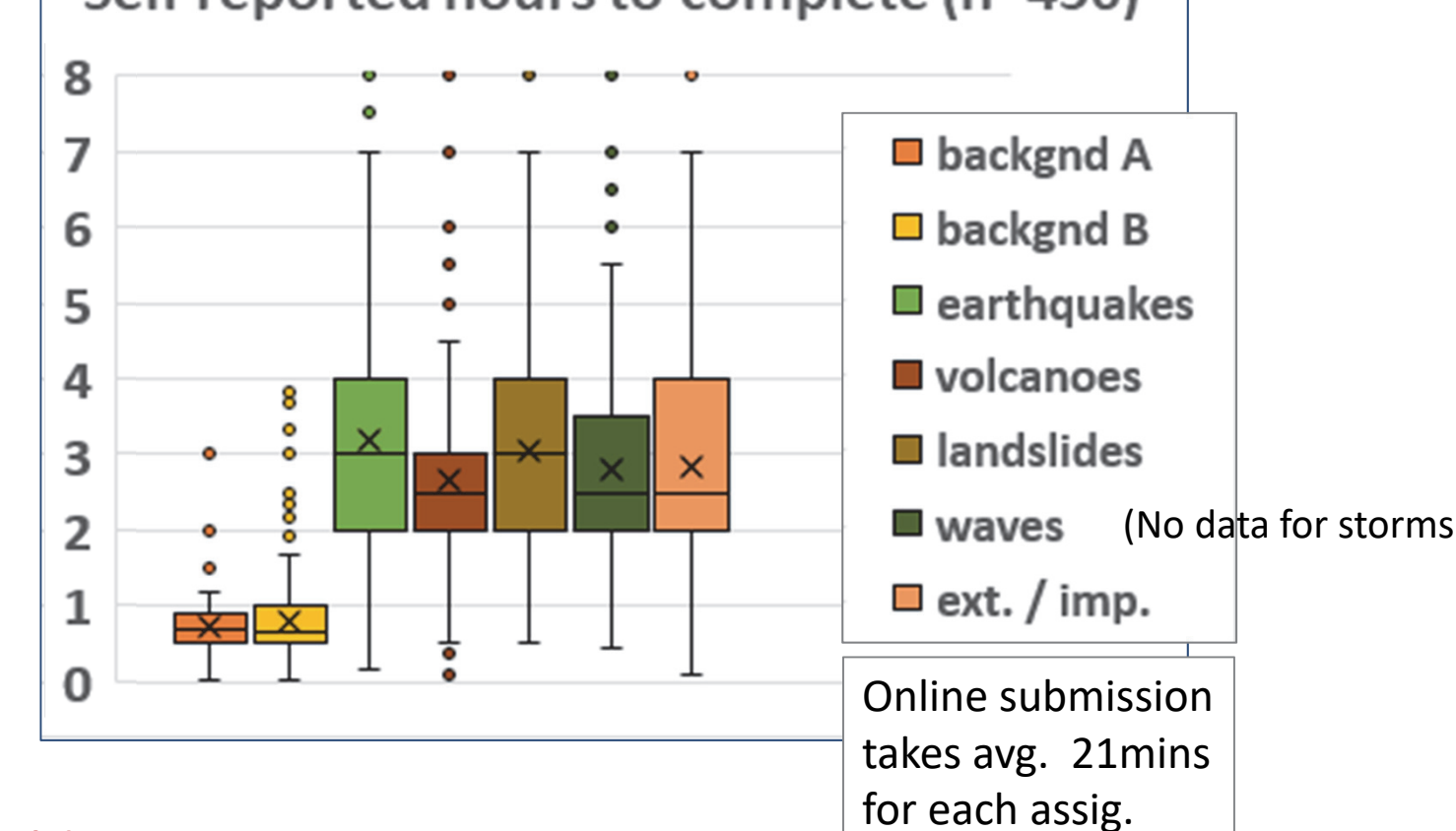
### Distribution of scores - all assignments



### How often have you read articles like the one for this module?



### Self reported hours to complete (n~450)



NOTES: "understanding" & "skills" data:  
1. No "understanding" data for the storms module  
2. Extinctions & impacts "understanding" assessed separately (Ext, Imp).  
3. No "skills" data for waves, storms or extinctions/impacts.

## Student's recommendations

### Feedback they want (N=344)

Answers to specific questions you pose while completing the assignment	45%
Summaries of avg stdev min/max scores for the whole class	43%
Comments provided online directly with each question	39%
HW-only disc'n board answered by instructors	38%
HW-only disc'n board answered by all students, monitored by instructors	24%
Office hours during the homework with an instructor or assistant	19%
Other - (enter suggestion in next question)	8%

Implications: • need to close the "learning feedback loop" (see conclusions).

### Benefits of multiple instructors

In this course, multiple instructors were a ...	- for helping me succeed.	- for making it interesting.
... large advantage	17%	34%
... small advantage	28%	38%
... neutral	37%	21%
... small disadvantage	15%	4%
... large disadvantage	4%	3%

### Preferred no. & grade weight

Number hw assigns.	hw grade weight (N=344)			tot
	less	same	more	
fewer	11%	23%	22%	56%
same	7%	15%	17%	39%
more	2%	2%	1%	6%
<b>totals</b>	<b>20%</b>	<b>40%</b>	<b>40%</b>	

Implication: • Students want "value for effort".

Implication: • Benefits of multiple teachers as seen as LESS about "success" than "interest".

## Open-ended feedback elicited from students (N= ~470)

### Midway questions

- Teaching / learning strategies that work well.
- What could be improved about this course?
- How YOU could improve your learning?
- Any other comments?

### Results ... no surprises!

- Focus on lecturing, content and exams.
- Students don't know what supports learning.
- They want less or easier work.
- Implication: need better study-skills scaffolding

### What is the most surprising thing you learned from this article?

- Landslides examples, the least "liked" assignment:
- In spite of "dislike", > 92% responses were thoughtful.  
Eg: "All of the scientific information put into it is incredible".
- Such comments reflect the broad purpose of assignments.

facts or methods in the article	49.5%
article's concl'ns or implications	21.1%
about science, research, rigour ...	15.6%
about the writing or article	6.4%
irrelevant comments	7.3%

### Examples of "reflective" questions aimed at encouraging personal thought about the hazard.

- What did you find most compelling as a description of how frightening such an event might be?
- What is one example of information from the text that helped you draw this conclusion?

Results: Answering causes reflection on seriousness of hazards, & possible personal consequences.

## Conclusions

### Successes

- Students perceive homework as relevant & impactful.
- Homework workloads are appropriate for a 1<sup>st</sup> year course.
- Degree of difficulty seems OK, in spite of very broad demographics.
- Clear preferences regarding topics and articles read.
- Development using STL + 1 (or 2) key instructors works well.
- Tactics to minimize dishonesty seem effective but take some effort.

### Challenges: lessons learned so far

- Piloting in Connect then deploying in Canvas was costly.
- Aligning online questions to worksheets for 2 versions is laborious.
- Instructors who teach only 4-5 lessons are under-invested.
- High instructor turnover makes sustaining innovation difficult.
- Closing the feedback loop needs further innovation.

### Moving forward

- Finish analysis of learning outcomes and student perceptions data.
- Release dual, isomorphic versions of each HW.
- Fully document review & feedback strategies.
- Identify options for alternative LS article.
- Increase Blooms-level of tasks, and maybe reduce number of questions.
- Enhance learning feedback (e.g. discussion boards; see above).