


Dep't Earth, Ocean & Atmospheric Sciences

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 THE UNIVERSITY OF BRITISH COLUMBIA





**Can students taking DE or f2f versions
 of the same course have
 equally effective / enjoyable learning experiences?**
 ~
 UBC FoS Supper Series, Nov 17, 2015

 Francis Jones, with Louise Longridge






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 Learning Fellow, EOAS, UBC, fjones@eos.ubc.ca

Participants

- **STLF:** project proposal, coordination etc.
 - Build resources (activities, images, video, etc.) & pedagogy
 - Deploy to CONNECT (or alternative...)
 - Evaluation; data wrangling, analytics ...
- **Dr. L. Longridge:** Lead DE instructor
 - Taking the “risks” of deploying for fully DE course.
 - Fitting new tasks into existing course structure.
 - Handling all feedback and communication with students.
- **Dr. S. Sutherland:** f2f Instructor (on sabbatical)
 - Configured original 50-min. hands-on lab experience
 - 50-min group-based whole-class follow-up with homework
- **Dr. P. Smith:** Original design of the exercise
 - For 2nd year geoscience majors
 - Still used as a 2-hr laboratory exercise with reporting.

To get started

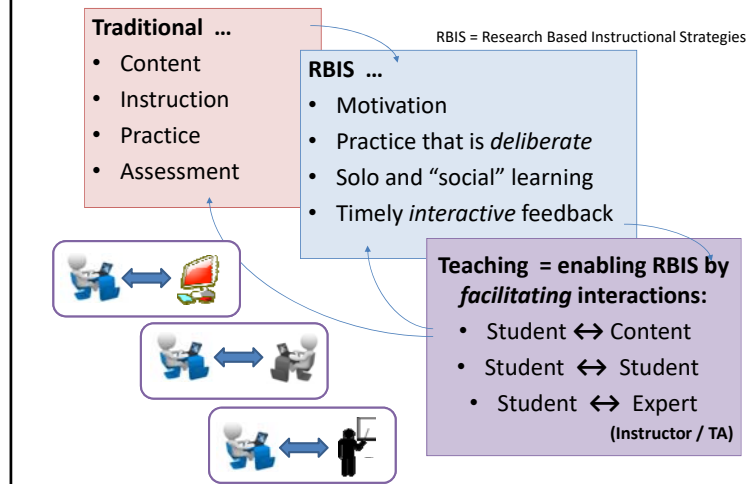
Grab desserts, etc...

1. First, a framework.
2. Compare challenges & opportunities in DE vs f2f.
3. Project context
4. Specific initiatives
5. One f2f → DE conversion example.
 - Project process
6. Evidence of change:
 1. Student products
 2. Quantitative / Qualitative feedback
 3. DE tool usage: groups, forums, online “hit-rates”, workloads, etc.
7. Discussion

Distance education vs face to face – DE vs f2f

- How many teach – or have taught – on line?
- How many are *thinking* of teaching a DE course?
- How many are involved with a course that has BOTH DE and f2f versions?
- What differences between teaching / learning f2f and online?

First, frameworks ...



Compare: opportunities / challenges

Collect some ideas

What are a few opportunities / challenges?

	Face to face	Distance education (Restrict thinking to asynchronous)
Student ↔ Content	opportunities	challenges
Student ↔ Student		
Student ↔ Expert <small>Instructor or TA</small>		

EOAS flexible learning project and courses

- Courses
- Specific DE to f2f translation project component

EOAS Flexible Learning project, 2014-16

Enrollments

Sections

- **EOAS 326**, Earth and Life Through Time
 - 3rd year elective for science students only.
 - Experiment with ideas in:
 - Active content; “Labs”; Small group work.



~ 450
1 f2f
3 DE

- **EOAS 116**, The Mesozoic Earth
 - 1st year elective open to all students.
 - Secondary focus.



~ 350
1 f2f
3 DE

- **EOAS 118**, Earth's Treasures: Gold & Gems
 - Later, apply “best” ideas from others.
 - Add a virtual museum activity.



~ 600
3 DE

All service courses, not core.

Introduced since 2014 Student ↔ Content *



1. **“Interactive” readings**: instant feedback on questions.
 - Tasks and questions embedded in basic content.
 - Instant feedback; not necessarily ‘graded’ ... but “instant”.
2. **Interactive figures** using image maps and JavaScript.
3. **Labs**: generate & share sketches and annotated figures.
4. **Several low-stakes, post-activity “quizzing”** opportunities
 - MC, ranking, fill-blank, matching, jumbled sentence, numerical, etc.
 - “Blooms Dichotomous Key”; check q’n sophistication & set targets.
 - Higher stakes testing familiar tasks and question types.

We have examples ready
if there's interest.

* Eg. Clark and Mayer, 2011

Stuff students did in 326-DE

Originally (~ 2005)

- Readings → module tests; largely multiple choice (MC).
- 2 “labs”
 - review content and resources,
 - answer MC questions.
- 2 Discussion board tasks:
 - intro;
 - short essay + 1 response.
- Discussion board open forums for questions.

Introduced since 2014 Student ↔ Student



1. Cooperative versus Collaborative¹:
 - distribute work & ‘agree’* versus *generate a whole bigger than the parts*
2. Cooperative opportunities
 - Semi-structured discussion (“introduce yourselves and chat”)
 - Share results of solo work in groups
 - Generate group versions of: quizzes (eg. 2-stage tests) or Cooperative products (eg. sketched problem solutions)
3. Collaborative opportunities
 - Not achieved this time around – but plans are afoot ... ☺*
 - Construction of knowledge and/or products (eg museum displays)
 - More autonomous than prescribed cooperative exercises
 - Blogs, journals, wikis, Google Docs, Google Earth ;

¹ Cooperative vs collaborative: see eg. Panitz, 1999

Introduced since 2014

Student ↔ Instructor



Expert ↔ novice interaction is important and “precious”

1. **Design** / facilitate semi-structured discussions.
2. **Rubrics** and exemplars
3. **Feedback on intermediate** work (may be automated)
4. **Feedback on final** work;
 - Collected feedback about all student work;
 - Personalized by referring to collected items.
5. Implement – and act upon – **student feedback**

Before progressing ... the ‘skinny’



1. These supper-series events always evolve (devolve?) into great discussions, so ...
2. Partial “conclusions” so far - since project evaluation steps are in progress.



Outline




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Can students taking DE or f2f versions of the same course have equally effective / enjoyable learning experiences?

Yes, but with different types of instructional effort.
We are encouraged by ...

1. Interactive resources can be constructed WITHOUT particularly special skills.
2. Engaging tasks can be developed with care and attention to purpose and pedagogic detail. 
3. Asynchronous small group interactions work with careful scaffolding. 

We still need to do better at

1. Closing the feedback loop VISIBLY and productively 
2. Assessments: a) align with tasks/activities & b) increase variety
3. Shift learning goals off “knowledge” → towards “skills”.
4. Incorporating analytics: Assessments & resource use or online behaviour.

Project progress so far ...

Successes

- Engaging, effective learning tasks and resources can be facilitated
 - We are still refining details.
 - Some simple 3rd party facilities are needed.
- Learning tasks first – resources second. Not vice-versa.
- Learning goals tend to evolve “organically”.

Project Evaluation

- Analytics data are hard to get, often requiring processing of raw data.
- Tests evolve with innovations, hence comparing before-after change is hard.
- Assessment sophistication can be gauged with *Blooms Dichotomous Key*.



Implications

For instructors

- DE pedagogy is different. Experience with f2f is not enough. Example: experience is needed developing questions in M.C. and other formats.
- Experience with *Connect* is vital – or close knowledgeable support.
- Awareness and moderate skill with web technology and resources is vital for development, less so (but still important) for instructors themselves.

For departments

- Need “official” points of contact for DE-instructional support.
- Need facilities to host resources that are not *Connect*-compliant.
- Converting course components DE \leftrightarrow f2f is possible but non-trivial.
- Can NOT improve a course with same resources used to “just” teach it.

For institution

- Analytics is necessary BOTH for improvement AND evaluation.
- Analytics for instruction has potential but needs development.
- I.T. support OUTSIDE the LMS is necessary, perhaps at Dep’t level. [data list](#)

Project progress so far (con’t.)

Limited to date

- Are there more RBIS evident? Interactions model can help.
- Are student \leftrightarrow instructor (novice-expert) more effective? Still a challenge.
- Incorporate feedback and analytics to help students directly (motivation, reflective practice & metacognition, etc.)

So far ... mostly f2f \rightarrow DE. Were any DE \rightarrow f2f conversions effective?

- eos116 homework activities
- Online resources can become available
- New museum activity: Virtual for DE118 first (January 2016), f2f after.
- However, based on consistency of feedback and analytics, we may be “making” too many resources and not “assessing” / adjusting enough.

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Example f2f activity / Lab:

See video examples showing lab and classrooms in action

- One 50 minute lab examining fossil and rock samples with TAs and instructor present.

<http://blogs.ubc.ca/wpvc/watch-look-for/the-laboratory-experience/>



- One 50-minute structured group activity follow up a week later.

<http://blogs.ubc.ca/wpvc/watch-look-for/the-subsequent-whole-class-follow-up-activity/>



- Some online quiz-like homework.

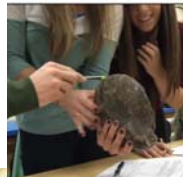
For DE – can we develop ...

- Same learning goals ?
- Similar experiences ?
- Online data entry (after paper work) ?
- Online sketching and upload of results ?
- Online digitized resources emulating specimens ?

Hands-on f2f components



Lab time



Handle specimens



Follow-up group-work in class with paper worksheets



Virtual components for DE

<http://eos.ubc.ca/courses/eosc326/content/trilogrpto-lab/> ID, PW in notes.

Zoom-in high resolution lab space with clickable Hotspots.



Hi-res specimen images + videos of "handling"



Components for BOTH f2f and DE

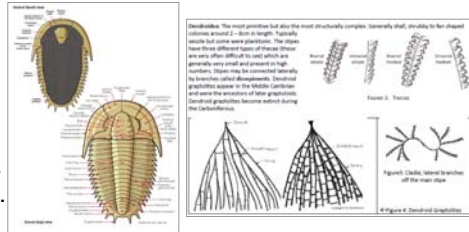
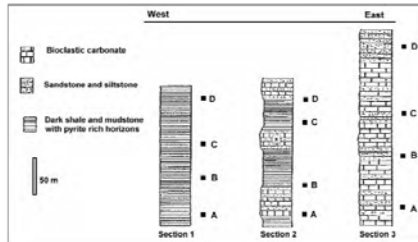
<http://eos.ubc.ca/courses/eosc326/content/trilopto-lab/Sketching/SketchExercise.html> ID, PW in notes

Same specimens



Same tasks
(including sketching)

Same goals.
Same documents.



DE and f2f differences:

Week 2, F2F lab:

1. Groups: Agree upon / re-submit fossil ID and ages.
2. Groups: answers to 2 point-form written questions.
3. Groups: Agree upon and re-submit sketched interpretation.
4. Graded by TAs.
5. Solution set: PDF provided online.

Phase 2, DE "lab" – Add team work: Going "live" early June.

1. Not done.
2. Questions done solo only.
3. Small groups: share, then agree upon and re-submit sketched interpretation.
4. Sketches graded by TAs
5. Solutions after grading.

NOTES:

- [Groups are permanent.](#)
- [This is the 3rd of 4 small group tasks.](#)

DE and f2f differences:

Week 1, F2F lab:

1. Manual / instructions
2. On paper: 21 fossil IDs and ages
3. Hands on:
 - real specimens
 - photos
 - 1 hr in lab with instructor & TAs
4. Online questions about fossils
 - all multiple choice.
5. Sketching on paper.
 - Graded by TAs

Phase 1, DE "lab":

1. Same add a [scenario](#)
2. [17](#) of 21 fossils, [3 exemplars](#)
 - [Digital input & autograding](#) of IDs / ages
3. Digitized specimens
 - [Interactive](#) lab environment
 - [Images](#): high resol'n, zooming, multi-view
 - [Videos](#): of handling specimens
4. Online q'ns ([not all MC](#)) about fossils to [address aspects of the scenario](#).
5. [Digital sketch](#): annotate given figures.
 - Sketch submission [only](#) graded by TAs.

Questions? Comments?

• Framework

- Facilitate RBIS by addressing [interactions](#).
- S <-> C S <-> S S <-> E

• Project context

- *Initially*: 2 service courses, 1 DE instructor, 1 f2f instructor.
- *Subsequently*: 3rd DE service + 2nd DE instructor, and others.

• Specific activity conversion

- A hands-on / classroom exercise for asynchronous DE.

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Evidence of change ...

- We are 19 mths into 24mth project; Collecting / assessing data is ongoing.
- **DE** courses produce a richer data-trail than **f2f**.
 - BUT ... accessing data is challenging (i.e. **Connect** is not helpful)

Evidence of ...

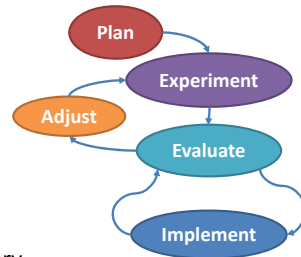
- Student interactions.
 - Content, Colleagues, Instructor / TAs
- Online and group-work behaviors.
- Decisions, interpretations and “products” that students produce.
- Requested feedback.

Evaluation options – i.e. possible comparisons:

- Compare DE and f2f activity, engagement & outcomes
- Compare prior- to current- **interactions**
- Compare prior- to current- **outcomes**

Actions versus evaluation: An evolving project process ...

- Evaluation details evolve based on success (or not!)
- Ideally, learning goals are the primary driving force
 - BUT the process is not linear and takes iteration
 - Why? Because it is not initially obvious which new ideas will be **practical** and what won't.
 - Requires an instructor who can confidently handle glitches.



Data sets

- Tests, quizzes and checkup on activities.
 - Analytics workflows are under development.
- Feedback results
 - Added as a small part of activities or tests.
 - [Active readings feedback](#)
 - Whole course [workloads and enthusiasm](#)
- Hits or time in segments of CONNECT
 - Course activity / Forums / Groups / single student
 - “Reports” and download formats are awkward
- Group work results
 - Activity reports and thread listings (some manual analysis is possible)
- Image work results
 - Annotated figures on uniform base-images

Data contexts

- [Quizzes, midterms, exams](#)
- [Lab exercises](#)
 - Our focus today
 - Includes sketching results
- [Small group activities](#)
 - Introduction
 - Lab 1
 - [Lab2 \(feedback\)](#)
 - Short essay and response
- Online “activity”
 - Content
 - [Hours](#)
 - [Hits](#) on the course site

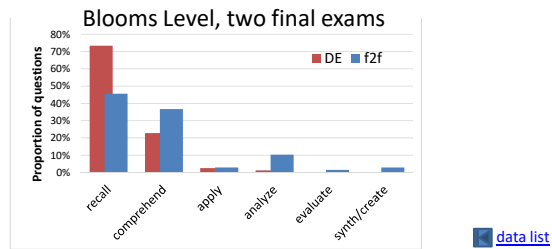
Questions? Suggestions?

[Or discuss & wrap-up](#)

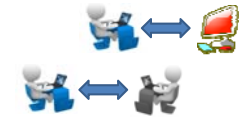
Exam / test results.

Not really ready yet; Why?

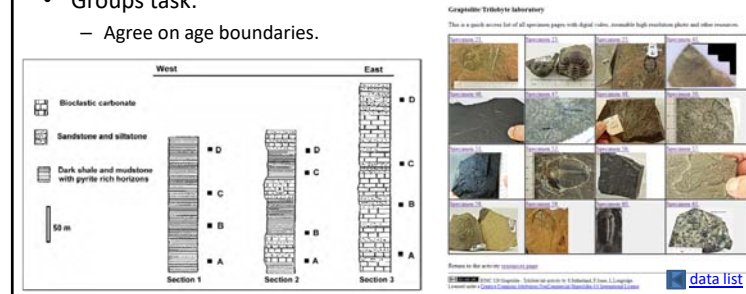
- Exams evolve with changes to learning goals and activities.
- Labour intensive since **Connect** is “stupid” about analytics.
- **But – we can analyze for test sophistication. Eg:**
Compare earlier f2f and DE exams; “Blooms Dichotomous Key”



Solo and group results



- Solo tasks:
 - Interpret 16 fossils from 4 “depths” at 3 locations, + 1 other unknown.
 - Determine ages from references.
 - Sketch lines bounding ages on geologic sections.
- Groups task:
 - Agree on age boundaries.



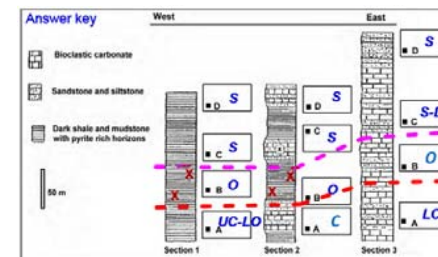
Data about the lab exercise

- Compare DE to original f2f exercise
- Sketches (solo and group)
- Discussion activity in groups
- Feedback about resources and workloads

Note: More here than we can cover, but we can pick and choose 😊

Lab 2 sketch result: eg. from one group

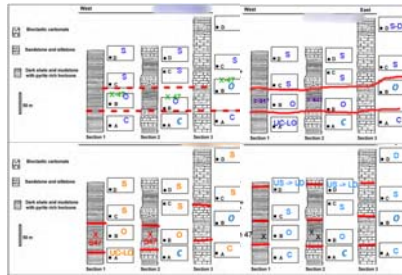
- Solo work varies in correctness and completeness
- Group work iterates towards correct & complete interpretation



Lab 2 sketch result: eg. from one group

- Solo work varies in correctness and completeness
- Group work iterates towards correct & complete interpretation

4 individual versions – done first



Group version after disc'n



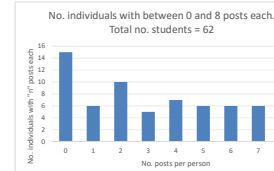
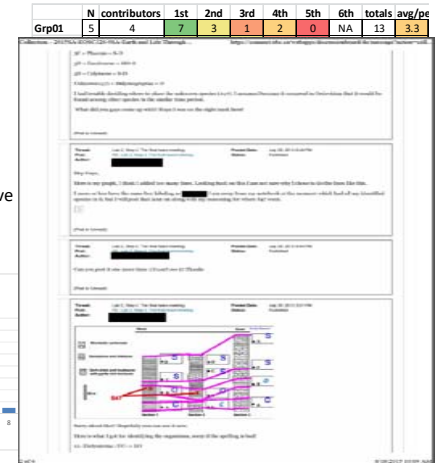
Solution key



Lab 2 sketching: solo and discussion results

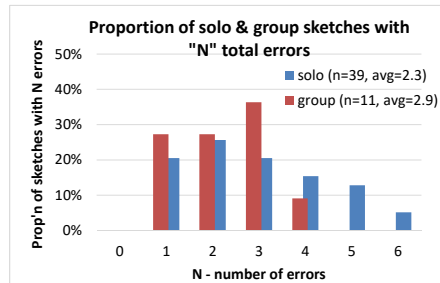


- Who posts ... How often?
- 12 groups
- Wide range of active-ness
- 2nd to post seems most active
- Very slight relation between score and group post-counts.
- Evidently, some room to improve scaffolding and motivation.



Lab 2 sketching: solo and grp error rates

- Based on rubric components.

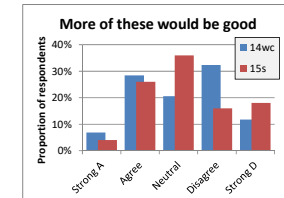


- Groups "better" than solo, but ... could scaffolding be improved?

[data list](#)

Lab 2 feedback

- "More of these would be great" ...
- '14-'15 diffs in mean not significant.



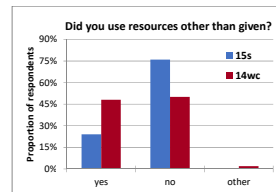
[data list](#)

Lab 2 feedback

- Which resources were Most / Least useful?
 - Video was "least" by smaller proportion of students in 15s.
 - Otherwise, similar.

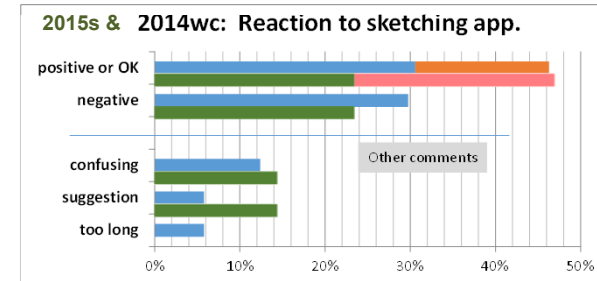
	most		least	
	14wc	15s	14wc	15s
video	13%	12%	55%	44%
zooming	72%	73%	-4%	0%
fixed	13%	12%	-7%	8%
multiple	2%	4%	-5%	-9%

- Did you use other sources? Which were most useful?
- More details next slide



Feedback from T/G lab 1st and 2nd iterations

- Did you like the sketching app? Dislike it? Any suggestions?

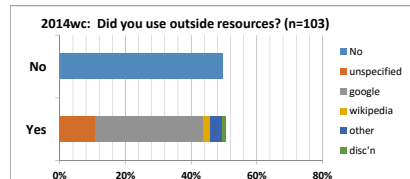


[data list](#)

Feedback from T/G lab 1st and 2nd iterations

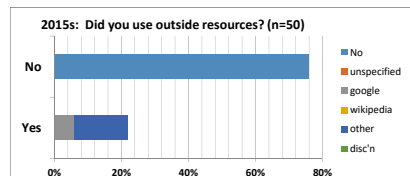


Outside resources used?



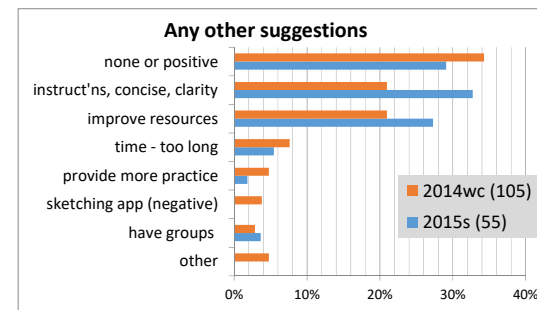
2nd iteration after some changes to questions and guidelines.

(Could apply χ^2 -test, but '14 and '15 do seem quite different).



Feedback from T/G lab 1st and 2nd iterations

- Any suggestions?



[data list](#)

Feedback from T/G lab 1st and 2nd iterations

Any suggestions?

- *Like it, Lab 2 sketching felt unnecessary but lab 1 sketching was really helpful (especially when we compared with a group).*
- *I think activities like these are extremely useful and fun when you can actually go into a lab with other students, but I found it difficult to make myself sit down and go through it on the computer; it isn't as fun or exciting seeing everything behind a screen and a lot of the time the interaction with other students is needed in order to figure things out.*
- *I liked this portion of the lab and really helped me with my understanding of the geological time columns and also helped me confirm my answers in worksheet 2*
- **From First Version:** *It might be nice to somehow incorporate group work into the activity (since in-class labs often benefit from team work).*

[data list](#)

General small groups data

- Compare prior to current DE course
- Recall – 4 small group activities
 1. Introduction
 2. Lab 1
 3. Lab 2
 4. Short essay and response

Conclusions:

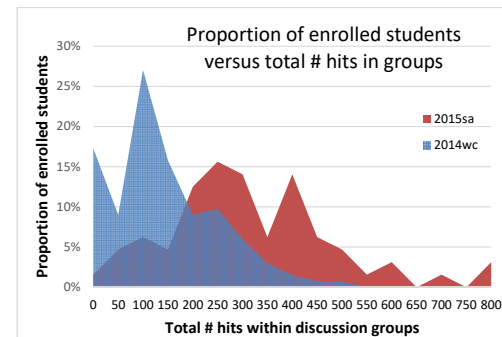
- Compare student feedback 2014 winter and 2015 summer
- 2014w = first attempt and NO group work
- 2015s = second attempt WITH group work
- Fall 2015 runs Nov 13th – 25th.
- Feedback suggests students reacted similarly.
- Conclusion – we need to pay closer attention to collective feedback and address common issues and recommendations.

[data list](#)

Hits within all groups



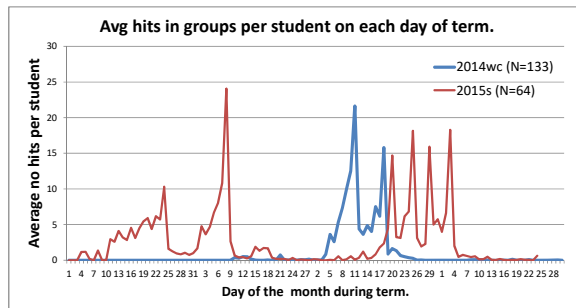
- Using Connect's "report" data.



[data list](#)

Hits within groups each day per student

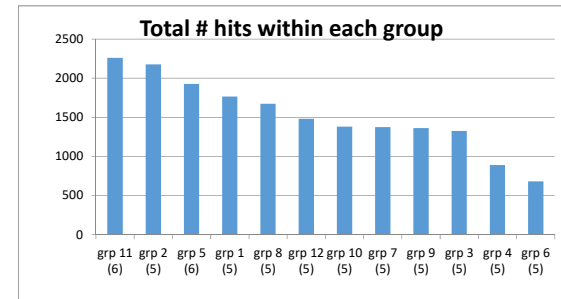
- Interaction with colleagues is distributed across the term.



[data list](#)

How active are small groups?

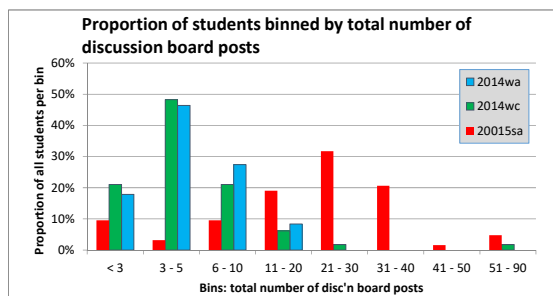
- This is quantity not quality, but group behavior seems to vary.
- Room for improved scaffolding and motivation.



[data list](#)

Total discussion board posts

- Quantity of interaction with colleagues is increased.
- What about Quality???



[data list](#)

Short essay + discussions: before/after small grps

2014wc and before

- Grps of 40-50 for this assign. only
- Five forums (topics) per group.
- Short essay:** post under 1 of 5 topics (ie. forums).
- Respond** to one other.

2 required posts

~ 1 "thread" / student

~ 3 posts / thread

2015s and after

- Same small grps for 4 activities.
- One forum (per grp) for this assign.
- Short essay:** post as a new thread, any 1 of 5 topics.
- Reply** to 3 others.
- Respond** to 1 reply (i.e. "discuss").
- Discuss further for bonus pts.**

5 required posts

~ 1 "thread" / student

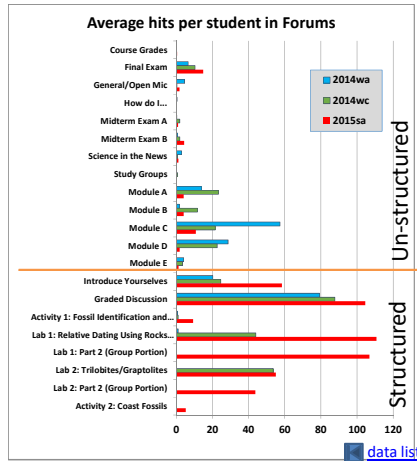
~ 7 posts / thread

[data list](#)

Activity in forums

Small groups introduced 2015s.

- Reduced unstructured engagement about content
- Increased structured engagement in 4 small-group activities.



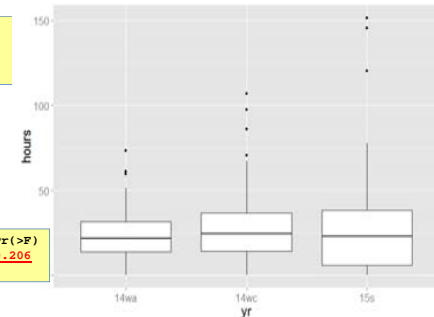
Total hours online



- Total hours is not significantly ($Pr=0.206$) different in three terms.
- However box plots and *stdev* do suggest increased variability.

Summary :

year	N	mean	sd	se
1 14wa	93	22.7	15.2	1.6
2 14wc	130	26.8	21.0	1.9
3 15s	77	28.5	30.0	3.4



ANOVA result:

	Df	Sum_Sq	Mean_Sq	F_value	Pr(>F)
yr	2	1569	784.5	1.59	0.206
Resid's	297	146525	493.4		

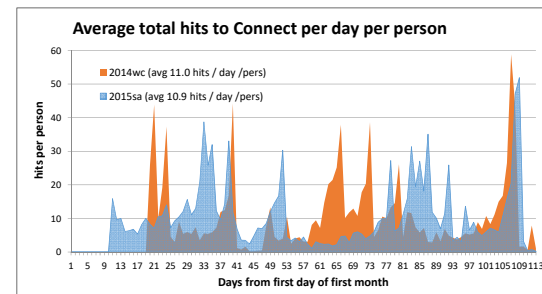
[data list](#)

Total activity: hours and “hits”

- Are students spending more time?
 - DE may be able to explore this question more easily than f2f.
- Compare prior to current DE course

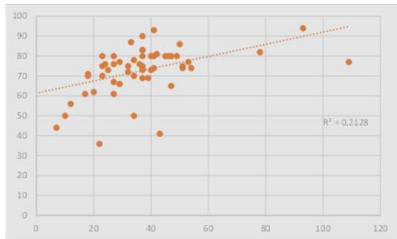
Total hits in Connect each day per student

- Total hits did not change after adjusting to 4 small group tasks.
- However, engaging in the course became less sporadic.



One more idea ...

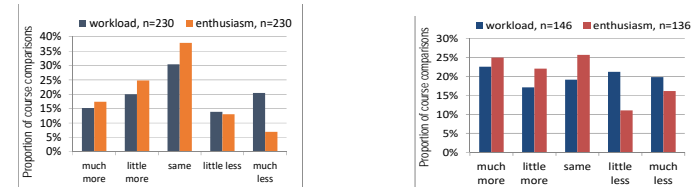
- Correlate “total submissions” versus final grades.
 - $R = 0.46$ (or $R^2 = 0.213$)
 - Not particularly convincing.
 - But consistent with other “time-on-task” vs “success” studies.



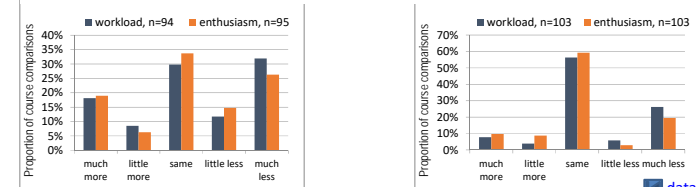
[data list](#)

Workloads and enthusiasm (SLES)

DE: fall / winter terms **largely similar**. f2f: “more work”, “more enthusiasm”



DE: 2014 / 2015 summer: **similar overall** but distinct in detail



[data list](#)

Workloads, enthusiasm and experiences

- Compare “new” DE to prior DE and f2f.
- Uses results of SLES (Student Learning Experiences Survey)

SLES for DE and f2f

“Significant” differences between f2f and DE

- Student Learning Experiences Survey (SLES);
 - 45 Likert-scale questions in f2f courses
 - 55 Likert-scale questions in DE courses
- For how many strategies do mean responses vary significantly?

	$P_{adj} < 0.05$	$P_{adj} < 0.01$	N
Between 4 DE sections	5	4	48
Between 4 DE and 1 f2f	5	12	22

- No open questions analyzed yet.

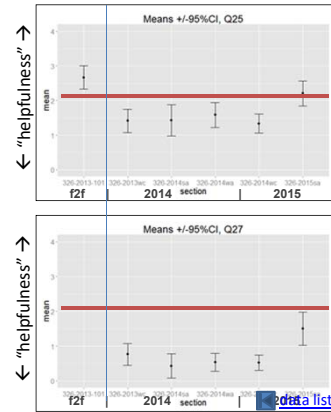
[data list](#)

SLES for DE (and f2f)

No specific “group” questions, BUT – 2015 is 1st to use small groups

- Other homework exercises (Not quizzes; eg. problem sets, etc.)
 $P = 0.0241$

- Projects you did with other students (written, oral, poster, etc.)
 $P = 0.0002$



Activated readings feedback

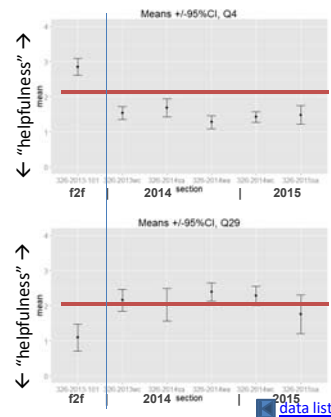
- Early “active content”. Questions asked to recommend changes.
- Resulting adjustments improved activities in subsequent terms.
- Time on task changed little.
- “Appreciation” changed little.

SLES for DE (and f2f)

Interesting f2f – DE comparisons:

- The text book

- Feedback on completed work



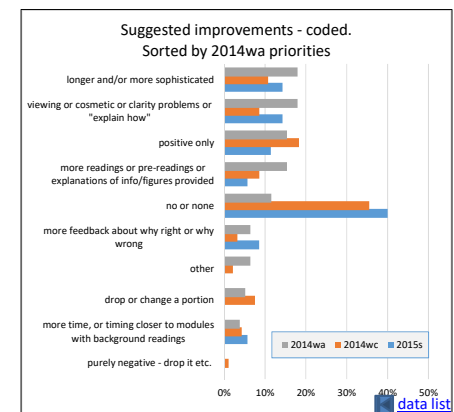
Open feedback from coast fossils activity

Effect of adjustments due to feedback in term 1.

Gray – first feedback

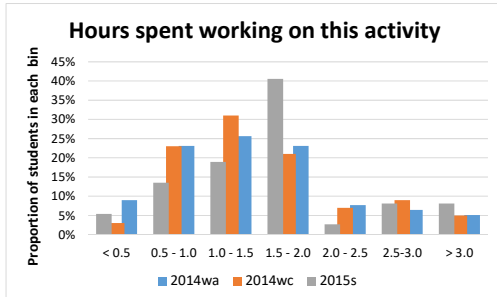
Colour – subsequent feedback

- Mostly “none”
- Term 1 priorities reduced



Time on coast fossils activity

- Time on this task seems little different.
- Possibly shifted to a more uniform 1.5-2.0 hrs. by summer 2015?
 - But summer and fall/winter terms have many reasons to be “different”.



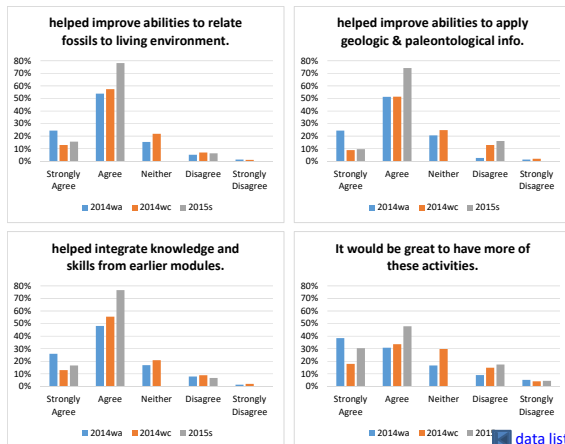
[data list](#)

Some references and resources

- <http://eos.ubc.ca/about/faculty/F.Jones.html>
- <http://eos.ubc.ca/research/cwsei/>
- <http://www.eos.ubc.ca/courses/Dist-Ed/DE326.html>
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Likert-scale feedback on coast fossils

Consistent from term to term.



[data list](#)