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# Re-Designing Hands-on Group Activities to Foster Deeper, More Engaged Learning in Distance-Education Courses

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Dep't Earth, Ocean & Atmospheric Sciences

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# Re-Designing Hands-on Group Activities for Distance-Education Courses

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EOAS-SEI



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# Interactive presentation goals …

**Together we will …**

1. Characterize similarities and differences of “Active Learning” for Distance education (DE) and face-2-face (f2f) settings.

2. Consider opportunities and challenges associated with translating learning activities from f2f to DE.

3. Outline one specific project at UBC.
    1. Pedagogic choices and phased timeline
    2. Demonstrate some activities
    3. Include preliminary results and feedback for the pilot deployment

4. Discuss technical & pedagogical aspects arising from this case.

# Components of “active” **F2F** courses

- **Presumption**: “active” learning in any setting ‘good’.
- What do you think are characteristics of an “active” f2f course?
  - One minute to think – jot down 1-2 ideas
  - Two minutes to share

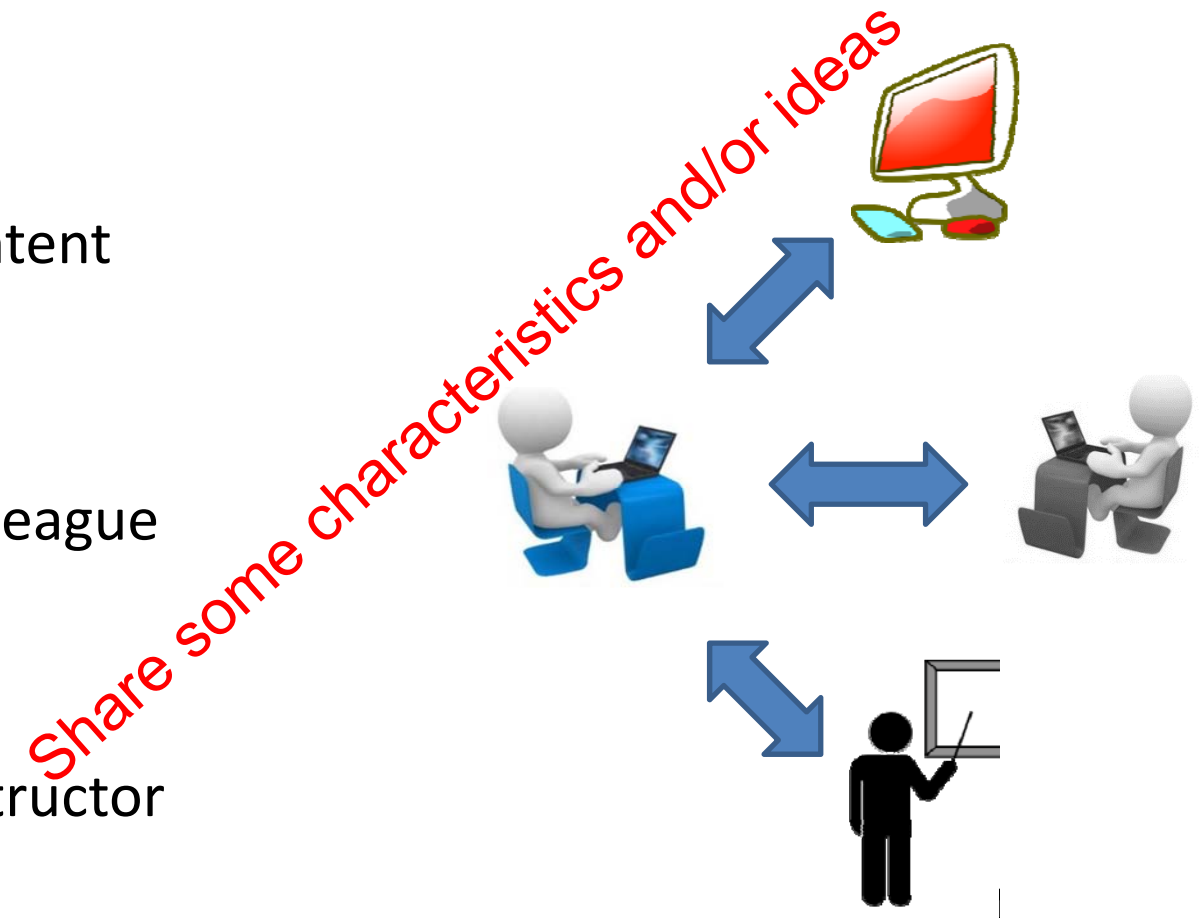
# Some components of "active" **F2F** courses

- Pre-class readings adequately scaffolded and utilized.
- Class time enabling …
  - Experts to "see" & react to student thinking (clickers, worksheets, etc. )
  - Peer instruction during – and outside of – class.
- Lecturing based on "time to tell" (after student effort and/or prediction).
- Student "products" and some ownership of content (adequately scaffolded).
- Learning with peers (peer instruction, group work, peer assessment, etc)
- Feedback and rubrics for intermediate and final 'products' and assessments.
- Variety and balance of graded work (extrinsic motivators).
- Also
  - A context and vested interest for students (intrinsic motivators).
  - Learning goals defining levels of mastery for students and instructors.

# Now, components of “active” **DE** courses

**Balance and variety of interactive learning pathways[1]**

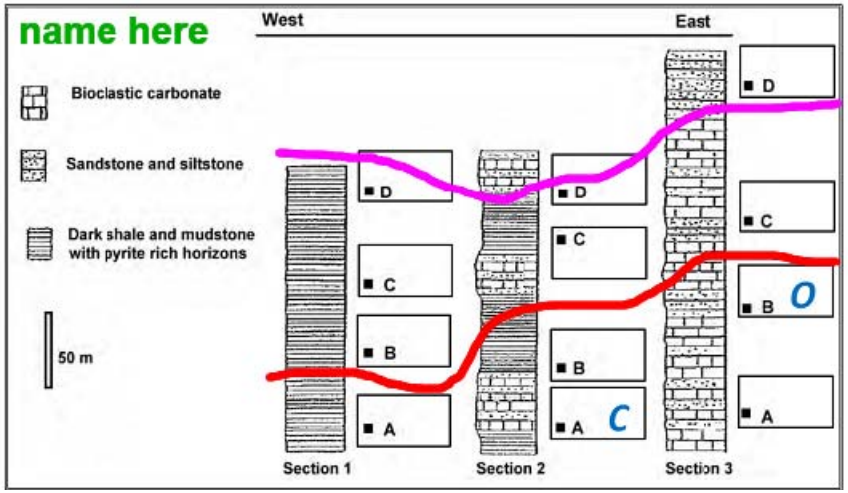
- Student ←→ content
- Student ←→ colleague
- Student ←→ instructor




[1]E.G. Kennepohl and Shaw. 2010

# Student ←→ content 1 *

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. Self-paced &/or sequenced video & media.
4. Generation and sharing sketches and annotated figures




* E.G. Clark and Mayer, 2011

# Student ←→ content 2*

4. Low stakes quizzes (more is better)
   - MC, ranking, fill-blank, matching, jumbled sentence, numerical, etc.
   - "Blooms Dichotomous Key" to characterize question levels and set targets

5. Other opportunities arising from well-crafted assessments
   - Analytics determine effectiveness and misconceptions
   - Pre-post concept tests characterize foundations & measure learning gains.

6. Higher stakes tests
   - Same question types
   - Isomorphic questions so individuals see "different" tests
   - Two-stage tests (challenging but possible in asynchronous settings).

* E.G. Clark and Mayer, 2011

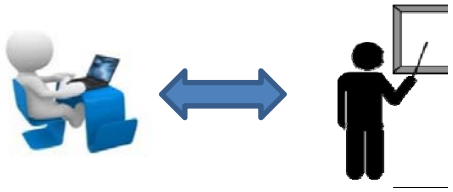
# Student ←→ colleague

1. Cooperative[1] opportunities
   - Engage in semi-structured, facilitated discussion
   - Share results of solo work in groups
   - Generate group versions of products or quizzes (eg. 2-stage tests)
   - Generate cooperative products (eg. sketched problem solutions)
2. Collaborative[1] opportunities
   - Construction of knowledge and/or products (eg museum displays)
   - More autonomous than prescribed cooperative exercises
   - Blogs, journals, wikis, Google Docs, Google Earth ;
     each has pros & cons (simplicity, permanence, institutional sustainability, etc.)
3. Peer review, critique, feedback, assessment
   - Explicit in BlackBoard's "self and peer assessment" facilities.
   - Implicit in cooperative or collaborative work. (eg CPR[2], but tricky to get right!)

[1] Cooperative vs collaborative: see eg. Panitz. 1999

[2] Search for "Calibrated Peer Review"

# Student ←→ instructor



1. Expert <-> novice interaction is important and “precious”
2. TAs are important
   - Reduced “power” relationship, “Semi-expert” and more “student-like”
   - BUT need training and practice to build pedagogic expertise (eg. ‘tutoring’)
3. Facilitation of semi-structured discussions.
4. Use (and display) rubrics and good/bad/ugly examples of work
5. Feedback (F.B.) in all assessments (some automated).
6. F.B. on intermediate AND final products;
   - Generate numbered F.B. items, indicate specifics for individual students but deliver all feedback notes to all students
   - Facilitated discussion about tasks & outcomes serve as F.B. to everyone.

- Also - implement explicit and visible actions based on *student* F.B.

[1] TBL=Team Based Learning; see Michaelsen, L. K., M. Sweet, and D. X. Parmelee, eds. 2009

# Example setting – one course, two modes

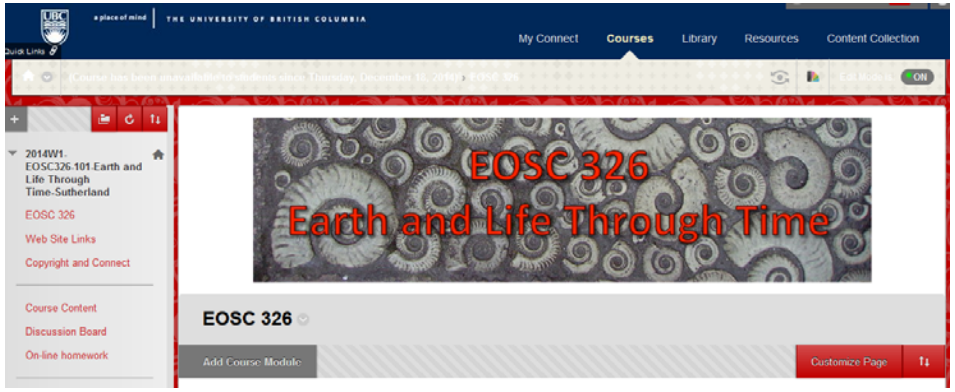
## Earth And Life Through Time

- 3rd year elective for science majors

- **F2f:** Three 1-hour lessons per week

- **DE:** *was* mainly readings, quizzes and 1 essay.

- Content similar but not identical.

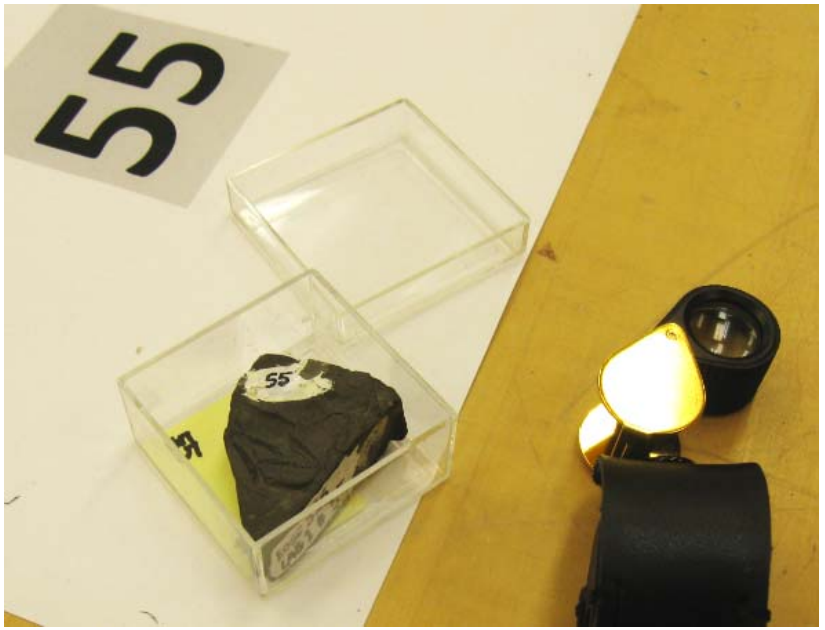



# Example activity in F2F version:

- A 50 minute “lab” examining fossil and rock samples with TAs and instructor present.
- One 50-minute structured group activity follow up a week later.
- Some online quiz-like homework

# “Hands-on” Components for F2F version:



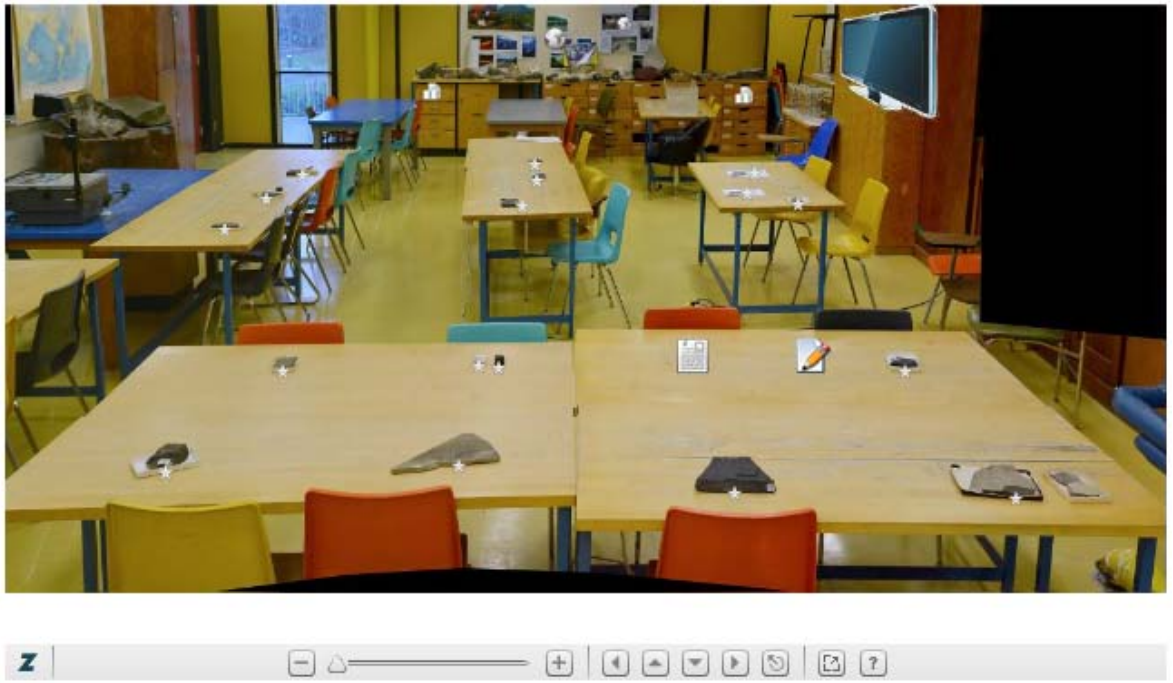
# Example activity

For DE – can we develop …

- Same learning goals
- Similar experiences
- Online data entry (after paper work)
- Online sketching and result upload
- Online digitized resources

# “Virtual” components for DE version:

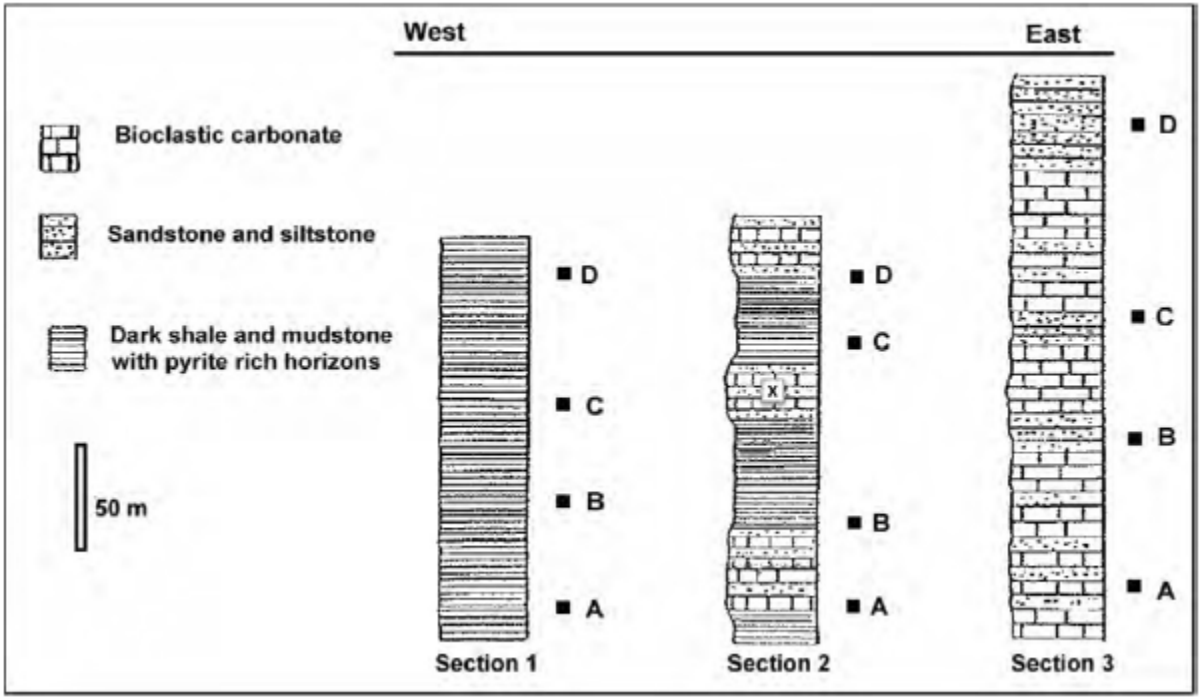
Zoom-in high resolution lab space with clickable Hotspots. Same for Specimens, plus videos of “handling”

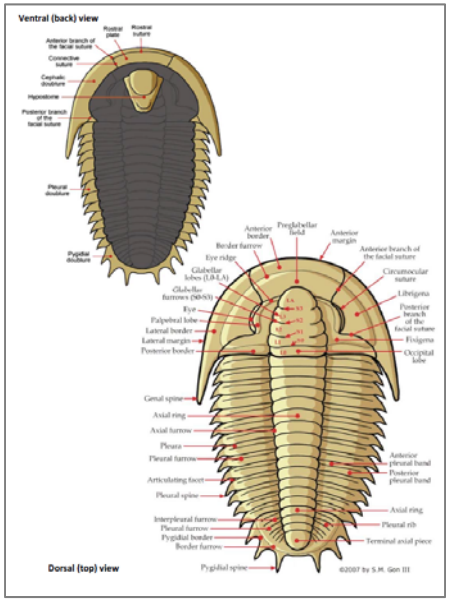


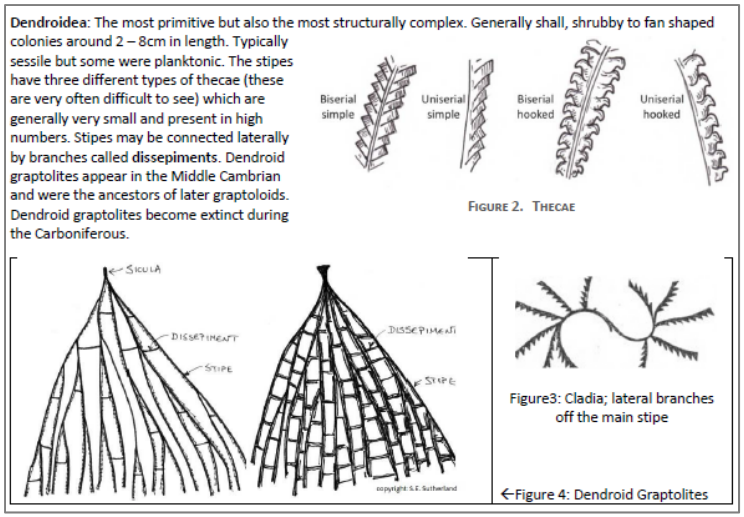

# Components for BOTH versions of this exercise:

Same specimens


Same tasks
(including sketching)




Same documents

# Components for both versions of this exercise:

Red underlined = new innovation

| Week 1, F2F lab: | Phase 1, DE "lab": |
|---|---|
| 1. Manual / instructions | 1. Manual / instructions including scenario |
| 2. Paper worksheet for 21 fossil IDs and ages | 2. Paper worksheet for 17 fossil IDs and ages, with three completed as examples<br>- Digital input & autograding of IDs / ages |
| 3. Hand samples & photos of specimens<br>- 1 hr with specimens & instructors | 3. Digitized samples of all specimens<br>- Interactive "lab environment"<br>- Images: high resol'n, zooming, multi-view<br>- Videos: of "handling" specimens |
| 4. Online questions about fossils<br>- all multiple choice. | 4. Online q'ns (not all MC) about fossils to address aspects of the scenario. |
| 5. Sketching on given sections.<br>- All graded by TAs | 5. Digitally sketch to annotate or elucidate given base-line figures.<br>- Sketch submission only graded by TAs. |

# Components for both versions of this exercise:

| Week 2, F2F lab: | Phase 2, DE "lab" – Add team work: Going "live" early June. |
|---|---|
| 1. Groups: Agree on and re-submit fossil ID and ages. | 1. Agree on & re-submit fossil ID and ages. |
| 2. Groups: answers to 2 point-form written questions. | 2. Agree on & re-submit 2 point-form written questions. |
| 3. Groups: answers to the sketched "interpretation". | 3. Agree on & re-submit sketched "interpretation". |
| 4. Graded by TAs. | 4. Sketch graded by TAs |
| 5. Solution set: PDF provided online. | 5. Solutions after grading. |
| | ALSO<br>- permanent small teams (7-8),<br>- group work in other "labs" and activities |

# Components for both versions of this exercise:

| New for the F2F "lab" – tentative: | Phase 3, DE "lab" – tentative: |
|---|---|
| 1. Add one level of technical complexity | 1. Add one level of technical complexity |
| 2. Add a student product; eg. research a specimen in the context of the given scenario & Google Earth. | 2. Add a student product; eg. research a specimen in the context of the given scenario & Google Earth. |
| 3. Groups apply new abilities rather than reproduce solo work. | 3. Incorporate peer-assessment or feedback. |
| 4. Incorporate "two-stage quizzing" | 4. Automate "two-stage quizzing" |

# Opportunities and Challenges

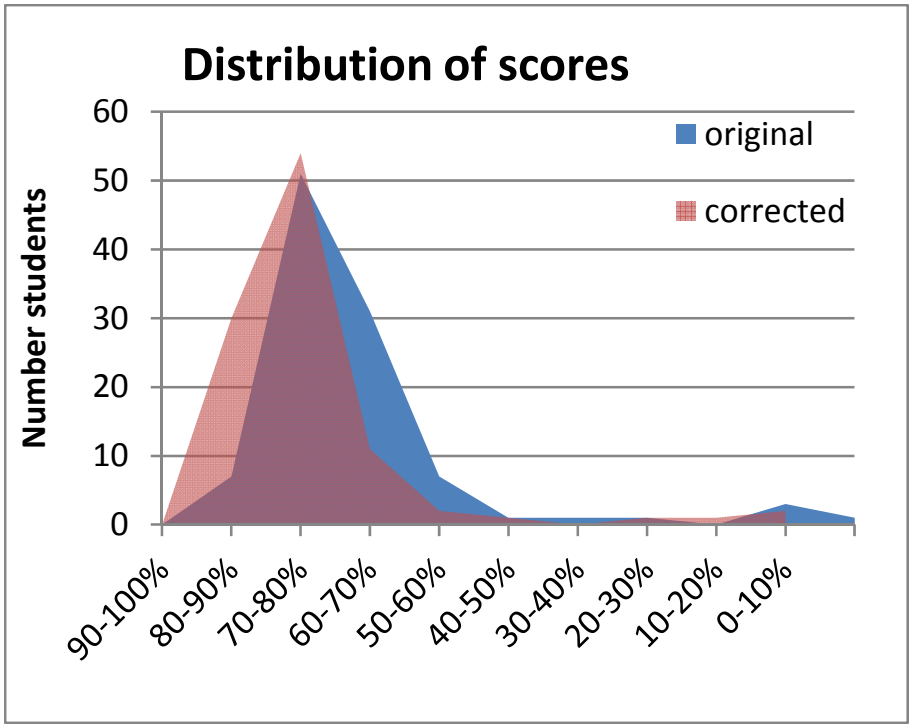
- First – think of and share one or two challenges you anticipate with some of our ideas.

# Challenges (pilot with 104 students)

- Testing LMS automation for all “failure modes” is hard!
  - Designer, instructor and TA all tested it, but errors still occurred
- A few questions were about concepts not fully “covered”, but this identifies shortcomings in resources.
- Most concerns were “confusing instructions” or “unclear expectations”.
  - Need demos, examples … i.e scaffolding or helping set expectations.

# Results (104 students)

- Corrections for “confusing” questions increased scores ->
- For version 2, we are reviewing …
  - Learning goals
  - Content provided
  - Learning activities
  - Assessments
  - Analytics: example below …




***Specific data entry & questioning scores suggest priorities for improvements***

| q'n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| avg | 73% | 94% | 81% | 93% | 95% | 95% | 94% | 94% | 95% | 90% | 81% | 93% | 81% | 80% | 90% | 69% | 86% | 91% | 82% | 60% | 43% | 36% | 86% | 53% | 85% | 61% | 76% | 80% | 70% | 49% | 51% |

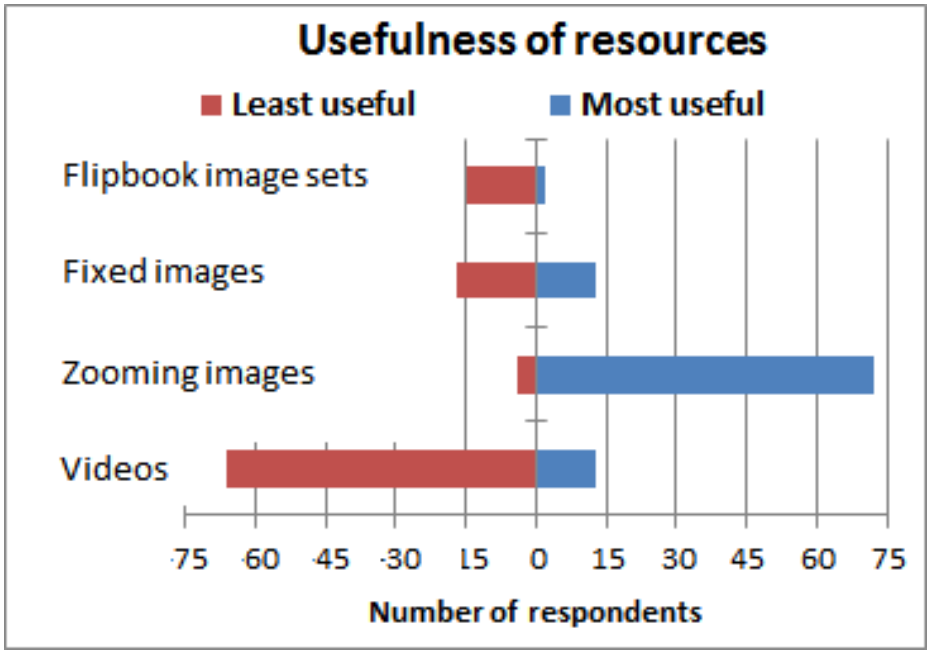
# Feedback from 104 students:

- Ad-hoc discussion board use > than other course components.
  - Better scaffolding of this process will be introduced next time.

- Which resource types were most/least useful?

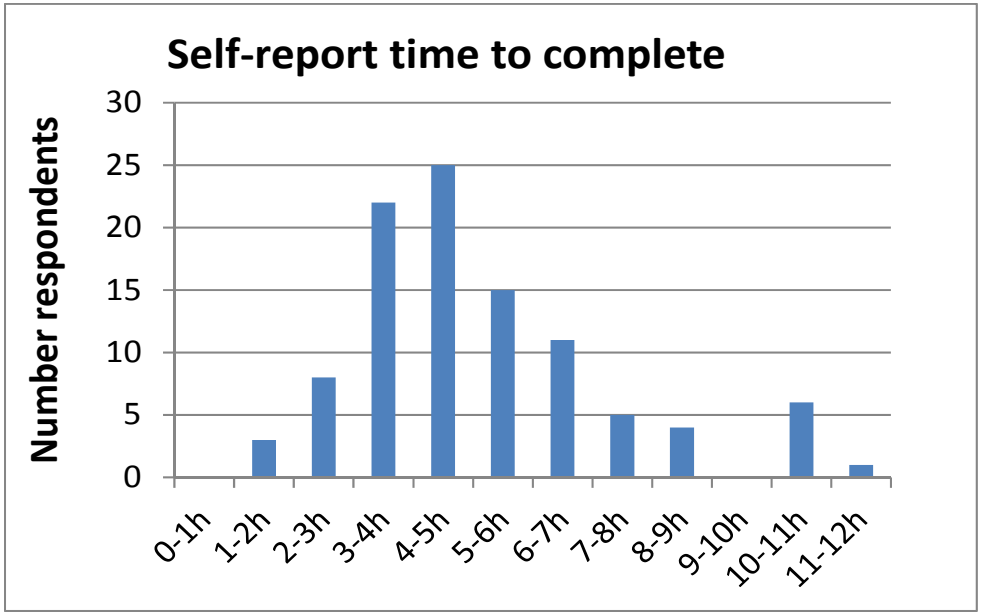
Results speak to alignment of tasks with resources provided.

- Eg. need to introduce tasks that need videos of samples.
- Eg. Ask about rocks containing fossils, not just fossils themselves.

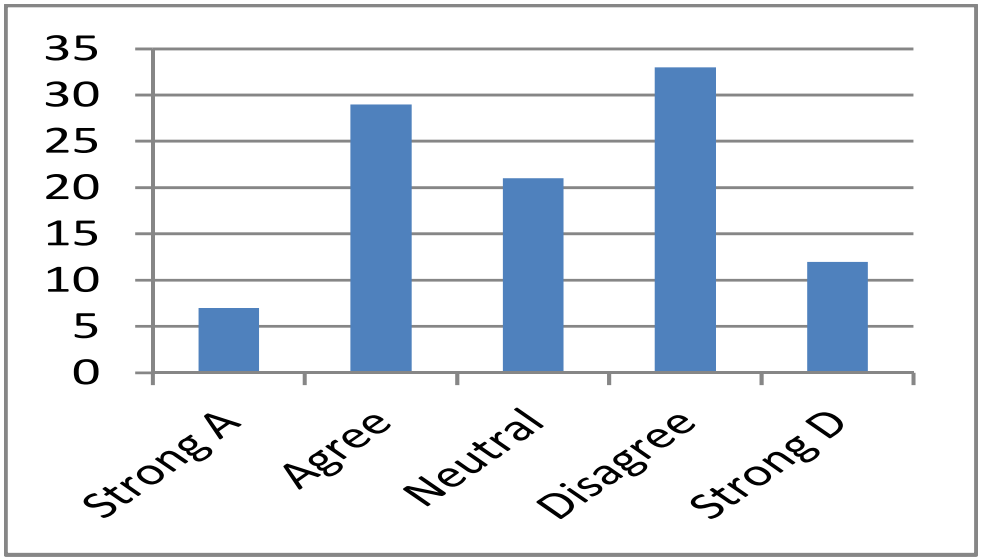


# More feedback from 104 students

- Self reported time to complete:
  - Seems reasonable.

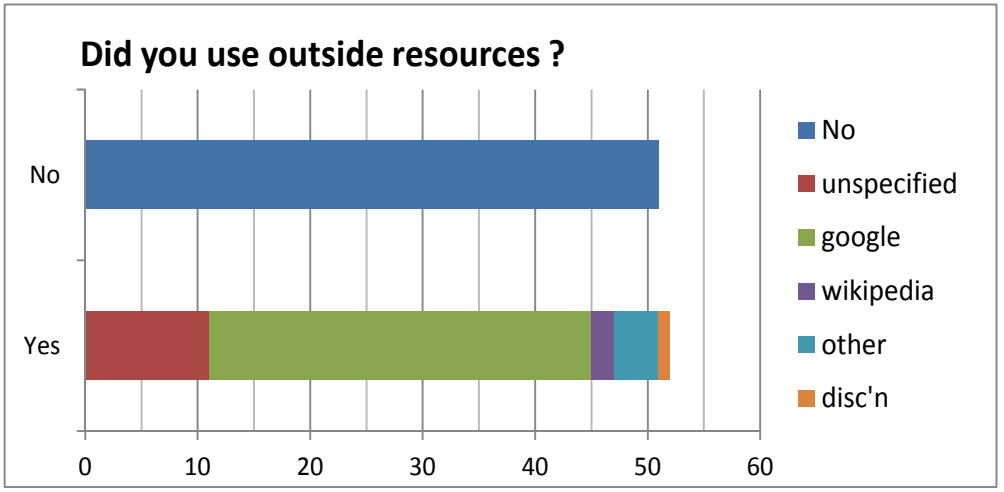



- *"It would be great to have more of these activities"*.
  - Encouraging for a pilot!

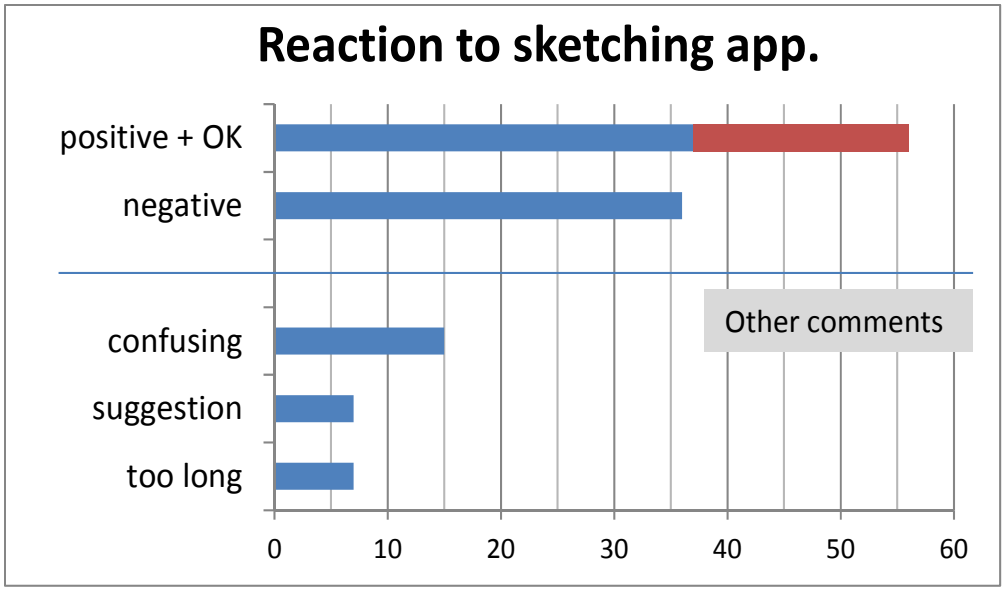


# More feedback from 104 students

- Used outside resources?
  - Suggests use of outside resources could be promoted explicitly.

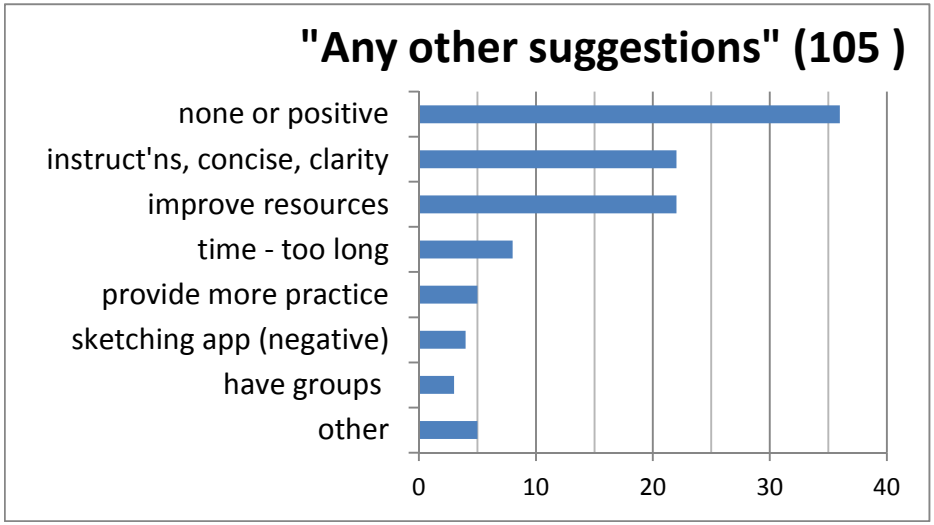



- The sketch app: Did you
  - like it?
  - hate it?
  - have any comments?



# More feedback

- Any other suggestions →




- Positive quotes:
  - *…perfect. The instructions were so on point that I had no issues with it.*
  - *I was confident working with this tool.*

- Constructive quotes
  - *Have a more concise instruction.*
  - *More practice … identifying fossils. I often didn't know what to look for.*
  - *… include  concepts we have learn in Module A*
  - *… incorporate group work … in-class labs benefit from team work.*
  - *…could be a great group activity instead of individual activity!*
  - *Divide into multiple sessions - it is quite complex & intimidating.*

# Conclusions?

- This activity is one small part of a two yr project (2014-2016)
- Pilot project entering phase 2 (of 3) this summer.
- Students appear to “like” engaging with specimens and concepts. Most problems are technical or “confusing”
- Workload appears reasonable.
- Tasks and purposes can be fine-tuned and “smoothed”.
- Make screen-casts of “how to”.
- Comparing performance in f2f and DE has yet to be done; requires more cooperation in terms of content.
- Incorporate higher level learning into subsequent assessments

# Questions or comments?

- General thoughts about f2f vs DE “active learning”?
- Specifics of implementation?
- Student reactions?
- Implementing “peer instruction” or group/team work?
- Research directions?
- Other topics?

# People

- Teaching and learning support (F. Jones- presenter)
  - Coordinate, produce, follow up.
  - Build resources (images, video, interactions, etc.)
  - Deploy onto Blackboard 9.x

- Lead DE instructor (Dr. L. Longridge)
  - Taking the “risks” of deploying for fully DE course.
  - Fitting new tasks into existing course structure.
  - Handling all feedback and communication with students.

- Configured for a service course (Dr. S. Sutherland)
  50-min. hands-on lab experience
  - 50-min group-based whole-class follow-up with homework

- Original design of the exercise (Dr. P. Smith)
  - For 2nd year geoscience majors
  - Still used as a 2-hr laboratory exercise with reporting.

# Some references and resources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