Followup on the IPCC Climate Atlas activity in EOSC112, Nov 29, 2021

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Activity preparation and delivery by Y. Egorova and A. Orsi.
Evaluation implemented and analyzed by F. Jones (OCESE project)

Introduction

The worksheet activity was started as a 20-minute in-class activity, finished at home, and delivered before the subsequent class. Submissions were delivered to Canvas either as PDFs or scanned images.

This worksheet activity was done either in groups or solo, depend on students' preference. Therefore, the counts represent the number of times a "thinking unit" of students (group or individual) mentioned the item counted.

Results here focus on the last 3 "reflection" questions. Only the PDFs (not the images) were transcribed, yielding 96 entries or a sample size representing 65% of the class. Duplicate responses were dropped.

In general, I get the impression that this was an impactful (i.e successful) exercise. There are sufficient quotes of new concepts learned, and expressions of interest or surprise, to indicate this is a great addition to the course, and could likely be leveraged to improve this and other courses.

Results

Choice of codes is arbitrary. Choices were made to characterize the "issues" being addressed by students. It is not efficient to try and capture the specifics of their entries at this stage of analysis.

The spreadsheet with complete raw data, the processing sequence, and results of coding is provided separately. The following three graphs summarize results.

Note that the spreadsheets have sortable columns, so if you are interested in (for example) "misconceptions", sort that column to gather all entries coded as involving a misconception together as top rows.

All three questions were coded using all useable data. Comparing 75% of these data to the complete results demonstrates little difference in general patterns. Therefore, the number of responses analysed is probably a fair representation of the most important issues or perceptions among these students. However, no concrete statistics was performed to confirm this. (That could be done if rigour is required.)

A few individual responses are highlighted in the spreadsheet. I thought these particularly insightful. There are certainly other well articulated comments. In these kinds of surveys, there are usually several students who are thoughtful and make useful statements. Normally I would return to these data a few days after coding to find some key points worth conveying to students.

A few suggestions for converting these results into feedback to students:

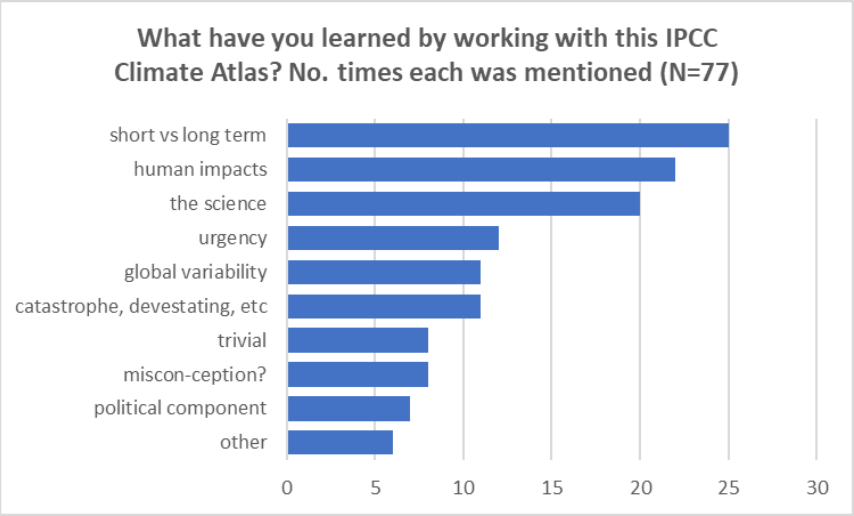
1) Identify what "issues" appeared to be top of mind in the class and tell students "your reflections generally appear to be emphasizing the following issues, although individual responses may have differed", or words to that effect.
2) Identify misconceptions and try to address them "politely". Eg. "Several students apparently misunderstood results in Earth's polar regions to indicate that these regions are warmer (or going to be warmer) than other regions. HOWEVER - all maps were displaying CHANGE in the parameter, not VALUES of the parameter.

Therefore “dark colors” in the polar regions means they will experiences the greatest change, not the greatest value. They will still be colder than lower latitudes, but they will have experienced greater change than other regions.

3) Pick out one or two particularly well-posed points or questions to show. Note that you don’t know who submitted these responses, but it is worth highlighting why you think they are particularly insightful.
4) Pick out one or two main “concerns” and address them somehow. We don’t want to send people home with a sense of doom and gloom. In fact, beginners are not all clear about how to think using a range of models. This is “advanced abstraction” and takes time to learn how to think through and weigh all the implications.

Summaries of responses to the three reflection questions

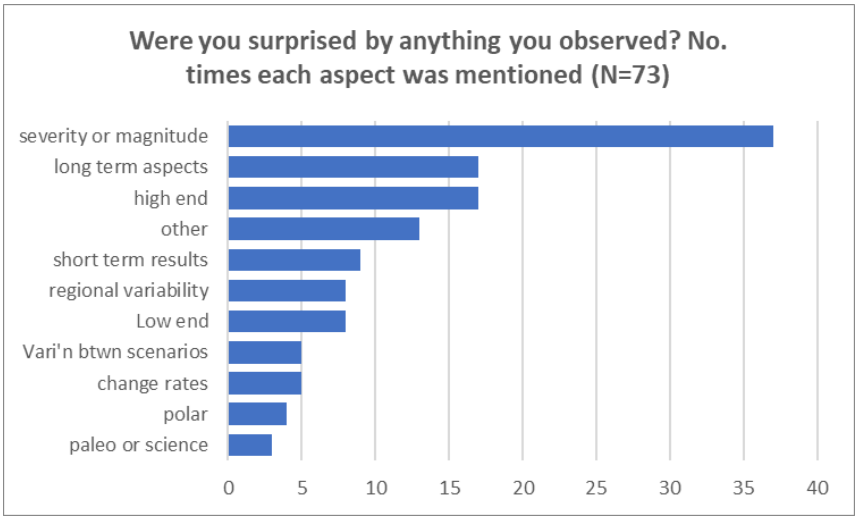
What have you learned by working with this IPCC Climate Atlas?



A few random, first impressions:

- Top three aspects identified seem to me well aligned with what the exercise (and the course) is all about.
- “Global variability” could perhaps be emphasized more specifically.
- Two misconception seems to be (a) “poles are warmer than rest of Earth” and (b) modeling produces “forecasts” (i.e. expected occurrences) rather than “different predictions under different sets of assumptions”.
- There are a few responses with a sense of “catastrophe” or “despair”. A few words to dispel these impressions wouldn’t hurt. These are “data”. They don’t predict doom – they inform decision makers so that actions taken are as well-informed as possible. This avoids “guessing”. (Or would, if decision makers were evidence-oriented. That’s why education is so critical – my own editorial comment.)

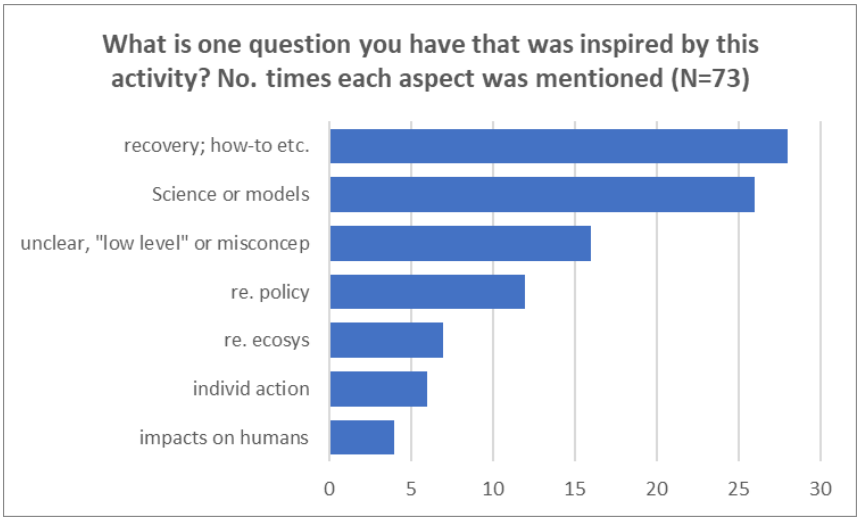
Were you surprised by anything you observed?



A few random first impressions

- Surprise about severity or magnitude of possible changes seems to have dominated. They seem be seeing the worst-case scenarios and are say "oh my goodness! …".
- Several mentioned "in my life time" or words to that effect.
- Few have mentioned surprise at any of the facts, figures, methods or purely intellectual aspects. So – this is a visceral, emotional topic. This is probably worth remembering as we try to figure out how best to teach the subject and help students grasp fundamentals and draw relevant, appropriate implications.
- Lots of surprise about timing, pace of change and "visibility" of impacts during the short term. This is "evidence" of the difficulty in convincing humans that they are in a place of "clear and present danger".
- Asking about "surprise" is useful because it helps articulate what the most impactful lessons were for each student.

What is one question you have that was inspired by this activity?



A few random first impressions

- Students are known to have generally poor question-posing skills. It's hard to ask a question when you are still struggling with the concepts. That's OK – it is after all a 1st year course, but it does remind us that seeing good questions, and then posing effectively, is a skill that takes time to develop.
- I was a bit (pleasantly) surprised to see nearly as many ask about the science, modelling or broader "ecosystem" implications, as about "how can we fix this".
- One potential adjustment to the exercise could be to ask them to "pose a question and answer it using the Climate Atlas". But – that's a fairly "high level" question, perhaps more appropriate in EOSC340 or other more senior course.

- A few wondered about how think about “accuracy of simulations”. Not sure if there’s a straight forward answer, but a few words might be worth while?

Recommendations for next delivery

Still need to edit the above for efficiency, then summarize ideas for improving efficiency, effectiveness and “sustainability” (ease of transfer to next instructing team).

Appendix

Steps to generate coded results

- transcribe into Word doc, using tables and "web view" so page size is no constraint
- paste 96 file names into a table with 96 rows.
- Results of transcriptions were copied to excel to facilitate “emergent” coding.
- Paste the 96 names into a spreadsheet and use Excel's "LEFT" function (or equivalent) to truncate filenames to ~10 characters. Paste these back into Word to make it easier to keep track of which is which.
- Where feasible, copy directly from PDF and paste into docx "as text" to avoid messy fonts etc.
- For hand written responses (or if text can not be copied out of PDF), use MS-Word’s speech recognition. This is surprisingly fast and accurate, but not faster than copy/paste.
- for "blanks" enter "blank"
- display codes, then replace "paragraph" with "space" (removes unwanted "new/line")
- copy resulting table out of MS Word and into spreadsheet
- put each column into a separate sheet
- Use conditional formatting on each column to flag duplicate entries
- convert duplicate entries to "duplicate" so comments are counted only once
- coding: add columns as you see fit, but revisit previously coded rows if a column is added or changed. Colums will usually stablize after ~50 rows.
- counting for totals can be used to track when sampling becomes sufficient to have proportional results not change much