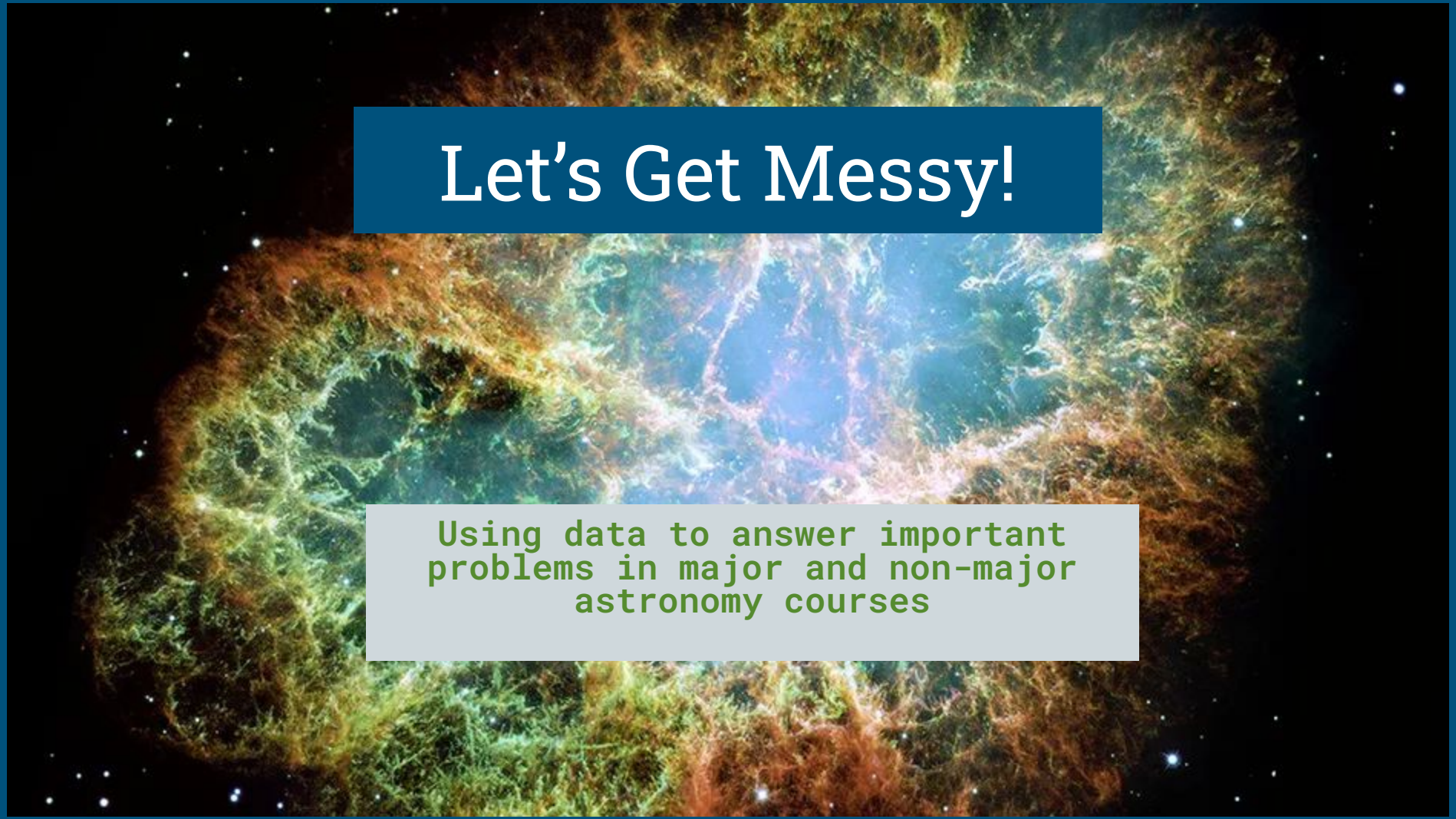
Let’s Get Messy!
Using data to answer important problems in major and non-major astronomy courses

What techniques or teaching strategies did you notice in Jessica's Syllabi?

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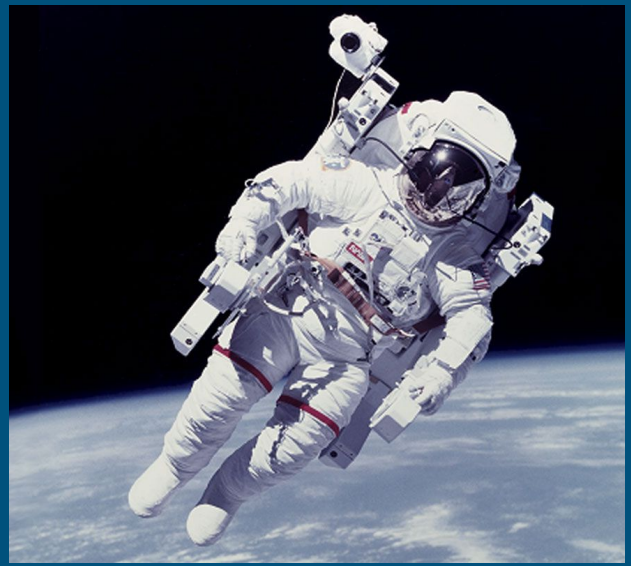
The Course: Astro 101

- 30 non-major students
- Designed to fulfill science credit
- Main course goal: *Students will develop a better understanding of how astronomy research is done and how scientific ideas are tested (while also practicing some math skills)*
- Challenges: wide range of student ability and motivation, coupled with a large range of topics to cover. No access to lab equipment as during Fall of 2020



Using data and incorporating choice

- Build multiple labs so students can choose labs that work for them
  - Had ~6 per unit, students needed to do ~4 to get full points (in labs)
- Added optional homework assignment where students participate in citizen science or explore how their own interests relate to astronomy
- Final poster project in which students were encouraged to choose a topic that excited them

The Course: Galactic Astronomy for majors

- 20 junior and senior astronomy major students
- All students have already taken some introductory physics and astronomy courses
- Many plan on pursuing a career in astronomy research
- Course goal: *Students will obtain a basic understanding of current research being done in extragalactic astronomy and what research tools are available to extragalactic astronomers.*

Programing! Programing! Programing!

- All astronomy research involves programming (as far as I know…)
- If we are preparing students to do research, they should have opportunities to engage in research-based activities
- Using Jupyter notebooks to build interactive (python) coding projects, students were able to learn some basic coding while also testing what we were discussing in class
    - Jupyter example: BPT diagrams

Lessons Learned

- Students enjoyed programming projects (multiple asked for more in course evals)
- Have back ups. Have back-ups to your back-ups. Code breaks.
  - If possible, practice on windows, macs, and linux machines before sending your students into the deep end
- When working in zoom breakout rooms, big questions with no right answers are great for getting discussions started
  - Ex: Which telescope in the decadal survey do you think should get funded? What type of weird galaxy would you want to research?

Discussion topics/suggestions

- What are some of the most essential skills in your field? How do students learn those skills?
- What potential hurdles might prevent adding real data to a course?
- What are some things you wished you learned in undergrad/before working in your field? Where do those skills fit in our curriculum?