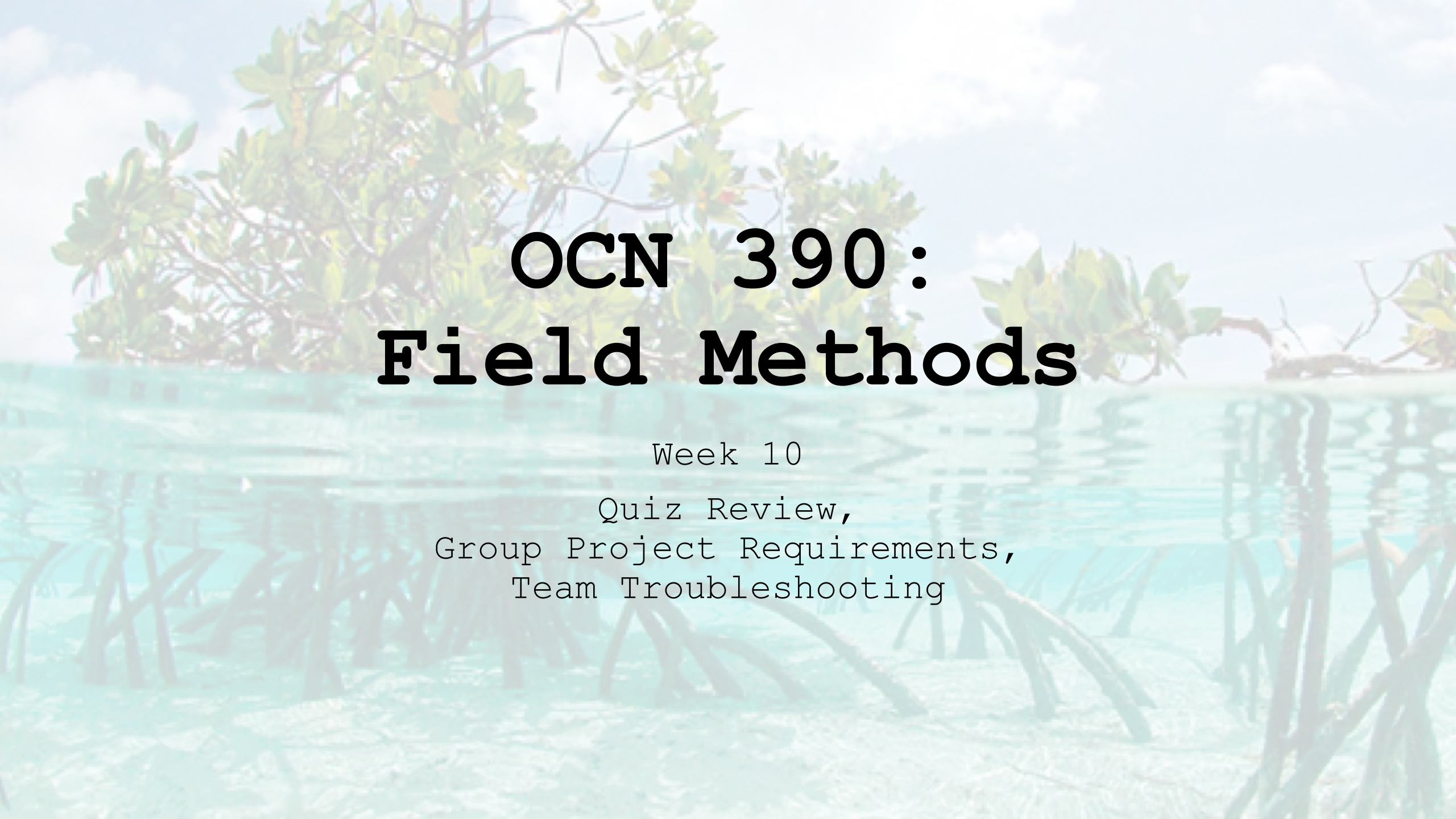


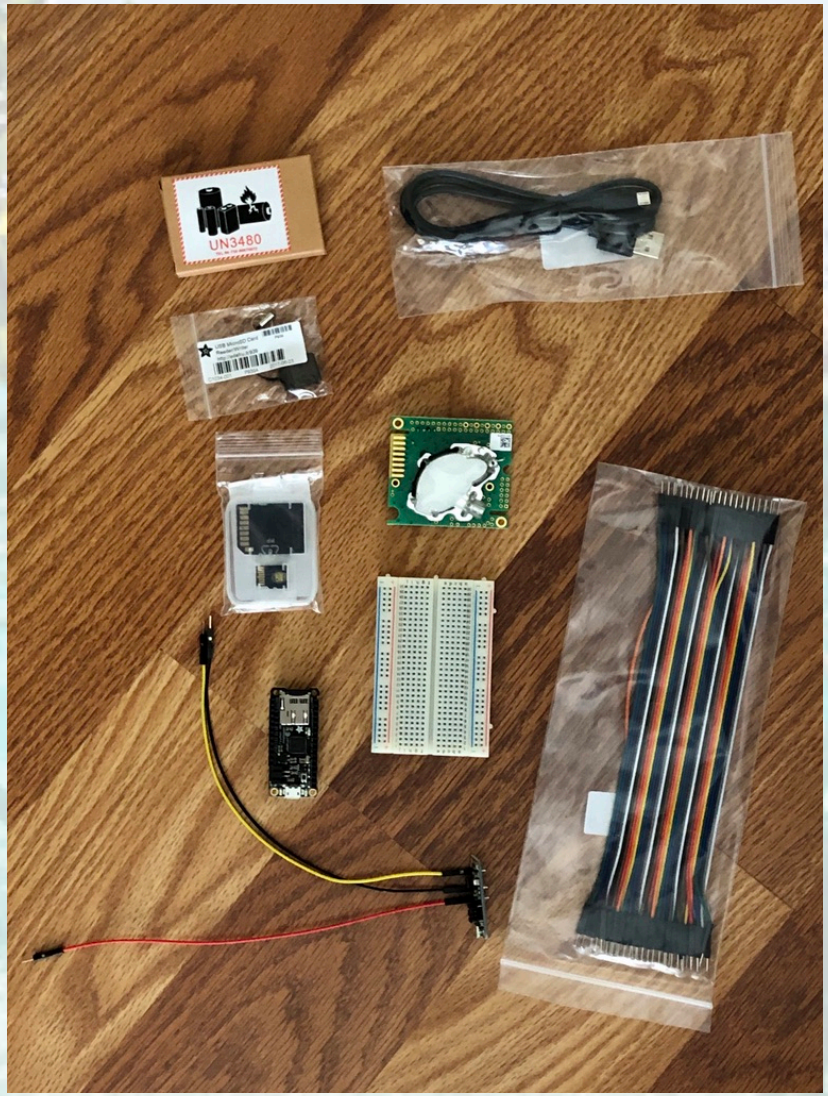
OCN 390: Field Methods

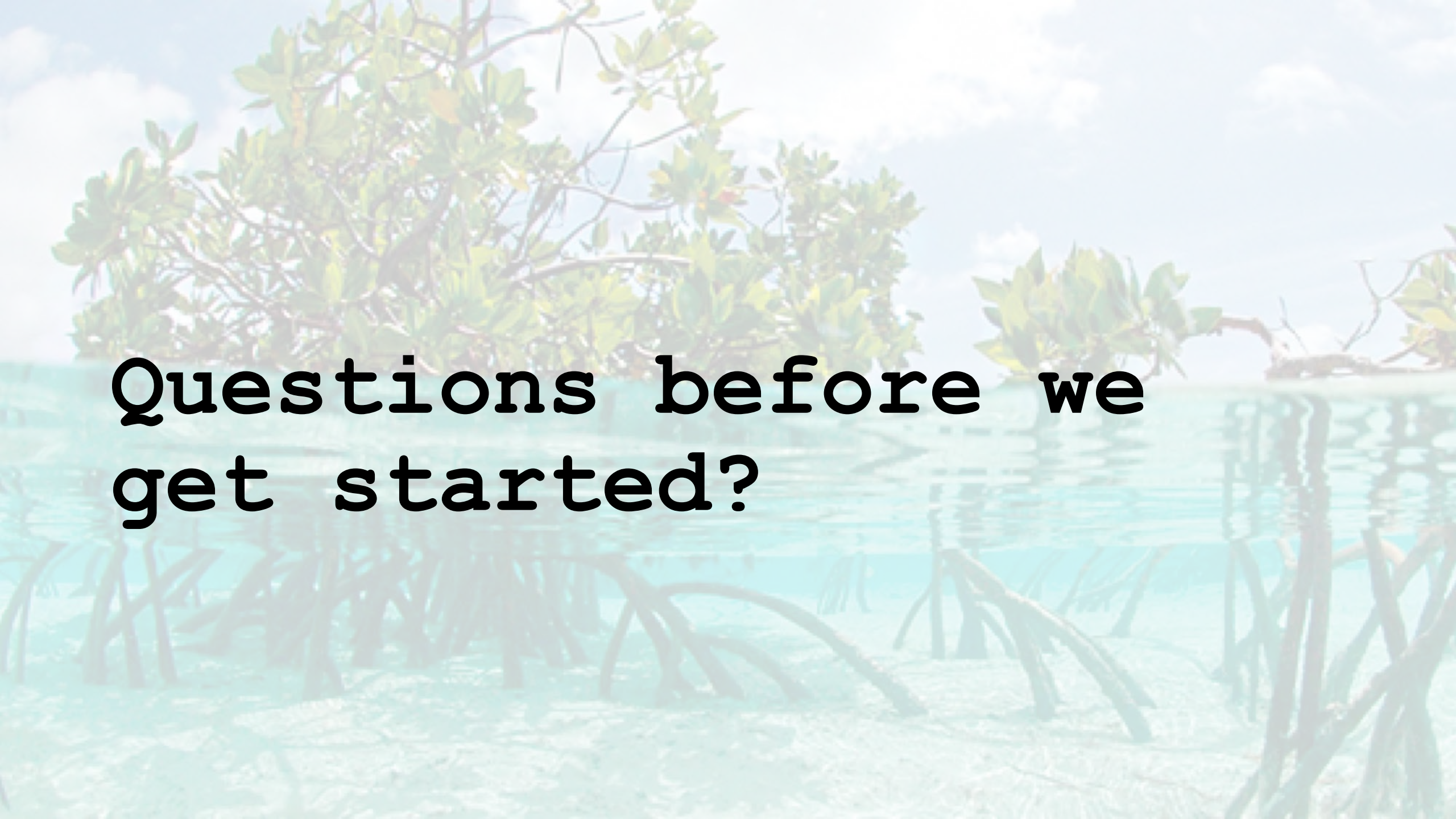
Week 10

Quiz Review,
Group Project Requirements,
Team Troubleshooting

Announcements

- Please take advantage of reaching out to me and Jack as early in the week as possible so that we can offer guidance!
- Rotate who is the keeper of the components
- Rotate who submits the group assignment
- CC your teammates on emails to me!




Questions before we get started?

Quiz Review

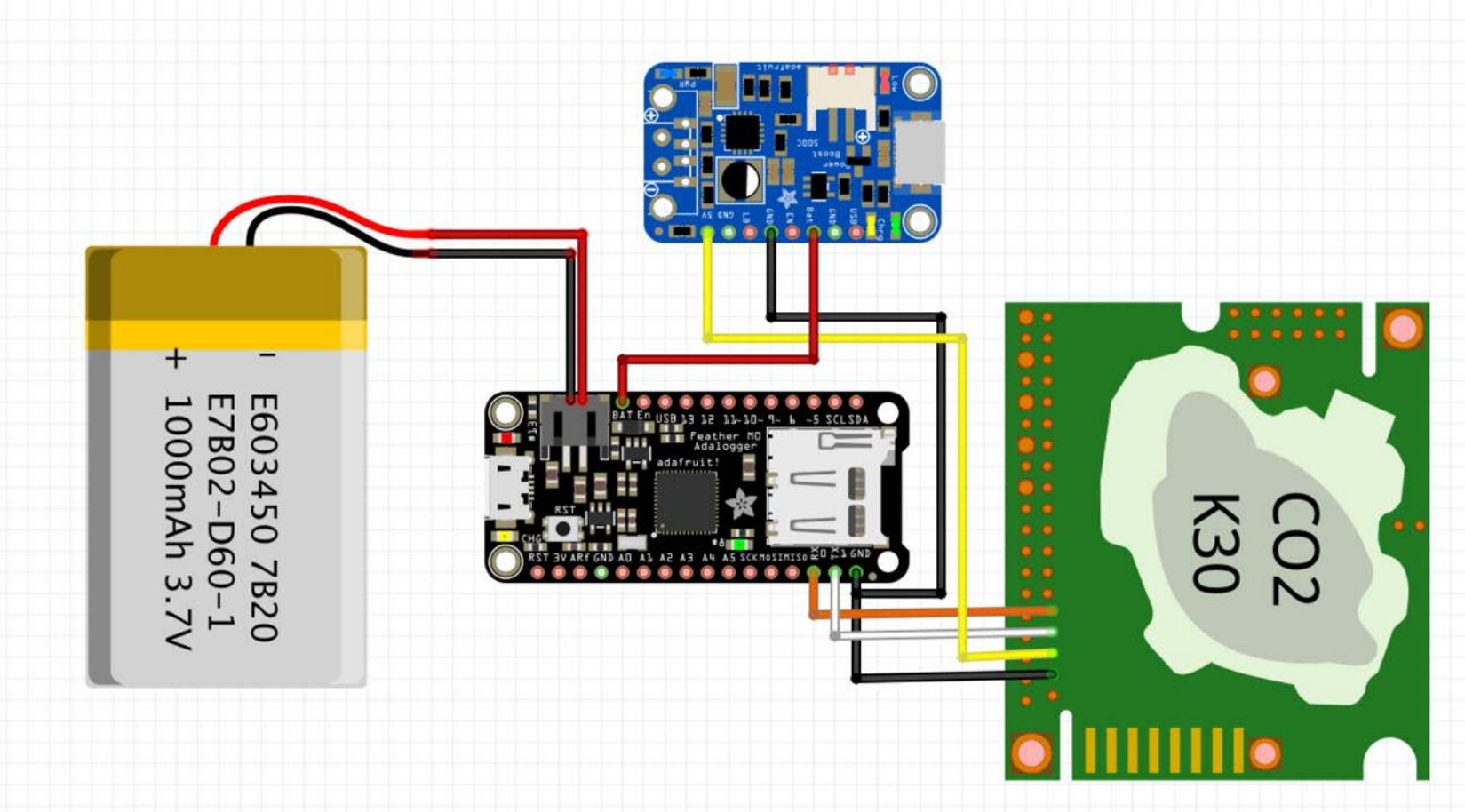
Quiz

(Write your name on top of page/send me email of photo in < 10 mins)

1. **BLOCK DIAGRAM**
   Draw a block diagram containing the **four physical components** other than the breadboard and indicating **all connections** necessary for stable functioning of the device.
   Draw each part as a **labeled rectangle** and **label all connections clearly**, differentiating voltage levels as needed on power lines.
   Ensure that any crossing wires carefully show whether they are connected or not using previously discussed notation.
   Note: Only one rectangle should be used for the Adalogger/microcontroller combination; these do not count as two of the four, just one component.

2. **FIRMWARE**
   Assuming you have the CO2 concentration stored in a variable named "CO2" and that at the time of code execution, CO2 = 702, write the lines of Arduino code required to print to your serial monitor the following:
   The current CO2 concentration is 702

Sensor Assembly Review



Quiz

(Write your name on top of page/send me email of photo in < 10 mins)

1. **BLOCK DIAGRAM**

   Draw a block diagram containing the **four physical components** (other than the breadboard) and indicating **all connections** necessary for stable functioning of the device.

   Draw each part as a **labeled rectangle** and **label all connections clearly**, differentiating voltage levels as needed on power lines.

   Ensure that any crossing wires carefully show whether they are connected or not using previously discussed notation.

   Note: Only one rectangle should be used for the Adalogger/microcontroller combination; these do not count as two of the four, just one component.

2. **FIRMWARE**

   Assuming you have the CO2 concentration stored in a variable named "CO2" and that at the time of code execution, CO2 = 702, write the lines of Arduino code required to print to your serial monitor the following:

   The current CO2 concentration is 702

k-30_read-and-save.ino

```
47  void loop() {
48    Serial.print("Co2 ppm = ");
49
50    // Poll sensor: UART K-30 comms
51    sendRequest(readCO2);
52    unsigned long valCO2 = getValue(response);
53    Serial.print(valCO2);
54    Serial.print(", seconds elapsed = ");
55    Serial.println(millis()/1000);
```

Grading

- 5 points:
  - for showing Rx on the K-30 to Tx on the Arduino and vice versa
  - showing 5 V and GND to the K-30 (5 V from PowerBoost; GND from PowerBoost or Arduino)
  - showing battery connection to the Arduino
  - showing battery voltage (BATT or 3.7 V is fine) and GND to the PowerBoost from Arduino
  - in question 2, the correct answer is
    Serial.print("The current CO2 concentration is ");
    Serial.println(CO2);
    Will also accept
    print("The current CO2 concentration is ", CO2);
    and don't worry about whether or not there is a semicolon
- - 1 point for not showing Rx/Tx lines from Arduino <—> K-30 (-0.5 only if it shows Rx/Tx but Rx is connected to Rx and Tx to Tx)
- - 1 point for not showing 5 V and GND lines from PowerBoost <—> K-30 (GND could come from Arduino)
- - 1 point for not showing one of the three main parts (Arduino, K-30, PowerBoost)
- - 1 point for not showing a second of three main parts
- - 1 point for not having correct print statements

Rest of this semester

- Any homework assignments you haven't submitted by **Friday, Mar. 26, @ 11:59 pm**
- Story Maps (team assignment; **deadline Monday, Apr. 12, 12:00 pm**). Send to me if you want feedback by Monday, Apr. 5, 12:00 pm.
- Draft report (individual assignment; **deadline Apr. 19, 12:00 pm**)
- Final report (individual assignment; **deadline Apr. 30, 11:59 pm**—no exceptions)
- Remaining classes to be used for additional topics in data analysis and scientific communication
- ~~Possible~~ re-quiz to correct mistakes from prior quiz

Class Grading

- Participation/Field Journal: 25%
- Assignments: 25%
- Story Map: 25%
- Final Report: 25% (including 5% points for draft; 20% for final)

Story Map Requirements

- You must tell a cohesive story touching on all of these topics, with several sentences for each (not necessarily in this order):
  - What was the motivation for your study?
  - What were your methods and procedures?
  - What did you learn? Results? Provide both quantitative results and also how they fit into the context of your study.
  - What challenges did you face? How will you make improvements prior to final report? How would you recommend that others overcome those in future semesters? What other data will you collect? What other analysis/analyses will you perform?
  - Conclusion: tie it all together.
- You must include ≥ 3 hyperlinked citations of peer-reviewed research described in context. Other hyperlinked references to papers, websites as needed.
- You must use ≥ 3 original images and/or videos of field site, sensor, field journal, etc. Include images from web (with citation) if they add to story.
- Image or written out version of your field checklist
- Preliminary data, nicely visualized **(at least 1 interactive map with your data and 1 time-series plot with your data)**. Interactive map should be made like last week's homework and embedded in Story Map. Time-series can be either an image of an Excel graph, python graph, or interactive graph.
- Additional paragraph sent via Canvas (not in Story Map) describing your contributions to all aspects of the team project to date.

Grading

- Your grade will reflect completion of the prior details as well as how impressed I am with your ability to collect, analyze, and visualize data using the techniques we've discussed, and your ability to carefully describe the field study (motivation, methods, results, challenges, and conclusions)
- Majority of grade comes from content but style, grammar, and spelling also matter.
- Your data collection requirements are very minor so your Story Maps must be great!

Citations in context

- Refer to your notes from Peter Fritzler's lecture on accessing peer-reviewed literature using Web of Science

Coastal salt marshes are hotspots for carbon storage because they are suboxic to anoxic, which decreases the rate of heterotrophic decomposition of soil organic carbon (SOC). In wet sediments, limited oxygen supply drives anaerobic metabolism by soil microbes, which lowers CO_2 emissions compared to upland terrestrial environments where aerobic metabolism dominates (Greenwood, 1961; Raich & Schlesinger, 1992). Moreover, sulfate-reducing bacteria compete with methanogens for substrate during acetoclastic and hydrogenotrophic methanogenesis, thereby lowering CH_4 production via this pathway (Tobias & Neubauer, 2009). That said, recent work suggests that in sulfate-rich marsh sediments, methanogenesis may proceed via methylotrophic methanogenesis where sulfate-reducing bacteria do not compete for substrate and this can result in high concentrations of gaseous CH_4 at depth (Seyfferth et al., 2020). The slow rate of carbon oxidation in marsh sediments results in large accumulations of SOC within these ecosystems (Chmura et al., 2003). However, there is a delicate balance between anaerobic and aerobic conditions in these tidal systems due to the tidal ebb and flood, which lowers the water table elevation and increases the redox potential of the sediments near tidal channels (Baumann et al., 2015; Seyfferth et al., 2020). These dynamic conditions could promote emissions of CO_2 and CH_4 from the land surface and water-to-atmosphere via changes in oxygen concentrations and redox oscillations (Moseman-Valtierra, 2012). Therefore, understanding the patterns and drivers of salt marsh greenhouse gas (GHG; i.e., CO_2 and CH_4) efflux is important to understand how SOC in salt marshes will respond to weather variability and global environmental change.

Citations in context (cont'd)

- Citations can be used for:
  - Introduction: setting up the motivation for your study, where it fits into the body of work already completed

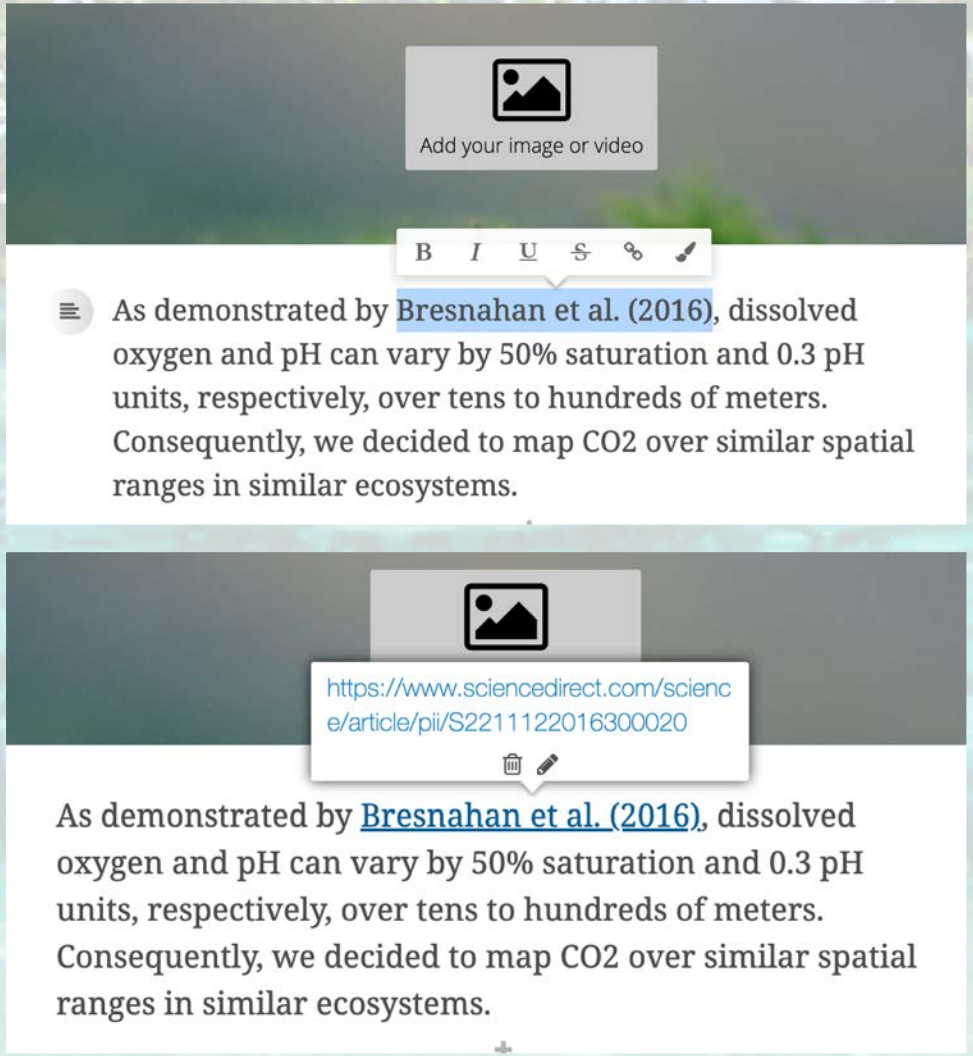
Citations in context (cont'd)

- Citations can be used for:
  - Introduction: setting up the motivation for your study, where it fits into the body of work already completed
  - Methods: describing how the experts have already attempted to execute such studies and perhaps differentiating your work from theirs or illustrating how you replicated it in pursuit of the answer to a different question

Citations in context (cont'd)

- Citations can be used for:
  - Introduction: setting up the motivation for your study, where it fits into the body of work already completed
  - Methods: describing how the experts have already attempted to execute such studies and perhaps differentiating your work from theirs or illustrating how you replicated it in pursuit of the answer to a different question
  - Discussion: describing how your results fit into the context of previous work. Did you repeat or alter a method and learn something new?

Citations are to be hyperlinked



Citations: good vs. bad

- Not necessarily the case that everything you find on Google (Scholar) is legit peer-reviewed science
- Use Web of Science/Web of Knowledge to ensure properly vetted sources
- I am not asking you to spend 20 hours working on library research but it is critical that you know how to access and cite peer reviewed lit, so search on Web of Knowledge, skim papers to see what they were studying, how they did it, and what they learned, and cite if appropriate.
- Not every single paper you come across will be relevant which is why it is critical that you write your citations in context.
- I will click on links when grading to see if paper is relevant. If I cannot determine how you picked paper or it’s not actually peer-reviewed, it won’t get credit.

Example of insufficient results section

- Just a bunch of numbers or graphs
- Sentences/phrases like “it was higher over here (at this time) than over there (at that time)” without putting it into context and suggesting why
- Using “raw” numbers when comparing; use (at least) simple statistical approaches like averages and standard deviations: see Excel demo

You will present to class on Apr. 12

- From where you are sitting, I will scroll and your team can divide up or ask one person to describe to the class what we are seeing. Aim for 5-10 minutes. Do not read exactly off of screen but tell the story of your Story Map

The goal: tell a story about why you decided to conduct a particular study, how you did it, and what you learned, including quantitative results, interpretations, and challenges faced

- You must tell a cohesive story touching on all of these topics, with several sentences for each (not necessarily in this order):
  - What was the motivation for your study?
  - What were your methods and procedures?
  - What did you learn? Results? Provide both quantitative results and also how they fit into the context of your study.
  - What challenges did you face? How will you make improvements prior to final report? How would you recommend that others overcome those in future semesters? What other data will you collect? What other analysis/analyses will you perform?
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