My approach

• Critical thinking is an important skill for many jobs after college

• Curiosity is a natural trait in all people
  • On average, 2 year olds ask 200 questions a day
  • For some, curiosity gets lost along the way

• Problem solving is a great way to practice critical thinking
My approach

• Research is a combination of curiosity and problem solving

• I attempt to engage students’ curiosity and problem solving skills through research
  • In class
  • Out of class
  • Beyond class
Examples – in class

Biology 103 and 104 for non-majors

- All labs inquiry based & students develop research questions, hypotheses, predictions, and graph predicted results
- Then the experiments begin
Examples – in class

BIO 472 Lecture - Benefits of Migration

The North Atlantic Right Whale Major Habitat Areas

- Canadian Conservation Areas
- United States Critical Habitat Areas
- Primary right whale sighting locations
- Occasional right whale sighting locations

Map showing migration routes and major habitat areas along the coast.
Alternative hypotheses of whale migration

- Calves can gain weight more quickly in warmer waters b/c invest less energy to keep warm
- Calves are less likely to be attacked by predators, especially killer whales

Examples – in class
Alternative hypotheses of whale migration

• Calves can gain weight more quickly in warmer waters b/c invest less energy to keep warm

• Calves are less likely to be attacked by predators, especially killer whales

How would you test these hypotheses, given the difficulties of directly measuring whale metabolism and observing killer whale attacks on whales in the wild?
Examples – in class

BIO 472 Lecture – Written Assignment

Research Proposal

• Use primary literature to pose and defend an original research question in animal behavior

• Develop a research proposal with methods to study the research question and justification for the study
Examples – in class
Biology 473 Bioacoustics and Animal Communication Lab
BIO 473 Bioacoustics and Communication Labs

As part of the designation of a Research and Scholarship course, Students as Scholars [oscar.gmu.edu](https://oscar.gmu.edu), students engage in scholarly inquiry:

- Research project for 5 weeks of labs
- Read primary literature
- Observe animal behavior and developing hypotheses to explain the behavior
- Collect and analyze data to support the hypotheses
- Present and defend their results to peers and instructors
Examples – out of class

- OSCAR URSP projects
  - 10 students over 3 years
  - Students bring the research questions
  - Variety of topics from influence of finances in endangered species conservation to differences in swimming distances of male and female polar bears

- Internships and Independent Study
  - 11 students over 3 years
Examples – beyond class

- Off campus opportunities
  - Use relationships with local NGOs and government agencies to offer internships
    - Natureserve in Ballston
    - American Bird Conservancy in The Plains
    - Manassas National Historic Battlefield in Manassas
    - Smithsonian Migratory Bird Center in DC
Summary

- Research strengthens critical thinking and ability to apply information to new situations
- Opens new career interests
- Employment opportunities
- Internal curiosity about world
- For me, strengthens my own research skills because to teach it I have to truly know it