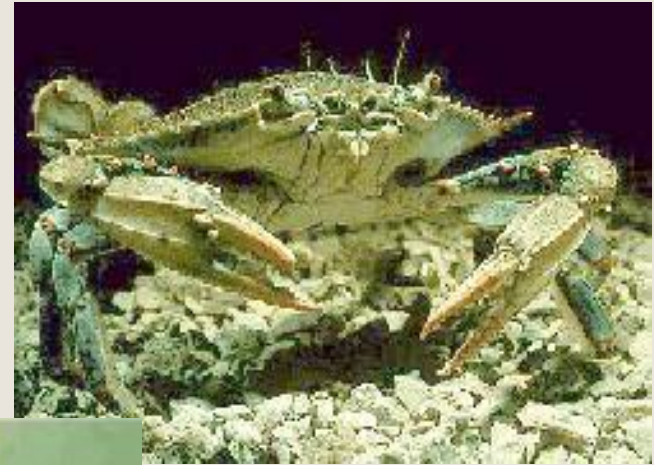


# Development of the Biology Capstone Experience



# Biology Department

- Largest major on campus
- Graduate 130-150 students a year
- 16 faculty members with active research program that offer undergraduate students research opportunities.
- Teach a large number of major and non-major experiences.
- Very diverse student body
- Departmental Honors Program
- 5<sup>TH</sup> Year Biology Master's Degree program
- 5<sup>th</sup> year program in Computational Biology (with Computer Information Sciences)

# Biology Undergraduate Program

- ***General Biology*** - is the most common major within the Department of Biology) and is perfect for students in the pre-health professions fields.
- ***Biology with a concentration in Molecular Biology*** - great for students considering Masters, PhD, or MD/PhD research programs.
- ***Biology with a concentration in Marine Sciences*** - students complete most of the General Biology requirements and study at Dauphin Island for two summers.
- ***Biology with a concentration in Environmental Sciences*** - great for students who want to work with environmental issues.
- ***Individually Designed Major*** - this option allows students to develop their own major of interest with approval from the Dean of the School of Natural Sciences and Mathematics...some of our students have created majors in Reproductive Biology and Women's Health as well as Biopsychology.

# Creating and Designing a Capstone Experience:

1. Determine the specific broad learning objectives for the academic program;
2. Determine the kind of student work that should be expected during the capstone experience (the content and performance standards);
3. Design the capstone experience to enable students to produce that work;
4. Inform students in the syllabus or related handouts how the objectives of the experience are designed to reflect a culmination of their abilities, knowledge, and/or values.
5. Determine how and when the faculty will assess the work that students produce;
6. Provide information in department assessment plans and other documents to be reviewed by various constituents regarding how the experience relates to the standards for the program and how they are evaluated.

# Student Outcomes in Biology Degree

- The bachelor of science degree is designed to help the students:
  - Obtain a firm foundation and advanced study in all important sub-fields of biology.
  - To master scientific concepts
  - Critically evaluate new scientific results and incorporate key findings into their base of knowledge.
  - Conceive and perform biological experiments that include data collection, data analysis and interpretation, and synthesis of findings.
  - develop critical thinking and problem-solving skills applicable to scientific and public issues.
  - Learn effective oral and written scientific communication skills.

**It is the first professional degree in the discipline and prepares students for careers in biological sciences and/or further training, including master of science and doctoral programs, as well as professional schools.**

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# Capstone Experience

A **capstone experience** is a experience designed to be offered in the final year of a student's major, a experience that ties together the key learning objectives that faculty expect the student to have learned during the major, interdisciplinary program, or interdepartmental major.

## Writing

- Develop ideas
- Organize
- Support evidence
- Style
- Mechanics
- Cite literature

## Ethics and Civic Responsibility

- Examine/identify ethical Dilemma
- Problem solving /critical thinking
- Investigate. Compare and evaluate arguments
- - Comprehend possible alternatives

## Quantitative literacy

- Data analysis
- Read and interpret graphs
- Understand logical arguments
- Data representation

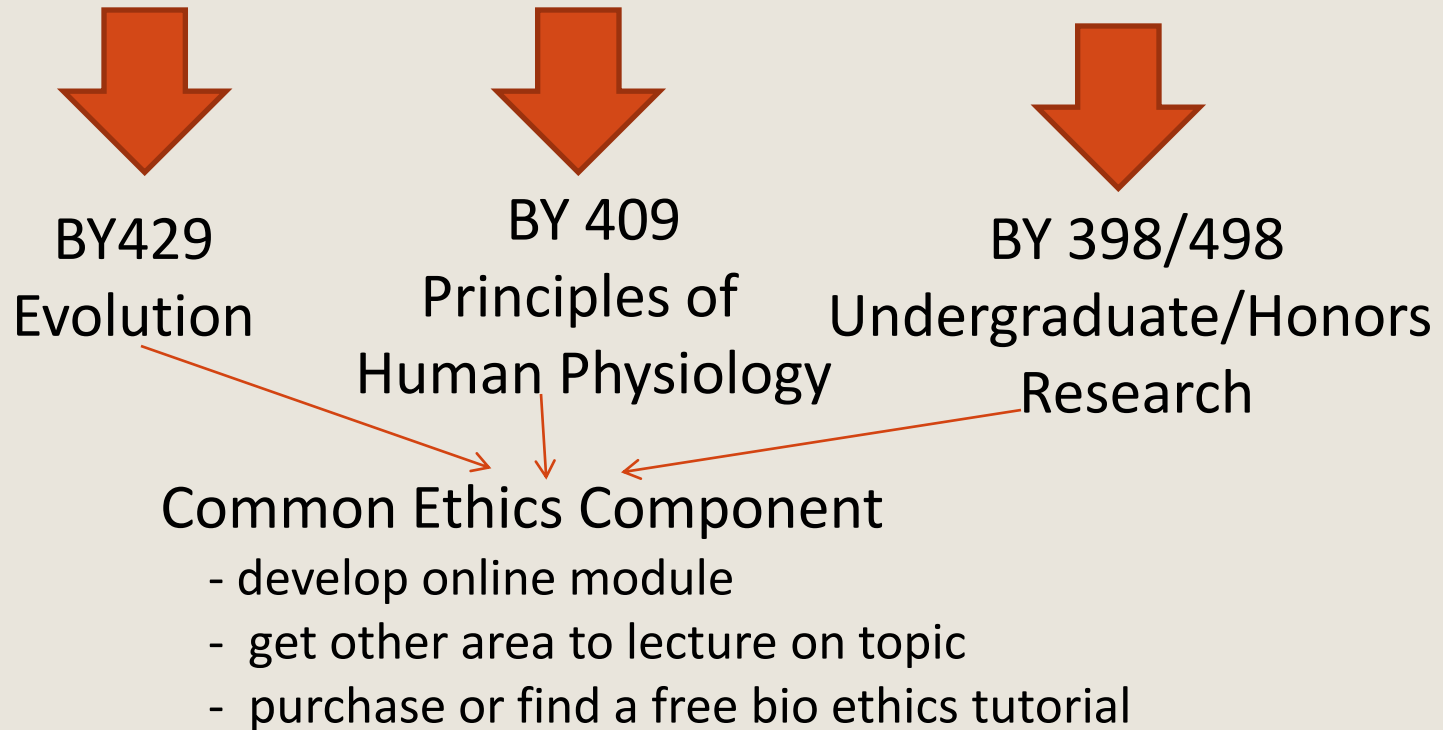
# Student Work

- **Writing** - honors thesis, research paper, laboratory report, research proposals, scientific review, case study response, poster presentation, reflective essays.
- **Quantitative Literacy** – research experiences (all components), problem sets, critical analysis papers, exams, statistical analysis.
- **Ethics and Civil Responsibility** – case students, position papers, essays, oral presentations, letters to groups.

# Problems

- Facilitating the number of classes needed to have a student teacher ratio of 30:1 (940 majors/16 Faculty)
- Increase in number of capstone classes offered;
  - Reduce the diversity of classes the department can offer
  - Reduce time for mentorship opportunities
  - Reduce research productivity
- What do we do with students who take a capstone experience prior to their last 30 hours of class work.
- Can experiences only be handled by faculty in the Biology Department

# CAPSTONE EXPERIENCE OPTIONS FOR STUDENTS



## **Common Option Outcomes:**

- 1) All culminating learning experience
- 2) All based on and reflect the specific approaches, methods and practices in the discipline
- 3) All choices have well defined learning outcomes and assessments
- 4) All reinforce and asses student competencies in writing, quantitative literacy and ethics

# Creating and Designing a Capstone experience:

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# Capstone Assessment Methods



- Try to use direct methods of assessment as opposed to indirect assessment.
- Direct assessments can be more easily facilitated in capstone experiences because they can be implemented in a specific forum with specific students—the capstone experiences.
- Here are some examples...

# Evaluation

## *Experience – Specific Rubrics:*

Student \_\_\_\_\_ Experience \_\_\_\_\_ Date \_\_\_\_\_

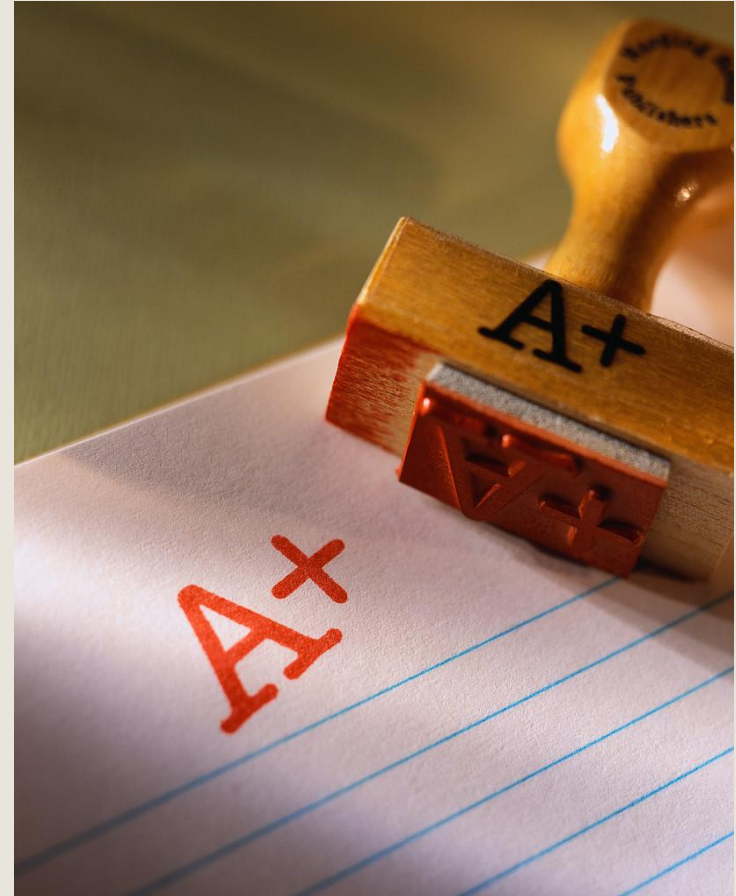
**Intended Outcome: the student will use clear and concise communication in the written form.**

Performance Area	Rating = 4	Rating = 3	Rating = 2	Rating = 1	Score
Structure	Written work has clear and appropriate beginning, development and conclusion. Paragraphing and transitions are also clear and appropriate.	Written work has adequate beginning, development and conclusion. Paragraphing and transitions are also adequate.	Written work has weak beginning, development and conclusion. Paragraphing and transitions are also deficient.	Organizational structure and paragraphing have serious and persistent errors.	
Content	The length of the written work provides in-depth coverage of the topic, and assertions are clearly supported by evidence.	The length of the written work is sufficient to cover the topic, and assertions are supported by evidence.	Written work does not do an adequate job of covering the assigned topic, and assertions are weakly supported by evidence.	Written work does not cover the assigned topic, and assertions are not supported by evidence.	
Mechanics	Written work has no major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.	Written work is relatively free of errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.	Written work has several major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.	Written work has serious and persistent errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.	
Total					
Overall Score = Total/3					

# Standardized Examinations

## Major Fields Test

- **Nationally-normed.** Percentiles can be used to compare with students outside a department or university.
- **Informative.** Sub-scores (if available) can be used to assess different skills or content areas in the curriculum
- **Adaptable.** Some test products (i.e., ETS subject tests) allow departments to submit their own questions.



# Using Capstone Assessment Results

- Summary measures should be “elegant”—they should be easily organized, easily described, and should be informative
- Should lead to discussion of the program, not the value of the capstone experience only
- Good idea: If it is possible to use the same assessment for students entering a program (such as freshmen), then the value added by the program might be demonstrated
- It is important to implement capstone assessment annually (or at least on a regular schedule) so capstone assessment results can be compared by faculty over the years.