# STEAM

## Science, Technology, Engineering, Art, Math

Dani Herro, Assistant Professor Digital Media and Learning
Cassie Quigley, Assistant Professor Science Education

CLEMSON UNIVERSITY

# Why STEAM now?

- 
- AM means (definition)
- Current efforts
- Examples of STEAM in classrooms
- Future preparation - cradle to career

# Statistics and Trends

- 
- 

  and increasing STEM graduates.
- Where are the STEM graduates? Entering fields that encourage diverse ways of thinking and thought— including interdisciplinary fields that incorporate the arts.
- Women fill close to half of all jobs in the U.S., yet hold less than 25% of STEM-related jobs.
- 43% of U.S. school-age children today are of African American, Latino, or Native American descent. Less than 15% hold an engineering bachelor's degrees
- We need to improve the composition of the STEM education pipeline to include more women and underrepresented minorities to reflect America's shifting demographics.

The goal of initiatives instilling STEM in classrooms is not to create more scientists, engineers, or mathematicians but instead to develop capable students who can function in a highly technological world that draws upon multiple knowledge types (Vasquez, Sneider & Comer, 2013).

# What is STEAM?

- STEAM educational practices draw on each of the disciplines, while appealing to a broader base of students who explore and make connections between art, music, mathematics, science, and engineering and technology.
- Adding the “A” means.....

STEAM teaching extends beyond aesthetics and includes the liberal arts.

STEAM teaching increases motivation, engagement, and effective disciplinary learning in STEM areas.

Studies of STEAM-based curricula demonstrate a higher percentage of students interested in pursuing careers supporting the fields of math and science.

# Example STEAM Unit

**Scenario:**
numbers that are surprising the wildlife officials.  In addition, the number of live births of sea turtles is declining at an alarming rate.  Obstacles faced by young and adult sea turtles are staggering, but it is the increasing threats that are causing them to be very close to extinction

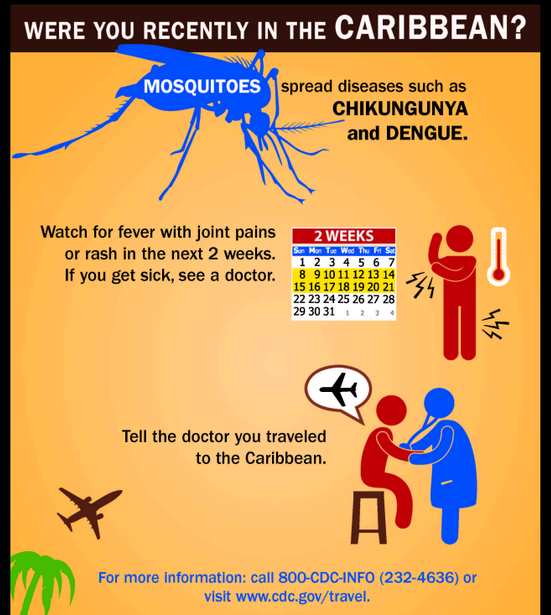
**Problem:** Investigate the causes of the deaths of the mature sea turtles and causes of the low birth rates.

**Goal:** Once the causes are determined, groups will create a variety of ways to disseminate this information to increase the public's awareness and understanding about sea turtles. This information will be displayed at the Greenville Zoo and revealed on June 6, 2015- National Oceans Day.




# Another Scenario

In May 2015, 15-yr-old "Trevor" was taken to the emergency room at Mary Black Hospital after being unable to get out bed and complaining of headache and severe muscle aches. Trevor arrived with a high fever (101°F) and his parents noted small red bumps had appeared all over his body the day before. Doctors noted he had returned from a family vacation in Jamaica three days prior, where he played sand volleyball every afternoon, often getting numerous mosquito bites. After running some blood tests to confirm their suspicions, Trevor was diagnosed with a mosquito-borne infection.

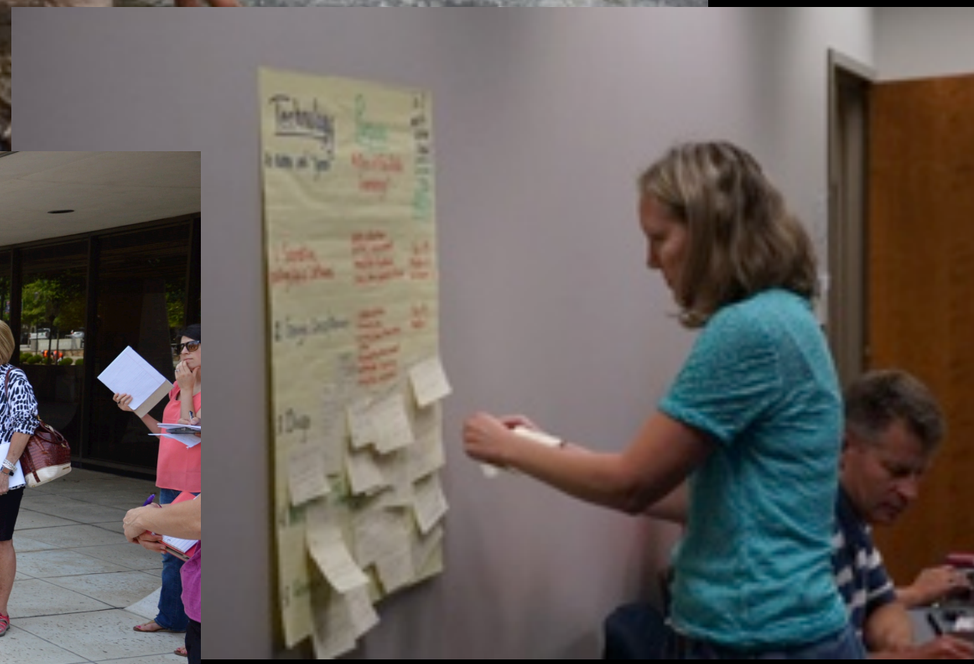


# Synergy – Current Efforts

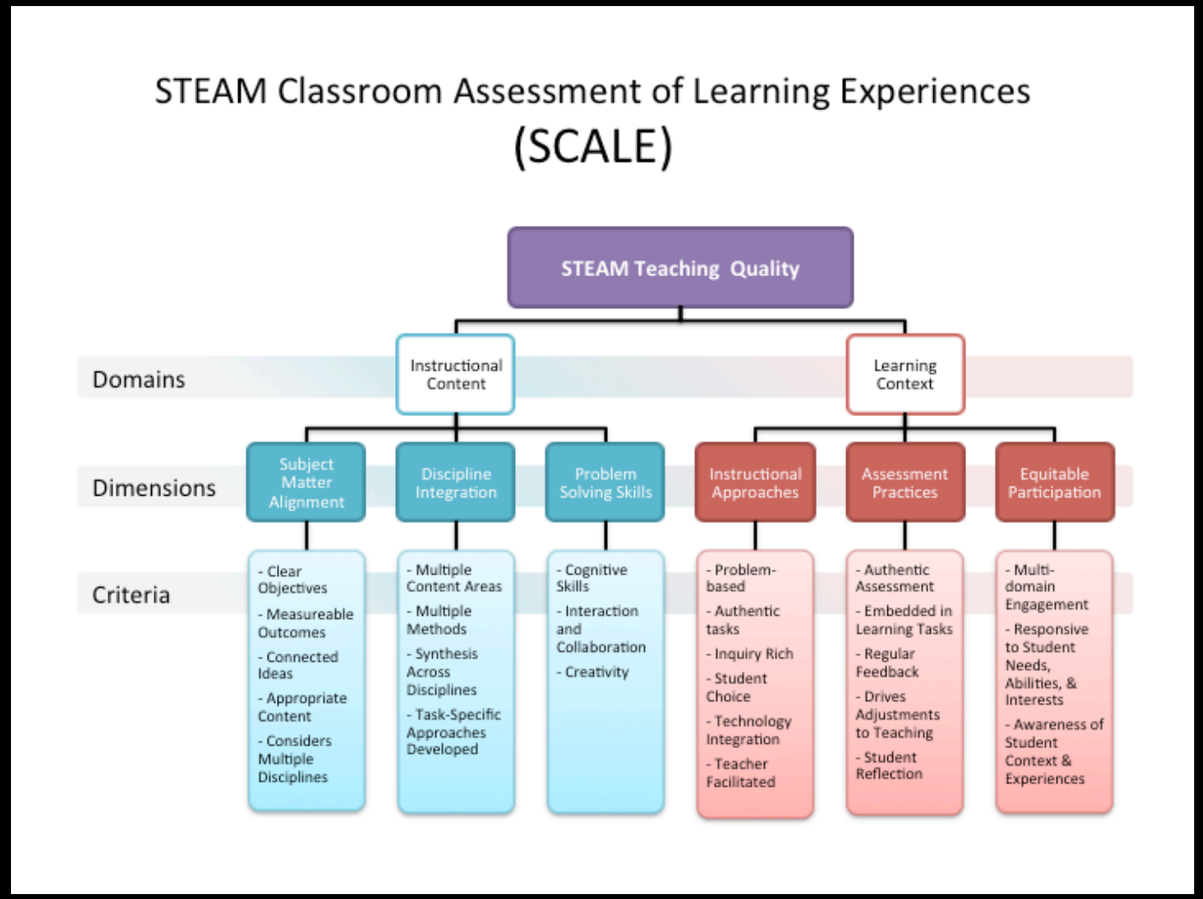
- 
- 
- 
- 
-

# Faculty in Residence

# Educating Teachers



# SCALE and CoMeasure




**CoMeasure: A Rubric to Assess Student Collaboration in STEAM Units**

**Sample STEAM Scenario:** Each year thousands of hatchling turtles emerge from their nests along the southeast U.S. coast and enter the Atlantic Ocean. Sadly, only an estimated one in 1,000 to 10,000 will survive to adulthood. The natural obstacles faced by young and adult sea turtles are staggering, but it is the increasing human threats that are causing them to be very close to extinction. Today, all sea turtles found in U.S. waters are federally listed as endangered, except for the loggerhead, which is listed as threatened. Many people think the issue is overblown or not really worth spending time and money to protect the turtles. Your task is to research the risks for sea turtles, calculate the changes in population rates including the live births and numbers of deaths each year, research the historical significance of sea turtles for South Carolina, and finally create a presentation providing visitors with relevant information about how to help prevent this turtle from going extinct. This information will be displayed at the Greenville Zoo next to giant sea turtle sculpture made out of recycled materials on World Oceans Day, which you will also create with your team. (*Portions of this scenario courtesy of Sea Turtle Conservancy*)

| **Inquiry Rich / Multiple Paths** | | **Description**: One of the hallmarks of STEAM teaching and learning is that students are given a scenario that has a variety of solutions requiring them to consider various lines of inquiry (or questions) that might arise in exploring or solving the problem. In STEAM collaboration, we would expect students to work with group members to explore and refine the questions, negotiate with group members to choose appropriate materials and methods (e.g. looking at sea turtle birth and death rates on local conservation websites), ask their peers about the relevancy, accuracy or utility of what they find, and with their group raise new questions (e.g. Does the rise of sea levels contribute to this problem? Outside of scientists, how seriously do citizens consider this problem and take action?) | |
|---|---|---|---|
| **Attribute** | **Needs Work** | **Acceptable** | **Proficient** |
| Develops unique questions towards solving the problem | Student begins inquiry process without group discussion | Student suggests questions to support inquiry but does not refine questions as he/she begins problem solving | Student suggests and refines questions to support inquiry towards problem solving |
| Chooses method or materials appropriate to solving the problem posed | Student chooses methods or materials without negotiating with group members | Student sometimes negotiates methods or materials; they are not always appropriate to facilitate problem solving | Student negotiates methods and materials appropriate for inquiry to facilitate problem solving |
| Verifies knowledge and multiple sources to support inquiry | Student does not rely on peers for source or knowledge verification | Student checks in with peers to verify sources and knowledge or provide peer feedback to direct communication. Only one | Student checks in with peers to verify sources and knowledge aligned with inquiry, and provides peer feedback to direct |

Teacher Practices and Student Collaboration

# STEAM Certification

4 courses

Project-based Learning
Digital Media and Learning
Reflective Practice
Assessment

# Impact

- Transferable skills across disciplines
- Preparation for jobs in industries demanding STEAM and 21st century literacies
- Global reach and competitive workforce