Swimming into Science:

Sharks and Minnows Summer Camp

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The Foundation for The Gator Nation

Summer Camp Overview

- **Who?**

  Elementary-aged students

  (Grades 3-4)

- **Where?**

  Florida Museum of Natural History

- **How long?**

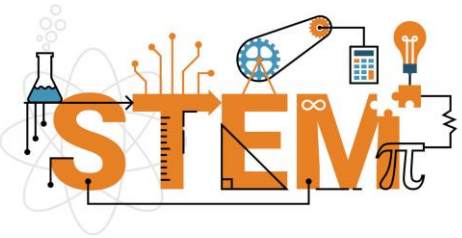
  Five half days (June 2018)

- **Theme?**

  STEM careers and Fish

Sharks and Minnows

Primary Goals



1. Increase interest and awareness of STEM careers

2. Identify and address misconceptions about STEM careers

3. Identify and address misconceptions about fish

REPORT TO THE PRESIDENT

ENGAGE TO EXCEL: PRODUCING ONE MILLION ADDITIONAL COLLEGE GRADUATES WITH DEGREES IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS

PCAST (2012)

Theoretical Framework

Dorsen's Factors	Brief Description	Intervention Actions
Career Awareness and Decision to pursue a STEM career	STEM careers cannot be pursued if students are not aware of them and how they are introduced to those careers will influence their decision to pursue those careers.	Participants were introduced to five STEM careers.
Academic Preparation and Achievement	Academic preparation should be augmented with informal extracurricular STEM experiences, which will in turn enhance interest and performance in formal classrooms.	Camp activities were aligned to Florida's K-12 teaching standards (NGSSS) to augment formal education.
Identification with STEM Careers	Students must envision themselves in STEM careers, which can be facilitated by role models and/or real-world experiences.	Participants experienced authentic STEM practice and met early career professionals (role models).
Self-efficacy	Students must feel confident in their ability to succeed in STEM careers.	Implemented a validated survey to measure attitudes towards STEM careers.
External Environmental Factors (Barriers and Supports)	Life experiences, both positive and negative, dictate a student's perception of STEM.	The summer camp is a STEM-related life experience.
Interest, Enjoyment, and Motivation	Positive childhood experiences have a strong impact on STEM career pathways.	Participants' responses indicate an overall positive experience.

Summary of the six factors that influence students' pursuit of STEM careers from Dorsen et al. (2006).

Evaluation Plan

Front-end (Needs Assessment)

- Prior to implementation
- Compromise between my interests and the museum's needs

Formative

- During implementation
- Students filled out scientific notebooks throughout the week (formative assessment tasks)

Summative

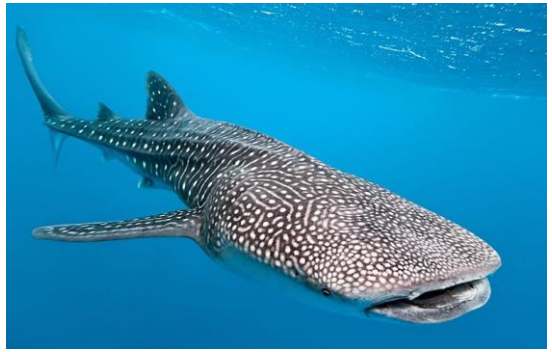
- After implementation
- Pre/Post validated survey on attitudes towards STEM careers

A Day in the Life of a Camper…

1. Introduce topic
2. Draw a Scientist Activity
3. Role Model Visit
4. Inquiry Activity 1
5. Museum excursion
6. Snack Break
7. Inquiry Activity 2
8. Inquiry Activity 3
9. Reflection

Day 1: Fish Anatomy and Classification

- **Driving Question:** What are fish skeletons made of?
- **Learning Objectives:** After day one, campers will be able to:
  - explain how living bony fish, sharks, and rays are classified.
  - relate body shape to locomotion.
  - understand the compositional differences between bone, cartilage, and teeth.
- ***Words to Know*:** Vertebrate, Chondrichthyes, Osteichthyes, Cartilage, Phosphate, Enamel, Dentine, Crown, Root
- ***Career Highlight*:** Biologist – someone that studies living organisms

Day 1: Fish Anatomy & Classification

Today we will:

- explain how living bony fish, sharks, and rays are classified.
- relate body shape to locomotion.
- understand the differences between bone, cartilage, and teeth.

What are fish skeletons made of?

Camp Progression and Scaffolding

Day 1	Day 2	Day 3	Day 4	Day 5
Topic: Fish Anatomy & Classification	**Topic:** Fossil Preservation	**Topic:** Stratigraphy	**Topic:** Ecology & Diet	**Topic:** Biomimicry
Career Highlight: Biologist	**Career Highlight:** Paleontologist	**Career Highlight:** Geologist	**Career Highlight:** Ecologist	**Career Highlight:** Engineer





Formative Assessment Task:
Draw-a-Scientist Test Checklist (DAST-C)

1. Lab Coat
2. Eyeglasses
3. Facial Hair
4. Symbols of Research
5. Symbols of Knowledge
6. Technology
7. Relevant Captions

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1. Male Gender
2. Caucasian
3. Indications of Danger
4. Presence of Light Bulbs
5. Mythic Stereotypes
6. Indications of Secrecy
7. Working Indoors
8. Middle Age or Elderly
9. Open Comments

Chambers (1983) & Finson et al. (1995)

Preliminary Results

- Participants: N=18
  - 9 Male, 9 Female
- # of Drawings: N=80
  - Biologist: n=15
  - Paleontologist: n=18
  - Geologist: n=15
  - Ecologist: n=16
  - Engineer: n=16

Stereotype	Frequency	Uncertain
Lab Coat	15%	5%
Eyeglasses	2.5%	0%
Facial Hair	3.75%	0%
Symbol of Research	63.75%	0%
Symbol of Knowledge	11.25%	0%
Technology	83.75%	0%
Relevant Caption (ex. “Eureka!”)	16.25%	0%
Male Gender	48.75%	13.75%
Caucasian	87.5%	10%
Indications of Danger	6.25%	0%
Presence of Light Bulbs	2.5%	0%
Mythic Stereotypes (ex. Mad Scientist)	22.5%	0%
Indications of Secrecy	0%	0%
Working Indoors	27.5%	3.75%
Middle aged or Elderly	2.5%	1.25%

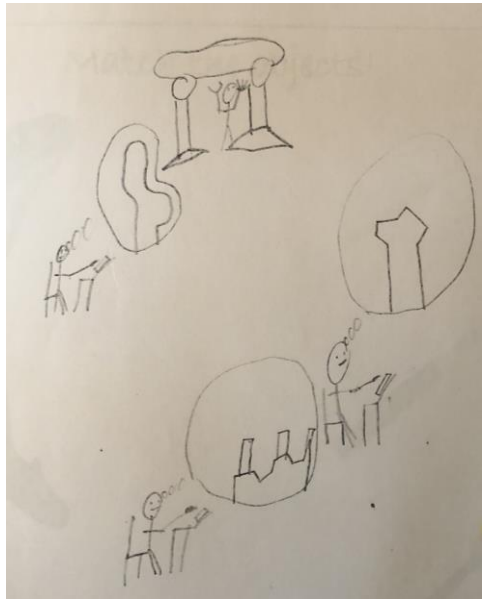
Biologist

Paleontologist

Geologist

Ecologist

Engineer

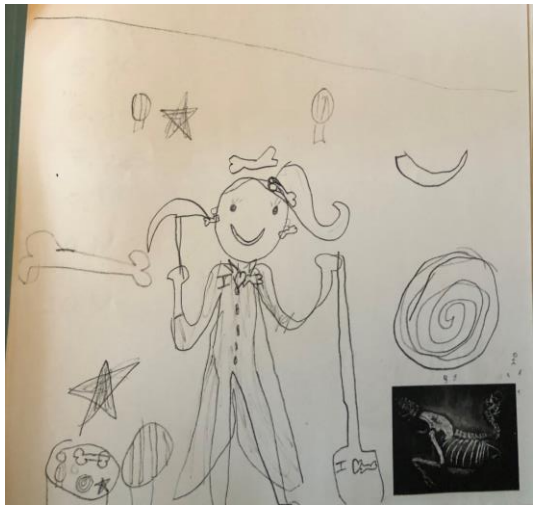


Observations

- Does not self-identify
- Non-descript appearance
- Loss of lab coat
- Location varies with profession
- Biologist = Chemist
- Geologist is sensationalized

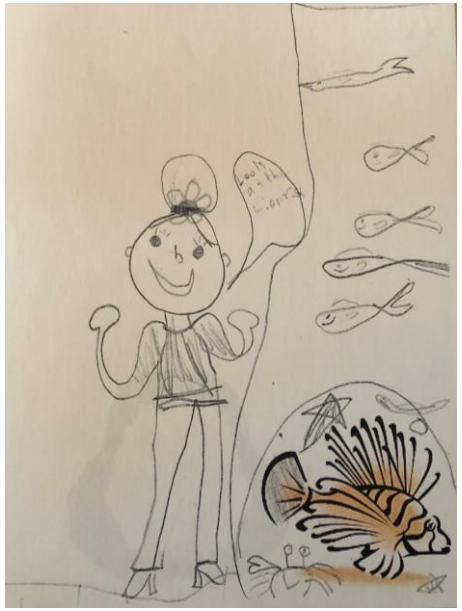
Biologist

Paleontologist



Geologist

Ecologist



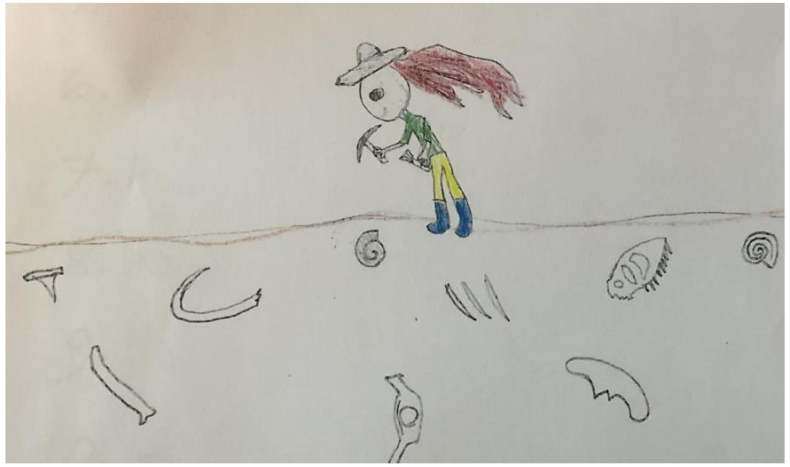
Engineer

Observations

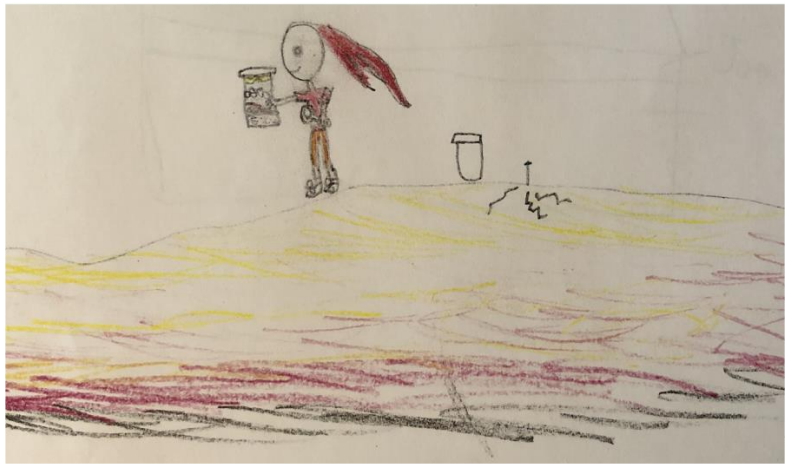
- Self-identifies with professions
- Depicts practice
- Change in appearance
- Location varies with profession
- Strong overlap between paleontologist and geologist

Biologist

Paleontologist

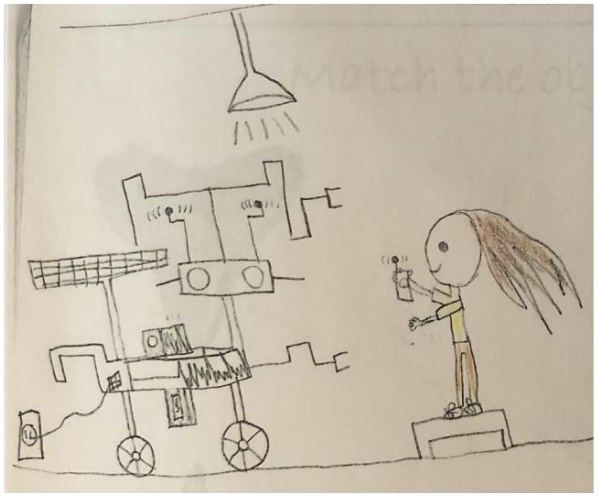


Geologist



Ecologist

Engineer



Observations

- Self-identifies with professions
- Depicts practice at high level
- Location varies with profession
- Strong differentiation between professions

Summary

DAST-C Results:

- Very few stereotypes about appearance, with the exception of ethnicity
  - Lab coat (15%), Eyeglasses (2.5%), Facial Hair (4%), Elderly (2.5%), Caucasian (87.5%)
- Many depictions of research and technology
- Gender largely reflected participant demographic
  - 49% male (n=39), 40% female (n=32)

Awareness of STEM careers:

- Biologist were often associated with chemistry and working indoors
- Ecology was often associated with animals and working outdoors
- Geology often sensationalized as rich, gem and mineral hunters
- Geology and paleontology were very similar and always depicted outdoors
- Engineers were typically associated with fixing/building

Next Steps

1. Validate DAST-C results with additional coders
2. Apply the Draw-an-Engineer Test (DAET)
3. Align observed trends in drawings to written responses in journals and results of validated survey
4. Analyze drawings of fish and written responses to identify misconceptions

Acknowledgements

Bruce MacFadden

Kent Crippen

FLMNH Education Staff

Junior Volunteers

NSF Grant No. DGE-1315138; DGE-1842473; DRL-1322725