

Modules Overview	
For grade level(s)	<i>Middle School (6th – 8th)</i>
Duration	MESA Period: 3 weeks of daily 50-60 minute sessions MESA Afterschool: 4 total sessions of 60-90 minutes each MESA Saturday: 2 Saturdays for total of 8 hours
Purpose	The GI Physiology module will introduce students to the field of biological science and its corresponding careers. The module will introduce students to the role of the human gastrointestinal tract; the location, functions, and appearance of its various structures; and associated disorders and diseases. At the end of the module students will be prepared to construct and label a model of the GI tract as well as answer questions prepared from information contained in the attached documents.
Objectives	Upon completion of this module, students will: <ul style="list-style-type: none"> • Be familiar with the MESA Day contest rules • Have a working knowledge of the function of the GI tract and related diseases/disorders • Identify the structures and appearance of the GI tract • Construct a model of the GI tract based on the knowledge acquired in this module • Answer a set of questions taken from the information contained in this module
Standards Addressed (Common Core and NGSS)	<p>California Common Core</p> <ul style="list-style-type: none"> • RST No. 4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. • RST No. 7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). <p>California’s Next Generation Science Standards (NGSS)</p> <ul style="list-style-type: none"> • Grade 6 <ul style="list-style-type: none"> • MS-LS1: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. • WHST.6-8.7: Conduct short research projects to answer a question. • Grade 7 <ul style="list-style-type: none"> • MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. • MS-LS1-7: Develop a model to describe unobservable mechanisms.

Assessment	<p>Students will be evaluated through the following methods:</p> <ul style="list-style-type: none"> • Assessment Worksheets • Project Testing and Evaluation • Ability to correctly answer questions related to the function of the GI Tract
Additional Resources	<p>The following supplemental materials are available on the California MESA website:</p> <ul style="list-style-type: none"> What is the Study of Life Careers in Science Label the GI Tract Activity One Label the GI Tract Activity Two GI Tract Word Search Mapping The GI Tract Digestion Dominoes

Background

Biological science is the study of living organisms, including their structure, function, organization, growth, evolution, and their interaction with the natural environment.

Some disciplines within biology include:

- Anatomy:** explores the structural organization of an organism
 - Astrobiology:** explores the origin, evolution, distribution, and future of life in the universe
 - Biochemistry:** explores the chemical processes within and related to living organisms
 - Botany:** explores the biology of plant life
 - Cellular Biology:** explores cellular structure and function including cell structure, cell division, and cell death
 - Ecology:** explores how organisms interact in their environment
 - Evolutionary Biology:** explores the origins and evolutionary processes of a species
 - Genetics:** explores genes and their role in inheritance
 - Molecular Biology:** explores cells, their characteristics, parts, chemical processes, and interactions among biological molecules
 - Neurobiology:** explores the cells and tissue of the brain and nervous system
 - Physiology:** explores the interaction between molecules, cells, muscles and organs
- Refer to the Powerpoint “Careers in Science”.

Benefit To Society

Biologists hold the key to unlocking solutions to some of the world biggest challenges. Whether working to protect our planet’s biodiversity, identifying new sustainable energy sources, researching diseases that affect our aging population, or identifying new agricultural techniques to improve conditions for our worlds’ most vulnerable populations, science gives us an understanding of the natural world and helps ensure a more sustainable future.

12 Ways Science Can Save The World – In pictures
<http://www.businessinsider.com/12-ways-biology-can-save-the-world-pictures-2012-9?op=1>

Engineering Design Process

The engineering design process will be a theme that spans all of the PBL modules, so an extensive lesson isn't required to be included in each module. However, it may be more effective to focus on particular parts of the process that work well with this module. For instance, there are various forms of brainstorming that could be recommended such as collaborative sketching (C-sketching) and mind-mapping.

Engineering Design Process/Module Content

Using the four steps of the engineering design process students will produce a competition ready project.

- ✓ Investigate
- ✓ Plan
- ✓ Create
- ✓ Evaluate

Note: All documents italicized below found in Supplemental Materials

Introduction

- *What is the Study of Life PowerPoint*
- *Careers in Science PowerPoint*
- 12 Ways Science Can Save The World – In pictures:
<http://www.businessinsider.com/12-ways-biology-can-save-the-world-pictures-2012-9?op=1>

Investigate/Research

- Introduce students to the Gastrointestinal Tract
 - Food goes in, then what? Find out in this movie! (5:09)
http://kidshealth.org/kid/closet/movies/DSmovie.html?tracking=59983_H
 - Digestive System (3:34)
<https://www.youtube.com/watch?v=JnzbipJuAA>
- Review GI function using the *Gastrointestinal Physiology Document*
- Students may test their knowledge with
 - **BrainPop.com** allows students to virtually build the digestive system by dragging and dropping where each organ belongs
<http://www.brainpop.com/games/buildabodydigestivesystem/>
 - *Label the GI Tract Activity One*
 - *Label the GI Tract Activity Two*
 - *GI Tract Word Search_Digestion Dominoes*
- Thoroughly review MESA Day Rules
- Students should create their own design notebook with
 - All organs and functions of the GI Tract

Plan/Brainstorm

- Students should complete the *Mapping The GI Tract* Activity to gain a general knowledge of how to construct a GI model
- Using their design notebooks students should
 - Brainstorm possible materials for each structure of the GI Tract
 - Draw a diagram of their model
 - Answers all questions found in the MESA Day Rules
 - Devise a method for memorizing and testing knowledge of the GI Tract questions

Create

- Students should
 - Create a freestanding model using designs found in their notebook
 - Create a display containing the materials table and hand drawn or computer generated diagram

Evaluate

- Model and display may be judged using the rubric found in the MESA Day Rules
- Students should be independently tested on their knowledge of the GI Tract
- Using scores students should reexamine their design/materials and make the necessary enhancements recording all results in the notebooks

Pacing Guide

Note: The MESA Curriculum is intended to be flexible and to meet the needs of all MESA delivery models. As the lessons are developed, please keep in mind what components can be “sacrificed” for the afterschool/lunch/Saturday models where the instruction time is usually less than a MESA period.

Recommended pace for MESA Periods:

Week One: Introduction to the Gastrointestinal Track	
Monday	<ul style="list-style-type: none"> • Introduction to Biological Science
Tuesday	<ul style="list-style-type: none"> • GI Tract Videos • GI Function (Gastrointestinal Physiology Document)
Wednesday	<ul style="list-style-type: none"> • GI Function (Gastrointestinal Physiology Document)
Thursday	<ul style="list-style-type: none"> • Label the GI Tract Activity 1 & 2 • GI Tract Word Search • Digestion Dominoes • GI Function (Gastrointestinal Physiology Document)
Friday	<ul style="list-style-type: none"> • Updating design notebook • Review of MESA Day Rules

Week Two: GI Model Construction	
Monday	<ul style="list-style-type: none"> • Mapping the GI Tract
Tuesday	<ul style="list-style-type: none"> • Design Model and Display
Wednesday	<ul style="list-style-type: none"> • Construct Model and Display
Thursday	<ul style="list-style-type: none"> • Construct Model and Display
Friday	<ul style="list-style-type: none"> • Construct Model and Display
Week Three: Evaluate and Redesign	
Monday	<ul style="list-style-type: none"> • Memorize and Test Knowledge of GI Questions
Tuesday	<ul style="list-style-type: none"> • Evaluate Model and Display
Wednesday	<ul style="list-style-type: none"> • Test Knowledge of GI Questions
Thursday	<ul style="list-style-type: none"> • Reevaluate and Update Design
Friday	<ul style="list-style-type: none"> • Make necessary Design Improvements • Evaluate Model and Display & Test Knowledge of GI Questions

**** Add as many weeks as necessary for the module**

Recommended pace for MESA Afterschool Programs:

Afterschool	
Day 1	<ul style="list-style-type: none"> • Introduction to Biological Science • GI Tract Videos • GI Function (Gastrointestinal Physiology Document)
Day 2	<ul style="list-style-type: none"> • Construct Model and Display • Memorize and Test Knowledge of GI Questions
Day 3	<ul style="list-style-type: none"> • Construct Model and Display • Memorize and Test Knowledge of GI Questions
Day 4	<ul style="list-style-type: none"> • Evaluate Model and Display & Test Knowledge of GI Questions

**** Add as many days as necessary for the module**

Recommended pace for MESA Saturday programs:

Saturday	
Day 1	<ul style="list-style-type: none"> • Introduction to Biological Science • GI Tract Videos • GI Function (Gastrointestinal Physiology Document) • Construct Model and Display • Memorize and Test Knowledge of GI Questions
Day 2	<ul style="list-style-type: none"> • Construct Model and Display • Evaluate Model and Display & Test Knowledge of GI Questions

**** Add as many days as necessary for the module**