



## **Course Design Document.**

# **Middle School Human Anatomy, Part One: Musculoskeletal, Cardiovascular and Digestive Systems**

## **1 | Project Context**

STEM Skool, Inc. is a Charlotte, NC-based education nonprofit organization with a mission of ensuring that every kid, regardless of race, ethnicity, religion, gender, or socioeconomic status, has access to a quality STEM education.

We create hands-on, engaging, culturally relevant programs designed to spark interest and increase achievement in science, technology, engineering, and mathematics for pre-kindergarten thru 12th grade students.

Throughout the school year, we produce units of study that center on a particular science and engineering unit of study. For our Fall 202 session, we will be studying human anatomy and physiology. We will be creating three separate courses for our different age groups: kindergarten-2nd graders (lower elementary), 3rd-4th graders (upper elementary), and 5th-8th graders (middle school).

For the purpose of this capstone project, I have focused on course creation efforts for the first three weeks of the middle school human anatomy course in which we will study the human musculoskeletal, cardiovascular and digestive systems. The desired outcome of this course is for students to learn the structure, parts and functions of these systems.

## 2 | Learning Requirements

The audience for this course includes homeschooled 5th-8th graders as well as 5th-8th grade students who participate in our program in an after-school setting. Both homeschool and after-school students have high interest and aptitude in science and engineering. Approximately 75% of participating students have participated in our program over two or more school years.

We offer three course delivery formats for Middle School Anatomy, Part One:

- In-person for students living in the Charlotte, NC metropolitan area;
- Online classes for students living anywhere in the world who would like to take our classes virtually; and
- Self-paced, pre-recorded online classes for students who would like to work through material at their own convenience.

All students receive a weekly video lecture, vocabulary list, readings, supplementary videos, and independent activities via our course delivery platform. Then they participate in interactive live or in-person lessons with a course facilitator to review and reinforce what they've learned. Self-paced students communicate with course facilitators via a discussion board.

### 3 | Course Objectives

**Terminal Objective:** Identify the anatomical parts, structures and functions of the human musculoskeletal, cardiovascular and digestive systems.

**Enabling Objective 1.1: To Understand.**

Students will be able to summarize a carefully-selected reading detailing the anatomical parts and general function of the human musculoskeletal, cardiovascular and digestive systems.

**Enabling Objective 1.2: To Apply.**

Students will be able to label a diagram of the human musculoskeletal, cardiovascular and digestive systems when offered a blank document.

**Enabling Objective 1.3: To Create.**

Students will be able to assemble working models of a working joint to demonstrate understanding of the musculoskeletal system, a pumping heart to demonstrate understanding of the cardiovascular system, and the stomach to demonstrate an understanding of how digestive enzymes work in the digestive system.

## 4 | Instructional Strategy

Typical of all STEM Skool courses, Middle School Anatomy, Part One will center on **constructivism**, a theory that recognizes that students construct new understandings and knowledge by integrating with what they already know with new material.

Students are far from blank slates! They use their bodies every day and have experienced first- and secondhand illness. Indeed, they have a few ideas about human anatomy and will use those experiences as a backdrop to this course.

Additional constructivist principles we employ include:

- Learning is an active process, and
- Learning is a social activity.

Students enrolled in this course receive access to a course delivery platform hosted by Thinkific.com. Through this platform, we embed a weekly topic introduction video and Padlet that contains a list of vocabulary words, detailed readings and articles, instructional videos, anatomy labeling worksheets, and instructions on how to complete a project or lab.

## 5 | Course Format or Structure

All students work through the information on the course platform independently throughout the week. Virtual and self-paced students complete projects and labs on their own and then meet with the course facilitator for 50 minutes each week to review course material and offer insights on their projects. In-person students meet with the course facilitators to review course content and to work in teams to complete weekly projects.

## 6 | Detailed Content Outline

Week 1: Module 1: The Musculoskeletal System	
Terminal Objective: Identify the anatomical components and functions of the human musculoskeletal system.	
<b>Enabling Objective 1.1: To Understand.</b> Students will be able to summarize a carefully-selected reading detailing the anatomical parts and general function of the human musculoskeletal system.	<b>Activity:</b> Memorize a list of vocabulary words defining the parts and functions attributable to the human musculoskeletal system. Read an OER chapter on the musculoskeletal system, and complete accompanying reading comprehension activities. <b>Resource:</b> <a href="https://www.ck12.org/book/ck-12-biology/section/21.3/">https://www.ck12.org/book/ck-12-biology/section/21.3/</a>
<b>Enabling Objective 1.2: To Apply.</b> Students will be able to label a diagram of the human musculoskeletal system when offered a blank document.	<b>Activity:</b> Fill in and color code a blank diagram of the human musculoskeletal system. <b>Resource:</b> <a href="https://quizlet.com/392988089/muscular-system-part-iii-label-the-muscles-diagram/">https://quizlet.com/392988089/muscular-system-part-iii-label-the-muscles-diagram/</a>
<b>Enabling Objective 1.3: To Create.</b> Students will be able to assemble a working model of a working joint to demonstrate understanding of the musculoskeletal system.	<b>Activity:</b> In-person students will work in teams of 2-3 to construct model joints. Remote students will work independently and present their models in online classes or via the discussion board. <b>Resource:</b> <a href="https://blog.sonlight.com/muscle-science-activity.html">https://blog.sonlight.com/muscle-science-activity.html</a>
<b>Assessment:</b> Students will be assessed on their execution and explanation of their musculoskeletal model as presented in a group setting.	
Week 2: Module 2: The Cardiovascular System	
Terminal Objective: Identify the anatomical components and functions of the human cardiovascular system.	
<b>Enabling Objective 2.1: To Understand.</b> Students will be able to summarize a carefully-selected reading detailing the anatomical parts and general function of the human cardiovascular system.	<b>Activity:</b> Memorize a list of vocabulary words defining the parts and functions attributable to the human cardiovascular system. Read an OER chapter on the cardiovascular system, and complete accompanying reading comprehension activities. <b>Resource:</b> <a href="https://www.ck12.org/biology/cardiovascular-system/lesson/Cardiovascular-System-MS-LS/?referr=concept_details">https://www.ck12.org/biology/cardiovascular-system/lesson/Cardiovascular-System-MS-LS/?referr=concept_details</a>
<b>Enabling Objective 2.2: To Apply.</b>	<b>Activity:</b> Fill in and color code a blank diagram of the human cardiovascular system.

Students will be able to label a diagram of the human cardiovascular system when offered a blank document.	<b>Resource:</b> <a href="https://askabiologist.asu.edu/sites/default/files/resources/coloring_pages/pdf/aab_human_heart_coloring_worksheet.pdf">https://askabiologist.asu.edu/sites/default/files/resources/coloring_pages/pdf/aab_human_heart_coloring_worksheet.pdf</a>
<b>Enabling Objective 2.3: To Create.</b> Students will be able to assemble a working model of a pumping heart to demonstrate understanding of the cardiovascular system.	<b>Activity:</b> In-person students will work in teams of 2-3 to construct a model heart. Remote students will work independently and present their models in online classes or via the discussion board. <b>Resource:</b> <a href="https://www.youtube.com/watch?v=tqMBLWABMAE">https://www.youtube.com/watch?v=tqMBLWABMAE</a>
<b>Assessment:</b> Students will be assessed on their execution and explanation of their cardiovascular model as presented in a group setting.	
<b>Week 3: Module 3: The Digestive System</b>	
<b>Terminal Objective: Identify the anatomical components and functions of the human digestive system.</b>	
<b>Enabling Objective 3.1: To Understand.</b> Students will be able to summarize a carefully-selected reading detailing the anatomical parts and general function of the human digestive system.	<b>Activity:</b> Memorize a list of vocabulary words defining the parts and functions attributable to the human digestive system. Read an OER chapter on the digestive system, and complete accompanying reading comprehension activities. <b>Resource:</b> <a href="https://www.ck12.org/biology/digestive-system/lesson/Human-Digestive-System-MS-LS/?referrer=concept_details">https://www.ck12.org/biology/digestive-system/lesson/Human-Digestive-System-MS-LS/?referrer=concept_details</a>
<b>Enabling Objective 3.2: To Apply.</b> Students will be able to label a diagram of the human digestive system when offered a blank document.	<b>Activity:</b> Fill in and color code a blank diagram of the human digestive system. <b>Resource:</b> <a href="https://www.twinkl.com/resource/us2-s-156-human-digestive-system-labeling-activity-sheet">https://www.twinkl.com/resource/us2-s-156-human-digestive-system-labeling-activity-sheet</a>
<b>Enabling Objective 3.3: To Create.</b> Students will be able to depict the function of the human digestive system.	<b>Activity:</b> In-person students will work in teams of 2-3 to execute a digestive enzymes lab. Remote students will work independently and present their lab results in online classes or via the discussion board. <b>Resource:</b> <a href="https://www.youtube.com/watch?v=ntCh4_nSwSs">https://www.youtube.com/watch?v=ntCh4_nSwSs</a>
<b>Assessment:</b> Students will be assessed on their execution and explanation of their digestive enzymes lab.	