Integrating Science and Technology
and
Catholic Curriculum Maps

Grade 5

Understanding Life Systems Strand

Human Organ Systems

Catholic Curriculum Corporation
Central and Western Region

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Understanding Life Systems Strand
Grade 5

Unit At-A-Glance

Note:
While this unit addresses the circulatory, respiratory and musculoskeletal body systems, it could be used to address any of the other body systems referenced in the revised Science and Technology document for the Grade 5 topic, Human Organ Systems, in the Understanding Life Systems strand.

Therefore, the investigations, activities and experiments in these lessons can be adapted and/or modified for instruction of other organ systems such as the nervous system and the digestive system.

Catholic Social Teaching:	Community and the Common Good
Essential Question:	How do we live in community?
OCSGE:	Develops attitudes and values founded on Catholic social teaching and acts to promote social responsibility, human solidarity and the common good (1d) Speaks the language of life… "recognizing that life is an unearned gift and that a person entrusted with life does not own it but that one is called to protect and cherish it." (Witness to Faith) (1e) Works effectively as an interdependent team member (4a)
Topic:	Human Organ Systems Students will understand the body is made up of a number of different organs and that these organs are parts of systems that can be affected by various factors.
Unit Guiding Question:	How do human organ systems work to meet my basic needs and what choices can I make to show commitment to and respect for my body as one of God's creations in community with others?

Unit Culminating Task:
Students will develop a board game that addresses the unit guiding question, using one particular organ system to highlight the incredible nature of God's creation. The board game will identify:

- the structure and function of the major organ system
- how the organ system interacts with and is affected by at least one other organ system
- at least two common diseases of the system and/or organs within the body system
- how choices we make and technologies impact this organ system and thereby demonstrate levels of respect for our bodies as God's creation

Essential Understandings	
Catholic Curriculum Map: ***Essential Question(s) & Links***	How do I become a committed responsible person? How do we live in community? • Deepen their understanding that human beings are the greatest of all God's creatures • Recognize that actions have consequences for themselves and others • Identify the qualities of commitment • Describe the term community
Science and Technology: ***Fundamental Concept(s)***	Systems and Interactions and Structure and Function

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Science and Technology: ***Big Ideas***	• Organ systems are components of a larger system (the body) and, as such, work together and affect one another (OE 2,3) • Organ structures are linked to their functions (OE 2,3) • Systems in the human body work together to meet our basic needs (OE 2,3) • Choices we make affect our organ systems and, in turn, our overall health (OE 1,3)
Science and Technology: ***Scientific Inquiry Skill***	Experiment
Science and Technology: ***Expectation Tags, Guiding Questions & Specific Expectations***	Relating Science and Technology to Society and the Environment • What social and environmental factors affect human health? (SE 1.1) • What effects might technology have on human body systems? (SE 1.2) Developing Investigation and Communication Skills • What effects might physical activity have on body systems? (SE 2.2) Understanding Basic Concepts • What are the roles and interrelationships of the major human body systems? (SE 3.1) • What is the basic structure and function of major organs in the respiratory, circulatory, and digestive systems? (SE 3.2)
Language Expectations:	Oral and Visual Communication • Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (OE 2) Writing • Generate, gather and organize ideas and information to write for an intended purpose and audience (OE 1) Media Literacy • Create a variety of media texts for different purposes and audiences, using appropriate forms, conventions and techniques (OE 3) • Reflect on and identify their strengths as media interpreters and creators, areas for improvement, and the strategies they found most helpful in understanding and creating media texts (OE 4)
Mathematics Expectations:	Data Management and Probability • Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including broken-line graphs (OE 1) • Read, describe, and interpret primary data and secondary data presented in charts and graphs, including broken-line graphs (OE 2)

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Unit Overview NOTE: Teachers will need to adjust the suggestions to address the learning needs of their students.				
Subtask	**Lesson / Time**	**Essential Understandings**	**Assessment**	**Resources**
1	Introduction to the Unit 1.1 Introduction – Community and Systems (40 minutes)	How do we live in community? Describe the term community (FA 5.1) Reflect on the communities that make up the world (FA 5.3) Demonstrate an understanding of the structure and function of human body systems and interactions within and between systems (S&T OE 3) S&T SE 2.4, 2.5, 3.1	Anecdotal notes	*Fully Alive*, chart paper, markers, post-its, copies of simple human body outline (One for each student or every pair of students), overhead transparency and markers
2	2.1 Introduction to the Circulatory System and the Culminating Task (40 minutes) 2.2 Heart Rates (40 minutes) 2.3 From Heart to Lungs (40 minutes)	How do we live in community? Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1) Describe community (FA 5.1) Reflect on the communities that make up the world (FA 5.3) Recognize that actions have consequences for themselves and others (FA 4.1) Analyze the impact of human activities and technological innovations on human health (S&T OE 1) Investigate the structure and function of the major organs of various human body systems (S&T OE 2) Demonstrate an understanding of the structure and function of human body systems and interactions within and between systems (S&T OE 3) S&T SE 1.1 2.1, 2.2, 2.4, 2.5, 3.1, 3.2, 3.4 Language Read and demonstrate an understanding of a variety of literary, graphic, and informational texts, using strategies to construct meaning (Reading OE 1)	Anecdotal notes, checklist, exit slip	*Fully Alive*, Human body outline with collated student information from Subtask 1.1, Romans 12: 4-6 written on blackboard or chart paper, Stopwatches, S&T notebook or recording paper, graph paper, Culminating Task rubric Students' or teacher prepared bar graph(s), computers, website recording sheet/heart health investigation guiding sheet Students' website recording sheet/heart health investigation guiding sheet, answer sheet, Diagram, illustrated book or video depicting the circulatory system, diagram of the circulatory system for each student, stopwatches

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		Recognize a variety of text forms, text features, and stylistic elements and demonstrate understanding of how they communicate meaning (Reading OE2) Mathematics Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including broken-line graphs (DM&P OE 1) Read, describe, and interpret primary data and secondary data presented in charts and graphs, including broken-line graphs (DM&P OE 2)		
3	Respiratory System Lesson 3.1 Lung Capacity (2 X 40 minutes)	How do we live in community? Reflect on and appreciate the uniqueness of others (FA 1.2) Recognize that actions have consequences for themselves and others (FA 4.1) Analyze the impact of human activities and technological innovations on human health (S&T OE 1) Investigate the structure and function of the major organs of various human body systems (S&T OE 2) Demonstrate an understanding of the structure and function of human body systems and interactions with and between systems (S&T OE 3) S&T SE 1.1, 2.1, 2.2, 2.4, 3.2	Anecdotal notes, Rating Scale	Diagram or model of the lungs, Plastic tubs, 2L plastic pop bottles with caps, measuring cups or graduated cylinders, rubber tubing, straws, water, rubbing alcohol and cotton balls/rubbing alcohol wipes or soapy water, coloured permanent marker for each student (ideally a different colour for each group member), experiment instruction sheets, transparency of experiment instruction sheet, experiment recording sheets/S&T notebook, BLM 3.1a, BLM 3.1b, Computers
4	Musculoskeletal System 4.1 Active Bodies (50 minutes) 4.2 Mechanical Arm (3 x 40 minutes)	How do we live in community? Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1) Reflect on and appreciate the uniqueness of others (FA 1.2) Recognize that actions have consequences for themselves and others (FA 4.1)	Anecdotal records Checklist, Group evaluation sheet, rating scale or rubric	Chart paper/post-its, markers, Various pieces of gym equipment – bean bags, hula hoops, skipping ropes, badminton rackets and birds, floor hockey sticks and pucks, gym mats BLM 4.2

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		Analyze the impact of human activities and technological innovations on human health (S&T OE1) Investigate the structure and function of the major organs of various human body systems (S&T OE 2) Demonstrate an understanding of the structure and function of human body systems and interactions of systems (S&T OE 3) S&T SE 1.2, 2.1, 2.2, 2.3, 2.4, 2.5 3.1, 3.2, 3.3, 3.4 Health and Physical Education Perform the movement skills required to participate in games, gymnastics, dance and outdoor pursuits alone and with others: locomotion/travelling, manipulation, and stability (FMS OE 2) Follow safety procedures related to physical activity, equipment, and facilities (AP OE 4)		Diagram/book/model/video of the musculoskeletal system or parts of the musculoskeletal system, cardboard rolls, Balloons, rubber bands, straws, popsicle sticks, toothpicks, tape, scissors, paperclips, paper fasteners, string or other materials appropriate in the creation of a model arm, mechanical arm instruction/ planning sheet
5	Culminating Task 5.1 Board Game (5 x 40 minutes)	How do we live in community? Deepen their understanding that human beings are the greatest of all God's creatures (F.A. 1.1) Identify and describe how the reproductive system differs from other body systems (FA 3.1) Recognize that actions have consequences for themselves and others (F.A. 4.1) Reflect on the communities that make up the world (FA 5.3) Analyze the impact of human activities and technological innovations on human health (S&T OE1)	Rubric	Student instruction sheet (BLM 5.1), sample board games, chart paper and materials appropriate for use in the creation of a board game such as construction paper, cardboard, markers, scissors, glue, paper fasteners, BLM 5.1

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		Investigate the structure and function of the major organs of various human body systems (S&T OE 2) Demonstrate an understanding of the structure and function of human body systems and interactions with and between systems (S&T OE 3) S&T SE 1.1, 1.2, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4		

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Subtask 1: Introduction to the Unit

Description
Students will explore various systems and their interrelationships, making a connection to God's complex creation of organ systems.

Lesson 1.1Introduction - Community and Systems
Purpose
Students will brainstorm the concept of community and systems as a means of introducing the topic of body systems and recognize its connection to Catholic communities.

Essential Understandings
Catholic Curriculum Map Links:

- How do I live in community?
- Describe the term community (FA 5.1)
- Reflect on the communities that make up the world (FA 5.3)

Science and Technology:

- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.5)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)

Assessment for Learning
Use observation to identify students who actively contribute to brainstorming session and partner activity. Provide feedback to students on brainstorming recordings and the human body outlines.
Note the organs and systems students are identifying as well as those not readily listed and use assessment information to identify the need for additional clarification on organs and/or body systems.

Teacher Notes
This lesson links to Theme 5 in *Fully Alive*. You may wish to establish a Word Wall that incorporates new vocabulary from the unit as it is introduced, exclusive to S&T terminology, or add vocabulary to an existing classroom Word Wall. You will need chart paper, and/or post-it notes, markers and copies of a simple outline of a human body students could label.

Instruction
Time to Teach 20 minutes

- As a whole group, discuss possible definitions for "community". List examples - i.e. church, school, making reference to the communities listed in Theme 5 of Fully Alive.
- Discuss how communities are like systems, trying to elicit the idea of different parts working together as a whole for a particular purpose.
- Record ideas on chart paper, eventually settling on a definition that sets a context for the concept of "system" for the remainder of the unit.
- Identify two or three examples of systems – i.e. musical group, church parish, computer.
- In small groups, students brainstorm additional examples of systems (communities) and record on chart paper or post-its.
- Whole-class sharing and/or discussion. Introduce the body as a system if it has not yet been listed as an example by the students.

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Time to Practice 10 minutes

- Based on their previous knowledge and/or experience, paired students draw (roughly) and label all the organs and/or body systems they can on a given human body outline.

Time to Share 10 minutes

- Whole-class sharing with pairs naming the organs/systems labeled on their outline and teacher records responses on a similar outline on a transparency or chart paper until all responses have been solicited.

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Subtask 2: Circulatory System

Description
Students will revisit their learning from the previous Subtask and focus on the circulatory system.

Lesson 2.1Introduction to the Circulatory System and the Culminating Task
Purpose
Students will begin investigating the circulatory system by finding and comparing their heart rate at rest and after exercise.

Essential Understandings
Catholic Curriculum Map Links:

- How do I live in community?
- Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1)
- Describe the term community (FA 5.1)
- Reflect on the communities that make up the world (FA 5.3)
- Recognize that actions have consequences for themselves and others (FA 4.1)

Science and Technology:

- Follow established safety procedures for physical activities (SE 2.1)
- Use scientific inquiry/experimentation skills to investigate changes in body systems (SE 2.2)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.5)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)

Language:

- Identify various elements of style - including word choice and the use of similes, personification, comparative adjectives and sentences of different types, lengths, and structures – and explain how they help communicate meaning (Reading SE 2.4)

Mathematics:

- Collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements (DM&P SE 1.2)
- Collect and organize discrete or continuous primary data and secondary data and display the data in charts, tables, and graphs that have appropriate titles, labels, and scales that suit the range and distribution of the data using a variety of tools (DM&P SE 1.3)
- Read, interpret, and draw conclusions from primary data and from secondary data, presented in charts, tables and graphs (DM&P SE 2.1)

Assessment for Learning
Use observation to identify students who recall information from previous Subtask.
Use checklist to assess mathematics expectations noted above.

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Teacher Notes

This lesson links to Theme 1and 5 in *Fully Alive* and incorporates Daily Physical Activity. Ensure students have a basic understanding of a pulse and how it is used as a measuring tool. Also ensure awareness of any student's physical limitations and adjust lesson as necessary. Add new vocabulary to Word Wall as needed.

You will need the whole-class human body outline from Subtask 1.1, Romans 12: 4-6 written on blackboard or chart paper, S&T notebook or recording paper, stopwatches, graph paper and copies of the checklist to assess graphs.

Instruction

Time to Teach 15 minutes

- As a class, recall the discussion as well as the body systems and organs recorded from Subtask 1.1 using the whole-class human body outline as well as what makes the labeled items qualify as "systems"
- Refer to the Old Testament passage that opens Theme 1 in *Fully Alive*, highlighting God's creative powers
- Use the metaphor in Romans 12: 4- 6 "Just as each of us has one body with many members, and not all the members have the same function, so too we, though many, are one body in Christ and individually members one of another" to emphasize how body systems function differently but work together, using Think-Pair-Share strategy
- Inform students you will be devoting the next few weeks learning about body systems and organs, including what they do for us, how they work independently of and with other systems, and about choices we make that affect their function.
- Refer briefly to the culminating task students will be completing as a means of communicating their learning by unit's end addressing the expectations recorded on the accompanying rubric.
- Introduce the circulatory system by informing students they will start by learning more about their own bodies.

Time to Practice 10 minutes

- In pairs, students find their resting heart rate by locating their pulse and counting the number of beats for 1 minute (or count for 15 minutes and multiply by 4).
- Ask students to record their resting heart rate and then predict how their heart rate will change after physical activity – record predicted exercise heart rate.
- Engage students in some type of physical activity for 1 minute and have them take their exercise heart rate as above and record their responses.
- Repeat after 1 minute of rest and record prediction and response.
- Students create a simple bar graph communicating their results and record one or two statements hypothesizing on the reason for the difference between them

Time to Share 15 minutes

- Whole-class questioning as time allows, from the document's sample guiding questions: What observations did you make about the effect of exercise on your heart rate? What happened to your breathing as your heart rate changed? How did your body temperature change? Why might your heart rate and body temperature change? What might explain differences between the heart rates of you and your partner?

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Lesson 2.2 Heart Rates

Purpose

Students will continue to investigate the circulatory system by comparing their heart rate results, discussing possible reasons behind variations and learning more about the circulatory system.

Essential Understandings

Catholic Curriculum Map Links:

- How do I live in community?
- Recognize that actions have consequences for themselves and others (FA 4.1)

Science and Technology:

- Assess the effects of social and environmental factors on human health, and propose ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial (SE 1.1)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.5)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)
- Identify common diseases and the organs and/or body systems that they affect (SE 3.4)

Language:

- Demonstrate understanding of appropriate speaking behavior in a variety of situations, including paired sharing, dialogue, and small- and large- group discussions (OC SE 2.2)
- Demonstrate understanding of a variety of texts by summarizing important ideas and citing supporting details (Reading SE 1.4)

Mathematics:

- Compare similarities and differences between two related sets of data, using a variety of strategies (SE 2.3)

Assessment for Learning

Use observation to identify students who recognize relationship between resting and exercise heart rate and amongst different students.
Provide whole-group or individual feedback on bar graphs.

Teacher Notes

This lesson links to Theme 4 in *Fully Alive*. Post a sample of students' bar graphs that illustrates a wide range of heart rates or create a graph on chart paper that displays some or all of the heart rate ranges in advance of the lesson. Add to Word Wall as needed.
You will need access to computers and S&T notebooks or paper for recording.

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Instruction

Time to Teach 10 minutes

- As a class, examine the student graphs or prepared teacher graph, noting the similarities and differences amongst results.
- In small groups students brainstorm possible reasons behind the graph results.
- Whole-class sharing of group discussions.
- Reflect on the introduction to Theme 4 in *Fully Alive* to highlight how decisions made can affect the health of our heart and therefore the gift of our life (i.e. exercise and proper diet strengthen the heart and lungs and improves the body's ability to produce oxygen; inactivity or activities such as smoking or drinking alcohol forces your heart to work harder)

Time to Practice 30 minutes

- Students work individually or in pairs at a computer to conduct a search of health factors related to heart health via the website of a local Heart and Stroke Foundation.

Time to Share 30 minutes (simultaneously with Time to Practice)

- Provide students with feedback as they are completing their response sheet

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Lesson 2.3 From Heart to Lungs

Purpose

Students will investigate the circulatory system further and be introduced to its relationship to the respiratory system.

Essential Understandings

Catholic Curriculum Map Links:

- How do I live in community?
- Identify and describe how the reproductive system differs from other body systems (FA 3.1)
- Recognize that actions have consequences for themselves and others (FA 4.1)

Science and Technology:

- Assess the effects of social and environmental factors on human health, and propose ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial (SE 1.1)
- Follow established safety procedures for physical activities (SE 2.1)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.5)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)
- Identify common diseases and the organs and/or body systems that they affect (SE 3.4)

Assessment for Learning

Provide whole-group or individual feedback on website student response sheets from previous lesson.

Teacher Notes

This lesson links to Theme 3 and 4 in *Fully Alive* and incorporates Daily Physical Activity. Add new vocabulary to Word Wall as needed. You will need students' website recording sheets from previous lesson, a diagram, book or video illustrating the circulatory system, a diagram of the circulatory system for each student and stopwatches.

Instruction

Time to Teach 20 minutes

- As a whole class, confirm responses recorded on website recording sheet or have an answer sheet students can consult.
- Provide students with a definition of "organ" and ensure students recognize the heart as the major organ of the circulatory system.
- Share diagram/book/video and supply each student with a diagram of the circulatory system.

Time to Practice 15 minutes

- Students work individually to show the journey of the blood through the body using arrows and using a method (perhaps colour) to differentiate between the veins (red) that carry blood to the heart and the arteries (blue) that carry blood away from the heart.

- In partners students find resting and exercise heart rates and monitor themselves and observe one another for changes occurring when heart rate is elevated. (faster heart beat, heavier breathing, open mouth to take in additional oxygen, diaphragm moving in and out)

Time to Share 10 minutes (simultaneously with Time to Practice)

- As a whole class, students share their observations (faster heart beat, heavier breathing, breathing from the mouth to take in additional oxygen, diaphragm moving in and out) and attempt to identify other body systems or organs activated during exercise – draw students' attention to the lungs if not mentioned in their responses and reference Theme 3 in *Fully Alive* where a specific reference is made to how the respiratory system responds to exercise.
- Students complete Exit Slip as a means of briefly sharing their learning from the lesson

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Subtask 3: Respiratory System

Description
Students will investigate the respiratory system, including its structure and function.

Lesson 3.1 Lung Capacity
Purpose
Students will conduct an experiment involving lung capacity.

Essential Understandings
Catholic Curriculum Map Links:

- How do I live in community?
- Reflect on and appreciate the uniqueness of others (FA 1.2)
- Recognize that actions have consequences for themselves and others (FA 4.1)

Science and Technology:

- Assess the effects of social and environmental factors on human health, and propose ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial (SE 1.1)
- Use scientific inquiry/experimentation skills to investigate changes in body systems (SE 2.2)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)

Assessment for Learning
Use observation to note students' group work skills during the experiment and incorporate into the rating scale assessing inquiry/experimentation skills.

Teacher Notes
This lesson links to Theme 1and Theme 4 in *Fully Alive*. You will need a diagram or model of the lungs, plastic tubs, 2L plastic pop bottles with caps, measuring cups or graduated cylinders, rubber tubing, straws, water, rubbing alcohol and cotton balls/rubbing alcohol wipes or soapy water, coloured permanent marker for each student (ideally a different colour for each group member), experiment instruction sheets, transparency of experiment instruction sheet, experiment recording sheets/S&T notebook, BLM 3.1a, BLM 3.1b.

Instruction
Time to Teach Day One 15 minutes

- Ask whole class to recall how the lungs are additionally activated during exercise.
- Use the lung diagram/model to illustrate visually how lungs inhale oxygen and exhale carbon dioxide.
- Recall the factors mentioned from Heart Rate lesson that might have affected variances in heart rates results amongst students.
- Discuss the concept of a "fair test", referring to variables that might affect experiment results
- Introduce experiment by informing students that just as they took and compared their heart rate, they will investigate and compare their lung capacity, or "vital capacity".
- View the experiment instruction sheet on overhead and review as a class.

- Discuss the one variable that will change in this experiment (the student conducting the experiment)
- Model the experiment steps using the materials and discuss the need for careful hygiene and safety when taking turns using the straws and tubes – refer to BLM 3.1a.
- Have students practice taking deep breaths and exhaling the breath for as long as possible.

Time to Practice Day One 20 minutes

- Students conduct experiment in small groups and complete recording sheet – BLM 3.1b.

Time to Share Day One 5 minutes

- Whole-class debriefing on group results and group dynamics thus far and recommendations for improvements as the experiment continues during the following lesson. Students also share how evidence of fair testing in the experiment, discussing the variables that remained the same and those that changed.

Time to Teach Day Two 5 minutes

- Briefly review the concept of a "fair test", the experiment instruction sheet and safety procedures.
- Ask students to identify new vocabulary for the Word Wall

Time to Practice Day Two 25 minutes

- Students resume and complete experiment and complete recording sheet – BLM 3.1b.

Time to Share Day Two 10 minutes

- Students submit recording sheets and groups share the differences in lung capacities.
- Whole-class sharing of possible reasons behind the differences in results

BLM 3.1a

Lung Capacity Experiment Instruction Sheet

Student Name: _____

How full of hot air ARE you? Conduct this experiment to find out!

Read the instructions first and decide how you will work together to complete the steps in the experiment. Work as a team, just like a group of scientists!

1. Fill the plastic bottle with water and empty it into the plastic tub so the tub fills about half way.
2. Refill the plastic bottle to the spot marked on the outside and secure the cap loosely on the bottle.
3. Select a straw and a coloured marker for each group member.
4. Keeping one finger on the cap and the bottle OVER the tub, carefully turn the bottle upside-down and into the tub so the mouth of the bottle is completely under water.
5. Keeping the mouth of the bottle submerged; remove the cap from the bottle.
6. Place a straw into the end of the rubber tube. Take a deep breath, pinch your nose, and exhale your breath into the straw for as long as you can. Pinch the tube closed as soon as you finish exhaling.
7. Mark the new water level on the bottle with your coloured marker.
8. Carefully return the bottle to an upright position and fill it with water as needed to the mark you made on the bottle.
9. Empty the bottle into the measuring cup and record the measurement on your recording sheet – this shows how much air you exhaled in one breath, known as your **vital capacity**.
10. IMPORTANT!!! SAFETY FIRST!! As each group member takes his/her turn, you MUST use a DIFFERENT straw and clean the end of the rubber tube each time.

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BLM 3.1b

Lung Capacity Experiment Recording Sheet

Student Name: _____

1. How much carbon dioxide did you exhale (What is the depth of your vital capacity)?

2. How much carbon dioxide did your fellow group members exhale? Record their name before writing their result.

3. Are any of these group members regularly involved in a physical activity such as a sport or dance?

4. If there was **no** difference in your lung capacities, what might be the reason(s)?
   If there **was** a difference in your lung capacities, what might explain this difference? Reflect upon and appreciate the uniqueness of others as God's creation.

5. Is there a way to improve your lung capacity? If not, please explain. If so, list possible ways of making improvements.

6. In what way would improving our lung capacity show our desire to be a responsible and committed community member?

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Subtask 4: Musculoskeletal System

Description
Students will investigate the musculoskeletal system and see its relationship to the circulatory and the respiratory systems in helping us complete a variety of tasks.

Lesson 4.1 Active Bodies
Purpose
Students will move through several physical activity stations to become more aware of the uniqueness of humans as God's creation.

Essential Understandings
Catholic Curriculum Map Links:

- How do we live in community?
- Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1)
- Reflect on and appreciate the uniqueness of others (FA 1.2)
- Recognize that actions have consequences for themselves and others (FA 4.1)

Science and Technology:

- Evaluate the effects, both beneficial and harmful, of various technologies on human body systems, taking different perspectives into account (SE 1.2)
- Follow established safety procedure for physical activities (SE 2.1)
- Use scientific inquiry/experimentation skills to investigate changes in body systems (SE 2.2)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)
- Identify interrelationships between body systems (SE 3.3)

Health and Physical Education:

- Use a piece of equipment to send and receive an object to a partner or a target (H&PE SE 2.2)
- Follow the rules of fair play in games and activities)H&PE SE 4.2)

Assessment for Learning
Use observation to note students' ability to make connections between the body systems introduced thus far to the musculoskeletal system.

Teacher Notes
This lesson links to Theme 1in *Fully Alive*. This lesson incorporates Daily Physical Activity or can be incorporated into Physical Education class. You will need various pieces of gym equipment – bean bags, hula hoops, skipping ropes, badminton rackets and birds, hockey sticks and pucks, gym mats.

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Instruction

Time to Teach 15 minutes

- In small groups, students brainstorm the things the circulatory and respiratory help us do and record on chart paper/post-its.
- Whole-class sharing of responses.
- Refer to Theme 1 of *Fully Alive*, focusing on the uniqueness of each person's systems and capabilities (i.e. heart rates, lung capacities).
- Referring to the human body outline from Lesson 1.1, ask students to identify other possible organs or systems likewise involved in helping us complete the recently brainstormed activities, leading students to point out the musculoskeletal system if necessary.
- Introduce the activities to be completed at each circuit station that will be further proof of the many capabilities God bestowed upon us: a) Skipping b) Badminton toss c) Hula hoops d) Push-ups e) Slap shots f) Bean-bag target.

Time to Practice 10 minutes

- In small groups, students rotate through the circuit activities.

Time to Share 10 minutes

- Think-pair-share on the movements the body was capable of completing during the circuit activity (balancing, throwing, resistance, momentum, etc.), which they found easier or more challenging, possible reasons why, and the body parts that helped them successfully complete the movements.
- Ask the students to identify any other work of God's creation besides humans that would have been capable of completing all the circuit activities (and as a result identify what this confirms about the uniqueness of humans compared to other living things).
- Think-pair-share on the technologies that help us complete the circuit tasks because of the abilities God has bestowed upon us such as running, balancing, aiming (i.e. materials used in the creation of equipment such as running shoes, medical equipment that helps us recover from injuries and thereby return to physical activity).
- Refer to the human body outline from Lesson 1.1 to select the body systems and organs involved in allowing students to perform these kinds of tasks, introducing the word musculoskeletal system once the students mention muscles and/or bones.

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Lesson 4.2 Mechanical Arm

Purpose

Students will design and build a model arm to demonstrate how the musculoskeletal system works, including organs within the system.

Essential Understandings

Catholic Curriculum Map Links:

- How do we live in community?
- Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1)

Science and Technology:

- Evaluate the effects, both beneficial and harmful, of various technologies on human body systems, taking different perspectives into account (SE 1.2)
- Design and build a model to demonstrate how organs or components of body systems in the human body work and interact with other components (SE 2.3)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)
- Identify interrelationships between body systems (SE 3.3)

Assessment for Learning

Observe students' group work skills during the activity and incorporate into rating scale or rubric.

Teacher Notes

This lesson links to Theme 1in *Fully Alive*. Add new vocabulary to the Word Wall as required. You will need diagram/book/model/video of the musculoskeletal system or parts of the musculoskeletal system, cardboard rolls, balloons, rubber bands, straws, popsicle sticks, toothpicks, tape, scissors, paperclips, paper fasteners, string or other materials appropriate in the creation of a model arm, mechanical arm instruction/planning sheet (BLM 4.2) and additional paper or a notebook for brainstorming group ideas. It would also be helpful to have either concrete or pictorial samples of model arms.

Instruction

Day One

Time to Teach 30 minutes

- In small groups students brainstorm what factors could affect their performance in conducting physical activities such as those performed in the previous lesson.
- Whole-class sharing of responses – bring students to the topic of different technologies that assist in physical activity performance, such as specific running shoe designs, new fabrics that wick sweat away from the body, improved equipment materials such as carbon fibre, commercials promoting performance enhancing food or drinks such as milk, electrolyte drinks and protein-enriched foods, asking how necessary they consider these technologies to be.
- Refer to the quotation that opens Theme 1 of *Fully Alive*, asking the students if they think God had such technologies in mind when he created humans.
- Inform students they will design and create a model of an arm.

- Share diagram/book/model/video of the musculoskeletal system or at least of an arm, describing its structure (muscles, bones), the organs of the musculoskeletal system (skin) and how they work in community with one another and other parts (tendons, joints) to produce movement and function efficiently.
- Introduce the materials available for designing and creating a mechanical arm in small groups, discussing how materials can be shared or traded between groups and how they might be used in the creation of a model arm.
- Review safety procedures for the use of such materials.
- Highlight the importance of an appropriate and realistic design for the model arm before moving to the development stage.
- Review the instruction sheet (BLM 4.2) that outlines the requirements of the arm and emphasize the need for students to consult the sheet during both planning and creation stages.

Time to Practice 10 minutes

- In small groups, students begin completing their mechanical arm instruction/planning sheet (BLM 4.2), noting steps, organizing their contributions to the task and sketching a labeled design for presentation to the teacher.

Time to Share (simultaneously with Time to Practice)

- Groups share their ideas as teacher circulates amongst groups.

Day Two

Time to Teach 5 minutes

- Review instructions and safety procedures.
- Inform students they will need to share their final design before moving to the creation stage.
- Provide ongoing feedback to students as they develop their design and create their model arm, making reference to BLM 4.2.

Time to Practice Day Two 30 minutes

- In small groups, students complete their mechanical arm instruction/planning sheet (except for the "Time to Reflect" portion, and move on to creating the arm after receiving teacher approval.

Time to Share Day Two 5 minutes

- Individual students begin completing their group evaluation sheet based on their work together thus far, adding to the evaluation each day they work as a group.
- Whole-class debriefing of the design and creation process.

Day Three

Time to Teach 5 minutes

- Review instructions and safety procedures.
- Inform students this is their last class-time opportunity to complete their mechanical arm

Time to Practice Day Three 20 minutes

- Groups complete their mechanical arm and their group evaluation.

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Time to Share Day Three 15 minutes

- Groups view all completed designs and models.
- Whole class debriefing commenting on and comparing various designs and models.
- Ask the students what insight into God's creation the process of designing and building a model arm might have given them.
- Students complete the "Time to Reflect" portion of the BLM 4.2.

BLM 4.2

Mechanical Arm Instruction and Planning Sheet

Student Name: _____

We use it every day without even thinking about it, but do we know how it works? How does our arm help us brush our teeth, do our homework and throw a ball? Let's start to find out by designing and building a mechanical arm.

Read the suggestions first and decide how you will work together to complete your task.

Group members: _____

_____

Planning:
The basic parts of an arm: bones (humerus, radius and ulna), muscles and joints
What materials will you use to form these parts?

How will these parts be connected so the arm can show movement? What materials will you use to make the connections?

Use the space below to draw a labeled sketch of your arm, including the names of the major muscles (at least two), joints (at least two) and bones (at least three) that make up the human arm.

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BLM 4.2 Page 2 **Student Name: _____**

Time to Reflect

On a scale of 1 – 10, where 1 is very poor and 10 is outstanding, how would you rate your group's mechanical arm?

How do you feel your mechanical arm compares to those developed by your peers? Please explain, making references to your design, the materials you used as well as your final product.

What might you do differently the next time you were asked to complete the same or a similar task?

Based on what you have discovered about the human arm, why do you think humans were created in the likeness of God? What important tasks does the human arm enable us to complete that many other creatures cannot perform?

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Subtask 5: Culminating Task

Lesson 5.1 Board Game

Purpose

Students will discover how they can communicate their learning from the unit on Organ Systems through the development of a board game.

Essential Understandings

Catholic Curriculum Map Links:

- How do we live in community?
- Deepen their understanding that human beings are the greatest of all God's creatures (FA 1.1)
- Identify and describe how the reproductive system differs from other body systems (FA 3.1)
- Recognize that actions have consequences for themselves and others (FA 4.1)
- Reflect on the communities that make up the world (FA 5.3)

Science and Technology:

- Assess the effects of social and environmental factors on human health, and propose ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial (SE 1.1)
- Evaluate the effects, both beneficial and harmful, of various technologies on human body systems, taking different perspectives into account (SE 1.2)
- Use appropriate science and technology vocabulary, including *circulation, respiration, digestion, organs,* and *nutrients,* in oral and written communication (SE 2.4)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (2.5)
- Identify major systems in the human body and describe their roles and interrelationships (SE 3.1)
- Describe the basic structure and function of major organs in the respiratory, circulatory and digestive systems (SE 3.2)
- Identify interrelationships between body systems (SE 3.3)
- Identify common diseases and the organs and/or body systems that they affect (3.4)

Assessment for Learning

Use observation to note students' group work, interpersonal skills and task commitment during the activity and incorporate into the rubric, a separate rating scale, or use "Learning Skills" in the student's report card. Use observation to make notes for use later when using the rubric for final evaluation of the board game.

Teacher Notes

This lesson links to Themes 1, 3, 4 and 5 in *Fully Alive* and Theme 1 in *May We Be One*. Students may work in groups to complete a board game depending on classroom size and the range of student ability. You will need student instruction sheet (BLM 5.1), a variety of sample board games, chart paper and materials appropriate for use in the creation of a board game such as construction paper, cardboard, markers, scissors, glue, paper fasteners (for creating spinners). Decide in advance upon the number of students/groups who can select a particular organ system to base their game upon so that each organ system is equally represented. Once all board games are completed, at least one class period (preferably two) should be reserved for all students to play one another's games – for this unit's purposes, it has been designated as "Time to Teach Day 5" (and could be extended to a Day 6) but in fact could be a different period, depending on how long students are taking to complete games in addition to your own time constraints.

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Grade 5

Instruction
Day One
Time to Teach 30 minutes

- Whole-class brainstorming of different board games, recorded on chart paper or blackboard.
- Ask students to identify the various parts that make up a board game, such as die/spinners, game cards, game player pieces, and record the various responses on a separate sheet of chart paper.
- Ask students to identify the aspects of a board game that make it appealing and enjoyable for a long period of time – in other words, that demonstrate good longevity, such as the board game *Monopoly* (visually attractive, clear rules, fun, sturdy game pieces) and record on a third piece of chart paper – all of which are now visible by all students in a prominent place in the classroom.
- Inform students that as members of God's community, they have been selected to demonstrate their understanding of humans as "God's work of art" as well as their commitment to promoting the health of others by creating a board game that highlights the incredible nature of God's complex creation of organ systems and reveals the different levels of respect for their bodies that people can have, based on choices they make.
- Whole-class discussion of the responsibility we have, as God's creation and as a person growing in commitment and living in community, to take care of ourselves physically and to model and promote respect for our bodies to others.
- In groups, students discuss and record on chart paper the ways in which they believe they currently carry out their responsibility to demonstrate respect for their bodies and promote a healthy lifestyle (i.e. take part in regular physical activity, stretch after exercise to protect their muscles and joints, eat healthily).
- Distribute the student instruction sheet (BLM 5.1) that outlines the task for them, as well as the task rubric.
- Review the requirements of the board game and the accompanying rubric and emphasize the need for students to consult them during both the planning and development stages.
- Discuss the ways in which students can incorporate information about organ systems and related learning into various parts of the game (i.e. game cards or areas on the game board instructing a game player to move several spaces forward because of having invited a friend to participate in a physical activity, thereby demonstrating respect for creation and supporting the community in a positive way).
- Clarify any questions the students may have about the culminating task.
- Allow students time to investigate the various board games (if any) you have brought in.

Time to Practice 10 minutes

- In small groups, students begin discussing their ideas for the board game and planning out the information that will be revealed as it is played, consulting and recording on BLM 5.1 and writing any additional ideas on paper or in a Science and Technology notebook as needed.

Time to Share (simultaneously with Time to Practice)

- Groups share their ideas as teacher circulates amongst groups.

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Day Two

Time to Teach 5 minutes

- Review instructions by referring to the instruction sheet and rubric.
- Inform students they will need to share their plan for their game before moving to the development stage.
- Provide ongoing feedback to students as they develop their game, making reference to the rubric as needed.

Time to Practice 30 minutes

- Students consult the instruction sheet as they formally plan out the game, and move on to creating parts of the game after receiving teacher approval.

Time to Share 5 minutes

- Whole-class debriefing of the difficulties they have experienced thus far with the development of their game and the strategies they used to overcome them, if any.

Day Three

Time to Teach 5 minutes

- Review instructions and have groups share which game development stage they have reached.
- Ask groups to share how they have divided the work involved in completing the board game.
- Inform students that tomorrow will be the last class work period they will receive to complete the board game.

Time to Practice 30 minutes

- Students resume working on their board game.

Time to Share 5 minutes

- Groups share one positive and one negative aspect of their work on the board game for the session, including any time-saving strategies or recommendations for future work on the task.

Day Four

Time to Teach 5 minutes

- Review instructions remind students this is the final class period given for completing the board game and that a future class period will be reserved for playing the games of other groups.

Time to Practice 30 minutes

- Students resume working on their board game.

Time to Share 5 minutes

- Groups inform teacher and peers if their game is complete, and if not, when their game will be ready for others to play.

Day Five

Time to Teach 5 minutes

- Inform students they will have the opportunity to play one another's board games.
- Share expectations regarding student conduct while playing board games.

Time to Practice 30 minutes

- Students play one another's board games.

Time to Share 5 minutes

- Students share what they have learned about God's creation and organ systems by playing the various board games.

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BLM 5.1

Organ Systems Board Game

Student Name: _____

As God's "works of art", we have been created in God's image and endowed with the responsibility to demonstrate respect for creation by not only taking care of our own bodies, but also by promoting the health of community members while respecting their differences and weaknesses. As a school community member, it is your responsibility to share your knowledge about a specific organ system with your peers, so that they have the opportunity to become further aware of the complexity of God's creation while learning more about the human body. Plan and develop a board game that will allow others in your community to discover the "works of art" human beings are in a fun, interactive way.

By playing your board game, players should learn the following information about an organ system:

1. The system's basic structure and how it works, including how it works with other organ systems
2. The structure and function of the system's major organs
3. Common diseases affecting the organs within a system and their harmful effects
4. Social and environmental factors affecting the organ system
5. Ways to reduce harmful factors affecting the organ system
6. Technologies (both positive and negative) affecting the organ system

Your board game should include some or all of the following components typical to most board games: Game rules or instruction sheet, game board, game pieces, a mechanism for moving game pieces around the board (i.e. die, spinner, cards).

Group members: _____

_____

Plan your game plan!

1. Game components/materials

_____

_____

_____

_____

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2. Object of the Game:

3. Game Rules (Suggested number of players, selecting first player, how play proceeds, etc.):

4. Winning Outcomes (Ways the game celebrates and respects our organ systems as God's work of art):

Integrating Science and Technology and Catholic Curriculum Maps

Understanding Life Systems Strand
Grade 5

			Student Name: _____	
Categories	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Knowledge and Understanding – Subject-specific content acquired in each grade (knowledge), and the comprehension of its meaning and significance (understanding)				
Knowledge of an organ system's structure, function, and common diseases of the system or organs within the system	The student: • demonstrates limited knowledge of an organ system's structure, function and common diseases of the system or organs within the system	The student: • demonstrates some knowledge of an organ system's structure, function and common diseases of the system or organs within the system	The student: • demonstrates considerable knowledge of an organ system's structure, function and common diseases of the system or organs within the system	The student: • demonstrates thorough knowledge of an organ system's structure, function and common diseases of the system or organs within the system
Understanding of how an organ system interacts with and is affected by one other organ system	The student: • demonstrates limited understanding of how an organ system interacts with and is affected by one other organ system	The student: • demonstrates some understanding of how an organ system interacts with and is affected by one other organ system	The student: • demonstrates considerable understanding of how an organ system interacts with and is affected by one other organ system	The student: • demonstrates thorough understanding of how an organ system interacts with and is affected by one other organ system
Thinking and Investigation - – The use of critical thinking skills and inquiry and problem-solving skills and/or processes				
Use of initiating and planning skills and strategies to identify how personal choices and technologies impact an organ system	The student: • uses initiating and planning skills and strategies to identify how personal choices and technologies impact an organ system with limited effectiveness	The student: • uses initiating and planning skills and strategies to identify how personal choices and technologies impact an organ system with some effectiveness	The student: • uses initiating and planning skills and strategies to identify how personal choices and technologies impact an organ system with considerable effectiveness	The student: • uses initiating and planning skills and strategies to identify how personal choices and technologies impact an organ system with a high degree of effectiveness
Use of processing skills and strategies to collect relevant information about an organ system and make a connection to at least one other organ system in a meaningful way	The student: • uses processing skills and strategies to collect relevant information about an organ system and make a connection to at least one other organ system in a meaningful way with limited effectiveness	The student: • uses processing skills and strategies to collect relevant information about an organ system and make a connection to at least one other organ system in a meaningful way with some effectiveness	The student: • uses processing skills and strategies to collect relevant information about an organ system and make a connection to at least one other organ system in a meaningful way with considerable effectiveness	The student: • uses processing skills and strategies to collect relevant information about an organ system and make a connection to at least one other organ system in a meaningful way with a high degree of effectiveness

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Use of critical/creative thinking processes, skills and strategies to make connections between personal choices and current technology to demonstrating respect for creation	The student: • uses creative/critical thinking skills and strategies to make connections between personal choices and current technology to demonstrating respect for God's creation with limited effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between personal choices and current technology to demonstrating respect for God's creation with some effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between personal choices and current technology to demonstrating respect for God's creation with considerable effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between personal choices and current technology to demonstrating respect for God's creation with a high degree of effectiveness
Communication - The conveying of meaning through various forms				
Communication of information about organ systems using an interactive method	The student: • communicates information about organ systems using an interactive method with limited effectiveness	The student: • communicates information about organ systems using an interactive method with some effectiveness	The student: • communicates information about organ systems using an interactive method with considerable effectiveness	The student: • communicates information about organ systems using an interactive method with a high degree of effectiveness
Application - The use of knowledge and skills to make connections within and between various contexts				
Application of knowledge of organ systems, relationship to other systems, diseases affecting the system and demonstrating respect for creation	The student: • applies knowledge of organ systems, relationship to other systems, diseases affecting the system and demonstrating respect for God's with limited effectiveness	The student: • applies knowledge of organ systems, relationship to other systems, diseases affecting the system and demonstrating respect for God's creation with some effectiveness	The student: • applies of organ systems, relationship to other systems, diseases affecting the system and demonstrating respect for God's creation with considerable effectiveness	The student: • applies knowledge of organ systems, relationship to other systems, diseases affecting the system and demonstrating respect for God's creation with a high degree of effectiveness
Transfer of knowledge of organ systems to showing respect for God's creation	The student: • transfers knowledge of organ systems to showing respect for God's creation with limited effectiveness	The student: • transfers of organ systems to showing respect for God's creation with some effectiveness	The student: • transfers knowledge of organ systems to showing respect for God's creation with considerable effectiveness	The student: • transfers knowledge of organ systems to showing respect for God's creation with a high degree of effectiveness
Making connections between science, technology, society, and the environment understanding the need to demonstrate respect for our bodies	The student: • makes connections between science, technology, society and the environment through an understanding of the need to demonstrate respect for our bodies with limited effectiveness	The student: • makes connections between science, technology, society and the environment through an understanding of the need to demonstrate respect for our bodies with some effectiveness	The student: • makes connections between science, technology, society and the environment through an understanding of the need to demonstrate respect for our bodies with considerable effectiveness	The student: • makes connections between science, technology, society and the environment through an understanding of the need to demonstrate respect for our bodies with a high degree of effectiveness

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Proposing courses of practical action to handle social, environmental and technological influences on how we treat our bodies	The student: • proposes courses of practical action to handle social, environmental and technological influences on how we treat our bodies with limited effectiveness	The student: • proposes courses of practical action to handle social, environmental and technological influences on how we treat our bodies with some effectiveness	The student: • proposes courses of practical action to handle social, environmental and technological influences on how we treat our bodies with considerable effectiveness	The student: • proposes to handle social, environmental and technological influences on how we treat our bodies with highly effective courses of practical action