An Inquiry-Oriented Approach to Teaching the Human Organ Systems Unit to Diverse Grade 5 Students

Written by Liliana Alexandra Theodorescu

The development of "the skills, strategies, and habits of mind required for scientific inquiry and technological problem solving" (Ontario, 2007, p.3,11) is one of the three overarching goals of the Science and Technology Ontario Curriculum (2007). This is expected given that the process of inquiry is closely linked to "the nature of science," which is an "empirical data-driven pursuit" that involves no unique exploratory method but "many idiosyncratic ways of approaching research and even of coming up with research problems in the first place" (McComas, 2004, p.25).

Broadly, scientific inquiry designates "the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work," alongside "the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world" (National Research Council, 1996, p.23). The Ontario Curriculum identifies two subjacent skill areas or types of inquiry skills, namely experimentation skills and research skills (Ontario, 2007, pp.11-16), which are detailed and contextualized in each unit.

The imperative to incorporate some level of inquiry into science teaching and learning may nonetheless seem daunting for Teacher Candidates entering their practicum placements, especially considering the need to accommodate a large variety of learning needs. In other words, one subsequent challenge of planning an inquiry-oriented unit is to integrate it with principles of differentiated teaching.

In tackling science inquiry, one chief difficulty stems from the multitude of definitions and interpretations of the concept. However, this can also be construed as an advantage: once one understands that "inquiry is polymorphous," "can exist solely as a minds-on investigation utilizing the Internet, research literature, and other resources," or "it can exist as a combination minds-on and hands-on activity" (Llewellyn, 2011, pp.3-4), then the possibilities to design and differentiate inquiry-based learning expand, and the teacher's task seems less unsettling. Such flexible approach to inquiry makes it easier to overcome the limited resources and technology available in Ontario classes.

Differentiation can be defined as the pedagogical approach "in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom" (Tomlinson & al., 2003, p.121); thus, differentiation ultimately serves the purpose of an inclusive education.

Llewellyn (2011) uses an inquiry grid that locates the source of the question and procedure and thus illustrates a gradual release of responsibility from teacher to student. He identifies four frequent categories of approaches to inquiry:

Demonstrated Inquiry or Discrepant Event	**Structured Inquiry**	**Guided Inquiry or Teacher-Initiated Inquiry**	**Self-Directed Inquiry or Student-Initiated Inquiry**
Teacher acts as a *motivator*: poses the question, plans the procedure, and analyses the results.	Teacher acts as a *coach*, "calling the directions of the activity" (p.18). Teacher poses the question, plans the procedure. Students analyse the results.	Teacher "assumes the role of a *facilitator* or *peer investigator*". Teacher poses the question. Students plan the procedure and analyse the results.	Teacher's role is that of a *mentor* or *"guide on the side"*. Students pose the questions, plan the procedures and analyse the results.
Adapted from Llewellyn, 2011, pp.11-21			

Depending on the classroom assessment, the teacher may opt for one type of inquiry, or, using a differentiated inquiry approach, can design "multiple or tiered levels of guidance and structure so that each learner has an opportunity to choose a level that is developmentally appropriate for his or her particular learning style" (Llewellyn, 2011, p.29).

In my practicum placement, I needed to plan the Human Organ Systems unit for diverse Grade 5 students, including English-language learners (ELLs). As shown in the figures at the end of the article, I used a combination of minds-on and hands-on inquiry-oriented tasks, which allowed all students the opportunity to develop both experimentation and research skills.

"Ages 10–14 mark a period in which children develop a strong sense of whether science is 'for them'" (Bonnette, Crowley, & Schunn, 2019, p.1). As "the one aspect of science that has remained constant [over time] is the importance of a scientific attitude: curiosity, wonder, a critical disposition, honesty, integrity, and healthy scepticism" (Wellington, 2001, pp.36-37), my chief objective was to create an exciting student-centred unit so that students would be enabled to enjoy science, and develop a scientific "growth mindset" (Dweck, 2006). We opened the unit with a read-aloud of JoAnn Deak's *Your Fantastic Elastic Brain* (2010), followed by a scavenger hunt and "Human Body Battle" or "What Am I?" games aimed to serve as a curiosity activation and a diagnostic assessment.

Using a "backward design" planning framework (Wiggins & McTighe, 2005), I started from the unit's big ideas and objectives, including the double goal of cultivating experimentation and research skills. An overview of the curriculum goals is provided in the **Appendix**. To foster collaboration and engage students in an equally fun and inquiry-oriented learning activity, we decided that one of the "big" activities introduced early and carried out throughout the unit

would be a group-project of building a life-size human body model. We resorted to heterogeneous instructional grouping, taking into account language buddies (who share the same home language but are at different levels of English language proficiency), aiming to improve both their science and language literacy skills.

> Another principle that needs to be considered when planning, for the instruction to be effective, is that *there must be some aspect of choice for the student*, "in terms of the details of the learning task, the ways the task can be carried out and how the task is assessed" (Ontario, 2008, p.2)

For the culminating task, students worked on a structured or guided inquiry research project, where choice was incorporated in the task, and scaffolded graphic organizers were provided whenever needed to make the inquiry more or less structured. For several examples of culminating tasks, see **Figure-1**.

To facilitate differentiation and inclusion through a multi-modal approach, and to make the most of the limited resources available, we implemented a rotating learning stations model, with 5-6 activity centres dedicated to one organ system in-focus at a time. Thus, students were presented "with a choice of learning experiences at various levels of difficulty" and, through peer-teaching and -assessment (assessment *as* learning), they "gain[ed] valuable leadership skills and confidence" (Schwartz & Pollishuke, 2018, p.122). For a list and brief description of the activity centres, see **Figure-2**. Each group of students spent, on average, one period per activity station and 5-6 periods would be needed for each

> "Organizing a classroom into activity centers is important because such an organization allows the teacher to responsively instruct and assist small groups of students - the most effective classroom organization for teaching and learning. Activity centers also facilitate the development of a classroom community that supports all students' learning […]." (Hilberg., Chang, Epaloose, 2003, p.1)

organ system in focus. Such exploratory centres encourage active participation, collaboration, self- and peer-assessment, and extended opportunities for critically-driven inquiry and research. Most importantly, activity centres allowed the teacher to work closely with one group at a time, either for explicit instruction or for experiment supervision. One station was always dedicated to hands-on experiments. Several examples of experiments are outlined in **Figure-3**.

Given the extensive content and the academic language demands of science, we felt it was crucial to teach the unit in a cross-curricular and integrated manner, so as to strengthen the relevance of some topics and maximize the time allotted for science learning beyond the short periods prescribed in the school calendar. Connections with both Literacy and Health and Physical Education were easily drawn. On the one hand, ELLs acquired elements of scientific vocabulary and procedural or expository texts, which significantly improved their understanding of the unit's content. On the other hand, articles related to the scientific content being learned (e.g., the dangers of smoking or teen vaping, or of certain diets) would be read and discussed by all students. For a list of suggested cross-curricular connections, see **Figure-4.**

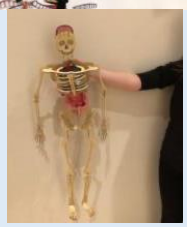
> "As they engage in scientific inquiry, students are frequently invited to generate questions, make predictions, formulate hypotheses, and generate explanations of their hypotheses or findings. These practices once again provide rich opportunities for language exploration. [...] [T]eachers can ask questions designed to evoke predictions and also model some common expressions of prediction in response to these questions. As they participate in these dialogues over time, students will develop the ability to ask these questions of one another. Teachers can also model for ELLs the most common grammatical structure for writing a hypothesis, which is similar to more general cause and effect reasoning." (Cummins & Early, 2015, p.93)

Lastly, the Human Organ Systems unit offers teachers a great opportunity to practise a flexible approach to inquiry through both experimentation and research projects, and using activity centres helps make the learning experience effective and engaging for all students.

Figure 1

Inquiry-Oriented Culminating Performance Tasks	
Research project	**Choice at the level of:**
Organ system presentation material for a doctor's waiting room	- topic: organ system or organ in focus; - will include the answer to at least one question posed by the student with regard to the chosen organ system; - type of product: brochure, three-fold pamphlet, poster, a scientific story, a 3D model or tri-folder; - can be either handwritten and hand drawn, or created on a computer, or using a combination of the two or a collage; - language used in the research process E.g.: ELL students can use their home language for research and drafting ideas; translanguaging strategies are used (Preview-View-Review); translation tools (picture/bilingual dictionaries and glossaries); speech-to-text app (Know Your Body Lite Edition), home language on the cards along with photos, etc.
Impact of disease, environment and technology on organ systems – presentation for a medical conference	- topic: a disease or disorder and the organ system it impacts (selected from a list provided by the teacher); - type of format: PowerPoint / Google slides / Prezi presentation; - language used in the research process.
Inquiry project booklet - scaffolded to take the students through each step of the inquiry project. E.g.: 1. choosing a topic – organ system; 2. activate knowledge; 3. preliminary research to come up with inquiry questions; 4. formulate specific guiding questions; 5. complete research while drafting ideas; 6. edit the booklet; 7. class presentation; 8. peer-assessment (two stars and one wish); 9. self-assessment.	- topic and inquiry questions: students choose an inquiry topic and ask three "thick" questions related to its functioning, factors influencing its health, diseases. The teacher approves of the topic/inquiry questions before students start their final research work. Students are guided throughout the stages of the inquiry-based research project. - language used in the research process.

Figure 2

Learning Stations / Activity Centres	
StationFocus	**Activity Description**
#1 Hands-on experiments	Under teacher's supervision, students conduct hands-on experiments related to the organ system being taught. *  * As an alternative to having an experiment station, all experiments may be conducted during a 3-period lesson after the systems have been introduced to the students. Additionally, *Scientists in School* may be invited if the initiative fits in the plan for the year.
#2 Working on the life-size human body model	Working as a group, students complete the organ system model (corresponding to the organ system being taught) for the full-size human body model: shared reading of assigned informative passages on organ systems; group discussion of the learnings; summarizing the information and writing it on the organ outlines. As students advance through the unit and learn about various organ systems, finalized systems are added one by one to their model. It is a great tool for assessment *as* learning: students will receive peer feedback from their group members, and they will improve their own work so that the group's human body model achieves the success criteria of scientific accuracy, detail, and neatness.   
#3 Podcasts & Human Body Puzzles and Games  	Students listen to a podcast on the organ system (or on a disease / disorder affecting it, a medical technology, factors influencing it, etc.) and jot down notes about the ideas or scientific facts presented in the podcast, using scaffolded graphic organizers. Then, the students share their learnings (notes) with their group members. Besides the organizer(s), students are also given a transcript of the podcast, and ELLs get a translation of the transcript. Few examples of Podcasts: - *Professor Hallux Builds a Body – Dazzling Digestion* https://www.funkidslive.com/learn/hallux/builds-a-body/dazzling-digestion/# - Liver and Pancreas (Physiology Fix-up) https://omny.fm/shows/fun-kids/liver-and-pancreas-more-physiology-fix-up?in_playlist=fun-kids!professor-hallux-builds-a-body

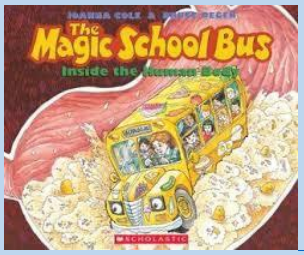
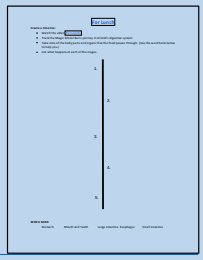
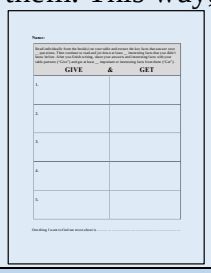
	- Respiratory System (More Physiology Fix-up) https://omny.fm/shows/fun-kids/respiratory-system?in_playlist=fun-kids!professor-hallux-builds-a-body#description - Blood Cells: https://omny.fm/shows/fun-kids/blood-cells-more-physiology-fix-up?in_playlist=fun-kids!professor-hallux-builds-a-body - Heart: https://omny.fm/shows/fun-kids/heart?in_playlist=fun-kids!professor-hallux-builds-a-body\ Then, the group members do a puzzle or play a game related to the organ system that is found in the bin on the table (regular 2D and 3D puzzles, jigsaw, clue games, etc.).
#4 Watch a video and check your understanding. Come up with 1-2 questions you want to find answers to.	Students watch on computer(s) or iPad(s) an assigned video about the organ system and use graphic organizers created and provided by the teacher to complete an activity based on the video to jot down notes about things they learned from the video. Students come up with their own questions for further research. ELLs are provided sentence frames or starters for their inquiry questions. Examples: *For Lunch - Magic School Bus* video: https://www.dailymotion.com/video/x6tx7y5 *How the Body Works – the digestive system:* https://kidshealth.org/en/kids/bodymovies.html?WT.ac=en-k-htbw-main-page-a  
#5 Researching information / questions about the organ systems. Give & Get.	Students ask questions and research information about the organ systems using a selection of books and articles. The inquiry can be self-directed, guided or structured. As they read, students complete a Give & Get activity. Each participant writes key facts or ideas from the readings that answer their questions. Then they share them, one by one, with the other group members in exchange for the learnings extracted by them. This way, they multiply their learnings.  
#6 Teacher conferences	Teacher works closely with small groups or individual students (direct instruction model, assessment, etc.).

Figure 3				
Lab Station: Hands-on (Manipulative) Inquiry – Experiments				
Organ System	**Type of Inquiry**	**Experiment Focus**	**Research Question**	**Materials Needed**
1. Digestive	Demonstrated/ Structured	The journey of food (Modelling or recreating the digestive process in the classroom using household items.)	What happens at each stage of the digestive process? How is food processed by our body?	Paper cups (large intestine), sealable Plastic bag (stomach), One leg from a pair of tights (small intestine); Tray (the body); Water (saliva); Orange juice or vinegar (the acid in the stomach); Crackers and banana (food); Large tray (to keep the area clean); Goggles; Gloves.
	Structured/ Guided	The role of saliva	What happens in our mouth or stomach? What is the role of saliva? What happens when we remove saliva from our tongues before eating? What happens to a cracker and its taste when held in your mouth for 2 to 3 minutes?	Crackers; Paper towel; Water; Stirring stick; Small zippered plastic bag; Plastic cups
2. Circulatory	Structured/ Guided	Measuring the Heart Rate	How does activity affect heart rate? How does heart rate respond to different types of activity?	Stop watches; Graph paper (Alternatively: clay, toothpick)
		Thermoregulation of body temperature (depending on distance from the heart)	How does temperature vary on different parts of your body?	Thermometer / fast-response temperature sensor; Data collection sheet; Chair (for students to be sit)
3. Respiratory	Structured/ Guided	The mechanics of the respiratory system	How does the diaphragm control the lungs?	2 Balloons; Empty medium plastic bottle

			How do we breathe? How do lungs expand?	Rubber band; Straw/tube; Scissors; (Possibly play dough)
4. Nervous	Structured/ Guided/ Self-directed	Measuring the Reaction Time	What's your reaction time? Who has the fastest reaction time?	Ruler; Data sheet; Chart paper; Pencil / Markers; Friends
General comment: Experiments can be adapted for the level of inquiry and scaffolding, depending on student levels, and time and resources constraints.				
Sources (modelling, instructions for the experiments)				

1) The Journey of Food:
https://www.stem.org.uk/resources/elibrary/resource/35396/digestive-system-experiment#&gid=undefined&pid=1
https://www.nelson.com/literacy/5/uniflips/NL5%20GIRK%20Uniflip/document.pdf

The Role of Saliva:
https://classroom.synonym.com/digestive-system-experiments-kids-7906821.html

2) Measuring the Heart Rate / "The Beat Goes On":
https://www.teachengineering.org/activities/view/cub_human_lesson05_activity2
https://www.scientificamerican.com/article/bring-science-home-heart-rate-excercise/
https://www.sciencebuddies.org/science-fair-projects/project-ideas/Sports_p006/sports-science/heart-rate-change-with-exercise#procedure
http://www.projecthealthyschools.org/involved/pdf/lesson5.pdf
https://classroom.kidshealth.org/classroom/3to5/body/systems/cardiovascular.pdf
http://www.phschool.com/science/biology_place/labbench/lab10/intro.html

Thermoregulation of Body Temperature:
https://d2n0lz049icia2.cloudfront.net/lab_experiment/c_3/10_Thermoregulation_Of_Body_Temperature.pdf

3) The mechanics of the respiratory system
https://www.sciencebuddies.org/stem-activities/lung-model
https://www.science-sparks.com/breathing-making-a-fake-lung/

4) Measuring the Reaction Time:
https://www.youtube.com/watch?v=81lPJtAp5Sc
https://www.youtube.com/watch?v=3vGwbB7TTuM
https://www.science-sparks.com/test-your-reaction-time/
https://humanbenchmark.com/tests/reactiontime

If Scientists in School can be invited, they provide very good workshops with demonstrations and structured inquiries for the Human Body unit, and represent a solution to the potential lack of resources for conducting experiments in the regular classrooms.

Safety Measures:

- Closely monitor the station where the hands-on experiments are conducted. For the experiments related to heart rate changes, breathing, and body temperature, as a result of exercise and resting, follow the regular safety procedures for physical activities and continuously monitor students for any physical discomfort that could affect their ability to perform the activity.
- During the experiments related to the digestive system (mainly mouth and stomach), in which crackers, tissues, water, orange juice or vinegar are used, ensure safety goggles, gloves, trays are used so that spillage will not result in any hazards and germs will not be spread. Avoid using items that can trigger an allergic reaction.
- As an additional safety precaution, in the Thermoregulation experiment, the fast-response temperature sensor should be placed only on those areas specified in the activity (e.g., earlobe, tip of index finger, nose, ankle).

Figure 4	
Possible Connections for Cross-curricular and Integrated Learning	
Subject / Strand	**Examples**
Health & Physical Education: Healthy Living strand D2. Making Healthy Choices Active Living strand B2. Physical Fitness B3. Safety	- Healthy Eating (The Canada Food Guide): E.g.: healthy plate / healthy diet project and presentation; - Substance Use, Addictions and Related Behaviours E.g.: class discussion; guided or student-initiated inquiry about smoking and alcohol abuse and their impact on the health of the organ systems; statistics, etc. - Connection with the scientific experiments for the circulatory and respiratory systems
Literacy (Oral communication; Reading; Writing; Media Literacy)	- Pre-teaching academic vocabulary associated with the science unit as an accommodation for ELLs; - Teaching grammatical patterns and scientific text features; - Teaching how to visualize information, and identify important ideas; - Classifying and organizing ideas; - Reading, analysing, writing non-fiction expository texts; - Research: gather information to support ideas for writing; - Producing media texts for specific purposes and audiences (may be incorporated in the culminating project tasks). By teaching science and literacy in an integrated manner, ELLs acquire elements of scientific vocabulary and procedural or expository texts, which significantly improve their understanding of the unit's content. Articles related to the scientific content being learned (e.g., the dangers of smoking or teen vaping, or of certain diets) would be read and discussed by all students.
Mathematics Data Management	- Connection with the heart rate experiment: e.g.: Collect data regarding heart rates (beats per minute) in connection with various types of physical exercise. Use two types of graphs to illustrate some of the data collected (e.g., a comparison of maximum heart rates); - Connection with a potential data management culminating task – survey project (come up with survey questions on health-related topics and collect and analyse data).
Social Studies	- The inquiry process, social issues – e.g., healthcare policies; - Connection with science curriculum expectations 1.1, 1.2.
French	- Practice French-language vocabulary related to body parts, healthy eating and living, etc.
Visual Arts	- While the science unit does not exactly fit the arts curriculum, the organ systems can be drawn and human body shapes can be drawn in Art classes using elements of design.
Drama Creating and Presenting (B1.1, B1.3)	- Creating and presenting a skit or a role on a topic related to the learning in the science unit (e.g., the role of a government representative who discusses the impact of smoking; a skit that illustrates the journey of food, etc.).

Cross-curricular / Integrated learning – Literacy goals (expectations) that this science unit connects to

Oral communication

2.3 Communicate orally in a clear, coherent manner, presenting ideas, opinions, and information in a readily understandable form (e.g., present an argument that has a clearly stated purpose, point-by-point development, and relevant supporting details).

2.7 Use a variety of appropriate visual aids (e.g., posters, charts, maps, globes, computer-generated organizers) to support or enhance oral presentations.

Writing

1.3 Research: Gather information to support ideas for writing, using a variety of strategies and a range of print and electronic resources (e.g., identify and use graphic and multimedia sources; keep a record of sources used and information gathered).

1.4 Classifying ideas: Sort and classify ideas and information for their writing in a variety of ways *(e.g., by underlining or highlighting key words or phrases; by using a graphic organizer)*

1.5 Organizing ideas: Identify and order main ideas and supporting details and group them into units that could be used to develop several linked paragraphs, using a variety of strategies *(e.g., making jot notes; following a framework)* and organizational patterns *(e.g., chronological order, comparison, cause and effect)*

1.6 Review: Determine whether the ideas and information they have gathered are relevant, appropriate, and adequate for the purpose, and do more research if necessary.

2.8 Producing drafts: Produce revised, draft pieces of writing to meet identified criteria based on the expectations related to content, organization, style, and use of conventions.

Media literacy

1.3 Responding to and evaluating texts: express opinions about ideas, issues, and/or experiences presented in media texts, and give evidence from the texts to support their opinions

1.5 Point of view: identify whose point of view is presented or reflected in a media text, ask questions to identify missing or alternative points of view, and, where appropriate, suggest how a more balanced view might be represented *(e.g., this documentary about various athletes does not include athletes who have physical disabilities; another character could be included to represent their experience)*

3.4 Producing media texts: produce a variety of media texts for specific purposes and audiences, using appropriate forms, conventions, and techniques

References

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Teaching Resources

- The Magic School Bus videos:

https://www.dailymotion.com/video/x6tx7y5

- Podcasts: Professor Hallux builds a body

https://www.funkidslive.com/learn/hallux/builds-a-body/

- BrainPOP Body Systems (transcripts of videos are available; however, one needs an account and a password, but many schools have them):

https://www.brainpop.com/health/personalhealth/bodysystems/

https://www.brainpop.com/health/bodysystems/digestivesystem/

- Various resources (videos, activities, quizzes, word finds)

https://kidshealth.org/en/kids/center/htbw-main-page.html?WT.ac=k-nav-htbw-main-page

- Information, articles, quizzes:

https://www.ducksters.com/science/biology/humanbody.php

- Nelson Guided and Independent Reading Kit:

https://www.nelson.com/literacy/5/uniflips/NL5%20GIRK%20Uniflip/document.pdf

- Explanatory lesson videos:

https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems

- Articles:

https://newsela.com/

- Instructions/ demonstrations for experiments:

1) The Digestive System

    a) The Journey of Food:

https://www.stem.org.uk/resources/elibrary/resource/35396/digestive-system-experiment#&gid=undefined&pid=1

https://www.nelson.com/literacy/5/uniflips/NL5%20GIRK%20Uniflip/document.pdf

b) The Role of Saliva, etc.:

https://classroom.synonym.com/digestive-system-experiments-kids-7906821.html

2) The Circulatory System:

a) Measuring the Heart Rate / "The Beat Goes On":

https://www.teachengineering.org/activities/view/cub_human_lesson05_activity2

https://www.scientificamerican.com/article/bring-science-home-heart-rate-excercise/

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Sports_p006/sports-science/heart-rate-change-with-exercise#procedure

http://www.projecthealthyschools.org/involved/pdf/lesson5.pdf

https://classroom.kidshealth.org/classroom/3to5/body/systems/cardiovascular.pdf

http://www.phschool.com/science/biology_place/labbench/lab10/intro.html

b) Thermoregulation of Body Temperature:

https://d2n0lz049icia2.cloudfront.net/lab_experiment/c_3/10_Thermoregulation_Of_Body_Temperature.pdf

3) The Respiratory System (a lung model / how the diaphragm controls the lungs):

https://www.sciencebuddies.org/stem-activities/lung-model

https://www.science-sparks.com/breathing-making-a-fake-lung/

4) The Nervous System:

https://www.youtube.com/watch?v=3vGwbB7TTuM

https://www.science-sparks.com/test-your-reaction-time/

https://www.youtube.com/watch?v=81lPJtAp5Sc

https://humanbenchmark.com/tests/reactiontime

- Teaching / planning materials:

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Deak, J. A. (2010). *Your Fantastic Elastic Brain.*Naperville, Illinois: Little Pickle Press.

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Appendix

The Curriculum Expectations for the Grade 5 Human Organ Systems Unit at a Glance

Understanding Life Systems - Fundamental Concepts:

Systems and Interactions: A system is a collection of living and/or non-living things and processes that interact to perform some function. A system includes inputs, out-puts, and relationships among system components. Natural and human systems develop in response to, and are limited by, a variety of environmental factors

Structure and Function: This concept focuses on the interrelationship between the function or use of a natural or human-made object and the form that the object takes.

BIG IDEAS
(enduring understandings)

Choices we make affect our organ systems and, in turn, our overall health.

(Overall expectations 1 and 3)

Organ structures are linked to their functions.

(Overall expectations 2 and 3)

Organ systems are components of a larger system (the body) and, as such, work together and affect one another.

(Overall expectations 2 and 3)

Systems in the human body work together to meet our basic needs.

(Overall expectations 2 and 3)

Goal 1
To relate science and technology to society and the environment

Goal 2
To develop the skills, strategies, and habits of mind required for scientific inquiry and technological problem solving

Goal 3
To understand the basic concepts of science and technology

Overall expectation 1: Analyse the impact of human activities and technological innovations on human health.

Overall expectation 2: Investigate the structure and function of the major organs of various human body systems.

Overall expectation 3: Demonstrate an understanding of the structure and function of human body systems and interactions within and between systems.

Specific expectation 1: Relating science and technology to society and the environment

1.1 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

1.2 evaluate the effects, both beneficial and harmful, of various technologies on human body systems, taking different perspectives into account (e.g., the perspectives of the developers of the technologies, advertisers, children and young people, parents)

Specific expectation 2: Developing investigation and communication skills

2.1 follow established safety procedures for physical activities

2.2 use scientific inquiry / experimentation skills to investigate changes in body systems (e.g., heart rate, breathing, body temperature) as a result of physical activity (e.g., exercise, resting, eating)

2.3 design and build a model to demonstrate how organs or components of body systems in the human body work and interact with other components (e.g., build a model that shows how muscles, bones, and joints in the human bodywork together as a system to allow movement of the arms or legs; build a model to show how the lungs and heart work as a system)

2.4 use appropriate science and technology vocabulary, including circulation, respiration, digestion, organs, and nutrients, in oral and written communication

2.5 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., create labelled charts or graphs to show changes in heart rate and breathing as a result of exercising)

Specific expectation 3: Understanding basic concepts

3.1 identify major systems in the human body(e.g., musculoskeletal system, digestive system, nervous system, circulatory system) and describe their roles and interrelationships

3.2 describe the basic structure and function of major organs in the respiratory, circulatory, and digestive systems (e.g., we have two lungs; each one is about 25 – 30 cm long and cone-shaped; the right lung is slightly bigger because it has three lobes and the left lung has only two; our lungs are responsible for gas exchanges)

3.3 identify interrelationships between body systems (e.g., the respiratory system provides oxygen and removes carbon dioxide for the circulatory system)

3.4 identify common diseases and the organs and/or body systems that they affect (e.g., epilepsy affects the brain [central nervous system]; appendicitis affects the appendix [digestive system]; asthma and emphysema affect the lungs [respiratory system]