Holyoke Public Schools
Middle School Science
Curriculum Map
Grade 7
The Human Body
Unit #1

August 2009
Overview of Curriculum Maps

Goals:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade
2. To have consistent instruction and assessment district wide
3. To prepare students for the MCAS test
4. to explain what is expected to be covered in each Science unit of study

Expectations:

The district’s expectation is for students to successfully meet the Massachusetts Science and Technology/Engineering Standards, through the use of the English Language Proficiency Benchmarks and Outcomes (ELPBO) to support instruction for English Language Learners (ELLs). Strategies for teaching ELLs are good teaching practice for all learners. In order to help facilitate this teachers are required to follow curriculum maps.

Feedback to Students:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during the workshop, and written responses to students’ work and notebook entries.

Resources: Prentice Hall Science Explorer: Human Body and Health

Student Text, Student Edition on Audio CD, Teacher’s Edition, 4 Color Transparencies

All-in-One Teaching Resources

Blackline masters, teaching support, and answer keys are organized by chapter.

TeacherEXPRESS

(4 CD-ROM Set) contains lesson management software, an Interactive Teacher’s Edition, correlates to state and local standards, and instructional tools.

Differentiated Instruction

Guided Reading and Study Workbook, Adapted Reading Study Workbook, & Adapted Tests

Extension Project: (for students who would like to do extra credit or want to learn more deeply on their own time).

Students create a paper model of the human body from the Body Book, Scholastic Inc.
The five essential practices for teaching English language learners are practices developed by America's Choice to support the literacy needs of ELL students. These practices are a result of current second language acquisition research, literacy development, and effective classroom practices. (*America's Choice: Teaching English Language Learners: Literacy*)

<table>
<thead>
<tr>
<th>Essential Practice 1</th>
<th>Classroom Applications</th>
</tr>
</thead>
</table>
| Develop Oral Language through Meaningful Conversation and Context. | • Develop oral language through meaningful conversation by planning language experiences and building consistent time to engage conversation.  
• Enunciate and rephrase difficult works allow extra time for practice and repetition.  
• Demonstrate and orally explain activities step-by-step. Rephrase difficult instructions  
• Use think-alouds. Verbally share the comprehension thought process.  
• Provide opportunity for practice: allow extra time for practice and repetition in oral, reading, and writing activities with appropriate feedback.  
• Allow students to respond through Turn and Talk activities, oral, choral reading and re-reading.  
• Use audio recording of a text to provide extended literacy opportunities where students listen to the reading of a text independently while developing fluency, accuracy, and language acquisition.  
• Plan daily read-alouds to model literacy strategies and to scaffold fluency, accuracy, and independent reading. |

Oral language is the foundation of literacy and a main tool for learning and interacting in both academic and social settings. Natural exposure and planned experiences with oral language facilitates increases in expression and understanding of the second language. Oral language also supports vocabulary development in context, paving the way for better comprehension and production. Exposure to rich oral and written language environments is vital for developing literacy and language skills.
<table>
<thead>
<tr>
<th>Essential Practice 2</th>
<th>Classroom Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teach Targeted Skills through Contextualized and Explicit Instruction</td>
<td>• Use clues of context to make instruction meaningful. Teach skills and strategies using materials, books or writing that students know and understand</td>
</tr>
<tr>
<td></td>
<td>• Use Big Books or shared reading to teach phonics, vocabulary and language features.</td>
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<tr>
<td></td>
<td>• Use student or teacher writing models to teach craft, spelling, and language use conventions.</td>
</tr>
<tr>
<td></td>
<td>• Teach phonemic awareness within a context. ELL children must attach meaning and experience to phonemes they may never have heard before. Teach phonemic awareness while explicitly teaching vocabulary, meaning, or within-a-story context.</td>
</tr>
<tr>
<td></td>
<td>• Understand the linguistic background native language and address these issues specifically.</td>
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<tr>
<td></td>
<td>• Pay special attention to sounds of letters. Languages have different linguistic features. For example, while the vowel sounds in English vary, Spanish vowel sounds are consistent. Students will transfer what they know about one language and automatically, and sometimes incorrectly, apply it to English.</td>
</tr>
<tr>
<td></td>
<td>• Use meaningful activities to teach phonemic awareness, such as language games, Word Walls, word banks, songs, poems, and rhymes that focus on particular sounds or letters.</td>
</tr>
</tbody>
</table>

Full literacy is a fluid combination of oral, reading, and writing skills. These skills must be taught through explicit and contextualized instruction that scaffolds learning. Contextualized instruction provides students with extra linguistic clues that support understanding not only of the content but also of the language being used in the lesson. Combining contextualized practices with the knowledge of phonemic awareness, phonics skills, language structures and functions, text patterns, and literary devices such as metaphors, analogies, figurative language, and unfamiliar cultural concepts, will aid students in achieving stronger literacy skills. Explicit skills give the students the tools they need to comprehend increasingly complex literacy demands.
<table>
<thead>
<tr>
<th>Essential Practice 3</th>
<th>Classroom Applications</th>
</tr>
</thead>
</table>
| **Build Vocabulary through Authentic and Meaningful Experiences with Words** | - Vocabulary development must be taught intentionally. Since word knowledge correlates with reading comprehension and meaning-making strategies used in decoding, it must be a focus for instruction.  
- Vocabulary development must be taught in context. Connect word knowledge with background knowledge and instructional context. ELL students need both meaning and context to acquire new vocabulary.  
- Facilitate and plan activities that support the three main ways vocabulary is learned:  
1. Through meaningful conversations with adults and other students.  
2. Listening to adults read at slightly higher levels than the student’s independent level.  
3. Read extensively on their own at their reading level.  
- Pre-teach vocabulary words, prefixes/suffix, context clues, and cognates. Build students' skill box with vocabulary and give them tools to understand and connect new vocabulary.  
- Use content Word Walls or word webs. Support cognitive structuring for ELLs by connecting new vocabulary to themes, ideas, or generalizations.  
- Explicitly focus on and teach academic language. Students need to be consistently exposed to formal or content specific language and vocabulary.  
- Explicitly teach the building blocks of language. Students need to learn the connecting and transition words of the English language ("however," "in conclusion", etc.) Teach them in context and teach them explicitly.  
- Focus teaching Tier 2 words, as well as essential Tier 1 words. Although most explicit vocabulary instruction should focus on Tier 2 words (words with a high frequency in the written language, example: examine), ELLs need instruction around Tier 1, or basic spoken words as well. |

Developing and deepening a student’s understanding of new words is essential for English language learners. Building vocabulary in the context of literature, experiences, and modeled writing ensures that students will own the new words they encounter. Vocabulary building is a lifelong process and students must learn ways to integrate and approach new and challenging words. Discussing, playing with, and using new words allows students to gain new vocabulary through meaningful, and therefore memorable, experiences.
<table>
<thead>
<tr>
<th>Essential Practice 4</th>
<th>Classroom Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build and Activate Background Knowledge</td>
<td>• Elicit student’s experience and comments. Connect school, literary and personal events through talking, writing, and reading.</td>
</tr>
<tr>
<td>Learning is based on establishing neural connections in the brain, drawing on previous experience, background knowledge, and prior and current environments. It is both the teacher's and the student's job to facilitate these connections in order to construct meaning and understand new ideas and concepts while expanding on their own world knowledge. Actively fostering these connections will enable students to more easily interpret their surroundings and assign meaning to new concepts while expanding their own</td>
<td>• Consider the cultural background of students when selecting literacy materials such as books and poems. Support language development of Ell students by giving them new English words for experiences that are close to home. Using materials that represent their cultural background increases motivation and supports participation.</td>
</tr>
<tr>
<td></td>
<td>• Discuss and build language around universal themes. Connect new language to universal experiences.</td>
</tr>
<tr>
<td></td>
<td>• Build content-based word banks and webs. Connect new language to other known words, experiences, and ideas to support cognitive structuring.</td>
</tr>
<tr>
<td></td>
<td>• Use native language and value home culture. View home cultures as a resource, rather than a liability.</td>
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<tr>
<td></td>
<td>• Use hands-on experience based instruction in all academic areas. Language can be built upon common classroom experiences.</td>
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<tr>
<td></td>
<td>• Encourage students to make connections before, during and after reading/</td>
</tr>
<tr>
<td></td>
<td>• Find out what students know, and build on their experience.</td>
</tr>
<tr>
<td>Essential Practice 5</td>
<td>Classroom Applications</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| **Teach and Use Meaning-Making Strategies**  
Intentionally teaching meaning-making strategies provides students with a toolbox to approach future learning challenges. Meaning-making strategies vary from helping students comprehend text to various strategies students can use to understand English-dependent lessons. Modeling appropriate behaviors to students gives them the tools to be autonomous learners and supplies them with options they can use to interpret environmental input, both academically and socially. | - Explicitly teach student meaning-making strategies. Model for students how to visualize, make connections, monitor for meaning, determine importance, etc.  
- Provide opportunities for practice. Sustain daily work periods in reading and writing for students to practice these strategies.  
- Systematically assess students and adjust instruction. Monitor progress and use data to adjust the focus of mini-lessons, conferences and small-group instruction.  
- Model activities and thinking for certain skills. Students need to see and experience what is expected of them before they perform a task.  
- Beginning ELLs need more than just phonics and English Language Development instruction. **EXPOSE STUDENTS RIGHT AWAY TO COMPREHENSION STRATEGIES.** Waiting to address skills in chronological order hinders academic growth and English proficiency.  
- Teach students how to help themselves in English-dependent lessons. Model your thinking and how you approach problems. Build students cognitive toolbox by explicitly teaching the ways to help themselves during difficult language situations. |
Engineering Unit Project: Design and Build a Hand Prosthesis

Massachusetts Science and Technology/Engineering Standards

TE#1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).

TE#2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.

TE#7.1 Explain examples of adaptive or assistive bioengineered products, e.g. prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, braces.

Students will design, build, and test a replacement for a human hand.

The prosthesis must:

• Grasp and lift a variety of objects
• Be activated by pulling a cord or string
• Spring back when the cord is released

Students’ designs must be approved by the teacher before they build and test their designs.

Students will begin work on this project about the fourth week, and will have time each week to work on this project.

Design and build a hand prosthesis, Prentice Hall Science Explorer: Human Biology and Health, p 5
Hand Prosthesis Project Rubric

<table>
<thead>
<tr>
<th>Parts</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td></td>
</tr>
<tr>
<td>• turned in on time</td>
<td></td>
</tr>
<tr>
<td>• followed directions given</td>
<td></td>
</tr>
<tr>
<td>• creative and practical</td>
<td></td>
</tr>
<tr>
<td>• showed effort given to project</td>
<td></td>
</tr>
<tr>
<td>• reflection of process to this point completed</td>
<td></td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td></td>
</tr>
<tr>
<td>• turned in on time</td>
<td></td>
</tr>
<tr>
<td>• followed directions given</td>
<td></td>
</tr>
<tr>
<td>• represented the design</td>
<td></td>
</tr>
<tr>
<td>• showed effort given to project</td>
<td></td>
</tr>
<tr>
<td>• reflection of process to this point completed</td>
<td></td>
</tr>
<tr>
<td><strong>Final Project</strong></td>
<td></td>
</tr>
<tr>
<td>• turned in on time</td>
<td></td>
</tr>
<tr>
<td>• showed effort based on prototype results</td>
<td></td>
</tr>
<tr>
<td>• can grasp and lift a variety of objects</td>
<td></td>
</tr>
<tr>
<td>• is activated by pulling a string</td>
<td></td>
</tr>
<tr>
<td>• hand springs back when string is released</td>
<td></td>
</tr>
<tr>
<td>• creative</td>
<td></td>
</tr>
<tr>
<td>• functional</td>
<td></td>
</tr>
<tr>
<td>• reflection completed</td>
<td></td>
</tr>
<tr>
<td>• reflection includes personal connection</td>
<td></td>
</tr>
<tr>
<td>• project presented in appropriate manner</td>
<td></td>
</tr>
</tbody>
</table>

Explanation of Scoring:
1 - minimal effort; incomplete; 8+ errors; student on task 60% or less class time
2 - little effort; incomplete; 6-7 errors; student on task 60%-70% or less of class time
3 - average effort; complete; 4-5 errors; student on task 70%-80% of class time
4 - above average effort; complete; 3-4 errors; student on task 80%-90% of class time
5 - excellent effort; complete; 1-2 errors; student on task 90%-100% of class time

Score: \( \frac{x}{100} = \_\_\_\_\_\_\_\_\_ \) Comments

90 - 100 % = A
80 - 89 % = B
70 - 79 % = C
60 - 69 % = D
59 - 0 % = F
Human Body Book Project

Students may work with one partner or by themselves to produce a book about the Human Body. This will enable the opportunity for ELLs to be paired with someone more proficient with the English language. Modifications need to be made for beginning ELLs.

The goal is for students to spend about 1 week at most on each system. First teachers should elicit prior knowledge about each system, then do a hands-on activity on each system, followed by time for students to learn what they need to about each system in order for them to produce several pages for their book. They may use the textbook, the internet, and any other resources that are available. The websites listed could be used as centers in your room if you can not bring your classes to the computer lab.

This book will be an excellent reference for students to review for the MCAS test in 8th grade.
Human Body Book Project

Parts

- Title Page .............................................. ___________
  o name, grade, class, date, teacher

- Blank Rubric Pages (2) .................................... ___________

- Table of Contents Page .................................... ___________

- Cell Parts and Functions .................................... ___________

- Cell Organization and Hierarchy Page ................. ___________

- Body System Pages
  Each body system page will include the following parts:
  o functions
  o cell hierarchy example (cell type, tissue, organ, organ system, organism)
  o diagram of major organs labeled and colored
  o explanation of interactions each system has with other systems
  o 2-3 interesting facts learned about each body system
  o 2 questions I still have about the body system
    - Skeletal System ...................................... ___________
    - Muscular System ..................................... ___________
    - Digestive System ..................................... ___________
    - Circulatory System .................................. ___________
    - Respiratory System .................................. ___________
    - Excretory System ..................................... ___________
    - Immune System ....................................... ___________
    - Nervous System ...................................... ___________

- Project Reflection (one page) ................................ ___________
  o What mattered the most to you about what you learned?
  o What was the most interesting part and why?
  o Which body system did you like best or least and why?
  o Why do you think this is an important project to complete?

- Bibliography Page
  o citations in proper format of all sources
    used to finish the project ......................... ___________
# Human Body Book Project Rubric

<table>
<thead>
<tr>
<th>Parts</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Title Page</td>
<td></td>
</tr>
<tr>
<td>Table of Contents page</td>
<td></td>
</tr>
<tr>
<td>Blank rubric pages (2)</td>
<td></td>
</tr>
<tr>
<td>Cells parts and functions page</td>
<td></td>
</tr>
<tr>
<td>Cell organization and hierarchy page</td>
<td></td>
</tr>
<tr>
<td>System pages (transfer average score from systems rubric pages) *</td>
<td></td>
</tr>
<tr>
<td>Skeletal System</td>
<td></td>
</tr>
<tr>
<td>Muscular System</td>
<td></td>
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<tr>
<td>Digestive System</td>
<td></td>
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<tr>
<td>Circulatory System</td>
<td></td>
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<tr>
<td>Respiratory System</td>
<td></td>
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<tr>
<td>Excretory System</td>
<td></td>
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<tr>
<td>Immune System</td>
<td></td>
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<tr>
<td>Nervous System</td>
<td></td>
</tr>
<tr>
<td>Reflection of Project Activities</td>
<td></td>
</tr>
<tr>
<td>Bibliography</td>
<td></td>
</tr>
</tbody>
</table>

**Explanation of Scoring: (all pages except system pages)**

1 - minimal effort; incomplete; 8+ errors; student on task 60% or less class time

2 - little effort; incomplete; 6-7 errors; student on task 60%-70% or less of class time

3 - average effort; complete; 4-5 errors; student on task 70%-80% of class time

4 - above average effort; complete; 2-3 errors; student on task 80%-90% of class time

5 - excellent effort; complete; 0-1 errors; student on task 90%-100% of class time

* Divide total score on system rubric page by 7 to obtain scores for the project rubric page.

Score: \( \frac{x}{80} = \) ___________  

**Comments**

- 72.0 - 80.0 = A
- 64.0 - 71.5 = B
- 56.0 - 63.5 = C
- 48.0 - 55.5 = D
- 47.5 - 00.0 = F
<table>
<thead>
<tr>
<th>Parts</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>System pages</td>
<td>1 2</td>
</tr>
<tr>
<td>name, class, date, specific body system title</td>
<td>3 4</td>
</tr>
<tr>
<td>functions</td>
<td>5</td>
</tr>
<tr>
<td>cell hierarchy example</td>
<td></td>
</tr>
<tr>
<td>labeled color diagram</td>
<td></td>
</tr>
<tr>
<td>explanation of interactions each system has with other systems</td>
<td></td>
</tr>
<tr>
<td>2-3 interesting facts learned</td>
<td></td>
</tr>
<tr>
<td>2 questions I still have about the body system</td>
<td></td>
</tr>
</tbody>
</table>

Explanation of Scoring:

1 - minimal effort; incomplete (3-0 parts) body system pages; 8+ errors; student on task 60% or less class time

2 - little effort; incomplete body (6-4 parts) system pages; 6-7 errors; student on task 60%-70% or less of class time

3 - average effort; complete (7 parts) body system pages; 4-5 errors; student on task 70%-80% of class time

4 - above average effort; complete (7 parts) body system pages; 2-3 errors; student on task 80%-90% of class time

5 - excellent effort; complete (7 parts) body system pages; 0-1 errors; student on task 90%-100% of class time

Score: \( \frac{x}{35} = \) ___________  

Comments

31.5 - 35.0 = A
28.0 - 31.0 = B
24.5 - 27.5 = C
21.0 - 24.0 = D
20.5 - 00.0 = F
<table>
<thead>
<tr>
<th>Name __________</th>
<th>Class __________</th>
<th>Body System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date __________</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Body System Functions</th>
<th>Cell Organization and Hierarchy Example</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Labeled Color Diagram</th>
</tr>
</thead>
</table>
Interactions of Body System with Other Body Systems

Interesting Facts Learned

Questions I Still Have About the Body System
Reflection
<table>
<thead>
<tr>
<th>Bibliography</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Books:</strong></td>
</tr>
</tbody>
</table>
| Author (last name first, first name and middle initial). *Title of the book*. City where book is published: 
  Publisher, copyright date. |
| Note: Two authors: second author's name is written first name, middle initial, last name and the two authors names are connected by the word "and". |
| **Magazine:** |
| Author (see books). "Title of the article." *Title of the magazine* day month year: page numbers. |
| Note: If article does not have an author, begin citation with the title of the article. |
| **Encyclopedia:** |
| Author (see books). "Title of entry." *Name of encyclopedia*. Year published. |
| **Signed Newspaper Article:** |
| Author (see books). "Title of article." *Name of newspaper*. Day month year, section: page number. |
| Note: If article is unsigned, omit name. |
| **Reference Book on CD-ROM:** |
| *Encyclopedia Name*. CD-ROM. City where CD made: publisher of the CD, year made. |
| **Internet Web Site:** |
| Site title or description. Author or writer, administrative title (if given). Last update (day month year). List server. Day month year accessed. <Electronic address>. |
Big Idea: All organisms are made of cells. Multicellular organisms have cells that work together.

Massachusetts Science and Technology/Engineering Standards
LSS #2 Recognize that all organisms are composed of cells, and that many organisms are single-celled (unicellular), e.g., bacteria, yeast. In these single-celled organisms, one cell must carry out all of the basic functions of life.

**MCAS item analysis (what do students need to be able to do?)**
- ✓ Know that all organisms are made of cells

LSS #3 Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).

**MCAS item analysis (what do students need to be able to do?)**
- ✓ Recognize the major organelles of animal cells
- ✓ Know the structure and function of the nucleus, chromosomes, cell membrane, cytoplasm, mitochondria, and vacuoles

LSS #5 Describe the hierarchical organization of multi-cellular organisms from cells to tissues to organs to organ systems.

**MCAS item analysis (what do students need to be able to do?)**
- ✓ Know the organizational hierarchy of multicellular organisms (cells to tissues to organs to organ systems)

**Cells/ Célula (1 week)**

**Vocabulary:** Cell/célula, cell membrane/membrana cellular, nucleus/núcleo, cytoplasm/citoplasma, tissue/tejido, organ/órgano, organ systems/órgano sistemas

- Teacher models how to handle and carry a microscope. Students learn about the parts of the microscope and become familiar with their function. Students learn to use a compound microscope. Students label a diagram of a microscope. Appendix B: Using a Microscope in Prentice Hall Science Explorer: Cells and Heredity, page 196C-197C. See appendix for a picture of a microscope for students to label from the following website.
  [http://webinstituteforteachers.org/~viturralde/micro2](http://webinstituteforteachers.org/~viturralde/micro2)

  *R.5.3.a. Identify graphic features found in text (such as illustrations, labeled drawings, type size, charts, maps, diagrams).
  *R.1.15.d. Use general dictionaries, specialized dictionaries, thesauruses, or related reference tools to increase learning.

  *From the Massachusetts English Language Proficiency and Outcomes for English Language Learners (ELPBO)*
Students learn the function of each part of a microscope. Students observe that the letter "e" is upside down when viewed under low power. Students notice when the slide with the letter "e" is moved in one direction, it appears to move in the opposite direction. Students observe how the letter "e" looks when viewed from low to medium and to high power. Discuss the following questions with students: What is the function of each part of the microscope? What happens when you move your slide left, right, up, or down? When looking at an object, how does it change when you go from low to medium to high power? What do you notice when you look at something with a microscope?

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.

Formative Assessment: NAEP released question
Sarah looked at some pond water with a microscope. She used the low-power objective lens to look at some green algae. The picture below shows what Sarah saw through the microscope.

If Sarah switched the lens from low power to high power, what would she see in the field of view?

A) A lot more cells than with the low-power view, but in lesser detail.
B) The same number of cells as with the low-power view, but in lesser detail.
C) The same number of cells as with the low-power view, but in greater detail.
D) Fewer cells than with the low-power view, but in greater detail.

Quick write: Students write in their journals about why scientists use microscopes.
*W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.
Teacher demonstration. Place eggs in vinegar and let the eggshell dissolve. After eggshell has dissolved teacher can show students the soft membrane that is still holding the egg together. Students record their observations in their notebooks.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.
*W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

Use overhead transparencies to help students learn new vocabulary: C5 An Animal cell. Copy animal cell without labels and have students fill in the parts of the cell on the diagram. Students write a sentence about the function of each cell part in their notebooks. (Do not teach about plant cells at this point, as we will do that in unit #4)

*W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.


*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

Students work in groups to discover that their skin is made up of cells. Students observe cheek cells under a microscope, Figure 1, p 7, Prentice Hall Science Explorer: Human Biology and Health. Students make a slide of cheek cells using iodine as a stain; Students draw a cheek cell under low, medium, and high power, and label the cell membrane, cytoplasm, and nucleus. Discuss with students three main parts of a cell. Students add the following vocabulary words to their glossaries: cell, cell membrane, cytoplasm, and nucleus.

*S.3.3. Demonstrate understanding when simple information is given.
*S.3.43. Participate in classroom discussions and activities, when frequent clarification is given.

Students read about and discuss the levels of organization in the body, pages 6 to 9, Prentice Hall Science Explorer: Human Biology and Health. Students add the following vocabulary words to their glossaries: cells, tissues, organs, and organ systems. Discuss with students the four different types of tissues.

*R.6.4.c. Identify specific, topic-related information in resources, using indexes, tables of contents, and electronic search key words.
*R.3.6.a. Identify text features (such as title, illustrations, headings, captions, graphics, bold-face type).
*R.3.6.b. Preview text features to predict meaning.
*R.3.6.c. Pause while reading silently to check that information makes sense.
Four Types of Tissue

- **On-line Activity:** Cell Game: Students learn the name of the parts of the cell

  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

- **Formative Assessment:** MCAS released question

  Q. What are the basic structural units of living organisms?
  
  A. cells
  B. nuclei
  C. organs
  D. tissues

*****************************************************************************

**Big Idea:** Body Systems work together and have specific functions

**Massachusetts Science and Technology/Engineering Standards**

LSS #6 Identify the general functions of the major systems of the human body (digestions, respiration, reproduction, circulation, excretion, protection from disease, and movement, control, and coordination) and describe ways that these systems interact with each other.

**MCAS item analysis (what do students need to be able to do?)**

- ✓ Know the functions of the major systems of the human body
- ✓ Be able to describe ways that the major systems of the human body interact with each other
- ✓ Know that gas exchange is a process of the respiratory system

- **Skeletal System/ Sistema Esqueletal (1 week)**

**Vocabulary:** Skeleton/ esqueleto, bone/ hueso, joint/ conjunta, ligament/ ligamento, cartilage/ cartílago, marrow/ médula

- Students compare and contrast the x-rays of normal human bones and broken bones. Students write a short story about how one of the bones from the x-rays they looked at was broken.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
  *W.2.4.a. Draw or sequence pictures to tell or retell a story.
  *W.2.4.b. Dictate sentences to tell or retell a story in chronological sequence.
  *W.2.4.c. List details that describe story events.

- Students look at bone cells under the microscope (if slides are available), otherwise look at bone cells on the following websites. The goal is for students to learn that the skeletal system (like all systems in the human body) is made of cells, tissues, and organs.
*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.

Bone Cell
http://lh6.ggpht.com/_cgO1ejPjIDA/R9u8JQfpuCI/AAAAAAAAATY/lbY_377TLpc/bone.jpg
and
http://facstaff.bloom.edu/jhranitz/Courses/APHNT/Lab_Pictures/compact_bone.jpg

Bone Tissue
http://biology.ucf.edu/~logiudice/zoo3713/Files/image173.gif

Bone

Skeletal System
http://www.mikalac.com/tech/sci/pho/skeletalsystem.jpg

- **On-line Activity:** Get the joints and unusual bones in the right places. This challenge requires Flash 5 and takes 5-10 minutes.
  http://www.bbc.co.uk/science/humanbody/body/interactives/3djigsaw_02/index.shtml?skeleton

- **On-line Activity:** Skeleton Game (Students put the bones in the right places on the human body)
  http://www.sheppardsoftware.com/health/anatomy/skeleton/Skeleton_game_1.htm

*S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

- **Introduce the Human Body Book Project** (see page 11). Students use available resources (textbook, internet, and other available books) to learn about the skeletal system and begin to create a book about the systems of the human body. Students must write about the function of each system, make a diagram and label the organs of each system, list interactions each system has with other systems, and more...see rubric. **Modify expectations for beginning ELL students.
  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
  *R.5.12.b. Identify content words to locate needed information in text.
  *W.2.8.f. Write brief research reports with clear focus and supporting detail.

- **Extension Project:** (for students who would like to do extra credit or want to learn more deeply on their own time). Students create a paper model of the human body from the Body Book, Scholastic Inc. A copy of the directions and handouts are included). Students should construct systems as they are covered in class.

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**Websites:**
How the Body Works Click on a body part to watch movies, take quizzes, read articles, solve word finds, and do activities http://kidshealth.org/kid/htbw/
In addition to the activities found in the last two resources in Background Information for Teachers, we present a few more activities here, touching on many of the human body systems. These resources are meant to complement your existing lessons.

My Body: The Inside Story [http://www.henry.k12.ga.us/cur/mybody/content.htm](http://www.henry.k12.ga.us/cur/mybody/content.htm)

**Muscular System/ Sistema Muscular (1 week)**

**Vocabulary:** involuntary muscle/ musculares involuntarias, voluntary muscle/ músculo voluntario, muscle/ músculo, tendon/ tendón, skeletal muscle/ músculo esquelético

*S.1.11. Clarify meaning of words, using beginning and bilingual dictionaries.*  
*R.2.15.a. Describe similarities and differences in the phonetic systems used in English and the student’s first language.*

- Create a KWL chart with students about muscles. Ask students to identify places in the body in which they can make a muscle move (examples: arms and legs), and places that they cannot (examples: heart, stomach). Label muscles as **involuntary** and **voluntary muscles**. (elicit prior knowledge)

    *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.*  
    *S.1.5. Employ vocabulary essential for grade-level content learning.*  

- **Quick Write:** Students write in their journals about places in their bodies that have involuntary and voluntary muscles.

    *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.*

- Students work in groups to complete the Activity: How Do Muscles Work? p 24 in the Prentice Hall Science Explorer: Human Biology and Health. Teachers should introduce experimental design. Students learn that muscles can respond repetitively but tire easily, and record their observations in their notebooks. Students create a data table to record their observations and write a conclusion in their notebooks.

    *W.1.3.a. Organize ideas related to writing topic using graphic representations.*

- **On-line Activity:** Put the mystery muscles into the right places on the body. This challenge requires Flash 5 and takes 5-10 minutes.


    *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.*
Teacher Demonstration: Bring in a cooked chicken leg and take it apart to show students muscles, tendons, and bones. Students write in their journals about the role of muscles, tendons and bones in movement.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

Students look at and discuss Figure 16: Muscle Pairs, p 27, Prentice Hall Science Explorer: Human Biology and Health. Ask students to bend their elbows so they can feel their muscles contract and relax as shown in the figure. Discuss with students that muscles can only contract, or become shorter.

*S.3.8. Demonstrate comprehension of oral questions on academic content that require short answers.
*S.3.36. Demonstrate comprehension of specific information heard in an academic context.

Students look at muscle cells under the microscope (if slides are available), otherwise look at muscle cells on the following websites. The goal is for students to learn that the muscular system (like all systems in the human body) is made of cells, tissues, and organs.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.

Muscle Cell/Tissue
http://umanitoba.ca/faculties/medicine/units/anatomy/images/Skelmuscropy.JPG

Muscle Cell Types

Muscle Tissue
http://www.corel.com/img/content/community/tips/px/2007-05a/Arm_4_Finished.jpg

Muscular System
http://www.encognitive.com/images/muscular-system-2.gif

Students use available resources (textbook, internet, and other available books) to learn about the muscular system and create pages for their book about the "Systems of the Human Body".

*R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
*R.5.12.b. Identify content words to locate needed information in text.
*W.2.8.f. Write brief research reports with clear focus and supporting detail.

Introduce Engineering Unit Project: (refer to page 9). Students should start working on the prosthetic hand project. Students should have time each week to work on this project in class.
Digestive System/ Sistema Digestivo (1 week)

**Vocabulary:** Digestion/ digestión, absorption/ absorción, enzyme/ enzima, esophagus/ esófago, stomach/ estómago, saliva/ saliva, mucus/ moco, small intestine/ intestino delgado, large intestine/ intestino grueso, gall bladder/ vesícula biliar, liver/ hígado, bile/ bilis

- What do you think happens to the food you eat? How does the food you eat get changed into nutrients and energy that your body needs? (elicit prior knowledge)
  - *S.3.8. Demonstrate comprehension of oral questions on academic content that require short answers.*
  - *S.3.22. Make predictions or inferences based on a story or information that has been heard.*

- **Demonstration:** How can you speed up digestion? p 60, in Prentice Hall Science Explorer: *Human Biology and Health*. Students observe that crushed sugar dissolves more quickly than whole cubes of sugar, and record their observations in their notebooks.
  - *S.3.22. Make predictions or inferences based on a story or information that has been heard.*
  - *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.*

- **On-line Activity:** Digestion Game (2 levels). Students drag parts of the digestive system to a human body with and without parts.

- Students work in pairs to complete the Math Activity: Protein Digestion, p 64 in *Human Biology and Health*. Students interpret a graph and record their observations in their notebooks.
  - *R.5.10.a. Locate and identify graphic features in text (such as charts, maps, timelines, tables, diagrams, captions, illustrations).*
  - *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.*

- Students work in small groups to complete the Lab: “As the Stomach Churns”, p 66-67, in Prentice Hall Science Explorer: *Human Biology and Health*. Students learn that small pieces of food are digested faster than large pieces.
  - *S.3.8. Demonstrate comprehension of oral questions on academic content that require short answers.*
  - *S.3.22. Make predictions or inferences based on a story or information that has been heard.*

- Students look at liver cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the digestive system (like all systems in the human body) is made of cells, tissues, and organs.
  - *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content*
learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.

Liver Cell
http://library.thinkquest.org/C004535/media/liver_cell.gif
Liver Tissue
http://www.epidemic.org/theFacts/theLiver/images/liverCell.jpg
Liver
http://www.freewebs.com/soaring_sphincter_travel_agency/Liver.jpg
Digestion System
http://eatwellgetwell.files.wordpress.com/2006/05/digestion_good2.jpg

- Students use available resources (textbook, internet, and other available books) to learn about the digestive system and create pages for their book about the "Systems of the Human Body".
  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
  *R.5.12.b. Identify content words to locate needed information in text.
  *W.2.8.f. Write brief research reports with clear focus and supporting detail.

- **Optional:** Students watch the DVD "Super Size Me" which explores the impact of fast food and obesity on Americans today. Students write a reflection in their journals.
  *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

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**Circulatory System/ Sistema Circulatorio (1 week)**

**Vocabulary:** circulatory system/ sistema circulatorio, heart/ corazón, valve/ válvula, artery/ arteria, capillary/ capilar, vein/ vena

**In Class Activities:**

- Students work with a partner to complete the Lab Activity: Heart Beat, Health Beat, page 90 in Prentice Hall Science Explorer, *Human Biology and Health* textbook. Have students practice taking their pulse before doing this activity. Students graph their pulse rates under different conditions, and draw conclusions about the relationship between physical activity and pulse rate.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
  *S.1.5. Employ vocabulary essential for grade-level content learning.
  *W.1.3.a. Organize ideas related to a writing topic using graphic representations.

- **Formative Assessment:** NAEP released question
Julio wanted to know how his pulse rate changed when he ran very fast. He measured his pulse rate before he started running, while he was running, and two minutes after he stopped running. Which graph best shows how Julio’s pulse rate changed?

A)

[Graph A]

B)

[Graph B]

C)

[Graph C]

D)

[Graph D]

On-line Activity about the Heart, p 80 in Prentice Hall Science Explorer: Human Biology and Health. Students learn the parts of the heart and see the flow of blood through the heart. Students label a heart diagram and write a brief caption describing the function of the heart in their notebooks.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.
**W.1.3.a.** Organize ideas related to a writing topic using graphic representations.

- Students look at heart cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the circulatory system (like all systems in the human body) is made of cells, tissues, and organs.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
  *S.1.5. Employ vocabulary essential for grade-level content learning.

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Heart Cell

http://www.emc.maricopa.edu/faculty/farabee/BIOBK/heartbeat.gif

Heart Tissue

http://www.abcam.com/ps/datasheet/images/ab19903_1.jpg

Heart

http://www.heart-health-weightwatcher.com/images/HumanHeartDiagram.jpg

Circulatory System


- Students use available resources (textbook, internet, and other available books) to learn about the circulatory system and create pages for their book about the "Systems of the Human Body".
  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
  *R.5.12.b. Identify content words to locate needed information in text.
  *W.2.8.f. Write brief research reports with clear focus and supporting detail.

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**Respiratory System/ Sistema Respiratorio (1 week)**

**Vocabulary:** Respiration/ respiración, trachea/ tráquea, bronchi/ bronquios, lungs/ pulmones, diaphragm/ diafragma

- Demonstration: A Breath of Fresh Air, p 248-249 in the All-in-One Teaching Resources, Prentice Hall Science Explorer: Human Biology and Health. Students learn what causes the body to inhale and exhale, and record their observations in their notebooks.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
  *W.1.3.a. Organize ideas related to a writing topic using graphic representations.

- Students should blow up the balloon several times before beginning this activity. Remind students not to share balloons. Students with breathing difficulties may not be able to blow up the balloons. How Big Can You Blow Up A Balloon? Activity, p 112, in Prentice Hall Science Explorer: Human Biology and Health. Students measure around the widest part of the balloon. Students repeat this activity several times and find the average circumference. Students infer from this activity the factors that might affect the volume of air a person can exhale.
*R.5.10.a. Locate and identify graphic features in text (such as charts, maps, timelines, tables, diagrams, captions, illustrations).

*W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

- Students work in pairs to complete the Math Activity: The Air You Breathe, p 113 in the textbook. Students interpret circle graphs about inhaled and exhaled air we breathe, to learn how the percent of gases change. Students record their observations in their notebooks.

*R.5.10.a. Locate and identify graphic features in text (such as charts, maps, timelines, tables, diagrams, captions, illustrations).

*W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

- On-line Activity: The Breathing Process Activity, p 119 in the Prentice Hall Science Explorer: Human Biology and Health textbook. Students explore the events involved during the breathing process, and write a brief summary about what they learned.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

*W.1.3.a. Organize ideas related to a writing topic using graphic representations.

- Students look at lung cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the respiratory system (like all systems in the human body) is made of cells, tissues, and organs.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

*S.1.5. Employ vocabulary essential for grade-level content learning.

Lung Cell
http://www.microscopyu.com/articles/fluorescence/filtercubes/triple/dapifitcrtcitc/images/dapifitcrtcitcmrc5mitolarge.jpg

Lung Tissue
http://www.materials.drexel.edu/breger/photos/biomedical/pulmonary_artery.jpg

Lung
http://images.inmagine.com/img/purestock/prs140/prs140052.jpg

Respiratory System

- Students use available resources (textbook, internet, and other available books) to learn about the respiratory system and create pages for their book about the “Systems of the Human Body”.

*R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.

*R.5.12.b. Identify content words to locate needed information in text.

*W.2.8.f. Write brief research reports with clear focus and supporting detail.
Formative Assessment: NAEP released question

Q. In your body, what two organs work together to make sure that oxygen gets to all the other organs of your body?

A) Lungs and kidneys
B) Heart and lungs
C) Brain and kidneys
D) Heart and liver

Excretory System/ Sistema Excretor (1 week)

Vocabulary: excretion/ excreción, kidney/ riñón, waste/ malgastar, filter/ filtro, urine/ orina

Students work in small groups to do an Inquiry-based Activity: Dirty Water. Teacher makes a mixture ahead of time using kitchen supplies, water, vegetable oil, vinegar, coffee grounds, salt, salad dressing, and garlic powder. The challenge is for students to see what group can produce the cleanest looking water in a given amount of time. Students use available resources, such as funnels, sand, gravel, cotton balls, coffee filters, charcoal for aquariums if available, paper towels, screens, etc. Students must design an investigation and make drawings with labels to show what they did at each step in the filtering process. Students present their results in the class. The purpose of this activity is to help students understand that the function of the excretory system is to filter the waste out of our blood.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.3.29. Demonstrate comprehension of oral, multiple-step directions.
*S.4.6. Make informal oral presentations that have recognizable organization (such as sequence, summary).

Students look at kidney cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the excretory system (like all systems in the human body) is made of cells, tissues, and organs.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level content learning.

Kidney Cell
http://www.microscopy-uk.org.uk/mag/imgmar06/BFLens_vs_PCLens_for_BF_02.jpg

Kidney Tissue
http://www.cbs.dtu.dk/staff/dave/roanoke/kidney04s.jpg

Kidney

Excretory System
Students use available resources (textbook, internet, and other available books) to learn about the excretory system and create pages for their book about the "Systems of the Human Body".

*R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
*R.5.12.b. Identify content words to locate needed information in text.
*W.2.8.f. Write brief research reports with clear focus and supporting detail.

Immune System/ Sistema Inmunológico (1 week)

Vocabulary: pathogen/ patógeno, infectious disease/ las enfermedades infecciosas, toxin/ toxina, immunity/ inmunidad

Students complete the Activity: A model of disease transmission: Why Did I Get the Flu? (see page 34).

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
*S.1.5. Employ vocabulary essential for grade-level learning.
*S.3.10. Demonstrate comprehension of simple sentences, including statements, questions, and commands, when spoken slowly, and with repetitions as needed.
*S.3.19. Retell steps of a process in logical order.
*S.4.3. Plan, rehearse, and orally present information on planned activities or cultural topics.
*S.4.4. Maintain focus on a topic during an oral presentation.

On-line Activity: Infectious Diseases, p 141 in the textbook. Students review infectious diseases, and write a summary about what they learned.

*W.2.3.a. List evidence from a literary or informational text that supports a given topic sentence.
*W.2.3.b. Select a sentence from a literary or an informational text that synthesizes a given set of facts or ideas.
*W.2.3.c. Write or dictate a sentence that synthesizes a given set of facts or ideas from a literacy or informational text.

On-line Activity: Immune Response Activity, p 149 in the textbook. Students learn how the immune system responds to an infection, and write a summary about what they learned.

*W.2.7.d. Write a short explanation of a process that includes a topic sentence, details, and a conclusion.
**Why Did I Get the Flu?**

**Guiding Question:**
How do diseases spread?

**Known Information:**
Organisms called pathogens cause many illnesses. These are microorganisms such as a bacteria, fungi, protozoa, or virus, which causes disease. An illness, which causes disease to be carried easily from one person to another, is called an **infectious disease**. Pathogens damage individual cells in the body and cause different kinds of symptoms. The kinds of symptoms depend on the pathogen. A sudden rise in the number of people who get a disease is called an **outbreak**.

In this simulation of disease transmission, each cup represents a person that may or may not have the flu disease. Think of the solution as droplets in the air from your nose because you sneezed.

**Materials:**
- 1 disposable cup
- 1 disposable plastic pipette dropper
- masking tape

**Safety Notes:**
- I must wear goggles during the simulation.
- I must not get any solution on myself. If I splash any solution on myself, I will immediately wash it off with soap.
- I must wash my hands at the end of the simulation.
- I will not taste or smell any of the solutions.
- If an accident occurs, I will tell the teacher immediately.

**Procedure:**
1. Choose a numbered cup. Write my name on a piece of masking tape and put it on the cup.
2. Record the cup number in my data table.
3. Walk around the room, simulating normal contact with others.
4. Only **one student of the pair** will fill their own dropper with 1 ml of liquid from their own cup.
5. **Without putting the dropper itself into the other person’s liquid**, I will dispense (put into the other cup) liquid from my own dropper into the other student’s cup. Record the other student’s paper cup number and name in the table. Remember, only one person of the pair is putting liquid into a cup.
6. Repeat steps 4 and 5 two more times with two different people.
7. Return to my seat when finished step 7.
8. The doctor (teacher) will add a drop of indicator solution to my cup. If I am infected, the clear liquid will change to pink or red. If I am not infected, the liquid will change to yellow or orange.
9. On the whiteboard, record my name, and contacts and whether **my** solution was infected or not.
Data:
Create a data table that includes spaces for: my cup number, the cup number/name of the three other students I exchanged liquid with, infected students cup numbers/names, uninfected cup numbers/names.

Transmission History:
Use a blank sheet of lined paper to complete this part of the lab. Use the information on the board to track the disease transmission route throughout the class. Try to determine who the original carrier of the disease was.

Discard any liquid in my cup into the container specified by my teacher. Throw the cup in the trash. Place the dropper in a place specified by my teacher.

Analysis Questions:
1. How will we have proof of the disease carriers?
2. Why was it important not to put my dropper into another person’s liquid?
3. What kind of pathogen causes the flu? (need to look this up in the textbook)
4. Which three scientists during the 1800s discovered how infectious diseases work? Describe their contributions to medicine. (need to look this up in the textbook)
5. Name the four kinds of pathogens and give an example of each. (need to look this up in the textbook)
6. Name the four ways pathogens are spread in a population. (need to look this up in the textbook)
7. How does this activity compare to the transmission of a real disease?
8. What steps can I take to keep from getting an infectious disease of any kind?
9. What do public health officials do to help control the spread of infectious diseases?
10. Suppose that instead of exchanging solutions three times, I exchanged solutions as many times as I wanted during a specified amount of time. What differences might be seen in this scenario instead of the way the class activity was done?

Activity adapted from:
“The Contagious Town Meeting: A Discussion of Disease Transmission.” Mr. Justin Armbruster, Science in Motion Staff, Juniata College Class of 2008
TEACHER NOTES:

1. The bottles of solution of 1 % phenol red and 0.1 N NaOH can be found in the consumable supplies of the Bacteria to Plants unit; a bottle of vinegar can be found in the consumable supplies of the Human Biology and Health unit. Droppers/pipettes are also in the Human Biology and Health unit consumables.

2. Phenol red is an indicator solution that will turn pink or red in a base (alkali) solution.

3. The "infected" stock solution is the base 0.1 N sodium hydroxide (NaOH). This concentration should produce a pH that will ensure that the diluted "infected" solution will react with the phenol red and turn a bright pink. The "uninfected" solution will turn yellow or orange in the presence of phenol red.

4. The "uninfected" stock solution is the vinegar. This is used to ensure that the "uninfected" samples turn yellow or orange in phenol red.

5. Please stress the safety procedures and follow them strictly.

6. One student only will have the "infected" solution. Note which cup you put the "infected" solution in and which student selects this cup.

7. Solutions: Read the materials safety data sheet which comes with the solutions
   - 100 ml Phenol Red: flammable
   - 100 ml Sodium Hydroxide: corrosive
   - 500 ml Vinegar: non-flammable and non-corrosive (a weak acid-acetic acid)

8. Using the solutions:
   - Phenol red: fill dropper and put a few drops into a cup to test student solutions; the teacher is the doctor and is dispensing the indicator into student cups
   - Sodium Hydroxide (NaOH): put 5 ml into one cup and be sure to note the number; remember only one cup in each class gets this solution
   - Vinegar (CH$_3$COOH): put 5 ml into each cup and number each cup; prepare one cup for each student in the class minus the one who has the NaOH

9. Making Solutions: **ALWAYS CAREFULLY ADD ACID/BASE TO WATER**
   - Phenol red: use as is without dilution
   - 0.1 N NaOH: use 9 ml H$_2$O and add 1 ml NaOH (to be used for all classes)
   - Vinegar: use 99 ml of H$_2$O and add 1 ml vinegar; then do a second dilution of 99 ml of H$_2$O and 1 ml of the previously made solution; this will make 100 ml of diluted vinegar solution to use (remember that you need 5 ml per student; make as much as needed)
Data:

<table>
<thead>
<tr>
<th>My Cup #</th>
<th>Cup Name and Number of Other Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infected Students Name and Number</th>
<th>Uninfected Students Name and Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Disease Transmission Route:

Use the data on the board to determine who started the flu.
**Analysis Questions Answers:**

1. How will we have proof of the disease carriers?
   - test results...phenol red changes color in a base solution

2. Why was it important not to put my dropper into another person's liquid?
   - contamination of my liquid by another person; if I am not infected, but the other person is, then I will infect everyone else

3. What kind of pathogen causes the flu?
   - a virus; it mutates (changes) as long as it is alive

4. Which three scientists during the 1800s discovered how infectious diseases work? Describe their contributions to medicine.
   - 1860s Joseph Lister hypothesized that microorganisms cause infections
   - 1860s Louis Pasteur showed that microorganisms cause some kinds of diseases and that killing them could prevent the spread of those diseases
   - 1870s and 1880s Robert Koch demonstrated that each infectious disease is caused by a specific kind of pathogen

5. Name the four kinds of pathogens and give an example of each.
   - streptococcus bacteria which causes strep throat or the bacteria which causes tetanus
   - viruses which cause a cold
   - fungus which causes athlete’s foot or ringworm
   - protists which cause malaria, African sleeping sickness and amebic dysentery

6. Name the four ways pathogens are spread in a population.
   - contact with an infected person
   - contact with soil, food, or water where the pathogen lives
   - contact with a contaminated object
   - bites by an infected animal

7. How does this activity compare to the transmission of a real disease?
   - activity mimics disease transmission because one person infects another who infects another who infects another and the infection spreads throughout the population

8. What steps can I take to keep from getting an infectious disease of any kind?
   - wash hands frequently
   - cover mouth when sneezing
   - stay home when sick
   - eat properly
   - get enough sleep

9. What do public health officials do to help control the spread of infectious diseases?
   - work with states, cities, and towns during outbreaks to encourage individuals who are sick to stay home; and if the disease is serious, the people who are infected may be put into isolation wards in a hospital

10. Suppose that instead of exchanging solutions three times, I exchanged solutions as many times as I wanted during a specified amount of time. What differences might be seen in the two outcomes?
    - the spread of disease would increase and more students would become infected; it would be harder to determine the original transmission route because there would be many cases of re-infection
Students look at immune system cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the immune system (like all systems in the human body) is made of cells, tissues, and organs.

*S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

*S.1.5. Employ vocabulary essential for grade-level content learning.

T Cell killing a cancer cell
http://www.science museum.org.uk/on-line/lifecycle/images/1-2-5-3-5-2-2-0-0-0-0.jpg

B Cell

Immune Cells
http://books.nap.edu/books/0309048931/xhtml/images/p200063c8q69001.jpg

Immune System
http://www3.niaid.nih.gov/NR/rdonlyres/3CEEF651-DF24-4237-B5C7-23818FFD0643/0/organsImmuneSystem.jpg

Students use available resources (textbook, internet, and other available books) to learn about the Immune System and create pages for their book about the “Systems of the Human Body”.

*R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.

*R.5.12.b. Identify content words to locate needed information in text.

*W.2.8.f. Write brief research reports with clear focus and supporting detail.

Formative Assessment: MCAS released question
Q. In the human body, which system functions primarily to defend the body against disease?

A. digestive
B. immune
C. nervous
D. respiratory

The Nervous System/ Sistema Nervioso (1 week)

Vocabulary: Stimulus/ stimulous, response/ respuesta, neuron/ neurona, nerve impulse/ sistema nervioso, nerve/ nervio

Students work in groups to complete the Ready or Not! Lab activity, p 181 in Prentice Hall Science Explorer: Human Biology and Health textbook, p 372-373 in the All-in-One Teaching Resources. (Optional: Part 2 Designing Your Experiment).
*S.3.8. Demonstrate comprehension of oral questions on academic content that require short answers.
*S.3.22. Make predictions or inferences based on a story or information that has been heard.
*W.2.7.d. Write a short explanation of a process that includes a topic sentence, details, and a conclusion.

- **On-line Activity:** Nerve Impulses, p 178 in Prentice Hall Science Explorer: *Human Biology and Health* textbook. Students review nerve impulses, and write a summary about what they learned.
  *W.2.7.d. Write a short explanation of a process that includes a topic sentence, details, and a conclusion.

- Students look at nerve cells under the microscope (if slides are available), otherwise look on the following websites. The goal is for students to learn that the nervous system (like all systems in the human body) is made of cells, tissues, and organs.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
  *S.1.5. Employ vocabulary essential for grade-level content learning.

  **Nerve Cell**

  **Nerve Tissue**
  [http://washington.uwc.edu/about/faculty/schaefer_w/TISSUES/nervous_tissue2.jpg](http://washington.uwc.edu/about/faculty/schaefer_w/TISSUES/nervous_tissue2.jpg)

  **Organ of the Nervous System**

  **Nervous System**

- Students use available resources (textbook, internet, and other available books) to learn about the Nervous System and create pages for their book about the "Systems of the Human Body".
  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.
  *R.5.12.b. Identify content words to locate needed information in text.
  *W.2.8.f. Write brief research reports with clear focus and supporting detail.

- **On-line Activity:** Neuroscience for Kids [http://faculty.washington.edu/chudler/experi.html](http://faculty.washington.edu/chudler/experi.html)
Additional Resources

Janice VanCleave's The Human Body for Every Kid: Easy Activities that Make Learning Science Fun (Science for Every Kid Series) (Paperback)
   Reading level: Ages 9-12

Human Body (DK/Google E.guides) (Hardcover) by Richard Walker
   Reading level: Ages 9-12

Human Body (Kingfisher Knowledge) by Richard Walker (Hardcover - Sep 15, 2006)
   Reading level: Ages 9-12

   Reading level: Ages 9-12

Human Body (Kingfisher Knowledge) by Richard Walker (Hardcover - Aug 2006)

Investigating the Human Body: Life Science (Science Readers) by Teacher Created Materials (Paperback - Feb 25, 2008)

Ultra-organized Cell Systems (Microquests) by Rebecca L. Johnson, Jack Desrocher, and Jennifer E. Fairman (Library Binding - Sep 2007)
   Reading level: Ages 9-12

Building Blocks: Cells, Organs and Body Systems (Bodyscope) by Patricia Macnair (Hardcover - May 16, 2005)

Cell Wars (Cells and Things) by Frances R. Balkwill and Mic Rolph (Paperback - Mar 1994)
Enjoy Your Cells (Enjoy Your Cells, 1) by Frances R. Balkwill and Mic Rolph (Paperback - Oct 15, 2001)

Reading level: Ages 9-12

Cells (Science Concepts, Second Series) by Alvin Silverstein, Virginia B. Silverstein, and Laura Silverstein Nunn (Library Binding - Feb 2009)

Reading level: Ages 9-12

Bones: Our Skeletal System by Seymour Simon (Paperback - Aug 8, 2000)

Reading level: Baby-Preschool

Skeletal System (Our Body) by Cheryl Jakab (Library Binding - Jan 2007)

Reading level: Ages 9-12

The Skeleton Inside You (Let's-Read-and-Find... Science 2) by Philip Balestrino and True Kelley (Paperback - Mar 14, 1989)

Reading level: Ages 4-8


Reading level: Ages 9-12

Understanding the Human Body - The Skeletal and Muscular System by Elaine Wood and Pamela Walker (Library Binding - Mar 12, 2003)

Reading level: Ages 9-12

Muscles: Our Muscular System by Seymour Simon (Paperback - Aug 8, 2000)

Reading level: Ages 4-8

Reading level: Ages 9-12

Guts: Our Digestive System by Seymour Simon (Hardcover - May 3, 2005)

Reading level: Ages 4-8

The Digestive System (True Books) by Christine Taylor-Butler (Paperback - Sep 2008)

Reading level: Ages 9-12

Digestive System (Human Body) by Kristin Petrie (Library Binding - Sep 2006)

Reading level: Ages 9-12

The Digestive System: (2nd Edition) (Body Focus) by Carol Ballard (Paperback - Aug 15, 2009)

Reading level: Ages 9-12

Break It Down: The Digestive System (Body Talk/Freestyle Express) by Steve Parker (Paperback - Jan 15, 2007)

Reading level: Ages 9-12

The Respiratory System (True Books) by Christine Taylor-Butler (Paperback - Sep 2008)

Reading level: Ages 9-12

Lungs: Your Respiratory System by Seymour Simon (Hardcover - Mar 13, 2007)

Reading level: Ages 4-8
Hardcover: 32 pages Publisher: Collins

The Heart: Our Circulatory System

by Seymour Simon (Paperback - May 23, 2006)

The Circulatory System (True Books) by Christine Taylor-Butler (Paperback - Sep 2008)
Reading level: Ages 9-12

Circulatory System (The Amazing Human Body) by Ruth Bjorklund (Library Binding - Sep 2008)
Reading level: Ages 9-12


The Nervous System (True Books) by Christine Taylor-Butler (Paperback - Sep 2008)
Reading level: Ages 9-12

The Brain: Our Nervous System by Seymour Simon (Paperback - May 23, 2006)
Reading level: Ages 4-8

Excretory System (The Amazing Human Body) by Lorrie Klosterman (Library Binding - Sep 2009)
Reading level: Young Adult