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Massachusetts Community Colleges
& Workforce Development
Transformation Agenda

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Contextualized Curriculum
for Adult Learners in Math and Literacy

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Accuracy in the Lab

Print: 🖨 📄 📝

Accuracy in the Lab

Industry Sector: Healthcare
Content Area: Literacy
Core Topic: Reading Comprehension

Expand All | Collapse All

Common Core State Standards

CCSS.ELA-Literacy.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
CCSS.ELA-Literacy.CCRA.R.7 Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
CCSS.ELA-Literacy.CCRA.R.10 Read and comprehend complex literary and informational texts independently and proficiently.

Adult Basic Education Standards

R1.3d Compare / contrast information from simple or adapted multi-paragraph texts

R1.4d Summarize ideas and information from texts of increasing length and complexity of content

R1.4f Draw conclusions and make predictions and inferences from information or ideas presented in texts of various genres (e.g. historical documents, newspaper and magazine articles, fiction and non-fiction, job-related materials)

R3.4d Adjust reading rate depending on the purpose (e.g. reading for detail vs. general idea)

Industry Overview

Healthcare in America

From neonatal nurses to radiology technologists, medical coders to medical office assistants, health educators to home care aides, the healthcare industry provides a vast and diverse array of services to individuals at every stage of life. Providing [nearly 17 million jobs](#) and accounting for an estimated [$18 million of the U.S. GDP in 2009](#), healthcare is the nation's largest industry. In Massachusetts, in particular, healthcare accounts for more than 15% of employment (compared with 12% nationally), accounting for approximately [one in six jobs](#). With an aging baby boomer population that is living longer, there is greater demand for more and higher quality preventative and long-term healthcare across the United States. [With eight of the 30 fastest growing occupations](#), healthcare is predicted to be one of the [fastest growing industries](#) both nationwide and in Massachusetts between now and 2020.

Careers in Healthcare

The healthcare industry includes a vast array of jobs related to planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development. This industry includes five career pathways:

- therapeutic services, which includes professionals who work directly with patients to improve their health by providing direct care and treatment for patients (for example, a nurse or a physical therapist assistant);
- diagnostic services, which includes professionals who plan and conduct tests to detect and diagnose diseases and injuries, and use test results to plan treatment (for example, a radiologic technologist or a sonographer, who perform diagnostic imaging examinations, such as X-rays or ultrasounds);
- health informatics, which includes professionals who compile and manage health information and records (for example, a medical records and health information technician, who organizes and manages patient databases; higher-level positions, such as administrators of healthcare facilities or departments, are also included in this pathway);
- support services, which includes professionals who provide assistance to other medical professionals, allowing them to do their jobs in diagnosing and treating patients or supporting therapies (for example, food service workers and nutritionists ensure that patients' meals are healthy and meet dietary guidelines); and
- biotechnology research and development, which include careers that involve bioscience research; while many of these professions require doctoral or medical degrees, some entry-level opportunities in the field require only an associate degree (for example, food and agricultural science technicians).

Mathematics and Communication Skills Needed in Healthcare

The growing complexity of the healthcare industry, including changing technologies, requires workers to continuously upgrade their skills. In addition to technical skills specific to their job, mathematics and literacy skills are crucial for success in all occupations across the healthcare industry.

Communication: First and foremost, no matter the job, good healthcare practitioners are committed to giving patients the best care available and keeping abreast of health research and developments in the field. All workers need to be able to read medical journals and understand medical terminology and vocabulary, as well as read and write literate emails to co-workers/supervisors. Many healthcare jobs also require the ability to read and interpret charts and access and interpret electronic medical records in order to provide quality care.

Many health careers, especially—but not exclusively—those in therapeutic services—involve interacting with patients and their families, in some cases working with people who may be sick, disabled, or dying. Even support staff in a medical office or hospital require effective oral communication skills as well as compassionate interpersonal skills such as the ability to listen and talk to patients to assess needs. Effective communication with colleagues as well as patients is crucial. Healthcare is increasingly a group activity, in which a patient's recovery depends on how well all members of a healthcare team perform specific function, and how well they communicate and collaborate with one another.

Mathematics: From reading charts to interpreting data to measuring and administering correct medicine, basic mathematics skills are essential for providing quality care across most healthcare occupations. Nurses, for example, use mathematics for calculations in all areas of their duties. They use mathematics to calculate dosages, caloric requirements for individual patients, calibrate

equipment, and interpret lab results. Charts and patient data are often presented as decimals or percentages, and a nurse must be able to convert between the two, thus requiring competency in understanding and using ratios, proportions and percentages.

Much of modern medicine is based on statistics, and all workers in the industry should have a basic understanding of how statistics are used to influence medical trends. Nurses, for example, need to be aware of the statistics behind prescribing medications and possible side effects or complications. They might use statistics to counsel patients on diagnoses or prognoses, or in gathering patient histories.

Career Opportunities in Healthcare with Education from Community Colleges

Massachusetts Community Colleges play a crucial role in preparing students for careers in health sciences across all sectors of the industry—therapeutic services, diagnostic services, informatics, and support services. All 15 community colleges offer pathways to nursing careers, the largest occupation in the healthcare industry. Additionally, Massachusetts Community Colleges offers associate degree and certificate programs that prepare students to enter occupations across all sectors of the industry, for example:

- *Therapeutic services:* registered nurse, practical nurse, nursing assistant, certified nurse's aide, massage therapist, fitness trainer and instructor, dental hygienist, dental assistant, pharmacy technician, physical therapist assistant, occupation therapy assistant, respiratory assistant, medical assistant
- *Diagnostic services:* radiologic technologist and technician, radiographer, surgical technologist, sonographer, phlebotomist, paramedic, polysomnographic technologist and technician, medical and clinical laboratory technician, magnetic resonance imaging technologist, nuclear medicine technologist, veterinary technologist
- *Informatics:* Medical record and health information technician, medical coder, medical interpreter, medical biller, medical transcriptionist, health educator

Recent Career Opportunities in Massachusetts

The following is a sample of healthcare job listings in Massachusetts that require an associate's degree or certificate:

- Registered Nurse (RN), AmeriCare At Home, Boston, MA [show]
- Medical Technologist, Emerson Hospital, Concord, MA [show]
- Ultrasound Technologist, Brockton, MA [show]
- Licensed Practical Nurse, Hologic, East Watertown, MA [show]

Employment Outlook for Healthcare

America's aging population is now nearing or entering retirement (opening new jobs), and will continue to require more services and the increased use of innovative medical technology for diagnosis and treatment. As a result, healthcare is one of the fastest growing industries both nationwide and in Massachusetts, where growth is even higher than nationally. For example, in 2010, Baystate Health of Springfield, which employs more than 10,000 across its Western Massachusetts system, said that it would likely need to hire about 15,000 people between 2010 and 2020 to replace retiring workers and meet increased demand.

One important factor in the healthcare industry is the financial pressure on hospitals to focus on efficiency and profitability, which results in discharging patients as soon as possible. These financial pressures, along with increased healthcare coverage under federal law, will likely result in a growth in out-patient services in the healthcare industry, such as rehabilitation clinics, long-term care facilities, and home care programs. As a result, occupations experiencing the largest growth include home care aides, physical and occupation therapist assistants, dental hygienists, and medical assistants.

Emerging careers in Health/Information Technology (HIT): Estimates based on data from the Bureau of Labor Statistics (BLS), Department of Education, and independent studies indicate a shortfall of approximately 51,000 qualified Health IT (HIT) workers who will be required over the next five years to meet the needs of hospitals and physicians as they move to adopting an electronic healthcare system, facilitated by the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009. The HITECH Act is a key component of healthcare reform. The Act encompasses interoperable electronic health records (EHRs) including computerized systems to order tests and

medications, and support systems to aid clinical decision making and the development of a national health information network to permit the secure exchange of electronic health information among providers. The Congressional Budget Office estimates that the incentive mechanisms in the HITECH Act will increase HIT adoption rates from 45 percent to about 70 percent for hospitals and from 65 percent to approximately 90 percent for physicians. To support job growth in this emerging career field and ensure the adoption of EHRs, new types of workers are needed to facilitate information exchange across healthcare providers and public health authorities, and assist in redesigning workflows within healthcare settings to maximize the quality and efficiency benefits of EHRs, while maintaining privacy and security of health information and records. To that end, the Department of Health and Human Services has embarked on an initiative to build the HIT workforce with community colleges as the primary training ground for these new workers: (1) Practice workflow and information management redesign specialists; (2) Clinician/practitioner consultants; (3) Implementation support specialists; (4) Implementation managers; (5) Technical/software support staff; and (6) Trainers. The average hourly earnings for community college program graduates are expected to be in the target range of between $12.46/hour to $20.25/hour.

Resources:

Healthcare Employment Outlook:

- Massachusetts Career Information System: Massachusetts-specific information on careers which can be used to look at different industries, occupations within those industries, and the skills and education needed to work in these jobs
- WorkKeys Occupational Profiles
- Bureau of Labor Statistics

Healthcare Career Information:

- Top 5 Reasons to Work in the Healthcare Field, About.com
- Break Into a Healthcare Career, About.com
- Healthcare Initiatives, US Department of Labor
- Six Healthcare Careers that are Booming, Yahoo! Education
- Career Clusters in Health Sciences, National Association of State Directors of Career Technical Education Consortium
- Explore Health Careers, American Dental Education Association

Massachusetts Healthcare Job Listings:

- Massachusetts Healthcare Jobs, Jobs.net
- Healthcare Jobsite, Beyond.com

Workplace Scenario (8th Grade Level)

This scenario is based on the work of a medical lab technician. For more information, view this video.

You are a medical lab technician (MLT). You work in a large regional medical center in a team of six. In your job, you receive blood and other samples throughout the day. You must run multiple tests measuring indicators in the samples you've received.   MLTs prepare specimens and either perform automated or manual tests on them. The manual tests require you to follow detailed instructions.

As part of your job you may receive blood or tissue samples from patients. You log in patient samples and prepare them for testing. You also set up medical laboratory equipment. You conduct routine laboratory tests and sample analyses. Additionally, you clean and maintain the medical laboratory and equipment. You must be very careful and accurate when running tests and using equipment. Mistakes in testing can seriously endanger patients' health. This job requires good reading and skills to be able to follow directions accurately.

One of your tasks each day is checking the laboratory machines. To do this, you must test a control sample for which you already know the value. If this quality check results in the same value as the control sample, you know the machine is working correctly. At the end of the day, you clean the machines. You then prepare them for the next day. Checking and cleaning the equipment are

important to receiving accurate results. You must be able to read and follow the directions for each task.

You sometimes need to read the machinery manuals. This will help you solve problems that arise. Similarly, it is important to read and understand directions for storing patient specimens. For example, some need to be kept at a certain temperature before analysis. Otherwise the results may come out wrong.

On a typical day a set of tubes will arrive to the laboratory. The tubes contain blood or other specimens and come with a form. You must read each order carefully to be sure you understand which test is required. The form and the specimens are each given a laboratory number. This number is on a sticker placed on the tubes and form. This label has a barcode that can be scanned. Test requests can also be uploaded from the Laboratory Information System (LIS). When you enter requests into the LIS, you must read closely. You must accurately type or scan in the laboratory number. You also enter the patient identification and any tests requested. Staff will then know what tests are pending and where to report results. The machines reading the computer information can also automatically run the requested test.

Each test has a different range for normal. You need to read charts or graphs to compare the results of the test with the range for normal. You then record the test results. If they are out of the normal range, you create an alert for the doctor. The MLT needs to make different comparisons, depending on the particular test's normal range. Sometimes, the test results are so out of range that the test should be rerun. You then need to compare the original and subsequent test results. This allows you to determine the appropriate result to report to the doctor. Sometimes you even need to redo the test manually. You will need to use reading skills to be sure you are correctly following directions for the manual test.

Workplace Scenario (High School Level)

This scenario is based on the work of a medical lab technician. For more information, view this video.

You are a medical lab technician (MLT) in a large regional medical center where you work with a team of six other medical lab technicians. In your job, you receive blood and other samples throughout the day, and you must run multiple tests measuring indicators in the samples you've received. MLTs prepare specimens and operate automated analyzers or may perform manual tests following detailed instructions. Your duties include collecting blood or other samples from patients, receiving tissue samples from patients, and logging in patient samples and preparing them for testing. You also set up medical laboratory equipment, conduct routine laboratory tests and sample analyses, and clean and maintain the medical laboratory and medical laboratory equipment. You must be very careful and accurate when running tests and using equipment since mistakes in testing can seriously endanger patients' health. This job requires good reading and skills to be able to follow directions accurately.

One of your tasks at the beginning of each day is checking the laboratory machines to be sure they are operating correctly. Some of the machines you may work with include hematology analyzer, an ultracentrifuge, or a gaschromatograph. To determine if machines are working correctly, you must test a control sample for which you already know the value. If this quality check results in the same value as shown for the control sample, you know the machine is operating correctly. At the end of the day, the MLTs must clean the machines, in some cases using bleach and distilled water, and prepare them for the next day.

Since checking and cleaning the equipment are important to receiving accurate results, you must be able to read and follow the directions for each task. You must also be familiar with any type of package inserts or booklets that come with the machinery. This will enable you to troubleshoot problems that arise. Similarly, it is critical to be able to comprehend and follow directions related to the storage of patient samples and specimens. For example, some specimens need to be kept at a particular temperature before analysis in order for the results to be accurate.

On a typical day a set of vacutainer tubes containing blood, or any other specimen, will arrive to the laboratory in a small plastic bag, along with the form. You must read the orders carefully to be sure you understand which test is required for each specimen. The form and the specimens are each given a laboratory number on a sticker placed on the tubes and form. This label has a barcode that can be

scanned by [automated analyzers](#) and test requests uploaded from the Laboratory Information System (LIS). When you enter requests into the LIS, you must read closely to accurately type or scan in the laboratory number, and enter the patient identification, as well as any tests requested. Staff will then know what tests are pending, and the machines reading the computer information can automatically run the requested test. Scanning in this information also lets the staff know where to report the results.

Each test has a different range for normal. You need to read charts or graphs to compare the results of the test with the range for normal, record the test results accurately and create an alert for the doctor if the results are out of the range. The kind of alert will depend on how far out of the range, so the MLT needs to make different comparisons, depending on the particular test's normal range. Sometimes, the test results are so out of range that the test should be rerun. You then need to compare the original and subsequent test results to determine the appropriate result to report to the doctor. Sometimes you even need to redo the test manually. You will need to use reading skills to be sure you are correctly following directions for redoing the test manually.

Core instructional context

Poor reading skills present significant challenges to students' career and college readiness. While the majority of the adults in this country are functionally literate, a high number of adults are poor readers, and this fact has major implications for employers. Adults with low literacy levels are more likely to be unemployed or hold very low paying jobs. According to the National Center for Educational Statistics "…about 22% of American adults have minimal literacy skills. Some are functionally illiterate in that they can read some words but not enough to understand simple forms or instructions."

In order to help students to become good readers, teachers may want to focus on skills to help build overall literacy, including vocabulary, fluency, and comprehension development.

A good reader

- confidently approaches reading tasks.
- activates their background knowledge before reading.
- knows the purpose for reading.
- can make predictions and choose appropriate strategies for the passage.
- summarizes major ideas and recalls supporting details, makes inferences, and paraphrases.
- can focus their complete attention on reading.
- uses appropriate word decoding skills.
- can monitor his or her comprehension during and after reading.
- can anticipate and predict meaning of words by using context clues and other strategies.
- can create visual and sensory images from text.
- has a large repertoire of strategies to help them attack an unfamiliar passage.

The following tactics are ideas to help build student vocabulary and background knowledge, fluency, and comprehension skills.

Building Vocabulary and Background Knowledge
In order for students to raise their reading proficiency, they need repeated exposure to new words. Encourage students to skim the assigned text and identify unknown words prior to reading and provide descriptions or an explanation of a new term or word for students. Students should make notes of unknown words to review and learn by reusing the word in an original sentence and practicing the word orally. They can also provide their own description for the word and attempt to connect the word to a picture or make a personal anecdotal connection to the word.

Vocabulary in expository texts may be highly technical (Tier 3) and require students to learn words associated with an unfamiliar topic. Tier 3 includes two types of words: (1) technical words and termsthat are typically found in glossaries in textbooks and usually taught to all students as part of content-area instruction, and (2) words that are important to the meaning of a passage, but encountered so infrequently that they are best defined for students during reading or lecturing. If a student is planning a career in healthcare, it's a good idea to make a head start on learning the vocabulary and how to decode the common vocabulary words, many of which use Greek root words and affixes.

Dr. Robert Marzano describes a six-step process for the [instruction of vocabulary]. (Marzano, 2005). According to Marzano, all six steps should be followed to ensure that learning takes place.

1. The teacher gives a description, explanation, or example of the new term.
2. The teacher asks the learner to give a description, explanation, or example of the new term in his/her own words.
3. The teacher asks the learner to draw a picture or symbol, or to locate a graphic to represent the new term.
4. The learner will participate in activities that encourage a deeper understanding of the words in their vocabulary notebooks (graphic organizer).
5. The learner will discuss the term with other learners.
6. The learner will participate in games that provide more reinforcement of the new term.

An example of a game to reinforce new terms is [Vocabulary Bingo]. Create bingo cards, writing in selected vocabulary words. Call out the definitions while students match the definitions to the terms on their cards. This activity is at the recall level on Bloom's Taxonomy, but it is a good way to help students familiarize themselves with terms and their definitions.

Another way to help students build vocabulary is to help them build [semantic maps], placing the word to be defined in the center and brainstorming ideas about the word. As students identify words that define the main word or mean the same, draw the semantic map to show relationships. The website [Visuwords] is an online thesaurus that provides semantic maps for words. Once a word is entered, rolling over the word in the semantic map provides the definition. Using this website is one way for students to build knowledge about families of words.

Students can also be encouraged to learn Greek and Latin prefixes, suffixes and common root words. Point out to students that they can unlock the meaning of a significant number of new words by knowing these word forms. One resource students might use is ["Root Words, Roots and Affixes"] or the list ["English Language Roots"]. One strategy the instructor can use is to identify roots and affixes of word that may be unknown to students during a vocabulary lesson. For example, the word "auditor," contains the root *aud-* meaning "to hear or listen" and the suffix *-tor* meaning "one who" or "one who hears or listens" and is used with this meaning in the scenario for this module. Another example included in the scenario for this lesson is the word *hematology.* Students can break this word down to the root *hema-* or *hemo-* meaning "blood" and *–logy* meaning "study."

Finally, have students keep their own vocabulary journal to record unknown words, especially academic words. The [Academic Word List] is a resource to help with identifying academic words, Have students record graphics and definitions in their own words as this can help students to better retain words over time.

Building Fluency
Fluency—the ability to read with accuracy, speed and expression—is important because it allows the reader to avoid the process of decoding each word along the way. One effective strategy to build fluency is repeated reading or the strategy of reading short passages several times and attempting to read a little faster each time. It will be more difficult for instructors to understand the students' reading issues if they are only asked to read silently. According to Guglielmino (2005), "finding a balance of activities (such as explicit instruction, guided reading, echoing the teacher's reading, reading in pairs, and silent reading) every day within a safe and non-threatening environment is most likely to produce positive results."

One specific strategy to build fluency is [WARF], which encourages students to:

- Widen your eye span. Read groups of words or phrases rather than one word at the time.
- Avoid skip backs. Keep reading even if you are not sure you understand.
- Read silently. Even if you have to place a finger on your lips to remind you.
- Flex your reading rate. When reading important information, read more slowly than when you are reading less important, less detailed information.

Other strategies to improve fluency include timed reading, repeated and monitored oral reading, teacher modeling, paired (partner) reading, tape-assisted reading, and chunking. For more information on these strategies, see [Florida GED PLUS College Preparation Program Curriculum and Resource Guide].

Difficult Material
Although fluency is important, when material is highly technical, reading more slowly may be more important than speed. Highly technical information is likely to be densely packed with concepts and technical vocabulary the learner needs to grasp. Slowing down will make this process easier. Strategies students can use to better understand the content are using thinking notes, highlighting important details and adding margin notes. As the student completes reading sections of the material, suggest he use the "look away" method to check for understanding and memory. (This is also a good study technique!) This page describes a process for reading difficult material.

Improving Comprehension
It is important to teach students that, with practice, reading can become easier. Instructors should consider their approach to teaching comprehension in terms of where particular students' confidence levels are in regards to reading.

Useful strategies for comprehension include retelling or summarizing the passage, discussing the reading and evaluating what was read. Writing a summary of what was read also reinforces the reading-writing connection. Encourage students to take notes as they read using a system such as Cornell Notes or Thinking Notes. Using graphic organizers to help students before, during, and after reading are also great tools, such as these graphic organizers from Scholastic.

Help students learn pre-reading strategies such as TIPP?. This strategy uses skimming to preview the text and develop questions students think the text may answer as they read. Point out that scanning is a different strategy used to locate specific information, such as the answer to a question. This is also a good time to activate prior knowledge with the use of a KWL chart or other strategy to help students recall what they already know about the topic. This video provides some ideas for pre-reading strategies: Silent Tea Party: Pre-Reading for Challenging Texts.

Finally, writing for understanding is a way for students to show and for instructors to check for comprehension. Students can keep a journal to predict what a reading will be about and then summarize the entire text after they read sections or individual passages, making note of any questions they have about the text. This is an easy way to model comprehension strategies in the classroom as well.

Reading Technical Texts
Technical texts such as the machine and safety manuals discussed in the scenario are especially challenging to read and comprehend. Reading experts (Fry, 2012, p. 74) suggest five kinds of information to look for in technical text: definitions and terms, examples, classifications and listings, comparison and contrast, and cause and effect. Fry also suggests a seven-step plan for students as they attack technical material.

1. Learn the technical terms.
2. Analyze the structure and understand it.
3. Skim the text, identifying questions you have.
4. Be sure you have a full understanding of each section before moving on.
5. Read slowly.
6. Pay attention to examples
7. Summarize after reading.

Reading Charts and Graphs
The purpose of using graphs and charts is to show information visually in a way that makes understanding supporting data better. Every single career involves some kind of necessity to interpret data, and that's why it's important to be able to interpret graphs. Many informational texts require "graphic literacy" or the ability to interpret charts and graphs. For example, in the scenario for this lesson, you need to read charts or graphs to compare the results of the test with the range for normal. Reading charts and graphs requires the reader to pay attention to details and to know how different charts and graphs are organized in order to read them correctly. This lesson from TV411 provides activities that help students learn how bar graphs, pie charts, and grid charts are organized. To work through the module, click "Begin Lesson" at the bottom of the page. Another activity to help students learn the parts of charts and graphs is here.

Example
The medical lab technician has received a blood sample to test for thyroid function. The test results

show that TSH level is 6.2, a Total T4 reading of 4.1 and a Free T4 reading of .6. Using the chart below, what conclusion could you draw from these readings?

Key Thyroid Function Tests
Laboratory Values and Interpretation
(Note: These are general values/averages. Lab values can vary somewhat from lab to lab. Always check to find out what the specific normal range is for the test value at YOUR lab.)

Test / Name	Normal Range	Interpretation
"TSH" Test -- Thyroid Stimulating Hormone / Serum thyrotropin	0.4 to 6 0.3 to 3.0 (as of 2003)	Under .4 can indicate possible hyperthyroidism. Over 6 is considered indicative of hypothyroidism. **Note:** the American Association of Clinical Endocrinologists has revised these guidelines as of early 2003, narrowing the range to .3 to 3.0. Many labs and practitioners are not, however, aware of these revised guidelines. (See Endos Say Normal TSH Range Now .3 to 3: Millions More at Thyroid Risk)
Total T4 / Serum thyroxine	4.5 to 12.5	Less than 4.5 can be indicative of an underfunctioning thyroid when TSH is also elevated. Over 12.5 can indicate hyperthyroidism. Low T4 with low TSH can sometimes indicate a pituitary problem.
Free T4 / Free Thyroxine - FT4	0.7 to 2.0	Less than 0.7 is considered indicative of possible hypothyroidism.
T3 / Serum triiodothyronine		

Source: http://thyroid.about.com/cs/newsinfo/l/bltest_values.htm

Answer: The patient is suffering from hypothyroidism.

Assessment
Assess students' written summaries of technical text they have read by using a classroom rubric. Also, use vocabulary quizzes or content quizzes to assess students' knowledge and understanding of the content they've read.
Sample rubrics to use or adapt include these:

- Assessing Critical Reading Competencies from a Student-Produced Text: Rubrics
- Rubric for Reading Technical Information

Contextualized learning activities

1. Vocabulary Development
This scenario includes vocabulary words that are likely to be new to many students. Help students build their vocabulary skills through the following activities:

a. Familiarize students with the concept of root words. If you have access to a computer lab, try using these interactive root word lessons from TV411, a non-profit devoted to helping adults gain basic reading, writing, math and science skills:
http://www.tv411.org/vocabulary/understanding-how-words-work/roots-and-t...
http://www.tv411.org/vocabulary/understanding-how-words-work/more-roots-...
If you do not have access to computers, you can still use the examples from these two lessons as part of your introduction to root words.

b. Select a series of vocabulary words related to the scenario. In small groups, with the support of web sites such as http://www.learnthat.org/pages/view/roots.html, have students work together to break down the prefix and/or root of each word and see if they can come up with a definition. Then compare definitions across groups and share the actual meaning of the selected words.
c. Choose several of the vocabulary words from the scenario that can easily be illustrated with a visual example. Give students a list of words and the visuals and ask them to match the words to the corresponding visual.

2. Reading for comprehension and following directions accurately
This scenario highlights the importance of good readings skills and the ability to accurately follow directions with regard to the proper handling of specimens and running manual tests as necessary to calibrate the medical machinery. To support the development of this skill, ask students to create a set of instructions for an accessible but multi-step task, such as making a sandwich or repairing a common household item. Then, have another student read the instructions and try to follow them accurately. Conclude with a class discussion about any challenges that arose both in writing and reading directions accurately.

3. Liberal Arts Connection
Support students in their general reading comprehension practice as well as in making the connection between themes from this scenario and books, poetry, songs, or films (or excerpts of these). For example, you might assign one of more of the following to discuss in class:

The Immortal Life of Henrietta Lacks, by Rebecca Skloot
Excerpt from the Prologue:
http://rebeccaskloot.com/the-immortal-life/excerpt/

Cutting for Stone, by Abraham Verghese
Excerpt from Cutting for Stone:
http://protomag.com/assets/cutting-for-stone-excerpt

The Ship Pounding, by Donald Hall

Nagasaki Cluster, by Blair Beebe

Notes from Sickrooms, by Julia Duckworth

Contextualized test items

1. Based on your understanding of root words, the word hematology refers to the study of what?

  a. heart disease
  b. blood
  c. cancer
  d. ulcers

2. A *gaschromatograph* is used to measure what kind of compounds? If you do not know the word, use your knowledge of root words to answer.

  a. metal
  b. liquid
  c. gas
  d. blood cells

Contextualized project

Reading for Accuracy: Understanding Consequences
A key concept for students to understand in this scenario is the importance of reading informational

text accurately, and the real world consequences of making a mistake. They also need how to comprehend information presented in a variety of ways (textual, visual, etc).

a. Have students research one or more typical medical lab tests (for example, cholesterol/lipid panel, pregnancy test, metabolic panel, thyroid panel, etc.). Have them explore the following questions, both drawing on a variety of media sources AND then presenting what they learn in multiple media formats (writing, charts, graphs, etc):

- What can be learned from results of this test?
- What are normal ranges for this test?
- What would an abnormal value be for this test?
- What are the consequences of making a mistake in the analysis of this specimen?

Sites that could be used to support this research include:

- Cleveland Clinic Laboratory Tests: http://my.clevelandclinic.org/heart/services/tests/labtests/default.aspx
- Normal ranges for common laboratory tests: http://www.rush.edu/webapps/rml/RMLRanges.jsp
- Middlesex Hospital Common Laboratory Services http://my.clevelandclinic.org/heart/services/tests/labtests/default.aspx

b. Have students read about the impact of making medical mistakes. You might draw from books such as Atul Guwande's *Complications: A Surgeon's Notes on an Imperfect Science* or news coverage of recent events such as Annie Dookhan's mishandling of specimens for drug testing. Then have students write about a situation in their lives in which a medical mistake was made. What was the impact? How could the mistake have been avoided?

Additional or extension activities, multimedia, readings and/or resources

Root Words and Prefixes: Quick Reference:
http://www.learnthat.org/pages/view/roots.html

TV411 video profiling the strategies an adult learner uses to identify the meaning of new medical words.
http://www.tv411.org/vocabulary/understanding-how-words-work/video-medic...

Reading Charts, Graphs and Timelines
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