Critical Thinking

Course
Medical Microbiology

Unit VI
Concepts of Medical Microbiology

Essential Question
Why should we use critical thinking to make informed decisions within and outside the classroom?

TEKS
130.207(c) 2GH, 3ABC

Prior Student Learning
None

Estimated time
1hr initially, activity maybe done on a weekly basis.

Rationale
Critical thinking is needed in every aspect of a medical career and is a key skill of a good microbiologist.

Objectives
Upon completion of this lesson, the student will be able to:

- Use critical thinking skills to solve a health related problem

Engage
Show the photo of the boy and dog below (or another photo of your choice) for 30 seconds. Then ask the students questions to see what they observed and remember. For example, what color was the dog's coat? Dog's leash? boy's shirt? House in the background? Put the photo back up for 5 seconds and ask some new questions. (Or use the second photo of a coral snake and see if they can determine if it is friend or foe.) Were the students better prepared for the questions when they were looking critically at the photo even though they had less time? Discuss how our observations in and out of the classroom are key to using critical thinking to make informed decisions.

Teacher Note: These can be done as often as once a week, once a grading period, or once a semester. Students can work alone or in pairs or groups. Links below may be helpful in finding sources or students can be challenged with finding new articles or problems on their own.

Key Points

I. Developing critical thinking skills related to reading and writing: (called critical incidence in Med School)
   A. Aid in reading comprehension and interpretation -- learning medical terminology will give students the ability to understand medical language and comprehend technical information
   B. Help students evaluate and apply the technical material that is read -- knowledge of medical terminology allows students to make decisions concerning tasks as a health care worker
   C. Help students with planning and organizing their thoughts -- in health care, writing clearly and logically depends on planning and the ability to use medical terminology

II. Developing critical thinking skills in math and science:
   A. Aids in problem solving
      1. problem solving requires knowledge of scientific inquiry and

use of mathematic functions and facts
2. Knowledge of mathematical computations and conversions allows accurate calculations to be made regarding health care problems

III. Developing critical thinking skills helps health care workers analyze, evaluate and act on information. Learning to think critically is much like learning to problem solve or use the scientific method. It involves a four step process:
   A. Identify: Observe a problem then ask a question that states what the problem is that needs to be solved
   B. Brainstorm: List all alternatives or outcomes by taking a few minutes to think of things that are positive, negative and interesting outcomes
   C. Rate or Test: Rate each possible consequence of each of the listed outcomes or alternatives. If possible test your option in an experiment
   D. Conclusion: Evaluate and choose the best course of action based on your rating or adjust your conclusion based on your data collected from your experiment

Activity

I. Evaluate a critical thinking problem pertaining to a current topic in medical microbiology. Conclusions may be shared by submitting a written report or giving a multimedia presentation to illustrate findings.

II. Random Item Description Warm-Up: have student describe a projected photo or a randomly selected object in the classroom to a partner without using the name. Helps to build critical thinking, communication, and observation skills.

III. Critical writing from the point of view of their name badge. Have students describe a lab or field trip or first day of school as if they were their name badge.

Assessment

Multimedia Presentation Rubric
Writing Rubric

Materials (all optional)

American Society for Microbiology activities for K-12: http://www.asm.org/index.php/k-12-teachers/classroom-and-outreach-activities

This Week in Microbiology: http://www.microbeworld.org/podcasts/this-week-in-microbiology

Apps
World of Viruses (download all 5 separate viruses) comic book presentation and 3D view of viral structures
Virulent – shows how viruses reproduce in a game

Accommodations for Learning Differences
For reinforcement, the student will identify and define medical and unfamiliar terms in the presented problem.

For enrichment, the student will evaluate additional resources to develop critical thinking skills by researching other apps or websites.

National and State Education Standards
National Health Science Cluster Standards
HLC07.01 Leadership and Teamwork
Health care workers will understand the roles and responsibilities of individual members as part of the health care team: Apply corrective action to an acknowledged conflict situation.
HLC08.01 Ethics and Legal Responsibilities
Health care worker will understand the legal responsibilities, limitations, and implications of their actions within the health care delivery setting: Use problem-solving techniques when confronted with legal dilemmas or issues.

TEKS
130.207 (c)2(G) analyze, evaluate, make inferences, and predict trends from data;(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

130.207 (c)3(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student; (B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials; (C) draw inferences based on data related to promotional materials for products and services;

Texas College and Career Readiness Standards
English-Listening:
B.3. Listen actively and effectively in a group discussion
Cross-Disciplinary Standards
Reasoning:
B.1. Consider arguments and conclusions of self and others.
Key Cognitive Skills
Problem solving:

C.1. Analyze a situation to identify a problem to be solved.
C.2. Develop and apply multiple strategies to solving a problem.
C.3. Collect evidence and data systematically and directly related to solving a problem

Photo from : http://www.cdc.gov/HomeandRecreationalSafety/Dog-Bites/biteprevention.html

Photo from: http://www.cdc.gov/niosh/topics/snakes/ (many other snake options on this page)

Multimedia Rubric

Student: _____ Class: _____

Title:_____ Other Group Members:_____

Date:_____ _____

Scoring criteria	5 Excellent	4 Good	3 Needs Some Improvement	2 Needs Much Improvement	1 N/A
Clearly and effectively communicates an introduction of the theme/objective of the project.					
Clearly and effectively communicates the content throughout the presentation.					
Integrated a variety of multimedia resources to create a professional presentation (transition, graphics).					
Presentation holds audience attention and relates a clear message.					
Timing between slides is beneficial for the viewer to read or observe content.					
Each image and font size is legible to entire audience.					

Scale:
26-30 A Excellent
21-25 B Good
16-20 C Needs Some Improvement
11-15 D Needs Much Improvement
6-10 F Not Appropriate
TOTAL=
Comments

Writing Rubric

Student: _____ Date: _____

Scoring criteria	4. Excellent	3. Good	2. Needs Some Improvement	1. Needs Much Improvement	N/A
The writing has all required parts from introduction to conclusion in smooth transition.					
The writing is interesting, supportive, and complete.					
The writing demonstrates that the writer comprehends the writing process.					
Accurate spelling, grammar, punctuation.					
Content of paragraphs emphasizes appropriate points.					
The writer shows an understanding of sentence structure, paragraphing, and punctuation.					
All sources and references are clearly and accurately documented.					

NOTE: N/A represents a response to the performance which is "not appropriate."