

For the “other required credits” in the bundle of credits, students in a Specialist High Skills Major program must complete learning activities that are contextualized to the knowledge and skills relevant to the economic sector of the SHSM. Contextualized learning activities (CLAs) address curriculum expectations in these courses.

Contact Information	
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Specialist High Skills Major	<i>Health & Wellness</i>
Course code and course title	SBI 3C Biology – College Prep
Name of contextualized learning activity/activities	Hospital Infection Control: <i>Hand Hygiene is the Key!</i> First Came SARS, Now Here Comes H1N1...
Brief description of contextualized learning activity/activities	The students will prepare bacterial cultures, write a lab report on the effectiveness of hand washing and then extend their knowledge of disease transmission and control to recent biological outbreaks such as SARS or H1N1.
Duration	<i>6 hours</i>
Overall expectations	C. Microbiology C1. assess the effects of microorganisms in the environment, and analyse ethical issues related to their use in biotechnology; C2. investigate the development and physical characteristics of microorganisms, using appropriate laboratory equipment and techniques; C3. demonstrate an understanding of the diversity of microorganisms and the relationships that exist between them.

<p>Specific expectations</p>	<p>C1.1 assess some of the effects, both beneficial and harmful, of microorganisms in the environment (e.g., decomposers break down waste, E. coli in water systems poses a severe risk to human health) [AI, C] C2.1 use appropriate terminology related to microbiology, including, but not limited to: <i>fission, conjugation, phage, dormancy, morphology, mycelium, spore, pathogen, and plasmid</i> [C] C2.3 prepare a laboratory culture of microorganisms (e.g., acidophilus) on agar, using proper aseptic techniques [PR] C2.4 investigate the effect of antibacterial agents on different bacterial cultures (e.g., the effects of antibacterial soap or mouthwash on a bacterial culture) [PR] C2.5 investigate and analyse the conditions (e.g., optimal temperature) needed by microorganisms for growth [PR, AI] C3.1 describe the anatomy and morphology of various groups of microorganisms (e.g., eukaryotes, prokaryotes, viruses) C3.5 describe how different viruses, bacteria, and fungi can affect host organisms, and how those effects are normally treated or prevented (e.g., hepatitis viruses can damage the liver, but vaccinations can prevent infections; streptococcus bacteria can cause respiratory infections, which are treated with antibiotics; ringworm is a fungal infection of the skin, treated with fungicides)</p>
<p>Catholic graduate expectations (if applicable)</p>	<p>CGE2b -reads, understands and uses written materials effectively; CGE2c -presents information and ideas clearly and honestly and with sensitivity to others; CGE3c -thinks reflectively and creatively to evaluate situations and solve problems; CGE4f -applies effective communication, decision-making, problem-solving, time and resource management skills; CGE5a -works effectively as an interdependent team member; CGE5e -respects the rights, responsibilities and contributions of self and others; CGE5g -achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others;</p>
<p>Essential Skills and work habits</p>	<p><u>Essential Skills</u></p> <ul style="list-style-type: none"> • Reading Text • Writing • Document Use <p><u>Numeracy</u></p> <ul style="list-style-type: none"> • Measurement and Calculation: • Data Analysis: (see Appendix B Lab Guide – Further Classroom Consolidation) <p><u>Thinking Skills</u></p> <ul style="list-style-type: none"> • Job Task Planning and Organizing • Problem Solving . • Finding Information <p><u>Work habits</u></p> <ul style="list-style-type: none"> • Working Safely • Teamwork • Reliability • Organization • Working Independently • Initiative

Instructional/Assessment Strategies

Teacher's Notes:

This realistic activity has been designed for Grade 11 College Biology students who are currently enrolled in the Health & Wellness Specialist High Skills Major program. Students should have already learned the anatomy and morphology of various groups of microorganisms, their lifecycles and methods of reproduction before beginning this activity. It is expected that students will require 6 class hours to complete all components of this activity, however up to 10 hours is allowed to complete a CLA.

Students will work both independently and as part of a team in preparing their Lab Report. Students will then work independently to complete a one page report on SARS or H1N1. The components of this activity provide several different opportunities for assessment. Once completed, all sections of the activity are to be submitted to the instructor for evaluation and feedback. All rubrics have been included in the Appendices of this document as noted below.

Teachers will require a regular classroom for day 1.

Teachers need to book a Science Lab for days 2 and 4.

Teachers need to book a Computer Lab for days 3 and 5 and if needed, day 6.

Lab Notes:

Protocol:

The lab protocol described in this activity has been used by the Infection Control Officer at a hospital to check nurses' hand hygiene awareness. Nurses were instructed to touch their fingertips around the edges and palms in the centre of a blood agar plate before and after washing with either soap and water or alcohol-based hand sanitizer. The results showed that alcohol-based hand sanitizer was the most effective method of hand hygiene as no microorganisms grew on those plates. Blood agar or tryptic soy agar with 5% sheep's blood is an excellent medium for supplying bacteria with nutrients and an environment in which we can see them grow (<http://www.sciencecompany.com/sci-exper/petridishes.htm>), however, nutrient agar may still be used. ***If teachers are pouring their own plates, plates should be allowed to dry at room temperature for at least 24 hours prior to the lab to prevent run-off.***

(Refer to <http://biology.fullerton.edu/biol302/302labf99/aseptic.html> for Aseptic Technique for preparing nutrient agar plates.)

Teachers should print out copies of the Handwashing Protocol for students to reference prior to beginning the lab activity. (See the Authentic Workplace Materials section.)

Safety:

Students will follow the safety precautions outlined in the text (Nelson Biology 11 pg. 113.). Environmental bacteria that are commonly found on the hands will grow on cultured plates. Students should expect to see *s. aureus*, coliforms, diptheroids, etc. The chance of the students carrying a pathogenic organism like *Salmonella* is highly unlikely. Most bacteria collected in the environment will not be harmful. However, once they multiply into millions of colonies in a petri dish they become more of a hazard. Students with open cuts should not participate in the inoculation of plates and students should never ingest or breathe in growing bacteria. Keep cultured petri dishes taped closed until your experiment is done. Then you should safely destroy the bacterial colonies using bleach. <http://www.sciencecompany.com/sci-exper/petridishes.htm>

Clean up and Disposal:

Once the experiment is completed, all used petri plates used must be decontaminated. If you do not have access to an autoclave for sterilization, you can decontaminate your experimental materials using disinfectants. An effective disinfectant is household bleach at 10% strength. You can make a 10% bleach solution by mixing one part of regular laundry bleach (e.g. Clorox®) with 9 parts of water. Other general common household cleaning reagents are also effective at decontaminating bacteria, and can be used. Decontaminate plates by carefully opening them and pouring a generous amount of disinfectant onto the agar surface. Leave the plates to soak for at least an hour. The sterilized, decontaminated plates can then be disposed of in your regular household garbage, but ONLY after sterilization, as described, is complete. http://www.sciencebuddies.org/science-fair-projects/project_ideas/Micro_Safety.shtml

Context:

This learning unit is contextualized specifically for students in the health care sector by emphasizing the benefits of hand hygiene as a key factor in preventing the spread of disease in a hospital setting. Students then describe how different viruses and bacteria can affect host organisms and how those effects are normally treated or prevented.

Strategies**Day 1**

- Teacher-directed review of Microbiology concepts needed for CLA (See Appendix F if needed)
Terminology related to microbiology (eg. pathogen, transmission, disinfect, sterilize, culturing, inoculate, aseptic technique, petri plate, agar, autoclave, bacterial colony etc.). Conditions for microbial growth (FAT TOM – food, acidity, time, temperature, oxygen, moisture)
1. Students read “Getting Started” p. 96 & 97 (Nelson Biology 11) and in pairs or as a class, answer the “Reflect on Your Learning” Questions 1 – 4. (p. 96)
 2. Students independently complete Review Sheet on Bacteria & Viruses (formative assessment/peer marking) – Appendix A

Day 2Science Lab

Performing a Lab – Culturing Bacteria (Refer to Student Lab Guide – Appendix B)
Hand washing demonstration & instruction – refer to Handwashing Protocol Posters (see Authentic Workplace Materials section for title/URL)

Day 3Computer Room

Complete introduction research & questions (Refer to Student Lab Guide – Appendix B)
Complete Hand Washing survey found at <http://www.cdc.gov/handhygiene/training.html>

Day 4Science Lab

Record observations – Appendix E (if needed)
Analyse lab results
Follow Student Lab Guide to complete Lab Report (summative assessment)

Day 5 & 6Computer Room

Complete Lab Report
Research – Investigate the SARS Outbreak or the H1N1 Pandemic – Appendix D

Modes of Learning:

Independent research/finding information
Teacher-directed instruction & demonstration
Guided group investigation & inquiry

Differentiated Instruction:**For students with no prior science lab experience, or if no science lab is available:**

- Use prepared slides or microviewers to observe growth patterns and morphology of bacterial colonies
- Provide video resources & guided feedback sheet with questions relating to the videos
- Invite a representative from the Regional Health Department to speak to the class
- Provide formatted observation sheets (see Appendix E)
- Instructor may perform the inquiry as a demonstration only and provide cultured plates (or photos of plates) for student observation and analysis.
- Have students design a graphic poster to educate workers in the health care field that effectively communicates the importance of hand hygiene to reducing disease transmission. (see Appendix C)

Assessment and Evaluation of Student Achievement

Strategies/Tasks	Purpose
1. Microbiology Terminology Worksheet	Formative assessment of prior learning
2. Review Sheet on Bacteria & Viruses	Formative assessment of prior learning
3. Hand Washing demonstration/practice	Diagnostic assessment of key learning studied in this inquiry
4. Small group Pair/Share – develop a hypothesis	Diagnostic assessment of student understanding of the purpose of the inquiry
5. Collaborative Lab Report – complete a practical Laboratory-based inquiry	Summative assessment of collaboration, practical skill and ability to make connections between observed results and the Big Question
6. Independent research and preparation of a written report	Summative assessment of knowledge, research and written communication skills
Assessment tools <i>Written review, skill demonstration, peer review, rubrics</i>	

Additional Notes/Comments/Explanations

The following may be used as add-ons or “Reach Ahead” options to add interest or additional information for students.

- “Handwashing with soap is the ‘*vaccine*’ that prevents infections.” (<http://www.globalhandwashing.org/>)
- The 4 F’s of Disease Transmission – flies, fingers, fluids and fields (surfaces)
- Conditions for microbial growth (FAT TOM – food, acidity, time, temperature, oxygen, moisture)

Further Classroom Consolidation: (Optional)

If time is available, teachers may wish to have students count the bacterial colonies present for each quadrant and chart the findings for the entire class in order to make comparisons between the various samples. Students can undertake a data analysis to quantify the effectiveness of each method (water, soap + water, alcohol-based sanitizer, etc.) in order to meet the numeracy skills outlined above.

Follow-up or DI Activity: (Optional)

Design a graphic poster to educate workers in the health care field that effectively communicates the importance of hand hygiene to reducing disease transmission. (see Appendix C)

Resources

Authentic Workplace Materials

Handwashing Protocol Posters (to be distributed to students for use in Lab Activity)

<http://www.ccohs.ca/pandemic/pdf/handwashing.pdf>

http://www.ccohs.ca/pandemic/pdf/hand_sanitizing.pdf

Human resources

Regional Health Inspector – Speaker’s Bureau

Print

Booth, Kathryn A., **Health Care Science Technology**. Glencoe McGraw-Hill, 2004. pp.66 – 71, 971 – 977

Di Giuseppe, Fraser et al., **Biology 11**. Nelson, 2003. 93 – 157

Video

- H.I.D.E & S.E.E.K!: eight strategies to prevent the spread of infection. Infectious Awareness, Inc., 1997.
- Confronting Epidemics: Three Case Studies: SARS, AIDS, Influenza. Video Education America, 2004.
- War Against Disease. National Film Board of Canada, 2003.

Websites

- http://en.wikipedia.org/wiki/Traveler%27s_diarrhea
- http://en.wikipedia.org/wiki/Food_safety
- <http://www.hc-sc.gc.ca/index-eng.php>
- <http://wwwn.cdc.gov/travel/default.aspx>
- <http://www.cdc.gov/handhygiene>
- <http://education.mit.edu/starlogo/models/applet/?url=files/library/bacterial-growth.slogo&title=Bacterial%20Growth>
- <http://www.globalhandwashing.org/>
- http://en.wikipedia.org/wiki/Hand_washing
- http://wiki.answers.com/Q/How_does_soap_work_to_clean_things
- http://en.wikipedia.org/wiki/Soap#How_soap_works
- http://www.ccohs.ca/oshanswers/diseases/washing_hands.html
- <http://biology.fullerton.edu/biol302/302labf99/aseptic.html>

Accommodations

- Use prepared slides or microviewers to observe growth patterns and morphology of bacterial colonies
- Provide video resources & guided feedback sheet with questions relating to the videos
- Invite a representative from the Regional Health Department to speak to the class
- Provide formatted observation sheets (see Appendix E)
- Provide computer access for students requiring literacy support

List of Attachments

Appendix A: Review Sheet

Appendix B: Student Lab Guide + Rubric

Appendix C: Handwashing Poster Activity Instructions + Rubric

Appendix D: Research Report Instructions + Rubric

Appendix E: Formatted observation sheet and data table

Appendix F: Microbiology Terminology Worksheet (Student worksheet + Teacher Answer Key)