Tourniquet Application:

Part 2 of "Stop the Bleed" Training

Illinois CTE Endorsement Area:

Health Science Technology & Human Services

Teacher and Student Editions

Original Lesson Developers: Nance Budde

ILCTE Leader, Nance Budde

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Converted to Format by Karen Aldworth

Current Phase of Lesson: Phase 3 of 5

Illinois State Board of Education

Illinois State University

Illinois' first public university.

Overview:

Mass casualty is an unfortunate experience we have all heard about in recent years. "Stop the Bleed" is a nationwide initiative to educate the public on what to do in the case of life- threatening bleeding. Although the formation of the "Stop the Bleed" program was prompted by public events, the information included in this lesson has value for accidents occurring in homes and at auto accident sites. All persons should be introduced to basic lifesaving skills and achieve a confidence in the skills needed to help save a life. In this lesson, the fundamentals of tourniquet application will be explored. The bleeding simulation activity and tourniquet application practice will reinforce the importance of a quick response to "Stop the Bleed" and save a life.

Classes or Discipline:

- All Health Science Technology classes
- Public & Human Services classes

Career Cluster:

- Health Science
- Human Services

Illinois CTE Endorsement Area:

- Health Science
- Human Services

Grade Level(s):

- Appropriate for all students in Secondary Schools and Post-Secondary Schools
- If this lesson is to be used with grades 5-8, teacher will determine appropriateness for their classroom audience.

Suggested Days/Minutes: (1) 2-hour session

Learning Objectives:

At the conclusion of this lesson, students will be able to:

- Identify life-threatening bleeding from non-life-threatening bleeding
- Explain the length of time needed for an average adult to "bleed out" and die.
- Demonstrate proper tourniquet application including; explaining body sites which are not able to be treated with a tourniquet and tightening the CAT tourniquet.
- Summarize the criteria for applying and removing a tourniquet.
- Compile a list of alternative materials that may be used for a tourniquet in the event a CAT tourniquet is not available.

Standards Addressed:

National Health Science Standards

- 1.1.2d Cardiovascular System: distinguishing blood components.
- 7.1.2b Standard Precautions: hand washing and gloving.
- 7.2.1 Personal Safety: safety procedures as outlined by CDC and OSHA.
- 7.5.2 Emergency Procedures & Protocols: apply principles of basic emergency response (safe location, contact emergency personnel and follow safety protocols)

Common Core Learning Standards:

- CC.K-12.SL.1 Comprehension and Collaboration: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas. Expressing their own findings clearly and persuasively.
- CC.K-12.SL.4 Presentation of Knowledge and Ideas: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Enduring Understandings:

- Students will continue to have confidence in their skills to assess emergency situations responding quickly and appropriately.
- Students will remain confident in their skill to assess scene safety.
- Students will have the ability to determine life-threatening bleeding as compared to non-life-threatening bleeding.
- Students will understand that life-threatening bleeding incidents can happen at home, work, school, church, mall, movies, motor vehicle accidents, etc.

Resources and References:

- Handwashing station (you can use bathrooms or kitchens. Paper towels are preferable to air dryers).
- Gallon milk jugs
- Tubing – ¼ inch in diameter, flexible and 5 feet in length. Amount of tubing required will be based on the size and number of groups in your classroom. (available at a hardware store)
- Red food coloring for water is optional
- Poster boards (can be purchased at an art supply store)

- CAT Tourniquets 1 tourniquet to every 4 students (can be purchased online at Amazon or the trainer will bring equipment).
- Train the Trainer mannequins or any other mannequins (if available)
- CNA, EMS, or Fire Science classes on campus may have mannequins that can be borrowed.
- If mannequins are not available, try "pool noodles." (found at major retailers and dollar stores)
- Disinfecting wipes for cleansing equipment following demonstrations.
- 5x8 lined Index cards (white or colored) – as takeaways for their notes.
- Colored markers, pen, pencils
- Internet connectivity for video viewing and Kahoot!
- How to Use a CAT Tourniquet Kahoot!

Essential Employability Skills:

There are four essential employability skills

- Personal Ethic: integrity, respect, perseverance, positive attitude
- Work Ethic: dependability, professionalism
- Teamwork: critical thinking, effective and cooperative work
- Communication: active listening, clear communication

The focus of this lesson is on integrity, professionalism, critical thinking and clear communication.

Skill	How it is addressed:
Integrity and Professionalism	Students will need to respond in a professional manner with the victim. Elaborate/Extend: Step 3 – 3rd & 4th bullet points.
Critical Thinking	Responders must think quickly as to what objects can be used in a bleeding emergency. These responders will have to immediately start with lifesaving techniques learned during this lesson in order to save a victim's life. Engage: Step 5 Explore: Part 1: Step 9 Elaborate: Step 1 & 2
Communication	It is essential that emergency responders effectively communicate with other responders & the victim(s) in a clear, calm and concise manner regarding all information pertaining to emergency events. Explore Part II: Step 5

Suggested Differentiation Strategies:

- The lab experience(s) with the water and milk jug would meet the needs of diverse learners
- Videos will reinforce information.
- Using group activities allows for peer learning.

- Designing a poster allows students with diverse learning styles an additional way to demonstrate understanding.
- Group and individual opportunities will include different learning styles.

Throughout this lesson the teacher notes and comments are in red.

1. Engage: (20 minutes)

1. Your teacher will have you take a 10-question pre-lesson quiz. Try your best. Keep your quiz to find out how many you answered correctly.

2. Your teacher will set up a Kahoot! game. Click here and wait for your game code.

   The Kahoot! game "How to use a CAT tourniquet" will assess knowledge regarding tourniquet use. The game will need to be started and run by the instructor and may be found at this link.

   How to use a CAT tourniquet Kahoot!

3. This is going to get messy, so it is best done outside in the grass. Each group will need the following items:

   - A plastic bag provided by your teacher.
   - A stopwatch or other timing device.
   - A milk jug or bucket of water.
   - Once outside, fill the bag with 4-5 liters of water. This is the approximate amount of blood circulating in the average adult human. Coloring the water red is optional.
   - Twist the top of the bag and/or fasten it to keep it closed. Make it personal by drawing a face on the bag and giving your bag a name.

   This activity should be done in groups of 2-3 students. The plastic bag can be any size large enough to hold 4-5 liters of water. Small trash bags will work fine and are relatively inexpensive. Used grocery bags will work since the top can be twisted closed and held with tape or a rubber band. Check grocery bags for air release holes which may be at the bottom of the bag. Once the bag is full of water, it will be about the size of a large pumpkin. Allowing students to draw a face and name their bag will help them identify the bag as representing a person. It is best if the bags are filled outdoors since they may leak in transit to the outside. If a hose is not available outside your building, water can be carried in buckets or empty milk containers.

4. Your bag is going to experience an "accident" that is going to cause "bleeding".

   Place the bags about 8 feet apart and line up the students about 12 feet away. Poke a hole in each bag going from one to the next quickly. They may quickly get nervous about how much water has leaked out before they arrive at the scene. This is realistic since help is not always quick to arrive. Yes, some will “bleed” longer than others. Also, do not be concerned that the hole poked in each one is the same. A small hole in some and a gash in others is appropriate. This is not

intended as a fair contest. It is a simulated accident scenario. When you are done with all the bags, ask the students to go to their bag and start their timer.

5. Start your timer and stop the "bleeding" any way you can as quickly as possible.

   It will be interesting to see how students attempt to stop the bleeding. Pinching – that won't work with a real victim. Tying or knotting - that won't work either.

6. Once the bleeding has been successfully stopped, stop your timer. How long did it take you to "Stop the Bleed"?

   If it took longer than 3-5 minutes or if the victim lost more than half their blood, they did not survive.

7. When the bleeding has stopped, pour the remaining blood into bottles or a graduated measuring container to determine how much blood was lost. Is your victim still alive?

8. How much blood volume can an average person lose and still survive?

   Approximately 2 – 2 ½ liters (40-50% of the circulating volume).

9. How long does it take for a person to "bleed out" from a major arterial bleed injury?

   Three to five minutes for an "arterial" bleed.

10. Discuss within your group other places mass casualty events have occurred other than at a school.

    i.e. movies, malls, churches, McDonalds, their work etc.

2. Explore: (40 Minutes)

Part 1:

1. Set a chair on the table and place a gallon milk jug full of water on the chair. This represents most of the blood of an average adult.
   Divide the class into groups of 3-4 students each.

2. Put a mark on the jug about halfway down. This represents how much blood can be lost before a victim will die.
   Be sure to use a black or red sharpie so that the mark does not wash off the jug.

3. Place one leg of the chair in a large basin. Be sure the basin is large enough to hold the entire contents of the gallon jug, as well as, the leg of the chair.
   Use basins that will hold at least a gallon of fluid so that you don't have overflow on the floor creating a safety hazard.
4. Get a plastic hose from your teacher and stick one end in the milk jug all the way to the bottom and place the other end in the basin. The plastic hose represents an artery.
   Look for soft flexible tubing approximately ¼ inch in diameter (which is the diameter of the femoral artery). Each group will need 5 foot of tubing.

5. Tape the hose to the leg of the chair in 2-3 places. The leg of the chair represents the bone.
   2-3-inch masking tape will work.

6. Wrap a thick towel loosely around the bone and artery several times. Hold the towel in place with several strips of tape. This represents the flesh, skin and muscle.
   Pool noodles, old bath towels, bubble wrap, or rags can work for this section. If you have a CNA class on campus, check with them.

7. Blow into the top of the milk jug to start a siphon. Time exactly how long it takes for the water to drain down to the "death mark."
   Encourage one member in the group to be the official timer. Be careful about cleaning the top of the jug if multiple students blow into it.

8. Stop the siphon and refill the jug.

9. Get a CAT tourniquet. Start the siphon again and apply the tourniquet once the bleeding starts.
   Watch the group's techniques. This can be repeated so that more students will be able to try to use the tourniquet.

10. Your teacher is going to lead a class discussion using the following questions:
    - Did it work? How can you measure your success?
    - What did you have to do to make it work?
    - Did you completely stop the bleed or just slow it down?
    - What surprised you about applying the tourniquet?

    Share your observations with them.

Part 2:

1. View How to apply a tourniquet (1:51)
2. View Radial Pulse Assessment and Palpation (1:54)
3. Your teacher/trainer will demonstrate the correct procedure for placing the tourniquet, how to tighten the tourniquet and assess the radial pulse to determine degree of tightness.
4. Your teacher will give you a handout on specific considerations when applying a CAT tourniquet.
5. In small groups, discuss what information surprises you on this handout? What was "new" information for you?
    - Can you talk with the victim if conscious?
    - Why would the victim be in pain after you applied a tourniquet?
    - How would you reassure your victim if you were the bystander responder?
6. In pairs, the teacher/trainer will demonstrate how to assess a radial pulse (for arm tourniquets). Practice with several classmates as partners.

    a. Introduce how to take a radial pulse. Indicate that if radial pulse can still be felt, the tourniquet is not applied tight enough.

    b. Students must be able to demonstrate the ability to find and assess the radial pulse BEFORE demonstrating correct tourniquet application.

7. Practice applying a tourniquet on yourself and 1 other student. The tourniquet is to remain in place only until the radial pulse is no longer felt but no longer than 1 minute. Your teacher will have cleared this procedure with administration.

    If your administration does not allow for practice on self and others, practice with a mannequin.

    If your administration prohibits this activity, obtain mannequins for practice. If your school has a CNA, EMS or Fire Science program, check with them for mannequin availability. Be sure students are serious about tourniquet application. Tourniquets are not something to be "played" with.

Part 3:

1. In small groups, students will research OSHA blood borne pathogens information.
2. While working with a person who is bleeding, you are likely to get their blood on you.
    a. Read the OSHA Fact Sheet: OSHA Blood Borne Pathogen Standard
    b. Your teacher is going to lead a discussion on the proper way to protect yourself from bloodborne pathogens exposure.

c. Look around the room and determine if anything in the classroom could protect you in the absence of gloves during bleeding emergencies.

Share that trash can liners, plastic garbage bags and lunch baggies could be used to cover their hands.

3. Explain: 20 minutes

Answer the following questions using the information you learned in the "bleeding" and tourniquet activities.

1. How does 1 (one) correctly placed tourniquet save a life?
   Stopping an arterial bleed has the potential to ultimately save the victim's life. (if that is the only injury the victim sustained).

2. How much pain will your victim experience after you apply a tourniquet?
   Correctly applied tourniquets "hurt" quite a bit. If it doesn't cause pain, it is either not applied correctly or tightly enough.

3. Where will you locate the radial pulse?
   Thumb side of the wrist along the radius bone.

4. Where would you place a tourniquet for an arm or leg wound?
   2-3 inches ABOVE the wound

5. What 2 (two) techniques can you use when talking to your victim?
   Any of these would apply:
   - Reassure the victim with a calm and encouraging voice.
   - Let the victim know that help is on the way.
   - Explain that the rescuer understands the tourniquet hurts but it needs to remain tightly in place, reinforce it is saving their life.
   - EMS will be able to give them something for pain upon their arrival.
   - Talk with the victim (if conscious) to take their mind off the pain caused by the tourniquet.

4. Elaborate/Extend: 20 minutes

1. Look around the classroom, what items can be used for a makeshift tourniquet?
    - Discuss as a group what you found that could work.
    - What items did your group find?

2. Pick something you found and use it on the jug and chair simulator. Did it work? How do you know that it worked?
   ID badge lanyards, hoodie ties, shoelaces, belts, pencils, pens etc.

3. View this video (2:33): **How a tourniquet saved this person's life**
    - Describe how you feel about these heroes?
    - Would you be able to save a life?
    - How would you define the professionalism seen in the video from the 1st responders?
    - What does professional mean to you? What does it look like?

4. In larger groups (5-6) design a display board describing when and how to use a tourniquet. Be creative.
   The completed display boards could be posted around the room for student recognition.
   Option: Allow students to use the handout at the end of this lesson.

5. Evaluate: 20 minutes

The following are possible means to evaluate student mastery of the objectives and standards addressed in this lesson.

- Post-lesson quiz with improvement compared to pre-lesson quiz.
  Found at the end of this lesson with answers.

- Tip Card accuracy:
  To include:
  1. How to differentiate life-threatening bleeding from non-life-threatening bleeding. Bright red & spurting with each heartbeat.
  2. Length of time for an average adult to "bleed out". 3-5 minutes.
  3. Tourniquet placement. 2-3 inches above arm & leg wounds.
  4. Wound locations that can never be treated with a tourniquet. Abdomen, chest, neck, knees, elbows, any joints.
  5. Length of time a tourniquet should remain on. Until removed by EMS or hospital emergency room physician.

- Demonstrate the correct process for applying and tightening a CAT tourniquet.

- Ability to identify other resources that can be used for a make-shift tourniquet. (shoelaces, hoodie ties, lanyards, belts, stick, pencil, pens etc.)

- Poster board displays for a graded project.

- Completion of a blood exposure incident report.

Handout for Tourniquet Application:

Source of material for steps [How to Use a Combat Application Tourniquet (CAT)]

Step 1: CAT Terminology

1. Friction Adapter Buckle
2. Windlass Rod
3. Windlass Clip
4. Windlass Strap
5. Omni-Tape Band

Step 2: Place Injured Extremity Through the Loop of the Omni-Tape Band

NOTE: You may have to thread the Omni-Tape Band through the Friction Adapter Buckle if it was not done so already.

Step 3: Place the CAT Approximately 2-4 Inches ABOVE the Injury

- You can use your fingers to estimate the distance (generally 2-4 fingers width should be enough)

Step 4: Once Placement of CAT Is Correct, Tighten the Omni-Tape Band Then Secure It onto Itself with the Velcro

Step 5: Twist the windlass rod NO MORE THAN 3 TIMES, then insert it into the windlass clip

- Twisting the windlass rod more than 3 times may cause it to break.
- If you can twist the windlass rod more than 3 times, repeat steps 2-4 and pull the Omni-Tape Band tighter.

Step 6: Thread the excess Omni-Tape Band through the windlass clip then secure it using the windlass strap

Step 7: Apply a 2nd CAT 2-4 Inches ABOVE the 1st CAT if bleeding is still not controlled

View the video (:51) at the end of this document for reminders:

How to Use a Combat Application Tourniquet (CAT)

Tourniquet Use Considerations Handout

1. Identify areas where tourniquets can be applied – extremities. Tourniquets should always be placed 2-3 inches ABOVE the wound. The higher on the extremity the better the bleeding control that is obtained.
2. Identify areas where tourniquets cannot be applied - i.e. neck, chest, abdomen and over joints (knees and elbows).
3. Analyze why victims will be in significant pain when a tourniquet is applied to a limb correctly.
4. Talk to your victim in a calm, reassuring voice. Tell them help is one the way. Explain you know that the tourniquet is painful but that it is saving their life.
5. How does one determine when the tourniquet has been applied correctly and with enough pressure to stop the bleeding?
6. Identify when a 2nd tourniquet can be used (when the 1st tourniquet does not control bleeding) and where it is to be placed – above the 1st tourniquet.
7. How long can a tourniquet remain in place? – it can only be removed by EMS or the Emergency Room physician.
8. A bystander responder SHOULD NEVER remove or loosen a correctly applied tourniquet that the stopped the bleeding even when victim is understandably in quite a bit of pain resulting from the correct application.
9. What is the priority in determining which victims will be transported first to the hospital?
10. Reinforce that bystander responders are not permitted to share any information about the victim except to a first responder.

11. Victims with abdominal and chest wounds will be transported first. Arterial bleeding wounds of the limbs will be next.
12. Makeshift tourniquets are not as effective as a CAT tourniquet, however, are better than not attempting to stop the bleeding. Some alternatives could include: shoelaces, hoodie ties, lanyards, belts, sticks, pens, pencils, etc.).

Pre/Post Quiz

1. What color and characteristic of blood would you expect to see when there is an arterial bleed?
    a. Dark red and trickling.
    b. Bright red and spurting.
    c. Dark red and spurting.
    d. Bright red and trickling.

2. How long should a tourniquet remain in place?
    a. Until the victim tells you it hurts too much to stay on.
    b. No longer than 5-10 minutes.
    c. Until removed by EMS or the hospital's emergency physician.
    d. Approximately 1 hour.

3. Tourniquets can be used for all the following body parts EXCEPT for these 2:
    a. Arms.
    b. Legs.
    c. Knees.
    d. Elbows.

4. When can you use a second tourniquet?
    a. It's better to use a 2nd tourniquet right from the beginning.
    b. Never use a 2nd tourniquet.
    c. If EMS tells you to apply a 2nd tourniquet.
    d. If the 1st tourniquet doesn't control the bleeding.

5. How much pain will a properly placed tourniquet cause the victim?
    a. A little bit of pain.
    b. No pain at all if properly placed.
    c. An extreme amount of pain if the victim is conscious.
    d. Most victims do not complain of pain.

6. Victims with which type of wounds are transported to the hospital before other victims?
    a. Arm wounds.
    b. Deep leg wounds,
    c. Superficial head wounds.
    d. Chest or abdominal wounds.

7. If a second tourniquet is needed, where should it be placed?
    a. Slightly below the 1st tourniquet.
    b. Slightly above the 1st tourniquet.
    c. You can never use a 2nd tourniquet.
    d. Apply 2nd tourniquet a bit looser.

8. The most important step in hand washing is ...
    a. The water temperature.
    b. Friction.
    c. Antibacterial soap.
    d. Correct drying procedure.

9. Which of the following scenario(s) would be UNSAFE for the responder? Choose all that apply.
    a. Victim laying in the street in traffic.
    b. Victim laying in a field.
    c. Victim near downed power lines.
    d. Victim has a weapon.

10. How long will it take an average adult to "bleed out" and die after suffering an arterial injury?
    a. About 30 minutes.
    b. 10-15 minutes.
    c. 3-5 minutes.
    d. Approximately 1 hour.

Answer Key:

1. b
2. c
3. c & d
4. d
5. c
6. d
7. b
8. b
9. a, c & d
10. c

Notes:

All ILCTE lessons are vetted by Curriculum Leader, Dr. Brad Christensen.

To see a review of this lesson by previous users, click here.

We invite users of this lesson to click here to leave follow up information and rating.

We would like to publish pictures / videos of your students using this lesson. Please send to Rod McQuality at: rdmcquality@ilstu.edu. By sending pictures, you have met all the picture / video release for your school.

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Tourniquet Application:

Part 2 of "Stop the Bleed" Training

Student Version

Overview:

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4. Your bag is going to experience an "accident" that is going to cause "bleeding".
5. Start your timer and stop the "bleeding" any way you can as quickly as possible.
6. Once the bleeding has been successfully stopped, stop your timer. How long did it take you to "Stop the Bleed"?
7. When the bleeding has stopped, pour the remaining blood into bottles or a graduated measuring container to determine how much blood was lost. Is your victim still alive?
8. How much blood volume can an average person lose and still survive?
9. How long does it take for a person to “bleed out” from a major arterial bleed injury?
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4. Get a plastic hose from your teacher and stick one end in the milk jug all the way to the bottom and place the other end in the basin. The plastic hose represents an artery.

5. Tape the hose to the leg of the chair in 2-3 places. The leg of the chair represents the bone.

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7. Blow into the top of the milk jug to start a siphon. Time exactly how long it takes for the water to drain down to the "death mark."

8. Stop the siphon and refill the jug.

9. Get a CAT tourniquet. Start the siphon again and apply the tourniquet once the bleeding starts.

10. Your teacher is going to lead a class discussion using the following questions:
    - Did it work? How can you measure your success?

- What did you have to do to make it work?
- Did you completely stop the bleed or just slow it down?
- What surprised you about applying the tourniquet?

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    - Can you talk with the victim if conscious?
    - Why would the victim be in pain after you applied a tourniquet?
    - How would you reassure your victim if you were the bystander responder?
6. In pairs, the teacher/trainer will demonstrate how to assess a radial pulse (for arm tourniquets). Practice with several classmates as partners.

7. Practice applying a tourniquet on yourself and 1 other student. The tourniquet is to remain in place only until the radial pulse is no longer felt but no longer than 1 minute. Your teacher will have cleared this procedure with administration.
   If your administration does not allow for practice on self and others, practice with a mannequin.

Part 3:

1. In small groups, students will research OSHA blood borne pathogens information.
2. While working with a person who is bleeding, you are likely to get their blood on you.
    a. Read the OSHA Fact Sheet: OSHA Blood Borne Pathogen Standard
    b. Your teacher is going to lead a discussion on the proper way to protect yourself from bloodborne pathogens exposure.
    c. Look around the room and determine if anything in the classroom

could protect you in the absence of gloves during bleeding emergencies.

3. Explain: 20 minutes

Answer the following questions using the information you learned in the "bleeding" and tourniquet activities.

1. How does 1 (one) correctly placed tourniquet save a life?
2. How much pain will your victim experience after you apply a tourniquet?
3. Where will you locate the radial pulse?
4. Where would you place a tourniquet for an arm or leg wound?
5. What 2 (two) techniques can you use when talking to your victim?

4. Elaborate/Extend: 20 minutes

5. Look around the classroom, what items can be used for a makeshift tourniquet?
    - Discuss as a group what you found that could work.
    - What items did your group find?

6. Pick something you found and use it on the jug and chair simulator. Did it work? How do you know that it worked?

7. View this video (2:33): **How a tourniquet saved this person's life**
    - Describe how you feel about these heroes?
    - Would you be able to save a life?
    - How would you define the professionalism seen in the video from the 1st responders?
    - What does professional mean to you? What does it look like?

8. In larger groups (5-6) design a display board describing when and how to use a tourniquet. Be creative.

5. Evaluate: 20 minutes

- Post-lesson quiz with improvement compared to pre-lesson quiz.
- Tip Card please include:
    1. How to differentiate life-threatening bleeding from non-life-threatening bleeding.
    2. Length of time for an average adult to "bleed out".
    3. Tourniquet placement.
    4. Wound locations that can never be treated with a tourniquet.
    5. Length of time a tourniquet should remain on.
- Demonstrate the correct process for applying and tightening a CAT tourniquet.
- Ability to identify other resources that can be used for a make-shift tourniquet.
- Poster board displays for a graded project.
- Completion of a blood exposure incident report.