
IMH TEP'S

LEGACY ACADEMY

8.1 Understanding the River of Life (Blood Typing)

Grade 8 Activity Plan
Consent form needed!

Reviews and Updates

8.1 Understanding the River of Life

Purpose:

1. To become familiar with the composition of blood
2. To identify the functions of each blood component
3. To discuss the different blood types and demonstrate how transfusions are possible.
4. To demonstrate how Anti blood typing is done

Keywords/concepts: red blood cell, white blood cell, platelet, blood plasma, blood typing, agglutination, antigen, antibody, genotype, phenotype, universal recipient, universal donor

Curriculum outcomes: 304-8, 304-9.

Take-home product: blood composition pie chart, labelled red blood cells

IMPORTANT: Consent forms should be sent out to the kids two weeks prior to the activity for their parents to sign. Students **SHOULD NOT** be blood typed unless they return with their written consent forms, signed by a parent/gaurdian!

Segment	Details
African Proverb and Cultural Relevance (5 min.)	“As the wound inflames the finger, so thought inflames the mind.” Ethiopia-Oromo
Pre-test (10 min.)	Discuss the following questions: Why is blood referred to as the river of life? What is the purpose of blood? What is it made of?
Activity 1 (10 min.)	Describe the components of blood and their percentages in blood. Construct a pie chart of these percentages.
Activity 2 (5 min.)	Explain the shape and functions of each blood component. Demonstrate how to shape red blood cells out of play dough. Have students play a matching game to consolidate information learned.
Concept (15 min.)	Explain blood types, antigens and antibodies using the ABO blood system chart. Invite students to place the correct antigens on red blood cells. Explain the possible genotypes and phenotypes that give rise to different blood types.
Activity 3 (15 min.)	Simulate blood transfusions using food colouring and water. Ensure students understand the role of antibodies and the concepts of universal donor/recipient.
Activity 4 (20 min.)	Blood typing mentor or other volunteers (with signed permission slip!)
Post-test (10 min.)	Celebrity blood type: Test the students' knowledge of blood typing using premade blood test cards. Play 'Bloody Slap Jack'.

Suggested interpretation of proverb: If you cut your finger, it is going to get red, and swell up. Inflammation may be painful, but it serves as a method of protection to get rid of anything toxic that may have entered your body when you cut it. In the same way, thought excites your mind, and stimulates it. Today during blood typing, our fingers will not be the only things getting inflamed. We should stimulate our minds to understand what is happening and why.

Cultural Background – Dr. Charles R. Drew



Dr. Charles R. Drew was an African American born on June 3, 1904 in Washington D.C. He won an athletics scholarship to Amherst College in Massachusetts. After he graduated from Amherst in 1926, he attended the Medical School at McGill University in Quebec, Canada. While at McGill, Dr. Drew developed interest on how to store blood. He returned to Washington D.C. in 1935 and become a professor at Howard University. In 1938 he received a research fellowship to study blood and he discovered that blood plasma can be separated from the blood cells using centrifuges. This discovery allows blood to be stored, preserved, and used during emergency

operations. He is called "The Father of the Blood Bank". He was appointed the director of the first American Red Cross Plasma Bank and started blood mobiles. He recruited thousands of blood donors for the Army and the Navy during the 2nd World War and he managed two of the largest blood banks during the War. His work on blood storage saved the lives of thousands of wounded soldiers and has subsequently been used to save the lives of millions of people around the world.

BACKGROUND INFORMATION

Blood has 2 main components: formed elements and plasma. Blood is 55% plasma and 45% formed elements. The formed elements of the blood include red blood cells, white blood cells and platelets.

1. **Red blood cells:** contain haemoglobin, a protein that binds oxygen. Transport oxygen to, and remove carbon dioxide from, the body tissues.
2. **White blood cells:** fight infection.
3. **Platelets:** help the blood to clot.

Plasma is a yellow fluid that transports the blood cells and platelets around the body. It contains proteins that help clean the blood and antibodies that help to fight infections.

The differences in human blood are due to the presence or absence of certain protein molecules called antigens and antibodies. The antigens are located on the surface of the red blood cells and the antibodies are in the blood plasma. Individuals have different types and combinations of these molecules. The blood group you belong to depends on what you have inherited from your parents. Not all blood groups are compatible with each other. Mixing incompatible blood groups leads to blood clumping or agglutination, which is dangerous for individuals.

ABO blood grouping system (see charts below)

According to the ABO blood group system there are four different kinds of blood groups: A, B, AB or O.

Blood group A: A antigens on the surface of your red blood cells and B antibodies in your blood plasma.

Blood group B: B antigens on the surface of your red blood cells and A antibodies in your blood plasma.

Blood group AB: both A and B antigens on the surface of your red blood cells and no A or B antibodies at all in your blood plasma.

Blood group O: neither A or B antigens on the surface of your red blood cells but you have both A and B antibodies in your blood plasma.

Blood typing and blood transfusions

Blood type can be determined by mixing the blood with different reagents including any of the three different antibodies and determining in which mixtures has agglutination occurred. The agglutination indicates that the blood has reacted with a certain antibody and therefore is not compatible with blood containing that kind of antibody. If the blood does not agglutinate, it indicates that the blood does not have the antigens binding the special antibody in the reagent.

For a blood transfusion to be successful, blood groups must be compatible between the donor blood and the patient blood. If they are not, the red blood cells from the donated blood will clump or agglutinate. The agglutinated red cells can clog blood vessels and stop the circulation of the blood to various parts of the body. The agglutinated red blood cells also crack and its contents leak out in the body. The red blood cells contain hemoglobin which becomes toxic when outside the cell. This can have fatal consequences for the patient.

The A antigen and the A antibodies can bind to each other in the same way that the B

antigens can bind to the B antibodies. This is what would happen if, for instance, a B blood person receives blood from an A blood person. The red blood cells will be linked together, like bunches of grapes, by the antibodies. This clumping could lead to death.

Activity 1: Components of Blood

Purpose: To be familiar with the percent composition of each component of blood

Item	Quantity (10 students)
Coloured pencils /markers	20
Protractor / Compass	10
Paper	10 sheets

Procedure:

Have students individually construct a pie chart depicting each type of blood cell and the percentage contained in human blood.

Activity 2: Matching Game. What is the function of blood cell?

Purpose: To identify the functions of each blood component

Item	Quantity (for mentor and 10 students)
Coloured pencils/markers	1
White Paper	2 sheets
Scotch Tape	1 roll
Playdough red colour	2 containers /enough for 10 students to make four red blood cells

Part 1: function of blood cells

Procedure:

- 1) Before going to the school, on blank pieces of paper, **list the functions** of the different blood components.
- 2) **Cut them out separately** and place tape on the back of them.
- 3) Write these **headings** on the board: Red Blood Cell, White Blood Cell, Platelet, and Plasma.
- 4) Have **students place** each function under the correct heading.

Part2: Shape of blood cells

- 1) Mentors make flash cards using the pictures below ahead of time. Use the cards to illustrate shape of each blood cell.
- 2) Describe how to make the shape of red blood cell with play dough
- 3) Each student should make 4

Activity 3: Understanding Blood Transfusion

Purpose: To discuss the different blood types and demonstrate how transfusions are possible.

Suggested format: Students should work in groups for part 2.

Item	Quantity (10 students)
Testing well plate/Ice cube tray	5
Food Colouring	5 blue, 5 red
Tape	5 rolls
Paper (two colour and white)	30 sheets – 10 of each colour
Toothpicks	1 box

Part 1: Understanding the different blood types

Procedure:

- 1) Use red blood cells made in previous activity
- 2) Use paper, tape and tooth picks to make flags representing the A and B agglutinogens. Use white paper for O, and colour paper for A and B flags.
- 3) Use tooth pick to insert flags into each red blood cell. Ask the student to make A, B, AB and O blood cells. Use the ABO blood system chart below for a guide.
- 4) Ask the student to determine the genotype(s) that would produce each blood cell type (phenotype). Use the ABO blood system and genotype charts below as a guide.

Part 2: Blood transfusion

Procedure:

- 1) With a permanent marker **label** four wells Type A, four Type B, four AB and four O.
- 2) **Fill** all the wells with water.
- 3) Set up each patient (well) with the **default blood type**. For example, put a drop of red colouring in wells marked Type A, these represent Patient A, and so on (for blood type AB mix red and blue food colouring together).
- 4) **Test one patient at a time with different blood types**. For example, start with Patient A. Place a drop of each blood type into each well representing Patient A. Put a drop of red colouring in one well, a drop of blue in the next, a drop of purple in the third, and a drop of water in the last column. (Repeat this procedure with Patient B, Patient AB, and Patient O).
- 5) Have **students make note** of which transfusions are safe, and which are not.

No colour change = safe

Colour Legend	
Type A	= Red
Type B	= Blue
Type AB	= Purple
Type O	= clear

Colour change = dangerous

- 6) Discuss with students why certain transfusions are not safe. Use the red blood cells labelled in activity 3 to determine which type of antibodies will bind to the red blood cell and what type of antibodies are made by the individual. Use the ABO blood system chart below for a guide.

Activity 4: Blood Typing

Purpose: To demonstrate how Anti blood typing is done

Item	Quantity (10 students)
Blood Typing Kit	1
Gloves	11 pairs
Sharps Disposal Container	1
Bandages	11

****Note: If a student's blood is to be tested, a consent form must be read and signed by his/her parent or guardian.**

- 1) **SAFETY:** Anyone who is handling blood should be wearing **gloves**.
- 2) Take out a **plastic blood test tray** and place it on a sheet of white paper so you can easily see if any agglutination happens later.
- 3) Using a different micropipette for each serum, place a **drop Anti-A serum** (blue) in circle labeled "A" and replace cap.
- 4) Place a **drop of Anti-B serum** (yellow) in the circle labeled "B" and replace cap.
- 5) Place a **drop of Anti-D serum** (clear) in the circle labeled "D" and replace cap.
- 6) Use the alcohol swabs provided to **clean the finger** that will be used.
- 7) Remove a sterile lancet from its wrapper. Firmly press the finger down about 1cm from the fingertip, and **pierce skin**.
- 8) **SAFETY:** Immediately **dispose** of the lancet in the sharps container. **Never reuse a lancet!!**
- 9) Gently massage the finger to push blood upwards towards the cut. Hold the finger over the test tray and gently squeeze **a drop of blood** in each circle.
- 10) Wipe any excess blood from the finger with an alcohol swab and apply a bandage if needed.
- 11) Using separate stir sticks for each drop of blood, **stir** until the blood and serum have completely mixed. Try to spread out the blood to make agglutination easier to detect.
- 12) Let it sit for a minute while you **observe**. If nothing seems to happen and the blood stays smooth, there was no agglutination. If it starts to look grainy, like small dots, agglutination has occurred.
- 13) Ask the student to interpret the data/identify each blood type.
- 14) Once blood type has been identified, **dispose** of test trays in the sharps container.

Post-test

Celebrity Blood Type








Write out the names of celebrities on previous blood test cards. With what has already been learned about blood typing, have the students deduce what blood type the celebrities must have. They should give at least two reasons they came to that conclusion.

If you do not have test cards from previous years: Perform a blood test on yourself or a friend that can be used as the blood sample supposedly from "Chris Brown" or any other celebrity you wish to use. This test should be done prior to your session with the students.

Bloody Slap Jack

Use a normal deck of 52 playing cards. Cover all face cards with an image of red blood cells, platelets, white blood cells, or plasma (Please refer to Notes). Two players lay down cards alternatively until a 'face' card appears. The first student to slap their hand on top of the pile and yell out the name of the image gets the opportunity to describe the function and take the pile. If they get it wrong, the other player has only to say the % composition of that component in blood to take the pile. If that player does not know, the players continue to lay cards on top of the pile. The player who gets all of the cards wins.

The ABO Blood System

Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood Cell Surface Proteins (phenotype)	 A agglutinogens only	 B agglutinogens only	 A and B agglutinogens	 No agglutinogens
Plasma Antibodies (phenotype)	 b agglutinin only	 a agglutinin only	NONE No agglutinin	 a and b agglutinin

The possible combinations of alleles produce blood types in the following way:

father	mother			alleles	blood type
	A	B	O		
A	AA	AB	AO	A+A = A	A+O = A
B	BA	BB	BO	A+B = AB	B+B = B
O	OA	OB	OO	B+O = B	O+O = O

Print 4 of each, and glue onto all face cards:

