

Lesson Plan Template

Overview

How does this lesson connect to my class and the unit?

Lesson Title: The Skin's Anatomy and Tattoos

Unit Title: Science of Tattoos

Duration of Lesson: 1.5 hours

Essential Questions:

- What is the structure of skin's anatomy?
- How does the structure of skin impact how tattoos are created and last?
- Why do tattoo artists need to account for variations in skin structure?
- What are the primary components of a tattoo, and how do these impact an individual's safety when getting a tattoo?

Instructor: Lindsey Good

Lesson Number: 2 of 4

YouthBuild Program: Teacher Fellows

Class Level: Adult Education

Why/Purpose

What are my learning goals for my students in this lesson?

Learning Target(s):

- Students will understand the three primary layers of the skin, as well as how these should be accounted for when getting a tattoo.
- Students will understand that tattoos are composed of both the pigment and the carrier, and both of these substances can vary greatly, depending on where the tattoo is created.
- Students should understand that there can be unsafe chemicals in the pigment and carrier, and that it is important to research these chemicals before receiving a tattoo.

Common Core Standard(s):

- Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Anticipated Barriers:

- Some students may be resistant to pre-determined student groups. Remind students that these groups are temporary for today's activity.
- The entry activity may go quickly, and that is alright. It is intended to bring students back to this topic before adding more information.

Lesson Activities

Academic Vocabulary:

These terms were taught during the prior lesson, and will be reviewed throughout this lesson:

- Subcutaneous
- Dermis
- Papillary
- Reticular
- Epidermis

These terms are new to this unit, and should be discussed during the lesson:

- Carrier
- Pathogen
- Pigment

Resources and Materials Needed:

- Chart paper
- Markers
- Each student will need:
 - 1 entry ticket with group info
 - [Tattoo Pigment Ingredients](#)
 - 2 cups
 - 1 paintbrush
- Each student group of 2-4 will need:
 - 1 container of honey
 - 1 cup of water for the experiment
 - 1 cup of water for rinsing paintbrushes
 - 1 cup of vegetable oil
 - 1 cup of Listerine (this works better if it's a lighter color)
 - 4 bottles of food coloring
 - 1 sharpie

Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action and Expression
<p><i>What opportunities will I provide to stimulate interest and motivation for learning?</i></p> <p>Students will be engaged in the lesson through the entrance activity, which</p>	<p><i>What opportunities will I provide for students to receive the information in different ways?</i></p> <p>Students will interact with the material through multiple means (peer interaction, class discussions and hands on activities).</p>	<p><i>What opportunities will I provide for students to express what they know?</i></p> <p>Students can show what they know through the entrance activity.</p>

<p>draws connections to prior content and allows students to clarify misconceptions from the prior lesson.</p> <p>The lesson provides hands on opportunities to create their own skin structure, and “inject” pigments and carriers into this structure.</p>	<p>Students will have the opportunity to interact with the material independently, with peers and as a class.</p>	<p>Students will use prior knowledge to create their skin structure, and expand on this knowledge by applying knowledge from today’s class.</p>
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Lesson Activities: *What learning activities will help students meet the learning objectives?*

Entry Ticket (10 minutes):

- As students come into the classroom, hand each student an entry ticket. The entry ticket will be used to group students (3-4 students, depending on the size of your class), and also provide the group with a specific question to answer. Instead of grouping students by name prior to class, consider making the distribution more random by using shapes, colors or another category to group students. This will help with groupings if students are absent.
- Base the group questions on Exit Ticket questions from the prior lesson. This will enable the student groupings to work together and answer any questions that might have confused students in the class. After answering these questions, ask for a volunteer from each group to read their question and give a quick response to the class. If students from other groups have anything they would like to add to the response, they will be encouraged to do so after the group member shares.
- After the entry activity, students should remain in their groups. They will be working with these peers throughout the class.

Skin Struction Activity (20 minutes):

- Break students into groups of 2-4, depending on the size of your group. Have students bring their skin structure illustration from the prior day to their groups.
- Give each student in the group an empty plastic cup, and provide the group with a small container of honey and a sharpie.

- Ask students to share the honey among group members. Each student should pour approximately one inch of honey in their cup.
- Tell students that this honey represents the lowest layer of skin's structure. Using knowledge from the prior lesson and the diagram as a reference, have students tell you what this lowest layer is (subcutaneous tissue), and label over it on the outside of the cup. Ask students to give a description of this layer.
- Once they have reviewed subcutaneous tissue, give each group of students a cup full of water, and ask each student to pour about two inches of water over the honey in their cup. Ask students what they notice (this could be an opportunity to review density, if desired!)
- Pose the question: As the second layer, what does the water represent? What is the role of this layer in the skin's structure? After they have explained, ask students to label the outside of the cup "dermis" over this section.
- Now, give each group of students a small cup of vegetable oil. Students should only use half an inch of vegetable water on top of their other substances. Ask students what this layer represents, and its role in the skin's anatomy. Once they have explained, this should be labeled "epidermis."
- Now that students have their models, it's time to introduce "ink" to the mix.

Tattoo Ink (20 minutes):

- Ask students to list what they think goes into the ink used for tattoos. As they list potential items, jot these down on chart paper.
- After students have created their list, inform them that few tattoo artists know what goes in the ink they use, as it is often a secret of the distributor. Therefore, if one person gets tattoos from two separate shops, it is likely that the ink in each tattoo will be different.
- Explain that there are two key components to the ink in every tattoo: the carrier and the pigment.
 - **Carrier:** The carrier is the liquid used to carry the pigment to the dermis layer of the skin. Additionally, it helps to prevent pathogens from forming within the ink, and allows for an even distribution of the pigment in the dermis. While there have been many solutions used throughout the history of tattoos, the safest, most common carriers include:
 - purified water
 - ethanol
 - Listerine

- glycerin
- witch hazel
- propylene glycol
- In addition to these safe carriers, many other substances have been used in the past. These substances can cause temporary or permanent harm, and are often toxic. It is common for reactions to these harmful chemicals to show up decades after an individual gets a tattoo:
 - denatured alcohol (this can burn skin)
 - rubbing alcohol
 - methanol
 - antifreeze
 - detergent
 - formaldehyde
- Pigments:
 - The materials used to make tattoos vary widely, so use the [Tattoo Pigments](#) chart for a list of common pigment ingredients and their carriers.

Ink and Tattoos Experiment (30 minutes):

- Now that students have an idea of how the ink in tattoos is composed, give them an opportunity to “inject” tattoo ink into their skin structures.
- Students should take their extra empty cup and pour half an inch of Listerine in the bottom. Have them choose a food coloring color, and add this to their Listerine. They can choose how much food coloring to use, or mix colors if they choose. With their spoon, students should stir the mixture. This substance is their ink.
- Based on their knowledge of skin structure and tattoos, ask them how the ink should be injected into the skin.
 - Give students time to respond that the ink needs to go to the dermis to remain permanent, as opposed to the epidermis where skin cells are shed.
 - Additionally, explain that their paintbrush represents a tattoo machine. Although the paint brush isn’t piercing through anything, it is creating a pathway for the ink to go through the dermis to the epidermis.

- When tattoo machines are used, 50-300 small holes are made in the epidermis per minute. This allows the ink to seep through these holes, and into the epidermis. Explain that the ink is held between the needles of a tattoo gun, just as the dye and Listerine is held between the bristles of the brush.
- Let students experiment with this.
 - Each student should still have their cup with honey, water and vegetable oil.
 - Ask them to dip their paintbrush in their Listerine and dye solution, then inject the paintbrush through the epidermis (vegetable oil) to the dermis (water).
 - What do they observe? The dye may float around in the water for a moment, but should then settle at the top of this layer, just below the vegetable oil. When students look from the top of the cup, the dye will be visible through the vegetable oil. This shows that although the dye is in the dermis, it shows clearly through to the epidermis, and is then preserved within the the dermis layer.
- If desired, this can be repeated by mixing water and food coloring, as water is another carrier for tattoo ink.
- Give students time to try this a few times, and observe how their “tattoo” changes as more colors are added.

Clean up and review (10 minutes):

- Have students cover the top of their structure with plastic wrap, then find a safe place in the classroom where students can store their structures, allowing them to revisit this in lessons going forward.
- Have students clean their paint brushes. The rest of the materials can be disposed of after the lesson.
- Once done, ask students to turn to a peer and share one thing they learned in class today.
- Inform students that the next lesson will be focused on the immune system and tattoos.

Evidence of Success (Formative Assessment): *How will my students and I know the extent to which the lesson objectives have been met?*

The students and I will know the learning objectives have been met once students have created their

basic skin structure, and as they observe the changes to their structure with the addition of Listerine and food coloring. Additionally, I will be able to observe progress toward objectives while walking through the classroom and observing student progress.

Closing Connections: *How will I provide opportunities for reflection and transfer of knowledge/skills?*

Options for reflection are available during the entrance activity. The entrance tickets give students the chance to review information from the prior lesson, while generating new questions to reflect with peers. Additionally, students will be given time to reflect while creating their structures and injecting their “ink.”

Reflections: *What can I include next time? What went well and what needs adjusting?*

Tattoo Pigment Ingredients

Color	Composition
True Black	Acrylic Resin, Pigment Black (Carbon Black), Glycerin, Water, Isopropyl Alcohol, Witch Hazel
High White	Acrylic Resin, Titanium Dioxide, Water
Red Cherry	Acrylic Resin, Pigment Red 210, Pigment Blue 15, Glycerin, Water, Isopropyl Alcohol, Witch Hazel
Hard Orange	Acrylic Resin, Pigment Orange 13, Pigment Red 210, Glycerin, Water, Isopropyl Alcohol, Witch Hazel
Bowery Yellow	Acrylic Resin, Pigment Yellow 65, Titanium Oxide
Dark Green	Acrylic Resin, Pigment Green, Glycerin, Water, Isopropyl Alcohol, Witch Hazel
Baby Blue	Acrylic Resin, Titanium Dioxide, Pigment Blue 15, Glycerin, Water, Isopropyl Alcohol, Witch Hazel
Deep Indigo	Acrylic Resin, Pigment Violet 1, Titanium Oxide, Glycerin, Water, Isopropyl Alcohol, Witch Hazel

Credit: <https://acsundergrad.wordpress.com/2013/07/11/the-chemistry-of-tattoo-ink/>

Academic Vocabulary

Subcutaneous: Subcutaneous tissue is connective tissue, and is the deepest layer in the skin's composition. The thickness of this layer varies depending on the organism and where it is on the body.

Dermis: The dermis is the thickest, toughest layer of the skin. This layer contains hair follicles, sweat glands, blood capillaries, nerve endings, and other structures. The dermis gives skin elasticity, as well as a sense of pain and temperature. The dermis is divided into the papillary and reticular layers.

Papillary: The papillary layer is located at the top of the dermis. The papillary provides nutrients to the epidermis, allowing the epidermis to build skin cells called keratinocytes. Additionally, the papillary helps to regulate the body's temperature. Fingerprints are formed in the papillary, as a result of uneven bumps within this layer.

Reticular: The reticular layer forms the base of the dermis. The reticular provides skin with elasticity, allowing it to bounce back when pinched or stretched.

Epidermis: The epidermis is the outermost layer of skin. This layer provides the first defense against viruses and bacteria, while also regulating body temperature.

Carrier: The tattoo carrier can be a single substance or a mixture. It is used to carry the tattoo pigment evenly to the skin's dermis, while preventing the growth of pathogens.

Pigment: The pigment provides the color to the tattoo. There are a wide array of tattoo pigments used, including heavy metals and plastics.

Pathogen: An agent that causes viruses or disease.