

CEP 800: Designing a Lesson Plan With Technology

Summary

Lesson title: Investigating Our Traits

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Subject area: Life Science – Genetics and Heredity

Technology integrated: Online poll/survey tool (<http://obsurvey.com>); Glogster (<http://glogster.com>)

Length of lesson: 2-3 (55 minute) class periods

Suggested grade level: Middle School

Lesson Abstract: This lesson is meant as part of an introduction to a unit on genetics and heredity. By investigating some of their own observable characteristics, students will gain a better understanding of the differences in certain phenotypes, as well as using their own data to conclude that certain traits are controlled by only one gene while others are controlled by multiple genes. They will use an online survey tool (obsurvey.com) to create a survey of traits they wish to explore, have others participate in the survey, and then analyze the results in graphic form through the obsurvey.com reporting tools. Finally, they will produce an online poster using glogster.com and share their results and conclusions with the class.

Content/Lesson Objectives:

- Students will investigate and compare observable characteristics and traits (phenotypes) of humans.
- Students will use appropriate scientific tools (meter sticks and other metric measurement tools) to collect data.
- Students will use online tools (obsurvey.com and glogster.com) to collect, analyze and report data.

Essential Questions:

1. How does family lineage impact future generations?
2. How does data analysis enable us to make informed predictions?
3. What characteristics are shared by inherited traits?

Student NETS Standards Alignment:

- Student NETS 3d– Research and Information Fluency: Students apply digital tools to gather, evaluate and use information. Students process data and report results.

- Student NETS 4c—Critical Thinking, Problem Solving, and Decision Making: students use critical thinking skills to ... solve problems ... Students collect and analyze data to identify solutions and/or make informed decisions.

Pedagogy and Content:

In the past I have taught these same series of lessons without the technology. This integration of technology allows the students to participate in more engaging, relevant, and interactive methods of collecting and displaying data. Students will be working in groups to create their knowledge about how their different traits are inherited, which definitely connects with the constructivist learning theories. They will be participating in direct inquiry by posing questions, collecting data, and drawing conclusions.

Technology – Pedagogy and Content:

The technology embedded in this lesson provides students with opportunities to collaborate, perform data analysis, and communicate their findings with each other in ways that mimic the methods scientists use. These are clearly “twenty-first century” skills that are essential for students to develop. Obsurvey and Glogster are both content-general technologies, and each allows students to collect and analyze data, as well as present their findings in ways that they could not in a traditional setting. Students are able to have family members or friends who do not live close-by take their survey, and they are able to embed video, audio, and other rich multimedia into their interactive posters. Students are able to participate in more in-depth data analysis by using these tools, which connects to two of the essential questions for the unit – “How does data analysis enable us to make informed predictions?” and “What characteristics are shared by inherited traits?”

Materials:

- Small squares of scrap paper
- “Investigating Our Traits” handout (attached)
- Online poll/survey tool: (<http://obsurvey.com>)
- Measurement tools (rulers, meter sticks, tape measurers)
- “Analyze Our Data” handout (attached)
- Glogster (<http://glogster.com>)
- Computer with projector for student presentations

Detailed Lesson Procedure:

- Introduction:
 - As a warm up activity, give each student a small square of paper. Give them five minutes to silently write down 5-10 bits of information that describe the way they look at that moment, so that another person could identify them.

- Collect all of the squares of paper, and explain that you will be reading off the traits and the students should try and guess who you are describing.
 - As you read, write the traits on the board one by one, in two columns: things that are not inherited (like clothing color, accessories, hats, etc) and things that are inherited (like eye color, hair color, hair texture, etc). Do NOT title these columns.
 - After you have had students guess several student descriptions, encourage them to work in groups to give a title to each of the columns on the board. This allows them to think about the difference between inherited and non-inherited traits.
 - Have them share their ideas, then explain how some traits can be inherited (meaning they are encoded in your body and are naturally expressed) and some are things that a person does throughout their lifetime that are not inherited. Encourage students to think of other inherited or non-inherited traits to add to the list.
- Main Lesson:
 - Introduce the “Investigating Our Traits” activity (handout in appendix). Explain that students must work in groups to create a survey to collect data about different traits. They should select 10 of the traits given on the handout to investigate.
 - Once they have selected their traits, they should use the site <http://obsurvey.com> to create a survey for their classmates and family to take. In order to save their results, students will need to create a free account (using an email address) or sign in using their Facebook account.
 - An opportunity for differentiation could be telling some groups of students what types of questions to ask (ie multiple choice, short answer, check boxes, etc) in their survey, while allowing other groups to determine this on their own.
 - Once they have created their survey and had it reviewed by a teacher, they can share the URL of their survey with another group.
 - Each group member should take the survey of another group. Students may need to measure their hand span, their long jump, height, or reaction time using meter sticks or a tape measure. They will need a space where they can move around to record this data.
 - Each group member should take their own survey link home and have family or friends who are not in the class take the survey as well. Students who do not have a ruler at home may need to borrow one. They should have at least a total of 20 people take the survey to have enough data.
 - The next day in class, have students sign back in to their account and take a look at their data. Obsurvey.com allows students to download the data in graphic form as a picture.
 - Students should analyze their data using the attached “Analyzing Our Data” handout. This handout also explains the presentation of their data through <http://glogster.com>.
 - Assessment:
 - To assess student understanding of the concept of phenotypes or observable traits, each small group of students will create a Glog (on glogster.com) that presents their data. Students can download their data from obsurvey.com as pictures, and then arrange these with a conclusion in their online poster.
 - Students will each present their results by projecting their Glog in front of the class and explaining their data and conclusions.

- The Next Step...
 - During or after presentations of the online posters, students will be asked to independently describe a trait that is inherited and one that is not (basic knowledge) and to explain how they know the difference (basic understanding). If students are unable to do this, the next lesson will begin with a sorting task, where they are given many different characteristics on small pieces of paper and have to identify if they are inherited or not inherited and be able to defend their choices.
 - The Glogs (online posters) can be used as a jumping off point for the next lesson. I do not anticipate that every student in every group will be able to come to a conclusion about which traits are coded by single genes, and which are polygenic, however using the data the students collected in future lessons can be a great way to get them to be more engaged and interested in the material. I can use their data along with prompting questions about the way their data looked to encourage them to think about reasons for their figures.
 - If it seemed during data collection that a majority of the students did not understand how to utilize the metric measuring equipment appropriately, a short mini-lesson on metric tools would be necessary.

Lesson Plan Implementation Reflection

Part 1: Description of Lesson Plan

The lesson I taught as part of Modules 5 and 6 was an introductory inquiry activity for a unit on genetics and heredity. I developed it by integrating something students really enjoy learning more about – themselves – with the sixth and seventh grade science content on heredity. By investigating some of their own observable characteristics, as well as surveying those around them, students gained a better understanding of the differences in certain phenotypes within a population of individuals. Through an online tool (obsurvey.com), students worked in groups to create a survey of traits they wished to explore from a list of possible traits. They surveyed themselves and took their created link home to have others participate in the survey, and then analyzed the results in graphic form through the obsurvey.com reporting tools the next day. Finally, they produced an online poster using glogster.com and shared their results and conclusions with the class. Based on the data collected as a class, as well as group conclusions, students developed their own hypothesis of how traits are inherited – and how genes can work independently or together to determine phenotypes.

Through the course of this two-day activity, my objectives were to have students investigate and compare observable characteristics and traits (phenotypes) of humans; use appropriate scientific tools to collect data; use online tools to collect, analyze and report data (all adapted from Michigan Grade

Level Content Expectations for Science). There were no major changes made to the original lesson plan I submitted for Module 5.

Part 2: Implementation of the Lesson

My students are a multi-aged and multi-abled group of sixth, seventh and eighth graders in Brighton, Michigan. The majority of them come from a fairly middle class background, and they are clearly digital natives as most – if not all – have access to some form of personal technology (be it a computer, tablet, iPod, or cell phone). I am extremely fortunate to team with a group of four other technology enthusiastic teachers for science, and they were eager to help carry out my lesson as a kickoff to our genetics and heredity unit: “The Evolution of...”

We started by splitting students into groups – something we do often when working with students of differing abilities. In each group, we ensured that of the four to five students, there was at least one first, second and third year (how our school refers to sixth, seventh and eighth graders), and that there was at least one student who was technologically savvy and would become the group leader. While the other teachers had the majority of the students in a large group and played the introductory game, I pulled the group leaders aside and briefed them on how to use Obsurvey and Glogster, the two online tools we used during the activity. The leaders were extremely excited to use the technology and they asked plenty of great questions, such as how to create accounts and specifics about the formatting in each tool. I was actually surprised that one of the aspects that interested them the most was that they could write their own multiple choice and short answer survey questions. My students truly enjoy the chance to integrate humor and wit into their learning!

After this initial session, we set our students to work. They met with their small groups, and although there were some small disagreements about which traits to survey, everything went fairly smoothly. There were only two real obstacles throughout the process: one was that our school’s server slowed down quite a bit with all of the computers connected to the Internet at once, and this lack of immediate progress was quite frustrating to some groups. The second problem had to do with the Wiki we used to have students post their surveys – if two groups posted at the same time, it only saved the second group’s survey. I resolved both of these issues somewhat by staggering the time when students went online and posted the links to their group’s survey.

Once all the surveys were posted online, my students were extremely excited to take the links to their surveys home in order to have their parents and siblings take them. The following day, we showed group leaders how to access the data collected from their surveys, which Obsurvey displays in a graphical format. Two of our goals as a middle school teaching team have been to have our students practice interpreting graphs as well as becoming more patient problem solvers. Both of these things were put to the test as students were quick to complain about how their data did not immediately show them anything. With some probing questions and helpful hints on what to look for, students started to make connections between the survey questions they wrote that would have a multiple choice answer and those that required the user to enter an answer themselves. The discussions in the

small groups were amazing to hear as a teacher! I loved seeing students develop conclusions based on their own data that they had collected.

Finally, using their Obsurvey graphs and their own conclusions, students used Glogster to create online multimedia posters to display their findings. They have had experience in the past using other online presentation tools, such as Prezi, and they loved getting the chance to create their own audio and video and link it to their poster. This actually ended up taking more time than I had anticipated because the students were so engaged in creating their final product. I believe it was worth the additional time to do something like this as opposed to a traditional poster or Power Point because students were able to take more ownership over their discoveries, and thus their learning.

Part 3: Reflections

Throughout the course of my lessons, my students learned several important things. First, obviously, was the specific content expectation about the types of traits that can be inherited as well as how different genes can control the process. They were able to do this by looking at their own individual traits and comparing them to others, and then making conclusions based on the patterns they observed. I also wanted my students to gain experience collecting data through the online tool Obsurvey as well as presenting data through Glogster, a multimedia rich poster-making program. Student knowledge was represented through their Glog, where as a group they had to present and explain graphical representations of their data and express their findings in a clear and concise conclusion written by the group as a whole.

The most important aspects of this experience for my students were the collaborative and communicative skills they developed through working in teams. Based heavily in social constructivism, I encouraged my students to participate in true inquiry by collecting raw data and interpreting the results to come to their own conclusions. This was extremely difficult for them as the data was not always perfect and there were no clear “answers.” As it was simply an introductory investigation to our genetics and heredity unit, I reiterated to my students that I was not looking for one particular answer, and that as long as they could back up their conclusions with data, they would be successful. This explanation of their findings was their assessment of the material, and I was excited to see that in one way or another, each and every group was able to rationalize their data. This led to some extremely rich discussions later on in the unit, when we were able to refer back to the data they had collected and how combinations of different genes can produce different results in phenotypes.

Several things were key to this lesson’s success: my colleagues’ willingness to take on a new technology, and briefing designated group leaders ahead of time about the technologies to head off any potential issues. My science team of teachers works extremely well together, and that is mainly because we are willing to take responsible risks when it comes to implementing new ideas such as this technology-rich lesson. It was actually one of their ideas to choose group leaders who would become the “experts” on Obsurvey and Glogster, which helped make the remainder of the lesson run smoothly.

Having taught this series of lessons both with and without the technology, I can honestly say that the addition of Obsurvey and Glogster provided clear opportunities for my students to work collaboratively and spend the limited time that we have together dedicated to data interpretation and analysis rather than simply data collection. Not only did the technologies engage them and keep them focused on the task at hand, but they were actually excited about having family members at home take their surveys, and recording their voices to explain what they learned, among other things. The two online tools we used were fairly intuitive to learn, and the only real issue was our school's Internet connection – so I did not receive that many questions on the programs themselves. Because they were working in teams of students who were not necessarily friends and who had differing levels of experience with technology and the science content, it was a great opportunity for them to collaborate and make the most of each other's strengths. As an educator, I could not have asked for a more authentic learning experience for my students.

Investigating Our Traits

You will be investigating some human traits of your classmates, friends and family in order to make some conclusions about how traits are encoded by genes. You will discover which types of traits are determined by one gene, and which have several genes that control them.

Directions:

- 1) As a group, choose 10 of the traits below.
- 2) Use a computer to log on to <http://obsurvey.com>, where you will create a survey to collect data about your traits. One of your group members should create a free account (you can also use your Facebook login information) so that you can log on tomorrow to access your results.
- 3) Create a survey question for each trait. You may need to create multiple choice, short answer, or check box questions depending on the trait.
- 4) Once your survey has been reviewed by a teacher, you may share the URL for your survey with another group. Each member of that group must take your survey.
- 5) Your group needs to take the survey of another group. Each member of your group must take their survey.
- 6) If you have time, you may take the survey of another group.
- 7) Email or bring the URL for your survey home and have 2-3 family members or friends take the survey as well. By tomorrow, your group should have at least 20 people that have taken your survey.

Traits

- Hand Span: Distance from tip of pinkie to tip of thumb when hand is fully stretched
 - Eye Color: blue, brown, green, hazel
 - Freckles: none, few, lots
- Reaction Time: Number of centimeters that pass before you can catch a falling ruler
 - Tongue Rolling: Tongue rolls into a tube – yes or no
- Reach: How far up a wall you can touch with your fingertips when standing on tip toe
 - Dimples: Dimples on cheeks – yes or no
 - Hair Color: Natural hair color – black, brown, blonde, red
 - Hair Texture: curly, wavy, straight
 - Height: How tall you are
- Hitchhiker Thumb: Your thumb tip bends backward when you give a “thumbs up”
- Earlobe Attachment: Earlobes are attached to the side of your face – yes or no
- Long Jump: How far you can jump with your feet together when standing still
 - Widow’s Peak: Your hairline makes a V – yes or no
 - Cleft Chin: Your chin has a small dimple – yes or no

Analyze Our Data

You will use an online site to present your human traits data and make conclusions about your results.

Directions:

- 1) Log back on to your account on <http://obsurvey.com>. Your group should have a total of at least 20 people who have taken your survey. Click on "Report" to view your data in graphic form. You can download each of your graphs to your server space by clicking on the small button "Download chart as image" under each graph.
- 2) Log on to Glogster, an online presentation site at <http://glogster.edu>. You will receive login information from your teacher. Your group will create an online poster using the site resources to display your data. Your poster needs to include the following:
 - a. A title and group member names
 - b. Several pictures, images or graphics
 - c. Four labeled, graphical representations of your data
 - d. A short description with each graph describing the data
 - e. One 3-5 sentence conclusion explaining which graphs depict traits that are controlled by one gene, and which traits are controlled by multiple genes and why.