

You're My "Karyo"-Type

Karyotype for Chromosomal Disorders

K20 Center, Alexandra Parsons
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Grade Level	9th – 11th Grade	**Time Frame**	1-2 class period(s)
Subject	Science	**Duration**	90 minutes
Course	Biology		

Essential Question

What is the value of genetic testing?

Summary

This is an introduction to karyotypes and what uses they have. Prerequisite knowledge would be basic genetic structures, such as chromatids, genes, and alleles. Using this lesson would lead nicely into having a discussion/next lesson about the ethics of gene therapy and CRISPR in humans.

Snapshot

Engage

Students watch a video about a boy with a genetic disorder.

Explore

Students assemble a karyotype in a Card Sort.

Explain

Students learn about karyotypes and the purposes for which they're used.

Extend

Students play the role of a genetic counselor and analyze a karyotype.

Evaluate

Students share their findings to the class.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD505: Analyze presented information when given new, simple information
EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

Next Generation Science Standards (Grades 9, 10, 11, 12)

HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Oklahoma Academic Standards (Biology)

B.LS3.1 : Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Attachments

- Explore-Karyotype-Card-Sort - Spanish.docx
- Explore-Karyotype-Card-Sort - Spanish.pdf
- Explore-Karyotype-Card-Sort.docx
- Explore-Karyotype-Card-Sort.pdf
- Family-Karyotypes.docx
- Genetic-Counselor-Analysis-Questions - Spanish.docx
- Genetic-Counselor-Analysis-Questions - Spanish.pdf
- Genetic-Counselor-Analysis-Questions.docx
- Genetic-Counselor-Analysis-Questions.pdf
- I-Notice-I-Wonder - Spanish.docx
- I-Notice-I-Wonder - Spanish.pdf
- I-Notice-I-Wonder.docx
- I-Notice-I-Wonder.pdf
- Karyotype-Teacher-PP.pptx

Materials

- Lesson Slides (attached)
- Karyotype Card Sort handout (attached; one per pair)
- Genetic Counselor Analysis Questions handout (attached)
- I Notice, I Wonder handout (attached)
- Family Karyotypes document (attached; for teacher use)

10 minutes

Engage

Show the video about Max and his life having a genetic disorder. While students are watching the video, have them use I Notice, I Wonder to jot down observations. Students create a T-Chart (or the included attachment) with one side being I Notice, and the other being I Wonder, and students write down observations and questions as they think of them during the video.

Teacher's Note: Video Purpose

The video is only 3:30 minutes. Even though there is some great information in the video, don't expect students to come up with much. This is just to prime their minds for genetic disorders and the impact they have.

After watching the video, have students casually share a few things they noticed and a few things they wondered.

Embedded video

https://www.youtube.com/watch?v=cAl6ZoQ7Mes

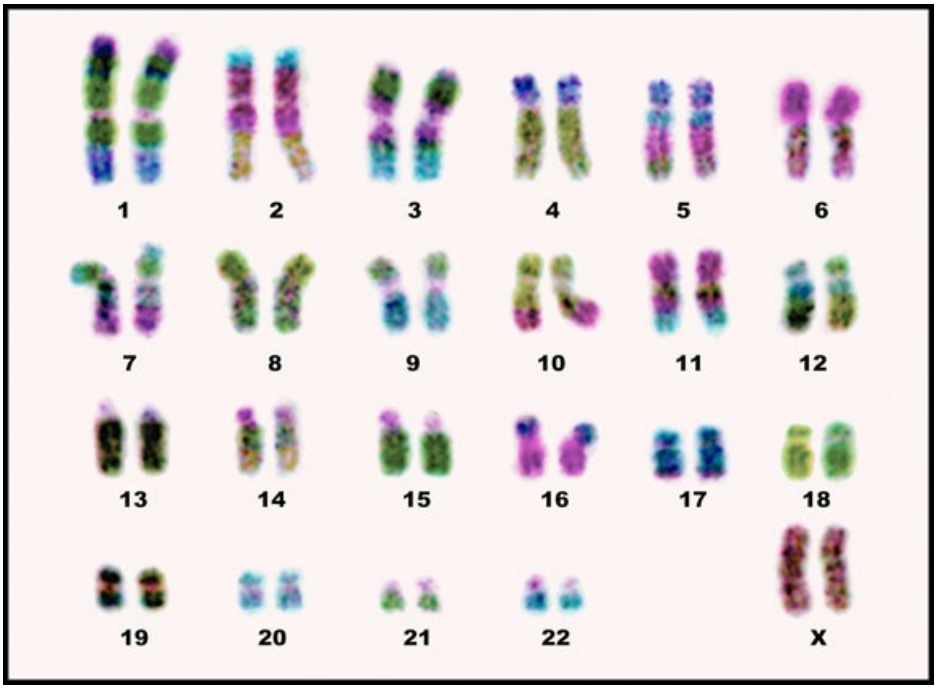
10 minutes

Explore

Pair students up. Pass out a set of the attached **Explore Karyotype Card Sort** handout to each pair. Tell the students that there is a full human's set of chromosomes in the envelope. It is their task to organize the chromosome pairs together and decide how to organize the full set.

Teacher's Note: Academic Language

At this point, students don't know what a karyotype is, so using that word would be counterintuitive right now. That's why, at this point, we just call it the complete set of chromosomes. However, 'chromatids', 'chromosomes' and other basic genetic words should be known, so should be used. If your students don't know the words they should, this is a great time to review them.



This is what the karyotype looks like fully assembled. Since it's colored, that should make it easier for students... as long as they aren't color-blind.

10 minutes

Explain

After the pairs of students make their card sort, use the included Lesson Slides to ask questions about their reasoning and to show the true answer. Allow students time to compare their karyotype to the formal answer, and to figure out how their reasoning fits with the accepted format.

Once the real answer is posted, ask the students:

1. Why are there two of each? Answer: one comes from the mother and one comes from the father
2. Why does the last set go at the end, and not between 4 and 5?
3. What is the gender of this person?

Finish the conversation with asking the students to I Think/We Think. Individually, ask the students, based on what they've seen, to write out what components need to be included in a karyotype, and what can be determined, or inferred, from a karyotype. After they write on their own, turn to a partner and share their responses together and created a shared vision to use for the next idea.

15 minutes

Extend

For each pair of students, pass out a karyotype for each family, and a copy of the attached **Genetic Counselor Analysis Questions** handouts. Prompt the students to analyze the karyotypes, and answer the questions as if they are genetic counselors that are about to answer questions that the parents will have. Tell them to be thorough, and as clear as possible.

Teacher's Note: Sensitivity

Remind the students that, even though these are fake, to still keep in mind that this really happens in real life, and it's not a joke. Use this as an opportunity to have your students formulate scientifically sound explanations while still keeping the feelings of the parents in mind.

15 minutes

Evaluate

Have students share their letter with the class. Display each karyotype, either on your own or in the Lesson Slides provided, so the students have something to reference when they share.

Resources

- Inspiration for Extend: http://www.ashg.org/education/gena/AdventuresInKaryotyping_L2.pdf
- K20 Center. (n.d.). I notice, I wonder. Strategies. https://learn.k20center.ou.edu/strategy/180
- K20 Center. (n.d.). I think / we think. Strategies. https://learn.k20center.ou.edu/strategy/141
- K20 Center. (n.d.). T-Chart. Strategies. https://learn.k20center.ou.edu/strategy/86