Classroom Teacher Preparation

Technology 2: Biometrics

Please use the following to prepare for the next SfS lesson.

Description:

In this lesson, students learn about using measurements or natural patterns of body parts (eyes, fingerprints, etc.) as means of identifying individuals and how those unique body patterns can act as security identifiers in the technological world. Students will then design and measure their own hand geometry biometric.

Lesson Objectives – SWBAT ("Students Will Be Able To…"):

3rd-8th

- Explain why biometrics is a growing field with increasing importance in cyber security
- Identify unique physical and behavioral characteristics of humans that can be used as a way to identify each individual
- Evaluate the advantages and disadvantages of hand biometrics and compare this means of identification to other common biometric markers

Preparation:

This lesson can serve as an introduction to the use of biometrics in technology.

Disciplinary Core Idea (DCI):

PS4 Waves and their Applications in Technologies for Information Transfer – PS4.C Information Technologies

- (3rd-5th) Patterns can encode, send, receive and decode information.

Science & Engineering Practice (SEP):

Analyzing and Interpreting Data

Room Set Up for Activities:

Students will be working in small groups of 4-5 and can work at desks, benches or on the floor.

Safety:

There are no safety precautions for this lesson.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Forensics**. Modules include:

Anatomy & Physiology 22: Fingerprinting – Students learn how fingerprints are formed, the forms friction ridges take and the prints they can leave behind, before investigating the various ways of studying fingerprints. Students will experiment with fingerprint dusting, lifting, inking, and will also practice analyzing prints.

Anatomy & Physiology 21: Hair Identification – Students examine hair for various species and see how they microscopically differ.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: http://www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by learning how to create a whole face biometric.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- Biometric Identification (1:55) - nice, quick summary of the topic: https://www.youtube.com/watch?v=eZTfgNIiNUA
- Biometrics Technology (4:18): https://www.youtube.com/watch?v=Vy2e_Zb0eoY
- Biometrics (2:53), dry for students but informative for teachers: https://www.youtube.com/watch?v=D2fv91DcXw8
- Fingerprints and other Biometrics: https://www.fbi.gov/services/cjis/fingerprints-and-other-biometrics/
- The Boring and Exciting World of Biometrics: http://www.pbs.org/wgbh/nova/next/tech/biometrics-and-the-future-of-identification/
- Iris Recognition vs. Retina Scanning- What are the Differences?: http://www.m2sys.com/blog/biometric-hardware/iris-recognition-vs-retina-scanning-what-are-the-differences/
- Why do we have Fingerprints and Why are they Unique?: https://www.scienceabc.com/innovation/why-are-fingerprints-unique-and-why-do-we-have-them.html

Answers to Questions on the Lesson Extension:

Q: Could you create a whole face biometric that was unique to only you?
A: Yes, students should find that the numbers for the face biometric are unique as compared to family members!

Q: Do you think that a whole face biometric would be as good as DNA in identifying you? Why or why not?
A: DNA would be more exact in identifying you because it is unique for each individual and can't be altered with age, hair, glasses, etc. However, it isn't realistic to collect DNA routinely and analyzing it takes far too long to be useful in the technology world as a security biometric.

Q: What could you do to make your facial biometric stronger?
A: Most biometrics can be made stronger by taking more data points.

Q: What are some ways that a facial recognition scanner might be "fooled" into not identifying you?
A: You can trick a facial recognition scanner by turning your face to an odd angle, wearing glasses, a big hat, or even lots of makeup, or by having asymmetrical hair that covers part of your face. Your face also changes shape when you have a big grin on your face, so changes in expression can alter a facial recognition scan. These methods might be important to people who care about their privacy and wish to not be identified using facial recognition software that exists on social media or technologies in retail stores that collect facial recognition data unbeknownst to their customers.