



Personal Genetics Education Project

Ethical, Legal and Social Issues in Personal Genetics

Title: DNA, Crime and Law Enforcement

Aim: How will advances in DNA technology impact individuals, law enforcement and society?

Time: This lesson can be adjusted to fill 1 or 2 days.

Guiding Questions:

- How is DNA analysis used by law enforcement in the United States? How is scientific progress affecting how DNA is used to solve crimes?
- What are the benefits and dilemmas of collecting DNA from people when they are arrested, but before they have been charged with a crime?
- As a society, how should we balance privacy rights with the rights of crime victims?
- How can DNA evidence be used to free innocent people?
- Are certain groups of people affected differently than others by the policies and procedures around DNA collection and law enforcement?

Learning Objectives:

By the end of the lesson, students will be able to:

- Discuss why DNA analysis is an effective tool that may identify criminals.
- Discuss the ethical issues surrounding the use of familial searching to solve crimes.
- Analyze some of the controversies in using DNA to solve crimes.
- Debate the issues around privacy, freedom and public safety as they relate to DNA technology and crime.

Materials: Projector or Smartboard, laptop, handout.

Common Core Standards:

RH.9-10.6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

RH.11-12.3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.

RH.11-12.6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.

RH.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Background information and note to teachers:

The collection and analysis of DNA is an important tool in law enforcement. According to the FBI, as of 2013, over 200,000 cases have used DNA evidence to aid in criminal investigations. In addition, the Innocence Project states that over 300 people, several of whom were on death row, have been exonerated as a result of DNA evidence. As of 2014, over 10 million people in the United States have their DNA profile in a criminal offender database. Some expect this number will climb as a result of the 2013 Supreme Court decision in *Maryland v. King*, in which the Court ruled to allow law enforcement to collect DNA from people who are arrested, but not charged or convicted of a crime. This lesson examines some of the recent legal and scientific developments in DNA collection and analysis. Students are asked to explore issues related to public safety, privacy rights, race and the role of government, if any, in regulating the collection and storage of DNA.

This lesson highlights two cases as a backdrop to explore the challenge of establishing ethical and legal frameworks in a timely manner to guide the use of newly developed technologies. The key to solving both of these cases came from the identification of a partial match between DNA found at the crime scene and DNA from a biological relative of the person who committed the crime. In the first case, police apprehended a notorious serial killer by deliberately comparing DNA found at crime scenes to DNA from the lead suspect's daughter, which law enforcement obtained from a sample taken during a routine medical exam. In the second case, a man named Darryl Hunt was freed thanks to DNA analysis, after spending 19 years in jail for a crime he did not commit. Using an approach known as "familial searching," investigators deliberately searched criminal databases for a partial match to DNA found at the crime scene and, as a result, were able to link the crime to the brother of a man whose DNA profile was already in the database.

A key question that is woven through this lesson is how we as a society can use genetics to keep people safe, solve crimes and, at the same time, develop policies that provide appropriate safeguards and privacy protections. A useful message to share with students is that many experts do not agree on how DNA should be used to prevent and solve crime. The questions tackled in this lesson are currently being discussed at local, state and federal levels, and likely will be the subject of many legal debates and court cases

for years to come. This lesson uses concepts relevant to biology as well as history, government, law and civil rights.

Here is an outline of the resources and activities in this lesson.

1. Link to reading for students (page 3)
2. Do Now exercise (pages 3-4)
3. Link to PowerPoint slideshow (page 4, slide notes on pages 4-7)
4. Link to video clip; discussion questions (page 7-8)
5. Homework assignment (pages 8, handout on page 10)
6. List of additional resources (page 8-9)
7. Short quiz (answer key on page 9, handout on page 11)

After teaching this lesson, we would appreciate your feedback via this quick [survey](#), as well as your student's feedback via this brief [survey](#).

Reading for students:

The April 2008 article from the Washington Post, "[From DNA of Family, a Tool to Make Arrests](#)," summarizes issues related to the use of DNA as a forensic tool to solve crime with an emphasis on "familial searching." The article highlights the discussions and disagreements within the law and civil rights communities over how to most effectively and fairly use DNA in law enforcement. This article is used as a homework assignment to follow the lesson, but you instead may choose to have students read it in advance of the lesson.

Activities: Do Now exercise (5-7 minutes), slideshow (20 minutes), video clip (15 minutes) and discussion (10 minutes)

Part 1. Do Now (5-7 minutes)

Have students read this short scenario, individually answer the questions that follow and then share their answers in a brief classroom discussion. The text is on Slide 2 in the slideshow.

Imagine that there have been a string of murders that appear to be the work of one person. The police have a few leads, but little conclusive evidence. They have DNA, which they believe to be that of the murderer, but it does not match DNA profiles in the criminal databases. The police don't have enough evidence to arrest the lead suspect, nor do they wish to alert him of their interest in him. Instead, they obtain a warrant to get a sample of DNA from a medical test of the suspect's adult daughter to compare with DNA from the crime scenes. She does not know about this warrant and, therefore, has not given her consent.

1. Should the police require permission to analyze a DNA sample from the suspect's child? Why or why not?

2. Take the position of one of the victim's parents. Do you support this tactic? Why or why not?
3. Take the position of the suspect's daughter, who has had her DNA secretly tested. Do you support this tactic? Why or why not?

Part 2. Slideshow (20 minutes)

We provide a PowerPoint slideshow that highlights how DNA from suspects and convicted criminals is collected in the United States and how this system is helping to solve crimes. The slideshow also addresses ethical issues that arise from the use of DNA in law enforcement and how individuals and families are impacted. Students are encouraged to consider the many different perspectives and agendas that drive the debate behind whose DNA should be collected and stored, for what reasons should DNA be collected and how the databases should be used, searched and shared.

The slideshow is located on the pgEd website along with this [lesson](#), and accompanying explanatory notes for the slideshow are provided below.

Slideshow notes:

Slide 2: The scenario from the "Do Now" exercise is based on the capture and conviction of Dennis Rader, also known as the BTK serial killer. Allow students a few minutes for answers and discussions after this slide. Refer to the "Do Now" section on pages 3 and 4.

Slide 3: Between 1974 and 2004, Dennis Rader murdered 10 women. Captured and convicted in 2005, he is serving 10 consecutive life sentences. Police had evidence to strongly suspect Rader, but not enough to make an arrest. They subpoenaed his daughter's medical records and, as a result, obtained her DNA from a sample taken during a pap smear, a common gynecological test for women. If the daughter's DNA were closely related to DNA from the crime scene, the police would have enough evidence to make an arrest. This is exactly what happened and, when confronted, Rader confessed to the murders. Details on the Rader case can be found in NPR's December 2007 article, "[Police Use DNA to Track Suspect Through Family.](#)"

Slide 4: There are several types of criminal DNA databases. A forensic database stores DNA profiles from samples collected at crime scenes, and an offender database stores DNA profiles from people who have been arrested, charged or convicted of a crime. The two databases are compared to one another in an effort to match offender DNA with DNA collected from crime scenes. The *Nature Education* article "[Forensics, DNA Fingerprinting, and CODIS](#)" provides a scientific overview of how DNA profiles are generated.

Slide 5: In the United States, each state maintains its own database and may share information with the Federal Bureau of Investigation's (FBI's) database, known as the Combined DNA Index System (CODIS). There are also databases maintained by international collaborations, such as Interpol. Updated federal statistics as well as breakdowns by state are available on the [FBI's CODIS statistics](#) website. According to this website, "as of May 2015, CODIS has produced over 283,444 hits assisting in more than 270,211 investigations." CODIS now includes profiles of "arrestees," people who have been arrested but not necessarily charged or convicted. As of 2013, 29 states have statutes allowing for DNA collection from arrestees (see Slide 8 for 2013 Supreme Court ruling).

Slide 6: U.S. states regulate the types of offenses that require offenders to provide a DNA sample, so that the offender's DNA profile can be added to a criminal database. The statistics on the slide are taken from the [National Conference of State Legislatures](#). A felony is considered the most serious category of crime and includes violent crimes, many sex offenses and many drug-related crimes. A misdemeanor is a criminal offense that is less serious than a felony and generally punishable by a fine or short jail term.

Slide 7: Several states collect DNA for misdemeanors. This slide shows some of the misdemeanor offenses that require offenders to provide a DNA sample in some states. Law enforcement agencies argue that collecting DNA samples from people who commit misdemeanors helps catch people who may have already committed or who may in the future commit more serious crimes. Privacy advocates, such as the [New York Civil Liberties Union](#), argue that the scope of DNA collection is too broad and does not address other issues, such as correcting wrongful convictions.

Slide 8: The United States Supreme Court issued a major opinion in 2013 related to the collection of DNA from arrestees in its 5-4 decision in the case of *Maryland v. King*. In 2009, Alonzo King was arrested for assault, and his DNA was collected in the course of the arrest. Maryland authorities used his DNA profile to search a DNA database. They found a match linking King to an unsolved rape from 2003, and he was charged and sentenced to life in prison for this crime. The Supreme Court ultimately decided it is constitutional to take DNA samples from arrestees for the purpose of linking a suspect to other possible crimes. In its majority opinion, the Court argued that a DNA profile is fundamentally the same as a fingerprint, used to confirm identity, and that people who are arrested should expect diminished privacy protections. The Court was sharply divided, and the dissenting justices argued that DNA collection from arrestees is a violation of the 4th amendment, which forbids unreasonable search and seizure.

Slide 9: This slide highlights how quickly the CODIS database is growing. Between 2002 and 2015, over 10 million offender profiles were added to the

offender index. Many believe the databases will grow more quickly as a result of the Supreme Court decision allowing DNA collection from arrestees. For updated CODIS statistics, please refer to http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis_brochure.

Slide 10: A new technique to use DNA to predict facial features was featured in the *New York Times* in 2015. It drew a large amount of interest – the idea that a high quality, police-sketch style image could be rapidly produced from suspect DNA is appealing to many. Police in Columbia, SC, were the first to release a sketch of a suspect that was generated solely from DNA. However, there are concerns about the accuracy of the software. First, some experts feel that the technology is its infancy – and in fact, the product featured in the Times has not been subject to peer review, the “gold standard” in scientific research and publication. Others are concerned that it will be used unfairly and add to issues of racial bias and profiling in the criminal justice system. Andrew Pollack’s February 2015 article, “[Building a Face, and a Case, on DNA](#)” is in the *New York Times*.

Slide 11: A technique to search DNA databases, one that was not originally intended, is called familial searching. The following is an explanation of familial searching from [DNA Forensics](#): “Criminals whose DNA profile has never been entered into a DNA database because they were never arrested, prosecuted or convicted of a crime can still be identified through a technique called familial searches.” “Familial search” is different from a “partial match” and is an important distinction. According to Jeffrey Rosen, law professor at George Washington University, “partial matches emerge inadvertently from a routine search of the DNA database, while family searches represent a second deliberate trolling of the database for close biological relatives after the first search had failed to produce a perfect match.” A handful of states use familial searching, which often requires special permission.

Slide 12: Darryl Hunt was freed after serving 19 years in prison for a crime he did not commit. He finally was exonerated after DNA testing proved that he was not the perpetrator in the rape and murder of journalist Deborah Sykes. DNA evidence was used to locate and prompt a confession from Willard Brown, who was found through familial searching, as Brown’s brother’s DNA profile was already in an offender database. Hunt has become an activist and educator, and was awarded 1.6 million dollars in damages from the city of Winston-Salem, North Carolina. Although there have been some exonerations of innocent people using familiar searching, critics are concerned that this techniques invades people’s privacy and that DNA is fundamentally different than fingerprints.

Slide 13: Controversies about the use of DNA to solve crimes are in three main areas. First, it is scientifically possible to fabricate DNA, which could be planted at a crime scene (“[DNA Evidence Can Be Fabricated, Scientists](#)”

[Show](#)," August 2009, *New York Times*). Second, human error can make its way into the laboratory. For example, in Germany, a factory worker accidentally and repeatedly contaminated laboratory materials with her own DNA. This led investigators on a lengthy and useless hunt for a non-existent serial killer for many years, wasting money and resources ("[Germany's Phantom Serial Killer: A DNA Blunder](#)," May 2009, *Time*). Third, there is some concern that a partial match between unrelated individuals will be more likely in some populations or as the number of people in the offender index grows, at least with the number of genetic markers currently used to generate a DNA profile ("[Potential for Incorrect Relationship Identification in New Forensic Familial Searching Techniques](#)," February 2012, *Science Daily*).

Part 3. Video clip (6-13 minutes) and discussion (10 minutes)

Students will watch a short video about familial searching and DNA databases. There are links to two different clips below.

The first is from ABC News and addresses the arrest of Lonnie David Franklin, Jr., a serial killer who was arrested after an analysis of his son's DNA led to his arrest. The six-minute video can be found here:

<http://abcnews.go.com/Nightline/video/grim-sleeper-arrested-11148785>

1. Explain how the "Grim Sleeper" serial killer was caught.
2. Do you think familial searching is a tool more law enforcement agencies should use? Why or why not? What do you think about the idea that relatives of people in genetic databases could be under so-called "genetic surveillance?" Explain.

A longer clip from *60 Minutes*, "A Not So Perfect Match," which addresses issues surrounding familial searching, is below. However, as of January 2016, the site requires a subscription of \$0.99 per month (or \$9.99 per year). The clip is here: <http://www.cbsnews.com/videos/a-criminal-in-the-family/>. The class will then discuss as a group the questions below.

1. In the clip, which was more persuasive – the Denver district attorney or the attorney concerned about privacy rights? Why?
2. Do you think familial searching is a tool more law enforcement agencies should use? Why or why not? What do you think about the idea that relatives of people in genetic databases could be under so-called "genetic surveillance?" Explain.
3. The reporter says, "Crime runs in families." What does she mean? Is this a reasonable conclusion? Why or why not?

Note: In the *60 Minutes* clip, the reporter says that “crime runs in families,” but there is very little detail or discussion about this statement. Most likely, the reporter is referring to a number of sociological studies that show that people who are in the criminal justice system may be influenced by relatives who are in the same situation. A 2008 *USA Today* article, “[For many of USA’s inmates, crime runs in the family](#)” states that “Nearly half of the 2 million inmates in state prisons across the USA — 48% — say they have relatives who also have been incarcerated, according to a Justice Department report in 2004, the most recent comprehensive survey of state prison populations.” To date, there is no genetic variant that has been perfectly correlated with criminal behavior and, for those variants that some researchers have correlated with criminal behavior, there is much controversy. Criminologists, sociologists and others continue to examine the complicated relationships between crime, poverty, education, race, socioeconomic status as well as environmental and biological factors. pgEd has developed an entire lesson plan that explores the biological and environmental dimensions of complex behavior. This lesson, entitled “Genes, environment and genetic complexity: Aggression in humans,” may be found at <http://www.pged.org/lesson-plans/>.

Homework assignment:

Have students read the April 2008 *Washington Post* article “[From DNA of Family, a Tool to Make Arrests](#),” and answer the following questions using the information from the slideshow and/or ideas from the class discussion. A handout for students may be found on page 10.

1. What are the benefits of law enforcement using the DNA of a suspect’s relative to try to catch the suspect? What might be concerning about this approach? Explain.
2. What are the concerns related to oversight of “local” DNA databases (i.e. databases that are controlled by a county or local law enforcement, not by the FBI or state authority)? What are the reasons for and against keeping the DNA profiles of crime *victims* in addition to suspects?
3. It has been estimated that African Americans comprise approximately 40% of the CODIS database, despite comprising about 13% of the United States population. By extension, then, relatives of African-Americans are also more likely to be identified in familial searches of an offender database. What do you think about this discrepancy? Should something be changed to bring this more in line with the racial makeup of the United States population? How important are race and privacy considerations when developing these policies?

Additional resources for teachers:

For a scientific overview of DNA profiling: "[Forensics, DNA Fingerprinting, and CODIS](#)," 2008, by Karen Norrgard, *Nature Education*.

The Innocence Project, <http://www.innocenceproject.org/>

"[DNA Sample from Son Led to Arrest of Accused 'Grim Sleeper'](#)," July 2010, by Kim Zetter, *Wired*.

"[Science crucial to cracking BTK case](#)," March 2011, by Tim Potter, *The Wichita Eagle*.

"[Darryl Hunt's fight for freedom](#)," April 2007, by Farai Chideya, *NPR*.

"[The Surprising Imperfect Science of DNA Testing](#)", 2015, by Katie Worth, *Frontline*.

"DNA, Crime and Law Enforcement" quiz answer key (see page 11 for quiz):

1. The arrest of serial killer Dennis Rader, Darryl Hunt is freed after 19 years of imprisonment for a crime he did not commit, the "Shoe Rapist" in the United Kingdom.
2. F
3. T
4. T
5. F

Name_____

Date_____

Homework:

Read the article, "[From DNA of Family, a Tool to Make Arrests](#)," and answer the following questions using the information from the slideshow and/or ideas from the class discussion. Each answer should be at least one paragraph long.

1. What are the benefits of law enforcement using the DNA of a suspect's relative to try to catch the suspect? What might be concerning about this approach? Explain.
2. What are the concerns related to oversight of "local" DNA databases (i.e. databases that are controlled by a county or local law enforcement, not by the FBI or state authority)? What are the reasons for and against keeping the DNA profiles of crime *victims* in addition to suspects?
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Name_____

Date_____

“DNA, Crime and Law Enforcement” quiz

1. Short answer: List two examples of DNA being used to solve a crime.
2. The only way to have your DNA added to a state or federal criminal database, such as CODIS, is to be convicted of a felony. T/F
3. In addition to being useful to capture and convict criminals, DNA also has been used to free hundreds of people who have been wrongly convicted. T/F
4. If a person’s DNA profile is in a criminal database, a law enforcement agency might be able to use that information to identify and possibly arrest another family member who is suspected of a crime. T/F
5. DNA analysis is a foolproof tool to solve crimes and will likely replace traditional police investigations in the near future. T/F