

Criminalistics:
From Alienists to Today's Courtroom

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Criminalistics: A New Look at Crime

Last school year I was approached by Charlotte Kordek, my school district's technology supervisor, with a suggestion to expand the small amount of chemical forensics I taught in my Advanced Chemistry class into a full year course. Upon asking her if she thought there would be a large enough interest in the class she also suggested that I could teach it as a distance learning class. Well, after scheduling was completed I ended up with two sections of Criminalistics.

I have been reading background material and writing lesson plans daily and have included a few of my favorites in this report.

Criminalistics Syllabus

Origin and History of Criminalistics

The Crime Scene (Evidence Collection and Preservation)

Fingerprints	Position/Location of victim
Blood/Fluid splatters	Hair
Fibers locations and prints	Footprints and position
Documents	Weapon position
Wound angle of entry and position	Possible cause of death

Analysis of Physical Evidence

Fingerprint Analysis	Hair Analysis
DNA Analysis/Electrophoresis	Blood typing
Serology	Fiber Analysis
Print patterns	Chromatography of inks
Glass Analysis	Soil Analysis
Toxicology	Polygraph Testing
Voiceprint Analysis	Footprint/tire print Analysis
Ballistics	Gun powder residue
Coroner's exam	Forensic Anthropology
Forensic Photography	Forensic Entomology
Forensic Odontology	Forensic Engineering
Forensic Psychology/Profiling	Reconstruction of the crime

Provision of Expert Testimony

Fact, Not Truth

Famous Crimes

Jack the Ripper
Sam Shepard
The Kennedy Assassination

Elizabeth Borden
The Black Dahlia

Other sources of material for forensics include books, movies and television.

Below is a list of books and movies which provide good examples of criminal profiling and police forensics/investigations. Some of these (indicated by *)contain adult language and themes and are not appropriate for use in school but, are great sources for background information and examples of police investigative techniques.

Books:

Caleb Carr...The Alienist*

Edgar Allen Poe... “Murders in the Rue Morgue”, “The Purloined Letter” and others

Sir Arthur Conan Doyle... Any of the Sherlock Holmes Mysteries

Jeffery Deaver...The Bone Collector*

Agatha Christie... And Then There Were None , Murder on The Orient Express , and Death on the Nile

Raymond Chandler... The Big Sleep *

Dorothy L. Sayers...Lord Peter Wimsey novels

Dashiell Hammett...The Maltese Falcon

Movies:

Silence of the Lambs*

Kiss the Girls*

Seven*

The Usual Suspects

L.A. Confidential

Double Indemnity

Laura

Dial M for Murder

Rear Window

Murder on the Orient Express

Death on The Nile

And Then There Were None

The Big Sleep

The Maltese Falcon

Television:

The Profiler

Millenium

Murder She Wrote

Quincy, M.E.

The New Detectives

Fingerprint Activity

Level:

K-12

Purpose:

In this activity students will devise a method by which the fingerprints of the class can be categorized and identified. The ultimate goal of this activity is dependent upon the grade level of the class. Elementary school students may aim to study classification systems, while high school students may use a system of their own devise to correctly identify a particular student's fingerprint.

Background:

The origins of fingerprint identification go back three thousand years in Chinese history when prints were used as a method of signing legal documents. The popular acceptance of fingerprints as a means of accurately identifying criminals required two decades of scientific investigation. Surprisingly, this acceptance came only 100 years ago.

Time:

This particular activity takes approximately 6 hours of class time.

Procedure:

Divide students into groups of three or four. Each group takes the fingerprints of its members and analyzes them for various characteristics such as shapes or types of lines. Prints are made of all ten fingers. The students should make extra prints of the right thumb and index finger of each group member as well. These will be used in the latter part of this experiment.

Students look for traits of the their own design or choice. Many groups rely on the most common characteristics of whorls, loops and arches, even though they may be given different designations.

The students will then devise a general grouping system based on a code of classification traits. These groups should be very general like ABO blood groups. All persons can be classified as A, B, AB, or O blood type, but the classification is not very specific. Many possibilities exist. The students may group people based on the number of spiral shapes found on their fingerprints and classify them into 10 different groups. Or they may decide to form groups based on the patterns found on the thumbs. The students are asked first to classify the fingerprints of those in their own group and then the rest of the class's fingerprints into the general categories they have devised. It is interesting to see the various types of classification systems that are devised by students, but most of the systems resemble traditional fingerprint identification techniques.

After a general classification technique has been devised, the students' groups then devise a classification scheme which is very specific and can be used to determine a single individual's fingerprint. The students will begin with the members of their group and then eventually classify every person in the class using their system of identification.

The procedure to this point will probably take 3-4 hours: one for the taking of fingerprints, one for the creation of a general system of classification, and another one to two hours for developing the specific identification system.

Next, the systems are presented to the class. Each presentation should involve a complete description of both the general classification and specific identification systems, an explanation of how they were developed, and an explanation of the choice of those particular methods of classification.

As a final test, the extra thumb and index fingerprint samples of all students' are taken and then redistributed with anonymity. In other words, the fingerprints will not have any names attached to them. The student's systems can be tested to determine if they are capable of correctly matching prints with their owners. Younger students may accomplish this with a direct comparison of the unknown fingerprint to the known fingerprints. Senior high students should have a more complex system with which a catalogued print can be identified without a visual comparison..

Obviously this experiment should be more of an observational exercise for elementary students. High school students should utilize more complex classification systems and systematic testing of developed procedures. Afterwards, the students classification systems can be compared with the fingerprint identification standards used by the F.B.I. and other agencies.

Explanation of the Henry Classification System:

When analyzing a fingerprint scientists categorize prints into three types: whorls, loops and arches. The whorl pattern is used as the basis of the Henry system of classification in which prints are paired in the following manner:

$$\frac{\text{Right Index} + \text{Right Ring} + \text{Left Thumb} + \text{Left Middle} + \text{Left Little} + 1}{\text{Right Thumb} \quad \text{Right Middle} \quad \text{Right Little} \quad \text{Left Index} \quad \text{Left Ring} \quad 1}$$

If a whorl pattern appears on any of the first pair of fingers it is assigned a value of 16 and placed in the corresponding spot for that finger. If there is a whorl on any of the second pair of fingers it receives an 8. On the third pair a 4 and so on. Arch and Loop patterns receive no value. The numerator and denominator are then calculated by addition of the values which results in a fraction. This simple classification can be used to classify large groups of individuals fingerprints and eliminate suspects who do not have the same Henry Classification. One can see that this system of classification can only be

used if a full set of prints are available. Another drawback to this classification is that one-quarter of all people fall into the 1/1 category with their fingers having only arches and loops.

Many discussions can arise from this activity. It can be used to examine the feasibility of the student's systems and to talk about sample size in relation to the development of their system. In other words, is the class size a big enough sample from which to develop a classification system?

Note: At no time should any students fingerprints be removed from the classroom. Also, all prints should be destroyed after the fingerprint activity is completed.

Assessment:

Students will be assessed on the following areas:

Cooperation:

- 5 Students worked well together and shared responsibilities.
- 4
- 3 Students worked but responsibilities were not shared equally.
- 2
- 1 Students did not form a cohesive group and work was not completed.

Following Directions:

- 5 Students followed directions completely.
- 4
- 3 Students followed most directions; missed some details.
- 2
- 1 Students followed few directions.

Thoroughness:

- 5 The students' system was complete and properly identified all prints which were examined.
- 4
- 3 The students' system was complete and identified most prints correctly.
- 2
- 1 The students' system was incomplete and did not properly identify most prints correctly.

Organization:

- 5 Students had well organized ideas, excellent paragraph/ presentation structure.
- 4
- 3 Students were somewhat organized, but need to improve.
- 2
- 1 Students were disorganized. Ideas were scattered and confused.

Clarity:

- 5 Students presented information in a clear, confident manner.
- 4
- 3 Students hurried parts of the presentation, stumbled over some details.
- 2
- 1 Students mumbled, were inaudible, and/or raced through the presentation.

Edgar Allen Poe’s “The Purloined Letter”

Level:

7-12

Purpose:

In this activity students will have the opportunity to study logical search procedures and, more importantly, the process of profiling.

Background:

In 1841 Poe invented the detective story with "The Murders in the Rue Morgue". This story, his first and most important mystery work, set the form for Poe's other stories. The story seems to set the precedent for Sir Arthur Conan Doyle's Sherlock Holmes tales with the relationship between Dupin and the narrator being mirrored by Holmes and Watson. The method by which Dupin relates the specifics of the murder and solves it for the reader is very similar to a Holmes' denouement in which he reveals all to the reader.

Poe wrote many detective stories, including "The Gold Bug", "The Murders in the Rue Morgue", "The Purloined Letter", and "The Mystery of Marie Rogêt". For this exercise we will consider "The Purloined Letter" in great detail in relation to criminology, specifically in the areas of search procedures and profiling.

"The Purloined Letter", like any good detective story, acts a puzzle. It keeps the reader in the dark about the truth of "whodunit" so the opportunity to solve the crime with the detective is present. It centers on the theft of a compromising letter from the French Queen's bedchamber and the futile attempts of the police to recover this letter. The Police Commissioner then seeks the aid of Dupin to assist in solving the dilemma.

Time:

Approximately 4-5 hours.

Procedure:

There are two types of criminalistic procedures which are demonstrated in "The Purloined Letter", search procedures and profiling. The meticulous method by which the Minister's house is searched is an excellent beginning for discussion of police search procedures for crime scenes.

The students should have read the story previous to this discussion. They should have access to the entire story which includes footnotes to explain the translations and more obscure references in the text.

The search of the Minister's house should be handled as a simple recall exercise. Students can skim through the text and make a list of all the items and places of the house and how they were searched. Then the discussion should grow to include questions such as the following:

How might the search change if it were to be performed today?

How might the search change if it were performed in the room in which you are in now?

What types of technology are employed today both in reference to hiding things or finding things?

The discussion of the search procedure is very direct and while it does take a certain amount of imagination to think of various hiding places, it is the act of profiling in the story which actually solves the mystery.

“The Purloined Letter” is actually a story of the battle of wits between Dupin and the Minister. It is very similar to a chess game in which the moves are calculated and assessed before the actual move is made. The process by which the Minister manages to fool the Inspector, and then by which Dupin manages to beat the Minister is known as profiling.

Profiling is a procedure by which investigators make determinations as to what type of person has committed a specific crime or to predict what sort of crime a person will commit.

Dupin uses the second type of profiling since he knows the suspect (the Minister) and can analyze the way he thinks. The Minister has used the same method on the Inspector to devise a way to hide the letter in the first place. Also, the inspector has used this method to profile the Minister but has made a false assumption about him which causes the inspector to fail in his search to find the letter.

The inspector is the first to profile the minister. After he does, he bases his search procedure on the fact that the Minister is a poet, and as a poet the Minister is probably a fool and will hide the letter in what he thinks is a clever spot. This clever spot is believed by the inspector to be detectable by standard police search techniques. So, it should not take too long to find the letter in the Minister’s house. Because of his assumption, the inspector will never find the letter.

Previous to the police searches of the Minister’s house, the Minister probably thought at length about the inspector. He came to the conclusion that the inspector is a man of method and that his search procedure will follow a logical method as well. Knowing who he was up against gave the Minister the advantage and managed to secret the letter right out in the open, knowing that the inspector didn’t believe that he was very clever and would see the letter as unimportant.

Dupin profiles both the inspector and the Minister. He sees the inspector as a very logical man but realizes the mistake that was made in the inspector’s profile of the Minister. Dupin knows that although the Minister is a poet he is also a mathematician and has a keen, logical mind as well as the artistic and creative mind of a poet. Knowing this, made a mistake in Dupin also knows that the inspector will never find the letter.

Dupin knows that the Minister is going to be both logical about the inspector's search yet imaginative enough to come up with something out of the ordinary to do with the letter. Although Dupin understands this he must still go to the Minister’s house himself to search for the letter should be hidden from the police search, but yet easily available if it is to be used.

Dupin succeeds in locating the letter, creates a distraction the next day and recovers the letter.

Previous to the discovery of the letter, Dupin relates to the narrator the method with which he bested the Minister. Dupin relates the story of a schoolboy who won all of the marbles in a schoolyard. The schoolboy understood each of the other children in the yard and knew how they thought. Using this information about each of them he was able to second guess them and win all of the marbles. Dupin uses the same type of analysis of the Minister to accomplish his goal

The process that is described is profiling. After reading this story discussions of profiling in modern cases and in movies and television shows can be used to further develop this topic. Profiling usually involves the investigator 'getting into' the mind of the suspect and intellectually becoming him. This allows the investigator to understand the thought processes of the suspect and perhaps come to some conclusion of method or motive concerning a crime.

While "The Purloined Letter" is a wonderful example of profiling in police investigation, it is by no means the only one.

Assessments

Essays

The following essay questions were used as prompts for writing exercises associated with profiling, search procedures and “The Purloined Letter” itself.

Describe the intricate search the police conducted at the Minister’s house. After such thoroughness, why did Dupin suggest that the premises be searched again?

Dupin offers a detailed account of his method of reasoning, explaining in theory why the puzzle was solved by him rather than the police. Why was Dupin’s thinking correct and the police’s thinking in error?

Explain the significance of the story of the school boy and the marbles.

Why are the quotes in the beginning and end of the story appropriate?

The essays will be assessed using the Pennsylvania Writing Assessment Holistic Scoring Guide.

The Big Sleep

Level:

9-12

Purpose:

Students will discover the difficulty in following intricacies of plot and motive in the movie *The Big Sleep*. This information will be used to explain the difficulty investigators have when trying to build case against a suspect.

Also, students will pay particular attention to the use of characterization for a future writing assignment.

Background:

The Big Sleep was written by Raymond Chandler and adapted for the screen by director Howard Hawks and screen writer William Faulkner. It is a classic as a great detective movie and serves as a great example for suspect analysis, deduction and analysis of character veracity.

The movie itself is extremely confusing and I would recommend that any one deciding to use this movie in class should watch it at least three or four times before trying to tackle all of the intricacies.

Time:

Approximately 6 hours.

Procedure:

Even before the movie is shown the cast of characters should be revealed to the class. Detail should be given when possible but big clues about the plot should be hidden. The following is a list of main characters in the film with suggestions for possible descriptions (I believe they are listed in order of appearance or mention but, there may be some errors)

Phillip Marlowe	Private investigator
Norris	Butler
Carmen Sternwood	Not-so-wonderful daughter of General Sternwood
General Sternwood	Retired general, employer of Marlowe.
Sean Regan	Employed by Sternwood in the past as a chauffeur and problem solver, almost a son to General Sternwood.
Joe Brody	A blackmailer of the Sternwoods in the past.
Arthur Gwynn Geiger	Suspected of blackmailing Carmen Sternwood.
Vivian Rutledge	The other daughter of General Sternwood
Agnes	Bookseller, Mixed up with Brody and Geiger
Carol Lundgren	Geiger's shadow
Owen Taylor	Sternwood's chauffeur
Eddie Mars	Owens a casino and more
Mona Mars	Eddie's wife
Bernie Ohls	Detective works for District Attorney's office
Harry Jones	In love with Agnes.
Canino	Does wetwork for Eddie Mars

After previewing the cast of characters the movie should be presented in sections to the students. The instructor may wish to explain the scenes before they are shown or discuss them after the students have seen them.

During parts of the film the students should be questioned. These can be in the form of essay questions to be written out and assessed for a grade or they can be used to prompt general class discussions. The questions should not always be about the content of the film but, should also be about Marlowe's investigation techniques.

How would you investigate Geiger so he wouldn't realize he was being investigated?

Does Carmen have gambling debts?

Why does Marlowe go to the Library before Geiger's store?

How does Marlowe know Brody was at Geiger's house the night of the murder?

How is Eddie Mars related to Geiger and the Sternwoods?

When Vivian meets Marlowe at the restaurant why does she believe the case is over?

How does Vivian try to get Marlowe to stop searching for Regan?

Who killed the following characters?

Arthur Gwynn Geiger

Owen Taylor

Joe Brody

Sean Regan

Canino

Eddie Mars

Harry Jones

Why were each of the above characters killed?

What does Marlowe use as his name when Carmen Sternwood asks for it?

What do you think the title, *The Big Sleep*, has to do with the plot?

How was Sean Regan connected to the Sternwoods?

Who was blackmailing Vivian and why?

How did Marlowe know that Geiger's bookstore was a front for more nefarious dealings?

What was the purpose of the 'robbery' of Vivian in the parking lot of the casino?

What is a cipher? How was it used in the movie?

Vivian tries to pay off Marlowe with \$500.00 because she assumes the case is now closed. What case is she talking about and what case is Marlowe actually trying to solve?

Why is Eddie Mars' wife hiding out?

Resources

Literature

Crime Scene Investigations by Pam Walker and Elaine Wood

Criminalistics by Richard Saferstein, Ph.D.

Forensic Laboratory Science and Detective Mystery Writing by Gary Schiltz

Super Sleuths Workshop notes- by Rosemary Frollini , Governor's School for Physical Science Educators July 2000

The Big Sleep by Raymond Chandler

The Purloined Letter by Edgar Allen Poe

Websites

<http://garnet.berkeley.edu/~srubio/maelstrom.html> Edgar Allen Poe, Raymond Chandler and the detective story.

<http://members.aol.com/MG4273/poe.htm> Edgar Allen Poe site. Guide to classic mystery and detection.

<http://reviews.imdb.com/Reviews/133/13378> A review of the Big Sleep by Brian Koller.

www.cqu.edu.au/arts/humanities/litstud/naff/naffch_1_poe.html Edgar Allen Poe' short stories

www.crimescene.com Scenarios for investigating murders. Complete with evidence list and interviews.

www.filmsite.org/bigsleep.html Review of The Big Sleep by Tim Dirks with partial script.

http://www.nist.gov/srd/fing_img.htm Fingerprint image samples

<http://www.nist.gov/srd/nistsd9.htm> Fingerprint database for purchase 900+ sets of prints

www.reelclassics.com/Movies/BigSleep/bigsleep.htm Another review and synopsis of The Big Sleep by Elizabeth Anthony.

Movies

The Big Sleep-directed by Howard Hawks

Laboratory Experiments and kits also used in the Criminalistics class

Chromatography of inks

Flinn Scientific AP4503

Fiber Analysis

Carolina Science and Math AA-69-9875

Simulated Blood Identification

Fisher Scientific CQS19316
Flinn Scientific AP1213

Document analysis

Carolina Science and Math AA-69-9868
Fisher Scientific CQS25709
Flinn Scientific AP1777

Electrophoresis

Carolina and Flinn also have comprehensive kits for forensics. Most of the experiments can be designed by the classroom teacher without using a lab kit if she understands the basic chemistry behind it.

Application of Pennsylvania State Standards

Fingerprint Activity

Science and Technology

3.1.7, 3.1.10, 3.1.12 C- Unifying Themes-Applying patterns.

The fingerprint activity allows students to devise identification systems for fingerprints based on patterns of observed characteristics.

3.2.7, 3.2.10, 3.2.12 B-Inquiry and Design-Applying process knowledge to make and interpret observations as well as organizing the information in various ways.

This activity allows students to develop their own systems of classification based on their own observations.

3.2.4 C-Inquiry and Design- Use the elements of scientific inquiry to solve problems.

Younger students will be exposed to the process of devising their own investigation into how fingerprints should be organized.

3.3.4., 3.3.7 A Biological Sciences- Know the similarities and differences that characterize living things.

The formation of fingerprints should be explained on the cellular level for younger students.

3.6.4, 3.6.7, 3.6.10, 3.6.12 B Technology Education- Apply knowledge of information technologies of transmitting, receiving, storing, and retrieving.

Students are encouraged to present their report on their fingerprint system using word processing programs and are further encouraged to use email systems for submitting their reports.

Reading, Writing, Speaking and Listening

1.4.3, 1.4.5, 1.4.8, 1.4.11 B Types of Writing-Informational pieces(ie. Reports and descriptions)

Students will present their findings in written reports.

1.5.3, 1.5.5, 1.5.8, 1.5.11 Quality of writing.

Various aspects of writing quality will be assessed in the students' final reports.

1.6.3, 1.6.5, 1.6.8, 1.6.11 A Listen to others.

During the presentation of reports students will be asked to listen to the other students taking notes and asking appropriate questions when relevant.

1.6.3, 1.6.5, 1.6.8, 1.6.11 C Speak using skills appropriate to formal speech situations.

Students will be assessed on their ability to present their report to the entire class.

1.6.3, 1.6.5, 1.6.8, 1.6.11 E Participate in small and large group discussions and presentations.

Students will field questions from the audience and instructor during the presentation of their findings.

Mathematics

2.6.3, 2.6.5, 2.6.8, 2.6.11 Statistics and data analysis.

Students will use data collected during their investigation to construct graphs and formulate questions based on their data and other students' data.

The Purloined Letter

Science and Technology

3.2.7, 3.2.10, 3.2.12 B-Inquiry and Design-Applying process knowledge to make and interpret observations as well as organizing the information in various ways.

Students will apply information about profiling techniques to the story.

3.6.4, 3.6.7, 3.6.10, 3.6.12 B Technology Education- Apply knowledge of information technologies of transmitting, receiving, storing, and retrieving.

Students are encouraged to submit their essays using word processing programs through email systems.

Reading, Writing, Speaking and Listening

1.1.5, 1.1.8, 1.1.11 D Learning to read independently-Identifying basic facts and ideas in text using specific strategies.

Students will identify and understand the plot and essential ideas in the text and be able to form questions to assist in the clarification of information in the story.

1.1.5, 1.1.8, 1.1.11 G Demonstrate after reading understanding and interpretation of nonfiction text.

The students will be able to describe the characters of the story including how they fit into the plot and theme.

1.1.3, 1.1.5 H Demonstrate fluency and reading comprehension

1.3.3, 1.3.5, 1.3.8, 1.3.11 A and B- Read and understand works of literature and identify and analyze various literary elements.

1.4.3, 1.4.5, 1.4.8, 1.4.11 B Types of Writing-Informational pieces(ie. Reports and descriptions)

Students will present their responses to questions in written reports.

1.5.3, 1.5.5, 1.5.8, 1.5.11 Quality of writing.

Various aspects of writing quality will be assessed in the students' final reports.

1.6.3, 1.6.5, 1.6.8, 1.6.11 D Contribute to discussions.

Students will ask and answer questions which are relevant to the story.

The Big Sleep

Science and Technology

3.2.7, 3.2.10, 3.2.12 B-Inquiry and Design-Applying process knowledge to make and interpret observations and evaluate experimental information for appropriateness and adherence to relevant science processes.

3.2.7, 3.2.10, 3.2.12 C Apply and use the elements of scientific inquiry to solve problems.

Students will apply logical thinking skills and observations to the process of solving crimes.

3.6.4, 3.6.7, 3.6.10, 3.6.12 B Technology Education- Apply knowledge of information technologies of transmitting, receiving, storing, and retrieving.

Students are encouraged to submit their essays using word processing programs through email systems.

Reading, Writing, Speaking and Listening

1.2.8, 1.2.11 B Use and Understand a variety of media

1.4.3, 1.4.5, 1.4.8, 1.4.11 B Types of Writing-Informational pieces(ie. Reports and descriptions)

Students will present their responses to questions in written reports.

1.5.3, 1.5.5, 1.5.8, 1.5.11 Quality of writing.

Various aspects of writing quality will be assessed in the students' final reports.

1.6.3, 1.6.5, 1.6.8, 1.6.11 D Contribute to discussions.

Students will ask and answer questions which are relevant to the story.