# Shaping societies: Disciplinary literacy in forensic science

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For centuries, individuals living together have developed boundaries for the actions that they consider appropriate among the members of formed societies. These boundaries, called laws or rules by some communities, help to guide members in their actions. Members of a community are sometimes selected to determine if laws or rules have been violated by an individual. Communities turn to forensic science to help contribute to decisions surrounding whether an individual's actions violate the laws or rules of a particular community. Community members' evolving relationships with forensic science could shape the fate of other community members. We study literacy practices surrounding forensic science in order to determine community members' evolving relationships. These processes are called disciplinary literacy in forensic science.

Disciplinary literacy examines practices that are specific to different domains

(Ortlieb et al., 2024; Shanahan & Shanahan, 2012). Disciplinary literacy in forensic science explores the unique ways that forensic science texts are created and understood across

diverse participants. Forensic science is comprised of diverse sciences, such as biology or chemistry, which have unique ways of reading, writing, and speaking. Since multiple sciences within forensic science develop reasoning in different ways, it can be challenging to navigate multiple forms of science discourses in forensic science (President's Council of Advisors on Science Technology, 2016). A majority of research centering on communication in forensic science focuses on the roles and responsibilities of forensic science experts as they testify during trials (Hackman, 2021). In addition, research has examined the relationships between forensic science and ethics (Ward, 2023). For many years forensic scientists have focused on how to communicate their findings to judges and juries while positioning their statements within a lack of certainty. As Martire (2018) explains:

A forensic scientist can never know without any doubt (even if very small) that a particular suspect left a mark or contributed a sample. Their analytical methods cannot establish the ground-truth for a past event.

Instead, the result of a comparison between known and questioned samples (be they impressions, patterns, substances or scenarios) produces observations that the forensic scientist believes are more or less consistent with one or another possible past cause. (p. 619)

Forensic scientists reconstruct the cause of actions after studying the effects of the actions. Expert forensic science witnesses must find ways to talk about their conclusions while acknowledging the deconstructive nature of their methodologies. Research is needed that examines how forensic science is communicated beyond preparing forensic

scientists for trial. These discussions may help examine how reading, writing, and speaking forensic science can inspire the evolution of societies.

# What are the Types of Forensic Science Texts and Who Uses These Texts?

Many forensic science texts center on forensic evidence. Forensic evidence is forensic information that is collected and may be potentially used in a case. Forensic evidence may draw from sciences such as chemistry, biology, or physics. Figure one displays a set of possible uses for forensic evidence in the United States. Other countries may use forensic evidence in different ways. Once a case moves to trial, the participants involved in language exchanges centering on forensic evidence may become even more diverse. Hackman (2021) describes the coming together of such different individuals in a court:

A criminal investigation and the subsequent presentation of the case in court results in people coming together from widely disparate groups, bringing with them different educational backgrounds and understanding of science. Forensic scientists, police, lawyers come together with members of the public as finders of fact in the courtroom. This means that communications that occur during the investigation are often cross-disciplinary and have to traverse barriers, both cultural and social. (p. 2)

Detectives, witnesses, victims, suspects, lawyers, legal aides, judges, juries, insurance investigators, insurance claim processers, forensic scientists, and the general public all encounter forensic science texts in the course of their professional lives. The types and

purposes for these texts may vary. For example, forensic science texts may include DNA tests, tire track marks analysis reports, case appeal documents, paperwork needed to file case appeals, letters to opposing counsel, and insurance claims. As societies grow, the list of forensic science texts expands. Each of these types of texts uses language for different purposes and is shared with diverse audiences. We must begin to compare and contrast how each of these different types of texts uses languages to communicate. By understanding the differences across forensic science texts, individuals may become more persuasive readers and writers.

### What Can We Accomplish When We Communicate Forensic Science?

Over time humans develop better ways of explaining things. We evolve and grow in our understandings of the world. With the evolution of our understandings, we turn away from certain methodologies in forensic science and begin to adopt newer methodologies. Literacy practices evolve to reflect these changes. Within the United States, individuals may be accused of crimes, such as driving under the influence (DUI), hit and runs (vehicular assault), speeding, burglary, rape, or murder, that may prompt the collection of forensic evidence. An individual may know someone facing these charges or may be directly advising someone facing these charges. Individuals may be working in an office that is advising an individual facing these charges, may be tasked with deciding whether a person is found guilty or innocent of these charges, or may be prosecuting someone facing these charges. All of these actions involve the exchange of texts or oral communication. This constitutes disciplinary literacy in forensic science.

### Why Try to Understand Patterns Within Forensic Science Texts?

It would be helpful if communities understood patterns that can be found in written texts that center around forensic science. If we can understand the purposes for the different patterns within language in a text, we can better understand what an author is trying to accomplish. When an outsider to a community starts to try to understand texts that are used inside a community, it can sometimes be difficult to understand the meaning intended by an author. In addition, if authors understood the options that they had for using language, they might be better able to persuade.

In order to better understand how language is used by authors of forensic science texts, a qualitative study was designed to analyze documents filed within courts of appeals in the United States. After a criminal case has been awarded a guilty verdict, defendants may file documents to appeal the case. These documents serve as requests to overturn a case's outcome due to reasoning specified within the documents. Some appeals documents provide details as to the types of languages that center on communication surrounding forensic evidence. Analysis of these documents may help strengthen understandings of disciplinary literacy in forensic science.

As a researcher with twenty years of experience analyzing disciplinary literacy, I have investigated science and mathematical texts across audiences. For example, I have examined forensic science texts at a university level (Croce et al., 2023; Raje et al., 2024), and biology, chemistry, and physics texts across audiences (Croce, 2013, 2015a 2015b, 2020; Croce & Firestone, 2020; Croce & Goodman, 2020; Croce & Spence 2023; Croce

& Watson-Vandiver, 2020). In addition, I have also focused on mathematical texts used across diverse audiences (Croce, 2020, 2023; Croce, K. & McCormick, 2019). Within the study described in this article, I set out to examine how filed case appeal documents in the United States could tell us more about some of the literacy patterns that define forensic science texts. Specifically, the research question being asked within the study was, "What language patterns can be found in filed written court appeals that include forensic evidence over a seven-year period in Maryland?" Both content analysis and discourse analysis were used as research methodologies in order to better understand patterns within the texts. By researching how forensic evidence is shared, we can begin to understand the influence of forensic texts on decision making.

### **Data Collection**

The search engine Google Scholar was used to obtain documents filed within either the Court of Appeals or Court of Special Appeals within the state of Maryland between 2018 and 2025. This search yielded 14,000 documents. The search results were further filtered by using the search term "forensic evidence". The use of this filter then yielded 1,030 documents. Content analysis (Erlingsson & Brysiewicz, 2017) was used to find documents which specifically stated context related to how forensic science was used in the case of an appeal. This yielded the final 40 documents that were analyzed within the study. The selection criteria for documents used in the study can be described as follows: Court of Appeals documents or Court of Special Appeals documents filed between 2018 and 2025 in the state of Maryland that reference forensic evidence in the court proceedings of the cases.

### **Data Analysis and Credibility**

After content analysis (Erlingsson & Brysiewicz, 2017) was used to determine that the documents fell within the context of appeals filed in Maryland that included forensic evidence, discourse analysis was then used to analyze the forty documents. The initial coding process began as a research assistant and I independently coded the documents. The focus of the coding was to look for elements that stood out (Bahktin, 1981). We each assigned preliminary codes to each element. We then came together to discuss coding. A tentative agreement was made on coding that allowed each of us to independently recode each document. We met again to review the codes and introduce new codes. Over the course of five months, the process was repeated two additional times. In each meeting, we revised the coding system. The patterns presented in this article were developed as a result of this coding system. The credibility of the findings is based on the longitudinal nature of the study investigating documents created over seven years, as well as discussions between researcher and research assistant to test the accuracy and trustworthiness of the data analysis (Patton, 1990).

### **Patterns within Forensic Science Texts**

The study described in this article situates disciplinary literacy in forensic science in a specific time and place. The documents that were analyzed for the study were situated in the United States in Maryland within a seven year period. Other countries may produce documents that present different discourses that shape disciplinary literacy in forensic science. It is expected that discussions of the elements within disciplinary

literacy in forensic science will evolve over time and across and between countries. This article presents six patterns found within the discourses of the analyzed Court of Appeals and Court of Special Appeals documents found in Maryland. Table 1 presents each of the six patterns that were established across the documents.

**Table 1. Patterns in Court of Appeals or Court of Special Appeals documents** 

	Categories
Pattern one	Grouping forensic evidence with similar purposes
Pattern two	Using forensic evidence to help describe connections
Pattern three	Exploring forensic evidence that lies outside established patterns
Pattern four	Examining decision making using forensic evidence
Pattern five	Addressing a jury's desire for more forensic evidence
Pattern six	Investigating sociocultural distrust of science

### Pattern One: Grouping Forensic Evidence with Similar Purposes

Language was used within the documents to describe how forensic evidence with common purposes is grouped together. In this pattern readers can see how individuals label forensic evidence in ways that will connect juries or judges. Individuals are encouraged to distinguish forensic evidence within different contexts. *Reginald Dunlap v. State of Maryland* (2025) provides an example of these patterns. The "v" in the title means versus and is used to help distinguish the defendants and the prosecutors in each case. Within this document, the appellant asks that the court consider if a detective's testimony regarding geofence evidence should have been admitted into the court

proceedings. The appeal text states, "Did the trial court err in admitting Detective Galladora's testimony regarding "geofence" evidence?" (p.1) An appellant is an individual who files a document with a court that ranks above the court that rendered the initial decision on a court case. The case may be "overturned." The term "overturned" means that a second court disagrees with the first court on a case outcome. The decision of the second court may be implemented in replacement of the decision of the first court. In the appeals document Reginald Dunlap v. State of Maryland (2025), the validity of geofence data is questioned. Geofence data is often used when a suspect is unknown to investigators and the police would like to use technology, such as smart phone data, to determine which individuals were in a specific area at a specific time (National Association of Criminal Defense Lawyers, 2025). The officers provide a technology company with a geofence warrant requesting that the company provide information identifying individuals who were using devices that interacted with the company's technology at a specific time and place. Geofence forensic evidence is a set of evidence grouped together for specific purposes such as location identification. Many documents analyzed in the study contained examples of language being used to group together forensic science evidence with similar functions.

### Pattern Two: Using Forensic Evidence to Help Describe Connections

Conversational language might be coupled with scientific terminology in order to shape a case. One element within this category considers how conversational language may define for juries the elements of conditionality, causation, correlation, and cause and effect. Within the text of *Calvin M. Stevens v. State of Maryland* (2024), the appellant asks

the court, "Did the trial court commit plain error in permitting evidence and argument that three shell casings recovered at the crime scene had, unquestionably, been fired from a known handgun?" (p. 1). The appeal seeks to revisit connections of causation or correlation related to forensic evidence. Language is used to describe if one event directly led to another event or if one event only happened when another event preceded the first event. In the case of *Calvin M. Stevens, v. State of Maryland* (2024), language in the text is used to examine if shells may be directly linked to a specific handgun. Terms like 'unquestionably', 'failed', 'irrelevant', and 'no relationship' are used to persuade. These examples demonstrate how conversational language may be used to try to persuade juries to make connections between elements of forensic evidence.

### Pattern Three: Exploring Forensic Evidence That Lies Outside Established Patterns

Within this third category, language is used to explore how to consider forensic evidence that may serve as an exception to established patterns. Here language is used to consider the idea that just because something occasionally happens does not mean that it frequently happens. In this sense, language is used to consider how juries should weigh the importance of outliers. *Ryan Christopher Holden v. State of Maryland* (2023) describes how the forensic evidence of video was presented in the court in an effort to persuade:

Mr. Holden argues *next* that the trial court abused its discretion by admitting a video showing Mr. Holden holding a handgun. He cites three reasons. *First*, he contends the State failed to authenticate the video

"there was no relationship between the gun in the video and the crime charged." *Finally,* Mr. Holden contends that the video constituted unfairly prejudicial "other crimes" or "bad acts" evidence." (unpaged)

Here language is used to argue that just because something occasionally happens does not mean that it frequently happens. Phrases such as 'no relationship' are used to persuade. This is communicated by stating the connection that just because Mr. Holden is seen in the video holding a handgun does not mean that the same event occurred at the scene of the crime. This type of language is used to convince juries that past actions may or may not be predictors of future actions.

### Pattern Four: Examining Decision Making Using Forensic Evidence

Multiple examples demonstrate how individuals use language to describe how alternative decision making based on forensic evidence may or may not reshape a case. Individuals communicate the influence of forensic evidence on decision making before cases arrive in a courtroom. Within this pattern, language is used to describe how individuals communicate to juries the many possible pathways that forensic evidence can take before it arrives in a courtroom. Individuals encourage juries to review decision making that occurred based on forensic evidence. Examples of this can be seen in *Michael Earl Amick v. State of Maryland* (2023):

The police recovered several pieces of physical evidence and tested them for DNA, but the results were inconclusive. *Id.* at 4-5. The authorities did not

charge Amick at that time. *Id.* at 4-6. He moved to Hawaii. *Id.* at 6 n.7. In 2015, using new and more sensitive analytical techniques, forensic scientists detected a mixture of Amick's and Roxanne's DNA on two pieces of evidence. *Id.* at 5, 6. In 2016, while Amick was visiting his family in Maryland, the police arrested him. *Id.* at 6." (unpaged).

Phrases such as 'the results were inconclusive', 'did not charge at that time', and 'using new and more sensitive analytical techniques' are sometimes used to describe the journey that a case takes and how forensic evidence influences that journey. At multiple stages of the investigation, a different decision may have led to a different outcome.

Appeal documents sometimes question the reasoning behind different decisions that are made during an investigation.

### Pattern Five: Addressing a Jury's Desire for More Forensic Evidence

Language is sometimes used to help juries examine what is possible within the field of forensic science. In order to achieve this goal, sometimes language is used to describe a perceived lack of reliability within a type of forensic evidence. When examining what is possible, juries shape conclusions. *Anton Harris v. State of Maryland* (2024) provides an example of such language:

Most pertinent to the present appeal, the State presented the testimony of Zoe Krohn, a firearms analyst for the BPD who analyzed the cartridge casings found at the scene to determine whether they had been fired from the Polymer 80 handgun. Ms. Krohn used the Association of Firearm and

Toolmark Examiners' "Theory of Identification" (hereinafter "AFTE Theory") which is widely used by police officers." (unpaged). Later it was argued, "The State opposed the motion, arguing that the AFTE Theory is a reliable scientific method and attached numerous studies that it asserted demonstrate low error rates when examiners are tested on their ability to match cartridge cases and bullets. In advance of trial, appellant moved in *limine* to exclude the firearms identification evidence as unreliable under the *Rochkind-Daubert* standard set forth in *Rochkind v. Stevenson*, 471 Md. 1 (2020). He argued that firearms identification, generally, and the AFTE Theory, specifically, were unreliable. (unpaged).

When using words such as "generally", "specifically", and "unreliable" the author is using language to question the trustworthiness of the forensic evidence analysis, raising doubt as to the resulting decision making. Language is used to try to dissuade or persuade others to look for more collaborating evidence.

# Pattern Six: Investigating Sociocultural Distrust of Science

Sometimes language is used to investigate why jury members may develop a distrust of science as they navigate within and outside of different communities. Juries may relate to forensic evidence in multiple ways. Language is used to investigate why and if jury members consider how inequities may occur during investigations or prosecutions. These inequities can influence individuals to develop a distrust of court

proceedings that involve forensic evidence. For example, in *Albert M. Muldrow Jr. v. State* of *Maryland* (2023). it is stated:

When the evidence presented at trial will implicate, either directly or indirectly, the sexual orientation or sexual proclivities of a defendant or witness, the court must inquire about any potential bias among the jurors against homosexuality or homosexual acts. The court does not need to ask the *voir dire* question exactly as it is phrased, however, and may rephrase the question if appropriate. (unpaged)

Within this example, the documents present the possibility that the sexual orientation of the appellant may have informed the decision making centered around the case.

Language is used to suggest that the appellant's identity may have inspired bias in multiple participants engaged in the case. This may suggest that the decision making was biased and, therefore, unreliable.

The appeals documents analyzed in the study reflect actions and dialogue surrounding court cases in Maryland. Other forensic science texts may yield other patterns. Future research may investigate different contexts for forensic science texts such as examining DUI reports or insurance claims. Future research should begin to examine the types of language exchanges that define these texts.

## New Audiences Participating in Disciplinary Literacy in Forensic Science

While science communication has been around as a field for many years, it is only recently that new audiences have begun to attend to forensic science. Within the last

decade, there has been an increase in the types of media that focus on the depiction of real-life criminal cases. Podcasts, television shows, blogs, and movies all have examples of creators depicting analysis of forensic evidence. The rise of these genres has sparked interest in forensic science (Preece, 2025). The rise in the appearance of true crime media provides more opportunities for members of the public to be introduced to forensic science. The advanced interest in forensic science by the public has necessitated the development of new methods of communication within the field of forensic science. Hackman (2021) suggests that much is unknown regarding the challenges in communicating forensic science. This creates a need for more research that looks at disciplinary literacy in forensic science.

### Recommendations

Society as a whole would benefit from examining disciplinary literacy in forensic science. By understanding how forensic science communication evolves, members of communities may redefine how laws and rules are defined and enforced. In order to create this type of impact, educational environments might consider directing students to analyze the literacy practices within forensic science. For example, students in middle schools and high schools should be encouraged to examine how language impacts the decision making surrounding a case. University programs would benefit from including literacy in forensic science courses within the curriculums. Courses may reflect on the languages of persuasion and reasoning that are used in court of appeals documents. This type of analysis helps develop students' critical thinking skills. Organizations that support detectives, witnesses, victims, suspects, lawyers, legal aides, judges, juries,

insurance investigators, insurance claim processers, and forensic scientists might provide seminars that examine disciplinary literacy in forensic science. When community members understand the methods of communication surrounding forensic science, they will be better equipped to make informed decisions about the laws and rules that shape societies.

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# Figure 1. Possible uses of forensic evidence in the United States

