Commentary

Teaching To Avoid the "*CSI* Effect"

Keeping the Science in Forensic Science

by Elisa Bergslien

Because of the popularity of television shows such as *Cold Case Files, CSI,* and *Crossing Jordan,* as well as numerous cable reality shows, there has been a documented increase in student interest in the sciences *(1–4)*. To encourage this interest, forensic classes of all kinds have been popping up at high schools and colleges throughout the U.S. A quick perusal of the recent tables of contents of education periodicals, such as this *Journal,* reveals numerous articles discussing forensic exercises for students and discussions of ways to incorporate crime scene critical thinking exercises into the classroom.

Along with this burst of interest in science, there also have been a few less positive side effects of the popularity of these shows. One such side effect, referred to by many as the "*CSI* effect", is that the manner in which science is used to solve crimes on television has led to increased public expectations of science and a significant misunderstanding of how forensic science really works *(5)*. On television, virtually all of the crime scenes investigated are replete with significant physical evidence, all of which is quickly collected and then analyzed with a barrage of real and fictional scientific instruments. While the majority of the instruments shown on *CSI*—such as DNA sequencers and mass spectrometers—are real, the manner in which they are used is often far-fetched. Few chemists would be willing to grind up maggots and inject the resultant pulp into their gas chromatographs, an act that would almost certainly destroy the column. Nor is the episode in which sawdust from a specific ring in a tree branch is analyzed to determine the kind of gasoline used to burn a body beneath the tree four years earlier the best example of realistic science *(6)*. Other network shows are often much less careful about their scientific accuracy. Even with public understanding that crimes are not really solved in under 40 minutes, there are apparently increasing perceptions that the methods and tools shown on television are a realistic representation of those actually available to real life forensic investigators.

This is being demonstrated in courtrooms across America, where jurors have increased expectations about the types, quality, and level of evidence being presented *(7)*. A survey of the 500-member jury pool in the Texas trial of Robert Durst revealed that about 70% watched *CSI, Forensic Files,* or *Law and Order (8)*. Jurors interviewed after trials have admitted that their viewing of such shows has led them to expect the types of evidence they see on television in the courtroom. Prosecutors are increasingly worried that these shows, in effect, are tainting the jury pool by presenting forensic science with a level of certainty that is often impossibly high in real-world cases *(5)*. Things have reached the point that lawyers are hiring expert witnesses to explain why there isn't any physical evidence to be introduced in a case, or to explain to the jury that DNA testing is unnecessary because the source of a blood sample is already known *(8)*.

Unfortunately, the manner in which forensic science is sometimes presented in the classroom has the potential of reinforcing the *CSI* effect. Students are often presented with a streamlined critical thinking exercise that has a clear, demonstrable answer. The process in many cases has evolved into a series of steps similar to a more conventional laboratory exercise: perform this test, compare the results, identify the culprit. The result is that students may also be getting an unrealistic set of expectations about how real forensic science is performed. In their minds, the experts have better tools, get many more samples, and can identify samples more precisely, as if performing a larger scale version of the classroom exercise. Students who choose to pursue a degree in science are usually quickly disabused of this simplistic view of the scientific process, but non-science majors who are only exposed to these ideas in introductory-level or general science classes may end up with severely distorted ideas about the power of forensic science, and by extension, of all scientific disciplines.

Several steps can be taken in the classroom to avoid this result. The following is a list of suggestions based on my experiences in teaching forensic geology at the undergraduate and masters levels.

1. Make time to relate the project performed in class to one or more real cases, comparing and contrasting the quality of the evidence and its importance to the resolution of the case. It is especially illuminating if there are cases in which this evidence was used to exonerate the suspect. Most of the television shows are geared toward "nailing the bad guy", and students often don't think about the use of such evidence to demonstrate innocence. By placing the scientific evidence into a larger context, the students should get a more nuanced understanding of the realities of analytical work.

2. Develop activities where the suspect or suspects are innocent. Most exercises are compare-and-contrast activities with multiple "suspects" and conclude with a denunciation of the guilty. Students get used to the idea of having to pick one out of a set and will sometimes go to extraordinary lengths to make their data match something. An activity where none of the suspects is guilty would force students to re-think their approach and provide a good segue to a discussion of science fraud in the courtroom. There have been increasing numbers of examples of forensic data being manipulated for presentation in the courtroom, perhaps most infamously those of the FBI laboratory scandals *(9)* and the Oklahoma crime laboratory scandal involving Joyce Gilchrist *(10)*. This type of activity can lead to a discussion of how important it is to maintain objectivity in any branch of science.

3. Create activities where the evidence is contradictory or inconclusive. This forces students to confront a concept that many of them are uncomfortable with, that of uncertainty. Virtually all introductory level and even many intermediate-level laboratory exercises are geared towards getting the "correct answer". This type of activity lies in stark contrast to the realities faced by forensic scientists, or in fact most scientists, who are usually working with limited resources, a limited data set, and a great number of unknowns. Television shows seem to be giving potential jurors the perception that physical evidence should be able to provide a conclusive, correct answer. Occasionally challenging students with an exercise in which there is no clear answer forces them to confront the idea that there are limits to what science can do, and will hopefully start to provide them with the intellectual tools to evaluate more complex scientific problems where there is no clear "right answer".
4. Real forensic investigators have noted that one of the most unrealistic things about *CSI* is the almost omniscient database. Creating an exercise in which students are required to select portions of the material for analysis, or are only provided with a subset of the potential data set for comparison, makes them think critically about resource management, spend time planning their analytical approach, and defend their choices. This type of exercise could also introduce the concept of statistical relevance.

For those unfamiliar with the events mentioned above, there have been several FBI scandals that have involved withholding or mishandling evidence. The most famous recent example is the 3,135 Oklahoma City bombing documents that were withheld from the lawyers for Timothy McVeigh and Terry Nichols *(9)*. Other examples include the 2001 exoneration of Joseph Salvati, who served 30 years for a murder that the FBI knew he did not commit, and the 2001 release of audiotapes and other evidence that could have led to earlier convictions for the 1963 bombing of the 16th Street Baptist Church in Alabama that killed four girls *(11)*. In 1997, the Justice Department completed an 18-month investigation of the FBI's laboratory and found "serious and significant deficiencies". Investigators identified over three thousand cases in which prosecutions might have been compromised by faulty laboratory work or inaccurate testimony *(12)*.

Joyce Gilchrist, a forensic chemist in the Oklahoma City Police Laboratory, was fired in September, 2001, after an FBI investigation revealed that she gave testimony that "went beyond the acceptable limits of forensic science" based on laboratory notes that were "often incomplete or inadequate to support the conclusions reached" *(11)*. Gilchrist handled over 3,000 cases during her career and provided testimony that helped secure the death sentence in 23 capital cases *(13)*. An Oklahoma City Police Department memo obtained by the Associated Press revealed that not only did Gilchrist alter her own case notes, "there is compelling circumstantial evidence" that she "either intentionally lost or destroyed" crime scene evidence *(14)*.

The renewed interest in forensic science has been a boon for the sciences, but care must be taken with how this boon is utilized. Rather than catering to a current trend, this should be seen as an opportunity to advance understanding of the basic principles of science and critical thinking. As one judge has noted, television might be teaching jurors about DNA tests, but not enough about when to use them *(8)*. This is where science education should fill the gap, not only introducing the tools, but also teaching students about when and how to apply them.

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