

Transitioning a mock crime scene for remote learning

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Abstract: The COVID-19 pandemic resulted in transitioning an in-person introductory forensic science course to an online version of the course. Typically, the culminating experience in the course was a mock crime scene setup that required students to collect trace evidence, analyze trace evidence, analyze provided toxicology/autopsy reports, and present their results to others. The transition to the online learning environment required a new approach to the mock crime scene scenario, while still achieving the same learning objectives. In lieu of an actual mock crime scene, photographic evidence and police reports were provided so students could determine relevant evidence that needed to be collected from the crime scene and submit their evidence log. After that activity, students were provided a formal evidence analysis report, allowing students to interpret the evidence in an online learning environment. Finally, students completed a written report summarizing their findings. According to survey results, students gained confidence in their analysis skills and in their understanding of the course material. We believe that other online crime scene scenarios can be developed for upper-level courses to support the continuation of remote or hybrid learning environments, and as a preparation for online certification examinations.

Keywords: forensic science, teaching methods, remote instruction, case studies

Introduction

Forensic science and criminal justice majors typically take a general forensic science course as part of their introduction to the discipline. At our institution, we have a small building that has been used to stage mock crime scenes for students taking the introductory forensic science course. Given the relatively small class size (18-24 students), we typically assign four groups; two groups are responsible for staging two different crime scene scenarios, and two groups are tasked with solving the staged crime scenes. Students are required to incorporate at least five types of evidence into the mock crime setup (i.e., fingerprints, bloodstain patterns, hair, glass, and biological evidence) for subsequent collection and analysis. Students selected to solve the mock crime scene must analyze the evidence, develop a presentation for the class, and attempt to “solve” the case for their peers.

Additionally, as part of our commitment to the Age-Friendly University (AFU) initiative, we have also used mock crime scenes to promote intergenerational teaching and learning (1,2). The AFU initiative was launched in 2012 and calls for institutions of higher education to respond to the needs and interests of age-diverse populations through more age-inclusive approaches to curriculum and practices (3-5). For these scenarios, residents of Lasell Village, our University-Based Retirement Community (UBRC), develop a crime scene scenario for students to solve. Working with the course

instructor, the Village residents then gather the evidence for the students to analyze and set up a mock crime scene in their community. The forensic evidence includes footwear impressions, hair, fingerprints, toxicology reports, and an autopsy report. Students “interview” suspects, gather reference samples, process the crime scene, and attempt to solve the crime. Students are then split into groups and use several class periods to analyze the evidence, discuss results, and ultimately present their conclusions to Village residents in the form of a PowerPoint presentation. Each student group must explain how their particular evidence will be analyzed (i.e., for hair-microscopy) and then all students in the class present their conclusions as to “who did it” and “how”. After the presentation, Village residents divulge the solution to the crime (3).

Typically, the introduction to forensic science course is taught twice weekly for a total of 150 minutes per week. At least one session a week is devoted to laboratory exercises including bloodstain pattern analysis, hair analysis, blood typing, fingerprinting, arson investigation, impression evidence, and DNA typing. The other weekly session is lecture-based and includes weekly quizzes on course topics. Homework includes both published case studies (6) and case studies being developed for publication.

Due to COVID-19, in Spring 2020, the in-person course was moved to remote mid-way through the semester. As such, for students to participate in the

culminating mock crime scenario, an alternative method of delivery had to be developed. Further, laboratory exercises could not be delivered in person, thus course assignments had to be modified accordingly to provide students with the skills necessary to solve the mock crime scene scenarios. Using lessons learned from the Spring 2020 transition, and with the continued need for remote or hybrid learning, the introduction to forensic science course was again taught online in Fall 2021.

Crime Scene Scenario

The background for the online crime scene scenario included a case report prepared by the responding officer and a collection of photographs of the crime scene. Three different crime scene scenarios were developed, but for assessment purposes, only one crime scene was used for this study. A copy of the sample police report is provided in supplement 1. Crime scene photographs were uploaded to CANVAS (the learning management system used for this course) by the course instructor, with each photograph identified by a number. Example photographs are shown in **FIGURE 1** and **FIGURE 2**. **FIGURE 1** depicts an overall view of the crime scene and **FIGURE 2** provides an example of a close-up photograph of the crime scene. Approximately 20 photographs were taken of each crime scene.



FIGURE 1 Long view of mock crime scene scenario



FIGURE 2 Example of a close-up photograph of the mock crime scene.

Students were asked to thoroughly review the police report and the crime scene photographs. Students then completed **TABLE 1**, indicating the photograph number, the type of evidence they would collect, and how they would analyze the evidence. Students were not required to include all photographs in their evidence log if they determined a photograph did not showcase probative evidence.

TABLE 1 *Crime scene scenario evidence log.*

Photo #	Evidence Collected	Testing Required

Once the evidence logs were submitted, students were then provided with an "Evidence Analysis" folder on CANVAS. This folder contained the results from DNA analysis, drugs/toxicology analysis, trace evidence analysis, serological testing, and fingerprint analysis, ready for interpretation. Copies of the evidence analyses, and solutions will be provided on request. Students were asked to interpret the results of the analyses and write a formal scientific report. A sample report was provided to students, along with a report template (provided in Supplement 2).

Methods

At the conclusion of the exercise, a short anonymous survey was conducted to assess student learning and to gather feedback on the transition to a virtual mock crime scene. The survey was approved by the University

Institutional Review Board. Questions were taken from the SALG (student assessment of their learning gains) (7). The SALG is a web-based instrument that allows students to assess their perceptions of learning gains made over the duration of a course. Questions included a Likert scale with endpoints labelled (1) no gain and (5) great gain, and short answers. The survey asked students to self-report the gains they experienced from completing the mock crime scene scenario. Questions included a Likert scale or were short answer.

Results

Students were asked to what extent the crime scene scenario activity helped them develop their forensic science analytical skills. The majority reported gains ($M = 3.63$, $SD = 0.66$), with 62.5% of students reporting a good to great gain in their analytical skills as shown in **FIGURE 3**. Crime scenes can be large in area and include a variety of physical evidence. The ability to process a crime scene and collect essential evidence for analysis is integral for practitioners in the field (8-10). The virtual mock crime scenes that were developed for the course included a variety of physical evidence for the students to identify, as well as opportunities for discussion of evidence processing techniques. While students reported gains in their forensic science analytical skills, many students failed to identify evidence that would be of assistance to the case (e.g., powders, bottles). This weakness suggests that further activities are needed to improve students' evidence identification and collection techniques.

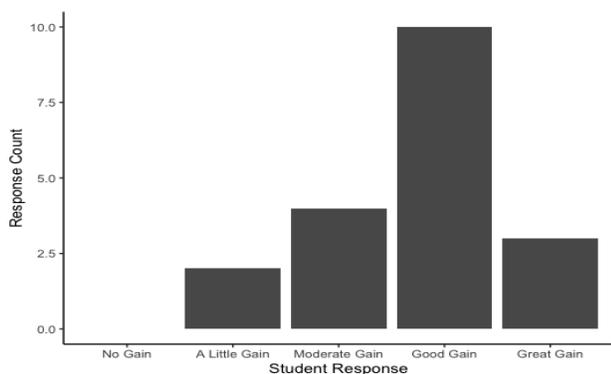


FIGURE 3 To what extent did the crime scene scenario activity help you develop your forensic analytic skills?

Students were also asked if the mock crime scene activity increased their confidence in understanding the course material. **FIGURE 4** shows that 68.8% of students reported a good to great gain in their understanding of the course material ($M=3.73$, $SD = 0.84$), as a result of “solving” the mock crime scene scenario.

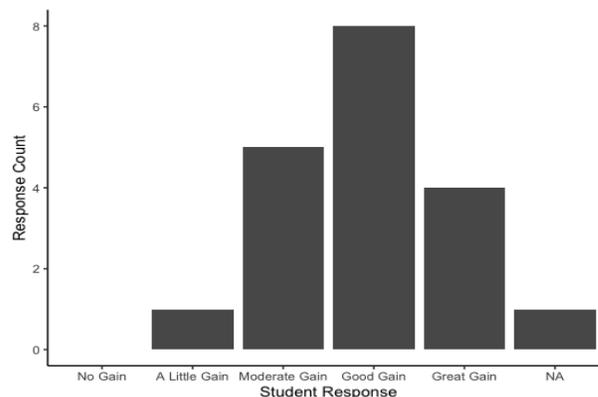


FIGURE 4 As a result of your work on the crime scene scenario, what gains did you make in your confidence that you understand the material in the course?

Students were asked for a response to the question: How did the mock crime scene activity contribute to your learning in this class? Responses included comments such as:

“It allowed me to put my knowledge of forensic science to the test using a hands-on learning experience. Much more valuable than any paper test.”

“It allowed me to apply my knowledge from the entire semester to a real-world scenario.”

“I was able to put everything that I learned in this one assignment. For example, the knowledge I learned from different modules played a role in completing the mock activity. It was a fun assignment and it got me really thinking as if I were a crime scene investigator. I wish I was able to do this activity hands on, which could have been really cool to do.”

Past research (11-13) has found that an authentic approach to scientific analysis versus a cookbook laboratory format provides for a better understanding of how scientific analysis is conducted and a greater interest in the scientific field. The above comments indicate that students enjoyed analyzing the mock crime scene, felt it was more useful than a traditional examination, and allowed them to apply the knowledge they gained in the course. Several students commented that it would have been more effective to do the activity hands on. They felt the in-person experience would add value to activity.

The final open response question asked how this activity changed the student’s attitude about forensic science analyses. Responses included comments such as:

“The case study changed my attitude because it showed me that I actually do know what I am talking about. It also showed me that I can have confidence when discussing how to do blood testing or drug testing.”

“This case study changed my attitudes about forensic science analysis by giving me a deeper insight into how evidence is collected; I did not expect the process to be as

intricate as described within the modules. Due to this reason, I found myself developing a deeper respect for forensic scientists and the work they do in order to confirm the involvement of a culprit, or suspect.”

The comments above, and other responses, indicate that students gained confidence in their knowledge of forensic science, and gained an understanding of the complexities of analyzing a crime scene. Several students commented that they were now aware that many different people (e.g., police, crime scene investigators, and scientists) participate in crime scene investigations, and that analysis is both time-consuming and difficult. Several students also commented on how the mock crime scene activity (and the course) changed their decisions regarding their major:

“It made the decision worth it to switch majors from forensic science to criminal justice as I would not like to do that work for a living.”

“It actually helped me better understand that this is the field I would like to go into when I graduate.”

Because this course is typically taken in the first or second year of our forensic science program, it provides an excellent means for students to immerse themselves in the field.

Discussion and Conclusion

The COVID-19 pandemic required courses that were taught in person to move to an online format. To continue to ensure that students in an introductory forensic science course had the opportunity to participate in a culminating experience, a mock crime scene scenario was developed for the online learning environment.

Due to ongoing challenges with COVID-19, Lasell Village residents have thus far been excluded from the online mock crime scene scenario but during the next online course offering, Village residents will once again be active participants. The tentative plan is for residents to assist in writing the scenario and participating in taped interviews. As with the in-person scenario, students will present their results to the residents, in the form of a Zoom meeting. Questions related to the Village participation will be included in future assessments as well.

The assessment results indicate that students felt the scenario increased their confidence in their understanding of the course material, changed their attitudes about forensic science analyses, and allowed them to test their knowledge in as realistic a manner as the online teaching environment allowed. Other researchers (14) have pointed out the importance of both collection and handling of physical evidence. While students were presented with photographic evidence, the complexity and amount of evidence associated with a physical crime scene could not be fully replicated solely through photographic evidence. The use of virtual reality technology (15) is a promising alternative that would address the above limitations but

currently the setup times and costs for that technology are prohibitive.

In the future, it would be helpful to gather additional student input on what improvements could be made to the online mock crime scene. It would also be useful to explore students’ attitudes towards forensic science analysis over the course of the semester, as many students enter the course using television crime shows as the basis for their understanding of forensic science (i.e., the CSI effect). As the need for remote or hybrid learning continues, we intend to further develop online crime scene scenarios for use in upper-level courses as a means to assess critical skills required for forensic science majors, and to prepare students for online competency certification exams.

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Supplement 1: Sample Police Report

July 27, 2019, 03:23

123 Pine Road, Billerica, MA

Report of Officer Farnam

On the morning of Saturday, July 27, 2019, at approximately 03:23, dispatch received a report of gun shots fired at 123 Pine Road. Upon arrival, I secured the scene and received the following information from witnesses:

The owner of the house, Mark Barker, was throwing a party with friends. At one point in the evening, one partygoer by the name of Steve Bell decided to pull a prank on another partygoer, Omar Littleton, by pretending to steal his drugs. Thinking Steve did, in fact, steal his drugs, Omar became very upset, and an argument ensued between the two men. Witnesses state that Omar left the party but stated “Wait until I come back for you!” before leaving. Approximately 45 minutes after the argument, witnesses state that Omar returned to the party, entered the backyard of the house, and began shooting at Steve. Steve was shot in the chest and was pronounced dead at the scene. Omar was seen running from the yard down the street.

I observed the scene to consist of a white house with a white vinyl fence along the perimeter of the backyard. The fence gate was located to the left of the house driveway. Upon entering the backyard through the fence gate, a shed was located straight ahead, and a deck was located to the right, in the very back of the house. On the deck, I observed a table with various beverages, white powder-like material, and green-leafy material. To the right of the table, I observed a male with an apparent gunshot wound to his chest. Red-brown stains were observed on the deck to the immediate right of the male.

A search of the area revealed a 9mm handgun in a nearby wooded area. Close to the gun, a piece of material,

such as that belonging to an item of clothing, was observed on the ground. The search for Omar Littleton has been unsuccessful at this time, however, his records reveal that Mr. Littleton has been convicted of multiple felonies.

CSI Lasell has been called in to assist with the forensic investigation of this case.

Supplement 2: Sample Report

[Date]

[Case Type]:

[Case Date]:

[Case Location]:

Dear Officer Farnam:

As per your request, an investigation was made of the scene involving [victim's name] in [case location]. An inspection of [type of location inspected] was completed and the scene was photographed. The following items were collected from the scene for [type of analysis] analysis.

- [Item 1 description]
- [Item 2 description]

The following is a summary of my analysis.

- [Item 1]: *Include your analysis summary here. This should include terms like match, non-match, etc. Support the reasons for your conclusions.*
- [Item 2]: *Include your analysis summary here. This should include terms like match, non-match, etc. Support the reasons for your conclusions.*

I trust this report will be of assistance to your ongoing investigation. If you have any questions or desire to discuss any analysis results with me, please contact me at your convenience.

Sincerely,

[Your Name Here]

CSI xxx University