DEVELOPMENT OF A MIDDLE SCHOOL LEARNING EXPERIENCE TO TEACH FORENSICS CONCEPTS USING A MOCK WRONGFUL CONVICTIONS CANINE CRIME SCENE

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For exonerations in which DNA evidence has proven innocence beyond reasonable doubt, nearly half of cases have revealed that the cause of wrongful conviction was due to failure to validate data, miscommunication of findings, or improper use of forensics. This suggests that there remains a gap in the education of forensic analyses across all disciplines involved in the judicial system. The traditional approach to relaying scientific concepts to students has been through textbook and didactic learning. Complementing these activities with practical laboratory-based experiences enhances understanding of concepts, regardless of whether the student is following law, law enforcement, or biological fields of study. To improve upon current approaches of relaying forensic science concepts, we developed a case study to teach: 1) proper sample collection; 2) DNA extraction; 3) PCR and sequence analysis to differentiate between samples; and 4) analysis and reporting. We utilized canine biological samples to stage a mock wrongful convictions case. First, we developed a DNA extraction and single nucleotide polymorphism (SNP) genotyping strategy to enable differentiation of canine suspects of different breeds and phenotypes. Additionally, we used a PCR-based strategy to differentiate between males and females by evaluating differences at the *AMELX* and *AMELY* loci on the X and Y chromosomes, respectively. We developed a mock crime scene report in which one dog had been “convicted” based on eye-witness testimony. The student, who was blinded to the identity of the canine criminal, was provided crime scene evidence chewed by the perpetrator dog. We extracted saliva DNA from the evidence, determined the gender of DNA contributor, and compared SNP genotypes at six genomic sites to twelve dog suspects. Using this approach, the student was able to exclude all but one suspect from contributing to the crime scene evidence, exonerating the wrongly accused dog. In addition to practical DNA-based work, this exercise promoted learning of key concepts in forensics including proper sample handling, use of positive and negative controls, and unbiased data analysis and reporting. This experimental exercise is broadly applicable to middle school, high school, and college settings to engage students in hands-on learning and to further enhance students’ understanding of forensic science.