B135 Integrating Undergraduate Mini-Research Project Exercises in Advanced Forensic Science Curriculum as a Course-Based Undergraduate Research Experience (CURE)

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Learning Overview: The goal of this presentation is to discuss the utility of introducing students in forensic science programs to perform research, thereby enhancing their critical thinking skills and preparing them for a career in crime laboratories.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing the community with future staff who have a better understanding of the fundamental knowledge of concepts involved in processing of evidence in crime laboratories.

One of the centerpieces of scientific education for undergraduate students with a science major is the incorporation of laboratory experiences.[1] The National Research Council (NRC) has emphasized the need for a revision in traditional laboratory courses to focus more on critical thinking skills and a deeper understanding and knowledge application.[2] More recently, original research and CUREs have gained a lot of attention as a high-impact strategy to improve learning outcomes resulting in improved student learning.[3] Additionally, several instructors have integrated research experiences into introductory science courses to improve undergraduate student interest and preparation for their science careers.[4] These research-based courses differ from expository (traditional) experiences since students are asked to develop procedures and outcomes for the experiments are not known. The benefits include learning important problem solving, critical thinking, communication skills, and gaining a deeper understanding of their field of study.

To improve student-learning outcomes in forensic science courses, this study has developed a research-based curriculum at the university. In the first seven weeks of the semester, students learn fundamental research techniques in a forensic biochemistry course that includes presumptive tests, DNA extraction, DNA quantitation, short tandem repeat-based polymerase chain reactions, and capillary electrophoresis. Using this fundamental knowledge, students develop a research problem/hypothesis, identify suitable protocols by a literature survey, plan and collect samples, determine variables, analyze data, and present their results as a formal laboratory report as well as an oral presentation. Students specifically design experiments dealing with changing variables (e.g., temperature, reaction conditions) in the collection, storage, and extraction of DNA for forensic DNA analysis. Data from Student Perception of Instruction (SPOI) and Student Assessment of Learning Gains (SALG) surveys administered at the end of the semester supported gains in student learning. Additionally, pre- versus post-survey data showed that students gained confidence in organizing and presenting their data, as well as a deeper understanding of the applications of biochemistry in forensic science. Incorporating research projects in other courses will help provide students with opportunities to be innovative and learn important critical thinking skills for their future careers.

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