

Cold Case Review & Analysis: Constructivist Learning in Forensic Science Through Collaboration With Law Enforcement Agencies

Amber L. Fortney, M.S.^{1*}; Caitlin E. Porterfield, M.S.¹; Wayne D. Lord, Ph.D.¹; Mark R. McCoy, Ed.D.¹; John P. Mabry, J.D.¹; R. Craig Gravel, M.A.¹; Special Agent Francia B. Thompson, B.A.²; Det. Sgt. Michael Huff (retired)³

¹W. Roger Webb Forensic Science Institute – University of Central Oklahoma, 100 North University Drive, Edmond, OK 73034

²Oklahoma State Bureau of Investigation

³Tulsa County Sheriff's Office Cold Case Task Force

*corresponding author: afortney@uco.edu

Abstract: Despite technological advancements and improved methodologies in forensic science and investigative practices, cold cases are a growing problem in the United States. Although there has been a surge in interest in solving cold cases due to advancements in technology, there has been very little research conducted on cold case investigation methodology. Many agencies lack the personnel and resources to devote adequate attention to cold cases. Federal dollars spent on cold case resolution in recent years focused only on those cases that could benefit due to improvements in DNA analysis techniques. The literature demonstrates that advances in other forensic disciplines can provide answers in unsolved crimes. In addition to inherent contributions to investigative invigoration and cold case resolution, collegiate cold case collaborations serve as a template for experiential and transformative illumination of unintended perceptual biases, investigative myopathy, and cognition fatigue. Such endeavors also provide practical insights into the sentinel importance of collaborator diversity, informed creativity, and objective analytics in both actively evolving and cold case investigations. This paper discusses the development of best practices guidelines for a cold case program in a collegiate setting through a case study of a cold case review and analysis course. The template for this cold case academic/law enforcement initiative is adaptable to other programs and projects in which case review is instrumental, such as the Innocence Project and the Child Death Review Board.

Keywords: cold case investigation, forensic science, constructivist learning, experiential learning, methodology

Introduction

Due to the autonomous nature of law enforcement agencies across the United States, and even throughout the world, there is no standard definition for the term “cold case”. Each agency sets its own parameters for designating a case cold. For the purposes of this article, the term “cold case” will be defined as “any case whose probative investigative leads have been exhausted” as set forth by the National Institute of Justice (NIJ) (1).

Despite technological advancements and improved methodologies in forensic science and investigative practices, cold cases are a growing problem in the United States. According to data from the Federal Bureau of Investigation's (FBI) Uniform Crime Reports, homicide clearance rates have declined from more than 90% in 1960 to a current rate of approximately 60% (see FIGURE 1). It is estimated that more than 300,000

homicides have gone unsolved in the United States since 1965 (2).

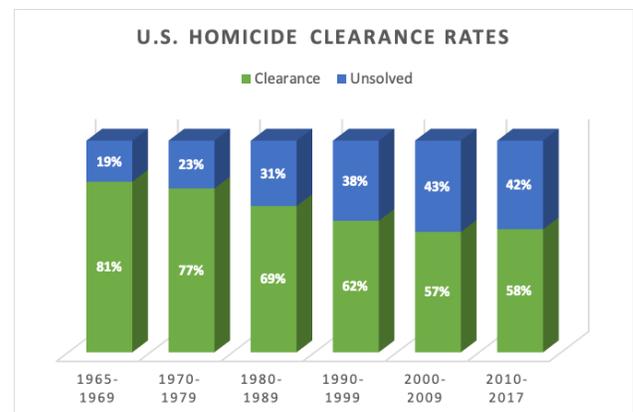


FIGURE 1 Homicide clearance rates (3,4)

From 2005 to 2015, the National Institute of Justice awarded nearly \$80 million in funding to agencies under the “Solving Cold Cases with DNA” grant program. This led to the formation of cold case task forces in many jurisdictions during that time (3). Since then a lack of funding and the demands of active caseloads have resulted in a reduction of the resources and attention devoted to cold cases. Meanwhile the number of unsolved cases continues to grow. This is unlikely to change unless new approaches to dealing with the cold case problem are implemented.

The methodology employed by cold case investigators begins with a comprehensive review of case file documents, followed by consultation with investigators who previously worked the case. Investigators work to identify and locate persons germane to the investigation and develop new leads to follow. Evidence must be administratively assessed to determine its suitability for additional analysis. A thorough yet concise summary of the case is composed to assist with further investigation (5, 6). The cold case investigator’s work does not stop there but proceeds with standard police work. However, a study of cold case units in Texas found that more than half of a cold case investigator’s time is usually spent reviewing case files and assessing evidence for further analysis (7). These are tasks for which many law enforcement agencies use volunteers, often retired homicide detectives. Forensic science students may be especially suited to these tasks because of their education. In fact, forensic science students possess many of the traits considered essential for cold case investigators: strong communication and interpersonal skills, strong research skills, patience, creativity, persistence, a high level of motivation, enthusiasm for the job, and current training about modern criminalistics technologies (6).

As a requirement for graduation, students in the Forensic Science program at the University of Central Oklahoma (UCO) are required to complete a Capstone Experience for assessment of student learning outcomes of their specific discipline and achievement of critical thinking and communication skills. A university cold case program offers students the opportunity to apply the cumulative knowledge and skills gained throughout their years of study to real world criminal investigations while providing a beneficial service to the community by assisting law enforcement agencies in their investigation of unsolved crimes.

Learning Theory

The review and analysis of cold cases represents a powerful instructional approach in forensic science and criminal justice. This strategy facilitates the learning process through the application of knowledge to ill-structured problems in real-world, authentic contexts.

The development of cold case review courses in higher education is supported by the constructivist learning theory and the situated cognitive theory particularly in regard to the application of problem-based learning, communities of practice, socio-culturalism, and authentic activities.

Constructivist Theory – Problem-Based Learning

A constructivist learning environment is a heuristic approach to learning that emphasizes higher order thinking skills. This instructional theory assumes that knowledge is constructed by the learner and values personal inquiry, divergent thinking, and multiple perspectives. Learning is self-directed and learners are provided opportunities to manipulate, interpret, experiment with, and revise knowledge (8). The learning process is mediated through authentic, meaningful problems that link concepts and content with individual experience (8, 9). These problems are complex and ill-defined (10) with no prescribed solution paths, multiple variables, no definitive constraints, and goals that are vague or unclear (9). A constructivist learning environment also offers no general principles for predicting outcomes and presents uncertainty about which concepts, rules, and principles to apply. Learners are also required to make judgments and defend their decisions (10).

The cold case review and analysis course at the UCO Forensic Science Institute utilizes a constructivist approach to develop learning experiences that are contextualized and active. Learning is self-regulated and mediated through authentic, complex, ill-structured problems. Students are tasked with reviewing actual cold case files and utilizing conceptual, structural, and experiential knowledge to generate investigative leads. The review of a cold case has multiple solutions paths and requires students to make judgments about which forensic concepts to apply, what information is relevant to the case, and what could be a potential investigative lead. Learners are required to use high level cognitive skills, decision-making, and to provide evidence to support claims. This approach values personal inquiry and divergent thinking.

Situated Cognition Theory – Communities of Practice, Socio-Culturalism, Authentic Activities

Situated cognition theory suggests that cognition is inherently tied to the social and cultural contexts in which it occurs (11). According to this theory, “interactive and collaborative instructional contexts provide individuals with opportunity for perspective taking and reflective thinking that may lead to higher levels of cognitive, social, and moral development” (12). Situated cognition theory supports the use of instructional strategies and

learning approaches that encourage students to think critically, collaborate with peers, and incorporate diverse perspectives in authentic activities (13).

Communities of practice are rooted in the situated cognition theory. Communities of practice involve groups of individuals organized around shared interests and collective learning (14). Emphasis is on experience, interaction, shared knowledge, and innovation (15, 16). Learning is accomplished through active participation in the social practices of the community (15). Communities of practice provide members with a sense of “joint enterprise and identity” that is manifested in cooperative efforts toward sharing and expanding knowledge, critical systems thinking, and problem solving. The approach recognizes that learning is not finite, but a continuous process of gaining new knowledge and defining relationships within each new context (14).

Situated cognition theory can be applied instructionally in the classroom through the use of authentic activities. Authentic activities contextualize the learning process using practical, ill-defined problems embedded in real-life contexts (17), collaborative group work, and the “use of language to communicate and internalize learning”. Learning occurs within a social environment and encourages students to “develop, share, and implement creative solutions to complex problems” (11).

Methods

A number of jurisdictions across the United States have enlisted the help of college students in reviewing cold case homicides, noting the advantages offered by a fresh set of eyes paired with enthusiasm for the work. We reached out to ten university cold case programs to inquire as to written protocol and procedure utilized by students in conducting case file review and analysis. The majority of respondents advised that they have no written protocol, relying instead on principles of journalism or direction from the partnering investigative agency for guidance (see **TABLE 1**). Dr. Bryan Byers, professor of Criminal Justice and Criminology at Ball State University, published an article describing the written protocol used by his students to review case files, conduct research, interview subjects, and create reports and public service announcements for partnering agencies (18).

TABLE 1 Protocol for university cold case programs

<i>Protocol for Case File Review</i>	<i>N</i>	<i>Course for College Credit</i>	<i>College Project</i>	<i>Student Club</i>
<i>Formal written protocol</i>	1	1		
<i>Apply principles of journalism</i>	2	2		
<i>Rely on investigative agency</i>	2	1		1
<i>No response to inquiry</i>	5	2	3	

Resources for the Development of Best Practices Guidelines

As demonstrated by the efforts to collect written protocol and procedures from other university cold case programs, these programs take a variety of forms, and there appears to be a lack of formal protocol and procedures for case file review. This research sought to understand the needs of law enforcement agencies investigating cold case crimes in order to develop best practices guidelines for a cold case program in a collegiate setting. It was determined that the creation of written protocol and procedures would require an amalgamation and synthesis of information from a variety of sources. We consulted experts in cold case investigations at regional, state, and local agencies, sought advisement from the faculty of the University of Central Oklahoma (UCO) Forensic Science Institute, and tested a variety of methods with students in a cold case review & analysis course over the span of a year.

Cold Case Review and Analysis Course

In 2018, the Forensic Science Institute entered into a partnership with the Tulsa County Sheriff’s Office Cold Case Task Force to work the agency’s 31 unsolved homicide investigations. The groundwork for the partnership was laid through careful consideration of the benefits, requirements, and restrictions for each party by a committee of faculty members acting as advisors. Through the partnership, the Cold Case Review & Analysis course began as a seminar for graduate students in the fall semester of 2018 and was opened up to include senior capstone students the following semester. The UCO Forensic Science Institute offers a multidisciplinary

program which requires students to pair a bachelor's degree in forensic science with a concurrent degree in another discipline which will best prepare them for employment in their chosen field. Areas of discipline for students enrolled in the Cold Case Review and Analysis course included forensic molecular biology, forensic chemistry, digital forensics, forensic psychology, criminal justice, and funeral service. The lead author was both a student and a teaching assistant in the class, using the time spent reviewing case files and working with other students to test and revise a systematic process for the review of case files as well as a standardized set of reports for conveying findings to the investigative agency.

Results

Through our experience with students in the cold case review and analysis course, it has become clear that a thorough review of case files can best be accomplished through a systematic approach. In reviewing a case file, the reviewer is essentially looking at bits of information and attempting to recreate a big picture of what occurred and who was involved. Similar to the tasks associated with processing a crime scene, a systematic process for case file review and analysis is needed to ensure thoroughness and minimize the potential for any meaningful bits of information being overlooked. It is also essential to properly document where each piece of information was found in the case file to allow the investigative agency to efficiently locate and verify the information in the event that it is later needed for legal matters. A variety of tools are needed to assist the reviewer in deriving meaning from the bits of information gleaned from the case file. Lastly, the information and its probative value should be succinctly and effectively reported to the investigative agency.

While each person may approach a case from a different perspective and have preferred means of organizing material, the spreadsheets and templates devised through this research provide the foundation for ensuring that a diligent and comprehensive review and analysis are achieved. With the objective of providing a time-saving service to the investigative agency, it is believed that a standardized set of reports are the best way to convey information about the case file and make recommendations for further analysis and investigation. **TABLE 2** represents an outline of the reports generated by the students for the investigative agency.

TABLE 2 Reports generated by students for the investigative agency

Report Templates		
	Solvability Factors	Report Narrative
Headings and Categories of Information	Type of crime	Questions and recommendations regarding the evidence
	Recent activity	Questions and recommendations regarding persons
	Case linkage	Other questions and recommendations
	Types of evidence	Information discovered not in the case file
	Status of evidence	
	Persons critical to the investigation	Viable investigative avenues

TABLE 3 represents an outline of the spreadsheets generated by the students during the case analysis and presented to the investigative agency along with the reports. Although the spreadsheets and report templates provide a standardized format for the organization of case data and presentation of analytic findings, students collaboratively apply critical thinking and their cumulative academic knowledge in their particular discipline to derive insights from case information and subsequently provide forensic and investigative leads to investigators. Each student's communication skills are honed and demonstrated in composing narrative analytic summaries and presenting their findings to the investigative agency.

TABLE 3 Spreadsheets generated by students for the investigative agency

Spreadsheets			
	Timeline	Evidence	Persons
Headings and Categories of Information	Date/Time	Item Description	Name
	Description	Item Origin	Description
	Location	Source Document	Source Document
	Source Document	Analyses conducted	Relationships
	Additional notes	Dates of all analyses	Contact info
		Recommendations for further analysis	Questions and New Information

A Summary of Best Practices and Guidelines: Administrative Considerations

In proposing a partnership with a law enforcement agency, issues of confidentiality and security will need to be addressed between school administrators and all stakeholders on the criminal justice side of the table, to include the sheriff or chief of police, the cold case task force leader, and the prosecutor. The cases on which the students will be working are criminal investigations, subject to all of the same legal requirements of active investigations. To avoid compromising the case, sensitive information related to the investigation must be kept out of the public domain, and the chain of custody for all items of evidence must be maintained.

At the same time, faculty should be attentive to the fact that students are not professional investigators or seasoned experts. Despite the time and effort invested in learning and evaluation, they do not yet have the training and experience necessary to fully prepare them to testify. To ensure that students are shielded from the possibility of being called to testify if, and when, the case is brought to trial, agreements between the university and the collaborating law enforcement agency should be explicit in communicating that students are to be considered case file reviewers, researchers, and analysts. They are not permitted to handle or examine items of physical evidence, interview witnesses, or engage in any other activities that would make their work-product discoverable.

It is emphatically recommended that a memorandum of understanding (MOU) be devised, explicitly laying out the requirements, responsibilities, and concerns of both

parties to the agreement. The MOU should define the parties, purpose, and mission of the collaboration and outline the organizational structure and the process by which its goals will be achieved. It should also address the means by which the requirements of confidentiality and protections will be imposed.

During the selection process, prospective students should be informed of the sensitive nature of the materials they will be reviewing and the absolute requirement that they maintain confidentiality of the case files. Each student in the course is required to sign a confidentiality agreement, pledging to adhere to its requirements and acknowledging that they understand the legal ramifications they would face for any failure to comply. Signed copies of each student’s confidentiality agreement should be kept by the university and provided to the collaborating law enforcement agency.

To ensure physical security, case files should be stored in a locked room to which there is limited access, and a log should be kept, indicating when case files are removed from, and returned to, storage and by whom. It is also necessary to take into consideration the need for confidentiality when selecting a classroom for the course. Students should be able to discuss aspects of the investigation and collaborate with classmates on reports without risk of being overheard by persons in adjoining areas. They should be able to utilize visual aids such as whiteboards and projectors without putting sensitive information on display to others in the building. Of even greater importance is a secure network of computers and printers on which students can conduct their work.

Course Structure

In addition to his/her duties as a mentor and student performance evaluator, the instructor for the course will act as a facilitator and liaison between the students and the law enforcement agency. The instructor should be able to guide and instruct the students and answer questions they may have about the ins and outs of homicide investigations. It would also be advantageous for the instructor to have a network of professional colleagues in the investigative and cold case fields, allowing for the procurement of guest speakers. An individual with a background in homicide investigations, as well as experience in the classroom, would be an ideal selection.

Selecting students from multiple forensic science disciplines would be advantageous in assembling a well-rounded group for the course each semester. No less important is that students selected for the course are those who have demonstrated a strong work ethic, a sense of responsibility, an adeptness for critical thinking, a firm understanding of the curriculum in prior coursework, and an enthusiastic interest in criminal investigations.

The desired outcome for this course is that students will provide informative reports to the investigating agency to assist them in furthering the investigation. At the same

time, students should benefit from the process by experiencing the opportunity to apply the knowledge and skills gained through previous coursework. For these reasons, students should be evaluated on their performance in several areas: participation and teamwork, proficiency in performing the tasks associated with case file review and analysis, effective report writing, and the presentation of findings to the investigating agency.

Case Management

Although the full potential for solvability of a case cannot be assessed until the case file review has been completed, an initial triage can be conducted through a review of the initial incident report, the crime scene report with sketches and diagrams, and the medical examiner’s report. Priority should be given to those cases in which physical evidence was recovered at the scene that has the potential to lead to the identification of the perpetrator and chain of custody was established through proper documentation of the scene. Weight should also be given to cases in which a suspect was identified in the incident report or witnesses were present who may be able to identify the suspect.

It should be understood that this initial triage is only for the selection and assignment of case files for the students to review. Solvability factors should be reassessed after the case file review is complete and provided to the investigative agency in a set of final reports. This will allow the investigative agency to triage the cases for further investigation.

Systematic Process for Review

Before the students take custody of the case file, it should be inspected by the law enforcement agency to ensure that no items of physical evidence are included. The documents should then be arranged in chronological order and separated into sections by document type (e.g. incident report, crime scene report, supplementary investigative report, property receipts, autopsy report, etc.). This is done to facilitate the locating of the document again when it is referenced in a cold case review report. An evaluation of completeness should be conducted to determine if anything appears to be missing from the case file. If the original case file was provided to students, a working copy should be made and the original expediently returned to the agency.

The primary objective in reviewing the case file is to identify evidence that can be analyzed using modern forensic techniques to aid investigators in furthering the investigation. In order to determine what analysis should be conducted on an item of evidence, the origin of the item must be known, and the context of its origin must be understood. This will allow the reviewer to evaluate what forensic probative value may be offered by the results of further analysis. In order to understand the potential

forensic value of the evidence, a comprehensive reading of the case file is required. In conducting the review, it is expedient to also gather data regarding persons, places, and events. The organization and comparison of these bits of information may reveal leads for investigators to follow and conflicts between two or more accounts that require investigative follow-up. Furthermore, an objective and robust understanding of the crime cannot be achieved without the integration and interpretation of such meaningful bits of information gleaned from the case file.

A systematic approach is recommended to facilitate and standardize the process of reading each case file document and recording significant data regarding evidence, forensic analysis, timeline events, and persons of significance to the investigation. Students in the Cold Case Review & Analysis course are provided with a set of spreadsheets designed to aid in the organization of this material. Data compiled through this process can then be used to compose reports for submission to the investigative agency. The flowchart depicted in **FIGURE 2** summarizes the process students are to use for case file review and analysis.

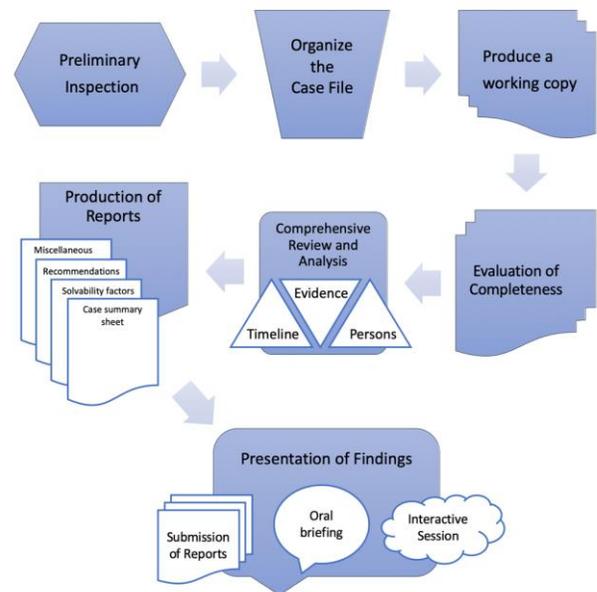


FIGURE 2 Cold case review & analysis flowchart

Standardized Reports for the Investigative Agency

Presenting the review team’s findings to the investigating agency should begin with documenting those findings in written reports. One purpose of the Cold Case Review & Analysis course is to reduce the demands of time and energy on investigators so that their efforts can be devoted to investigative activities. A series of standardized reports, allowing for slight variation to accommodate unique aspects of a case, is the best way to accomplish this

objective. This is partially predicated on the fact that law enforcement agencies routinely utilize standardized forms and reports to ensure clarity, thoroughness, and compliance with legal requirements. Once the investigators become familiar with the format of the reports authored by the review team, they will be able to effectively and efficiently grasp the content of the reports, quickly find desired information, and reference the reports to locate the specific case file source documents.

Students in the course are provided a series of written report templates, devised through consultation with the partnering agency, as well as through individual trial and error. Reports should include a reference citation for each item of significant information by citing the case file document in which the information is found. This may be done through in-text citation for narrative summaries or as a reference column in tables or spreadsheets.

Forensic and Investigative Advances

Due to the increased focus on cold cases brought about by “Solving Cold Cases with DNA”, investigators came to realize that, even in the absence of biological evidence, cold cases can often benefit from a second look. The intense focus of resources can reveal things that were previously overlooked. Simply taking another look with a fresh set of eyes can often shed new light on an investigation (5, 6, 19). Perhaps more importantly, advancements in DNA analysis have been accompanied by additional developments in other forensic areas as well as in the investigative arena (see **FIGURE 3**).

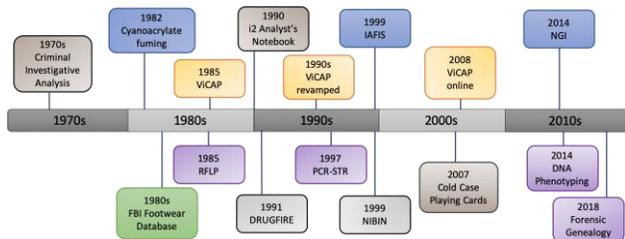


FIGURE 3 *Advances in forensic science and investigative technologies*

In addition to better methods for developing DNA profiles, CODIS has become more robust, increasing the likelihood of a cold hit, and scientists have developed additional applications for other types of DNA analysis, such as DNA phenotyping and forensic genealogy (20, 21, 22). Next Generation Identification (NGI) which replaces the Integrated Automated Fingerprint Identification System (IAFIS) became fully operational in 2014, with a more powerful fingerprint-matching algorithm and expanded search parameters (23, 24). Although solving cold cases using DNA gets more attention from the press, NGI has led to the resolution of many cold cases through the

resubmission of prints recovered decades ago (25, 26, 27). These and other developments have the potential to alleviate the cold case problem but only if someone takes the initiative to apply them.

Forensic science students receive education and training in modern forensic methods and technologies. Cold cases have been shown to benefit from advances in both forensic science and investigative techniques. Although seasoned investigators bring a wealth of experience to the table as members of cold case units, they are often less aware than are students of innovations that could develop new leads in dormant investigations. A chapter of the best practices and guidelines manual is dedicated to advancements in forensic and investigative technologies and methods and their applicability to cold case investigations.

Glossaries

Additional chapters included in the best practices and guidelines manual provide a series of glossaries for students in a cold case review and analysis course. In addition to a chapter on forensic and investigative advances, there is a chapter providing resources and tools for researching persons, places, and objects related to the investigation. Other chapters included are a glossary of disciplines of forensic science and an overview of evidence in criminal investigations.

Discussion and Conclusion

The cold case review and analysis course at the Forensic Science Institute applies situated cognition theory through its emphasis on experience, collaboration, interaction, and critical thinking. In the course, students from various forensic science specializations “engage in discussions from their diverse disciplinary and experiential perspectives and collaborate on investigations of their selected cases” (28). Students in the course build a community of practice by constructing a unified identity with social justice, critical praxis, and forensic science at its core. The course design encourages the application of shared knowledge and diverse perspectives to develop innovative approaches to complex cases and find solutions to ill-defined problems. Learning in the course is a continuous process that incorporates authentic activities – students analyze case information, apply knowledge, and identify new relationships in case materials. Course administrators support and guide the learning process through scaffolding. Scaffolding strategies include providing tools and resources, helping students navigate problems, and facilitating group discussions. The course involves social interaction and collaboration in authentic contexts.

While the in-person interactions with class participants is the typical learning environment, during the recent

COVID-19 quarantine we learned that the review of cold case files and the collaboration between law enforcement and students in this class adapted nicely to the virtual learning environment. Using a variety of synchronous and asynchronous tools and modifying methods of facilitation the course seamlessly progressed in the virtual learning environment. When the course was forced into the virtual environment, extra care was taken to protect sensitive documents and photographs. The success of conducting this class using alternative approaches online lends promise to the possibility of expanding the law enforcement jurisdictions that can participate in the cold case review process. The ability to file share, meet synchronously, and have collaborative team spaces to communicate and work offer an excellent way to facilitate this course.

The best practices and guidelines manual developed through this research effort is intended for use by institutions of higher learning with a focus on educating students for careers in the field of forensic science. Application of the provided guidelines will assist instructors in implementing an upper level course for students to engage in the review and analysis of case files pertaining to unsolved crimes designated as cold cases by the collaborating law enforcement agency. Such a course is ideally suited to graduate students and as an in-house practicum for seniors, as these students have completed the coursework necessary to prepare them for such an endeavor and should have greater levels of maturity and responsibility than students at an earlier level in their education.

The protocol developed by the authors to establish this cold case academic/law enforcement initiative may be provided upon request to anyone interested in developing such a course. Educators considering establishing a cold case program should keep in mind that its purposes should be twofold – providing a meaningful experiential learning opportunity for students of their institution while performing a needed service for law enforcement agencies within the community. Remember that our purpose, as forensic scientists, is to seek truth and serve justice.

Acknowledgements

The authors express gratitude to the Tulsa County Sheriff's Office, the Tulsa County District Attorney, the Oklahoma State Bureau of Investigation, Oklahoma County Cold Case Detective Mike Burke, the University of Central Oklahoma, and the UCO Forensic Science Institute for their support, participation, and contributions to this research.

References

1. Heurich C. Cold cases: Resources for agencies, resolution for families. *National Institute of Justice Journal* No. 260, 2008. Retrieved from <https://nij.gov/journals/260/pages/cold-case-resources.aspx>
2. Murder Accountability Project. Clearance rates: Uniform crime report for homicides: 1965-2017. Murder Accountability Project, 2019. Retrieved from <http://www.murderdata.org/p/blog-page.html>
3. National Institute of Justice. Cold case investigations and forensic DNA. National Institute of Justice, 2019. Retrieved June 1, 2019 from <https://www.nij.gov/topics/law-enforcement/investigations/cold-case/Pages/welcome.aspx>
4. Federal Bureau of Investigation. Crime in the United States, 2017. U.S. Department of Justice, 2018. Retrieved from <https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017>
5. Spraggs D. How to ... Open a cold case. *Police Magazine*, 2003. Retrieved from <http://www.policemag.com/channel/technology/articles/2003/05/how-to-open-a-cold-case.aspx>
6. Turner R, Kosa R. Cold case squads: Leaving no stone unturned. *Bureau of Justice Assistance Bulletin*, 2003. Rockville, MD: BJA Clearinghouse.
7. Reyes NC. Cold Case Investigation Units. *Texas Law Enforcement Management and Administrative Statistics Program Bulletin*, 2009;16(1):1-10.
8. Hannafin M, Land S, Oliver K. Open learning environments. In CM Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 1999:115-140.
9. Ge X, Chen CH, Davis KA. Scaffolding novice instructional designers' problem-solving processes using question prompts in a web-based learning environment. *J Educ Comput Res* 2005;33(2):219-248.
10. Jonassen DH. Instructional design models for well-structured and ill-structured problem-solving learning outcomes. *Educ Technol Res Dev* 1997;45(1):65-94.
11. Polly D, Allman B, Casto A, Norwood J. Sociocultural perspectives of learning. In R. E. West (Ed.), *Foundations of learning and instructional design technology*. Pressbooks, 2017. Retrieved from <https://lidtfoundations.pressbooks.com/chapter/sociocultural-learning/>

12. American Psychological Association Work Group. Learner-centered principles, 1997:6.
13. Brown JS, Collins A, Duguid P. Situated cognition and the culture of learning. *Educ Res* 1989;18(1):32-42.
14. Smith MK. Jean Lave, Etienne Wenger and communities of practice. *The encyclopedia of informal education*, 2009.
Retrieved from www.infed.org/biblio/communities_of_practice.htm
15. Chang J, Jacobs R. The relationships among participants' characteristics, perceptions, nature of involvement, and outcomes in strategic community of practice programs. *Hum Resour Dev Q* 2012; 23(3):341-362.
16. Wenger-Trayner E, Wenger-Trayner B. *Introduction to communities of practice*, 2015.
Retrieved from <http://wenger-trayner.com/introduction-to-communities-of-practice/>
17. Reeves TC, Herrington J, Oliver R. Authentic activities and online learning. *Res Devel High Educat* 2002;25:562-567.
18. Byers BD, Dubois S. Teaching about cold cases experientially: Creating meaningful learning experiences and products. *J Crim Just Educ* 2017; 28(3):368-392.
19. Davis RC, Jensen CJ, Kitchens KE. *Cold-case investigations: An analysis of current practices and factors associated with successful outcomes*. Santa Monica, CA: RAND Corporation, 2011.
20. National Institute of Justice. *Using DNA to solve cold cases: Special report*. NCJ 194197, July 2002.
Retrieved from <http://www.ncjrs.gov/pdffiles1/nij/194197.pdf>
21. Greytak EM, Moore C, Armentrout SL. Genetic genealogy for cold cases and active investigations. *Forensic Sci Int* 2019;299:103-113.
22. Kayser M. Forensic DNA phenotyping: Predicting human appearance from crime scene material for investigative purposes. *Forensic Sci Int:Genet* 2015; 18:33-48.
23. Criminal Justice Information Services. *NGI officially replaces IAFIS – Yields more search options and investigative leads, and increased identification accuracy*. Federal Bureau of Investigation, 2014.
Retrieved from <https://www.fbi.gov/services/cjis/cjis-link/ngi-officially-replaces-iafis-yields-more-search-options-and-investigative-leads-and-increased-identification-accuracy>
24. Criminal Justice Information Services. *Next Generation Identification*. Federal Bureau of Investigation.
Retrieved from <https://www.fbi.gov/services/cjis/fingerprints-and-other-biometrics/ngi>
25. Peterson Z. Fingerprint on beer can helps solve nearly three-decade-old cold case. *Times Free Press*, 2017 Mar 23.
Retrieved from <https://www.timesfreepress.com/news/local/story/2017/mar/23/mpleads-guilty-28-year-old-cold-case-killing/419116/>
26. Stokes J. Technical note: Next generation identification – A powerful tool in cold case investigations. *Forensic Sci Inter* 2019;299:74-79.
27. Winkley L. Single fingerprint helps crack decades-old cold case. *The San Diego Union-Tribune*, 2018 Jul 12.
Retrieved from <https://www.sandiegouniontribune.com/news/public-safety/sd-me-hayden-cold-case-20180712-story.html>
28. Johnson PC. *Cold Case Justice Initiative*. Syracuse University College of Law, 2020.
Retrieved from <http://law.syr.edu/academics/clinical-experiential/experiential-courses/cold-case-justice-initiative/>