

Virtual Training for Forensic DNA Professionals: Kinship and Parentage Analysis

Course Syllabus

Course Link: <https://academy.forensicstta.org/course/view.php?id=6> 

Course Overview

On behalf of the Bureau of Justice Assistance (BJA) and the Forensics Training and Technical Assistance (Forensics TTA) team, we would like to welcome you to the *Virtual Training for Forensic DNA Professionals on Kinship and Parentage Analysis*.

Developed by the Forensics TTA Program, led by RTI International, in collaboration with Bode Technology with funding provided by BJA, this self-paced, web-based training was developed to address a critical gap in kinship analysis training resources available to forensic DNA analysts. Kinship analysis—historically applied in paternity and family relationship testing—holds significant potential for resolving complex forensic cases, including missing persons, unidentified human remains, sexual assaults, and other violent crimes. Despite its value, many laboratories lack trained analysts or accessible instruction in this area.

The curriculum, designed for DNA analysts with 3–5 years of experience, features seven interactive modules covering foundational concepts, theoretical frameworks, and statistical applications of kinship analysis. Through real-world scenarios, guided calculations, and knowledge checks, learners will gain practical skills in applying kinship analysis to forensic casework. The course also highlights accreditation considerations, continuing education opportunities, and guidance for integrating kinship analysis into laboratory training programs.

By completing this training, learners will be equipped with advanced tools to support their laboratories and investigative partners in addressing some of the most challenging cases facing the criminal justice system today.



This online training has been approved by the American Board of Criminalistics (ABC) for recertification credits through RTI International.

This project was supported by Award No. 15PBJA-22-GK-01556-JAGT awarded by the Bureau of Justice Assistance. The Bureau of Justice Assistance is a component of the U.S. Department of Justice's Office of Justice Programs, which also includes the Bureau of Justice Statistics, the National Institute of Justice, the Office of Juvenile Justice and Delinquency Prevention, the Office for Victims of Crime, and the SMART Office. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

Course Contents

This training is organized into a series of interactive modules that you can explore at your own pace. Each module builds on the previous one, providing both foundational concepts and applied casework examples.

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Module 1 – Principles and Applications

- **Module Overview:** Module 1 introduces the foundations of kinship and parentage analysis, setting the stage for more advanced topics in later modules. Learners will gain an understanding of the history, concepts, and scientific principles that have shaped kinship testing, while examining its essential role in both forensic and non-forensic contexts.
- **Module Content Description:** Module 1 covers the evolution of kinship analysis from early paternity testing to its modern applications in forensic casework. Through discussion of landmark cases and legal precedents, learners will see how kinship testing applications have evolved and why it lends itself as a vital tool in complex investigations. Fundamental scientific concepts—including the laws of inheritance, the Hardy-Weinberg principle, genetic linkage, and recombination—are introduced and their relevance and importance to kinship testing is explained. Additionally, learners will explore mutations, the molecular biology of forensic markers, and their implications for genetic studies and forensic investigations. These topics are essential for interpreting complex kinship scenarios and working with degraded or complex DNA samples.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Explain the concept of kinship and parentage analysis and its significance in both forensic and non-forensic contexts.
 - Summarize the history of kinship analysis and the evolution of DNA analysis.
 - Discuss landmark cases and legal precedents that have shaped the field of kinship and parentage analysis.
 - Understand several new concepts, including the laws of inheritance, Hardy-Weinberg, genetic linkage, recombination, and their relevance to kinship analysis.
 - Recognize common mutations, the molecular biology of forensic markers, and their implications for genetic studies and forensic investigations.

- **Module Materials:** Module 1 includes a combination of a two-part video instruction, presentation slides, a workbook to reinforce key concepts, and a recommended reading list synthesizing references utilized in the lecture content. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the foundational principles introduced in this module.

Module 2 – Statistical and Population Database Overview

- **Module Overview:** Module 2 provides a foundation in the statistical principles and population databases that support kinship and parentage analysis. Learners will gain an understanding of how to apply the laws of probability and statistical tools to evaluate genetic evidence and strengthen the interpretation of forensic DNA results.
- **Module Content Description:** Module 2 introduces the laws of probability, the product rule, and the sum rule, demonstrating their relevance in kinship analysis. Learners will practice calculating statistical measures such as Likelihood Ratios (LRs) and Parentage/Paternity Indices (PI) to quantify the strength of genetic evidence and explore the use of conditional probabilities and Bayes' Theorem to assess the probability of parentage. This module also introduces learners to the structure, purpose, and application of various forensic databases, including autosomal Short Tandem Repeats (aSTRs), Y-Chromosome STRs (Y-STRs), and mitochondrial DNA (mtDNA), while emphasizing the importance of database validation in enhancing the accuracy of relationship inferences in forensic investigations.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Understand the laws of probability, the product rule, and the sum rule in the context of kinship analysis.
 - Understand and apply statistical concepts including Likelihood Ratio (LR), Parentage Index/Paternity Index (PI), conditional probabilities, and Bayes' Theorem to calculate and interpret the probability of parentage using genetic data.
 - Explain the effects of prior probability and LR on probability of parentage.
 - Recognize the structure, purpose, and application of autosomal Short Tandem Repeat (aSTR), Y-Chromosome STR (Y-STR), and mitochondrial DNA (mtDNA) databases.
- **Module Materials:** Module 2 includes a combination of a one-part video instruction, presentation slides, and a recommended reading list synthesizing references utilized in the lecture content. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the foundational principles introduced in this module.

Module 3.1 – Applied Parentage Statistics and Casework: Standard Trio Analysis

- **Module Overview:** Module 3.1 focuses on the application of statistical principles to standard trio parentage cases, where the child, mother, and alleged father are all available for testing. Learners will strengthen their ability to interpret genetic evidence in these commonly encountered cases and develop skills for communicating results in both reports and courtroom testimony.
- **Module Content Description:** Module 3.1 introduces the terminology and concepts specific to standard trio parentage analysis. Learners will review a range of example cases and practice calculating the statistics needed to assess parentage. This module also examines how standard trio analysis is applied in forensic contexts, preparing learners to write clear and defensible conclusion statements. In addition, guidance is provided to help anticipate questions that may arise during courtroom testimony, reinforcing both the technical and practical aspects of casework.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Understand terms and phrases associated with standard trio parentage cases.
 - Review a variety of standard trio parentage cases.
 - Understand and calculate statistics for parentage analysis and standard trio parentage cases.
 - Understand forensic applications to standard trio parentage cases.
 - Write conclusion statements and anticipate courtroom testimony questions.
- **Module Materials:** Module 3.1 includes a combination of a two-part video instruction, presentation slides, a recommended reading list synthesizing references utilized in the lecture content, and a practice worksheet presenting additional standard trio analysis calculation exercises. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the content presented in this module.

Module 3.2 – Applied Parentage Statistics and Casework: Sole Parentage Analysis

- **Module Overview:** Module 3.2 explores the application of statistical principles in sole parentage cases, where only one alleged parent and the child are available for testing. Learners will build skills in interpreting these more challenging cases and in effectively communicating results for forensic purposes.

- **Module Content Description:** Module 3.2 introduces the terminology and core concepts specific to sole parentage analysis. Learners will practice calculating the statistics required to assess biological relationships in cases where one parent is not available for testing and will explore the unique forensic applications of this type of analysis. Learners will also receive guidance on writing clear, scientifically defensible conclusion statements and preparing for courtroom testimony.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Understand terms and phrases associated with sole parentage cases.
 - Understand and calculate statistics for sole parentage analysis and sole parentage cases.
 - Understand forensic applications to sole parentage cases.
 - Write conclusion statements and anticipate courtroom testimony questions.
- **Module Materials:** Module 3.2 includes a combination of a two-part video instruction, presentation slides, a recommended reading list synthesizing references utilized in the lecture content, and a practice worksheet presenting additional sole parentage analysis calculation exercises. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the content presented in this module.

Module 3.3 – Applied Parentage Statistics and Casework: Reverse Parentage Analysis

- **Module Overview:** Module 3.3 focuses on reverse parentage cases, where the alleged child is unavailable for testing and the analysis is conducted using parental or close relative DNA profiles. Learners will explore how to approach these complex scenarios, apply appropriate statistical methods, and communicate findings effectively in both reports and courtroom testimony.
- **Module Content Description:** Module 3.3 introduces the terminology and concepts unique to reverse parentage analysis. Learners will practice calculating statistics to evaluate whether a DNA profile attributed to a potential child supports a biological parent–child relationship with a specified set of parents and explore the forensic applications of these analyses. This module also provides practical guidance for drafting clear and scientifically sound conclusion statements, along with strategies to anticipate and respond to courtroom testimony questions.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Understand terms and phrases associated with reverse parentage cases.
 - Understand and calculate statistics for reverse parentage analysis and reverse parentage cases.
 - Understand forensic applications to reverse parentage cases.
 - Write conclusion statements and anticipate courtroom testimony questions.

- **Module Materials:** Module 3.3 includes a combination of a one-part video instruction, presentation slides, a recommended reading list synthesizing references utilized in the lecture content, and a practice worksheet presenting additional reverse parentage analysis calculation exercises. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the content presented in this module.

Module 3.4 – Applied Parentage Statistics and Casework: Pairwise Kinship Analysis – Siblings

- **Module Overview:** Module 3.4 focuses on pairwise sibling cases, where DNA analysis is used to determine whether two individuals are related as biological siblings. Learners will explore the terminology, concepts, and statistical methods used in sibship analysis, while developing the skills to interpret results and present findings in forensic contexts.
- **Module Content Description:** Module 3.4 introduces the terms and phrases associated with sibling casework and provides examples across a variety of case types. Learners will practice calculating and analyzing the statistical measures that support sibship determinations and examine how these calculations are applied in forensic investigations. This module also covers courtroom testimony considerations, preparing Learners to write clear conclusion statements and respond effectively to questions related to sibling analysis.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Understand terms and phrases associated with pairwise sibling cases.
 - Understand and calculate statistics for sibship analysis and sibling cases.
 - Understand forensic applications to sibling cases.
 - Write conclusion statements and anticipate courtroom testimony questions.
- **Module Materials:** Module 3.4 includes a combination of a one-part video instruction, presentation slides, a recommended reading list synthesizing references utilized in the lecture content, and a practice worksheet presenting additional sibling analysis calculation exercises. A built-in knowledge check allows learners to test their understanding of the material before moving forward, helping ensure mastery of the content presented in this module.

Module 4 – Implementation and Additional Resources

- **Module Overview:** Module 4 provides learners with practical resources to support the integration of kinship analysis into laboratory operations and workflows. This module aims to assist learners in applying the knowledge gained throughout this training curriculum toward developing policies and procedures for offering kinship analysis as a forensic service within their laboratory.

- **Module Content Description:** Module 4 equips learners with practical tools and guidance to implement kinship analysis within forensic laboratory operations. Building on the concepts covered in earlier modules, this module focuses on translating knowledge into action by outlining considerations for integrating kinship workflows, developing operational processes, and preparing laboratory-specific policies and procedures. By the end of this module, learners will be prepared to support efforts pertaining to the incorporation of kinship analysis as a forensic service offering within their laboratory environment.
- **Module Learning Objectives:**
 - After completing this module, learners should be able to:
 - Describe the various key considerations pertaining to the integration and implementation of kinship analysis into forensic laboratory casework operations.
 - Be familiar with publicly available forensic laboratory standard operating procedures and manuals pertaining to kinship analysis.
 - Access key literature related to the historical, statistical, genetic, and analytical foundation for kinship analysis.
- **Module Materials:** Module 4 includes a combination of a workbook and accompanying checklist, a compiled recommended reading list synthesizing references utilized throughout the training module, and a list of publicly available forensic laboratory standard operating procedures and manuals that illustrate how kinship analysis has been integrated into existing laboratory workflows.

Course Lecture Instructor

Robert (Bob) Bever, PhD
Senior Scientist, Bode Technology

Robert (Bob) Bever, PhD, Senior Scientist at Bode Technology, has over 35 years of research and operational casework experience, serving as Laboratory Director as well as program director for federally funded research grants and contracts. He also has 30+ years of experience analyzing kinship casework to establish parentage, sibship, and avuncular relationships. He has reviewed over 40,000 parentage cases and testified in over 150 trials. His research has focused on method development for highly degraded samples, collection and extraction of DNA from touched objects, and analysis of non-human DNA. His current research focuses on evaluation of genomic techniques to generate accurate genotype files in support of forensic investigative genetic genealogy applications. Dr. Bever has a PhD in Microbiology from the University of Maryland and performed postdoctoral research on infectious diseases at the Oregon Health Science University and the University of Rochester School of Medicine.



Course Contact

Email the Forensics TTA team at ForensicsTTA@rti.org for assistance.

Course Completion Requirements

This course is asynchronous; therefore, all activities are set to automatic grading when requirements are met. Those requirements include:

- Learners must watch 90% of the Video Presentations to be marked complete and proceed to the next module.
- Learners must receive 80% or higher on Knowledge Checks to be marked complete and proceed to the next module.
 - There are no maximum attempt restrictions.
 - A randomized question bank is used when possible.

Please note that Module 4 (Implementation and Additional Resources) and additional module materials provided throughout Modules 1–3.4, such as workbooks and practice worksheets, do not count toward course completion.

- Module 1 – Principles and Applications
 - Video Presentations Part 1 and Part 2 = 96 minutes
 - Knowledge Check = 10 questions
- Module 2 – Statistical and Population Database Overview
 - Video Presentation = 78 minutes
 - Knowledge Check = 10 questions
- Module 3.1 – Applied Parentage Statistics and Casework: Standard Trio Analysis
 - Video Presentations Part 1 and Part 2 = 118 minutes
 - Knowledge Check = 22 questions
- Module 3.2 – Applied Parentage Statistics and Casework: Sole Parentage Analysis
 - Video Presentations Part 1 and Part 2 = 82 minutes
 - Knowledge Check = 10 questions
- Module 3.3 – Applied Parentage Statistics and Casework: Reverse Parentage Analysis
 - Video Presentation = 64 minutes
 - Knowledge Check = 10 questions
- Module 3.4 – Applied Parentage Statistics and Casework: Pairwise Kinship Analysis – Siblings
 - Video Presentation = 69 minutes
 - Knowledge Check = 10 questions

Once learners complete all required Video Presentations and Knowledge Checks, they will receive a Certificate of Completion. Total duration of hours for course completion is 9 hours, which is noted on the course's Certificate of Completion.