TRUMBULL PUBLIC SCHOOLS

Trumbull, Connecticut

Forensic Science
Grade 11/12

Science Department 2023

A Newly Approved Course

Curriculum Revision Writing Team

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Grade 11-12 Forensic Science
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The Trumbull Board of Education promotes non-discrimination in all of its programs, including educational opportunities and services provided to students, student assignment to schools and classes, and educational offerings and materials.

CORE VALUES AND BELIEFS

The Trumbull School Community engages in an environment conducive to learning which believes that all students will **read** and **write effectively**, therefore communicating in an articulate and coherent manner. All students will participate in activities **that present problem- solving through critical thinking**. Students will use technology as a tool applying it to decision making. We believe that by fostering self-confidence, self-directed and student-centered activities, we will promote **independent thinkers and learners**. We believe **ethical conduct** to be paramount in sustaining the welcoming school climate that we presently enjoy.

Approved 8/26/2011

INTRODUCTION & PHILOSOPHY

Grade 11-12 Forensic Science is consistent in the continued development of scientifically literate students, with a concentration on applying principles of biology, chemistry, and physics to the events surrounding crimes. Authentic scientific and engineering experiences build on one another and increase in complexity throughout students' K-12 education. In 2015, the Connecticut State Board of Education adopted the Next-Generation Science Standards (NGSS), which embody the National Research Council's *Framework for K-12 Science Education* (2012). Both the *Framework* and the NGSS stress the importance of teaching classroom scientific inquiry as practiced by scientists and engineers. The *Framework* provides a vision for American science education in the 21st century, while the NGSS provides grade-level student performance expectations, disciplinary core ideas, and crosscutting concepts.

The *Framework* and NGSS provide clarity to classroom scientific inquiry by stressing the importance of the eight practices of science and engineering. The practices were designed to help students understand how scientific knowledge develops, and to stimulate students' interest in and continued study of science. Three-dimensional learning facilitates student engagement with Science and Engineering Practices and Crosscutting Concepts to deepen their understanding of Disciplinary Core Ideas in order to explain phenomena and solve problems. Three-dimensional learning promotes development of student skills in the following areas:

- Knowing, using, and interpreting scientific explanations of the natural world (Disciplinary Core Ideas, and Crosscutting Concepts)
- Generating and evaluating scientific evidence and explanations (Science and Engineering Practices)
- Participating productively in scientific practices and discourse (Science and Engineering Practices)
- Understanding the nature and development of scientific knowledge (Science and Engineering Practices, and Crosscutting Concepts)

The shift of science education reflects the interconnected nature of science as it is practiced in the real world and builds coherently across grades K-12. The NGSS focus on deeper

understanding of content as well as application of content with an alignment to the Connecticut Core Standards. A deeper understanding and application of science and engineering practices prepare students for postsecondary success and citizenship in a world fueled by innovations in science and technology.

In Grade 11-12 Forensic Science, students will engage in an authentic application of scientific principles and practices as a means of solving crimes. Students will explore how physical evidence is handled and analyzed with current forensic technology, and how that evidence can tell the "story" of a crime. This hands-on course centers on two aspects of investigation: evidentiary and intellectual.

- Evidentiary - students will collect, analyze, and interpret evidence with the aim of problem solving
- Intellectual - scientifically literate students will conduct independent research about topics related to forensic science

Building on past experiences, this course synthesizes students' knowledge of the human body, properties of matter, energy, motion, and other topics from previous years of scientific education into a highly relevant problem-solving endeavor, demonstrating how real-world science is a transdisciplinary practice. To further their connection to the authentic practice of forensic science, students will explore careers in different branches of forensics along with the crime labs where this work is done.

Grade 11-12 Forensic Science is a non-leveled, half-year science elective, accessible to all general education students. The rigor and depth of this course are intended to give all students a rich experience, while preparing them for further study of forensics at the college level. This course does not replace core science classes like Chemistry and Physics; rather, it capitalizes on student interest in a real-world application of science.

COURSE GOALS

The course goals derive from the 2013 Next-Generation Science Standards, the 2010 Connecticut Core Standards, and the ISTE (International Society for Technology in Education) Technology Standards. Goals are listed specific to each unit in this curriculum guide, and developed through unit lessons using the 5-E learning model (engage, explore, explain, elaborate, evaluate) in order to encourage student engagement and foster metacognitive learning strategies through a reflective process. An important role of science education is not to teach "all the facts," but rather to prepare students with sufficient core knowledge so that they can later acquire additional information on their own.

COURSE ENDURING UNDERSTANDINGS

Students will understand that . . .

- The practice of forensic science is conducted by professionals in society who use ever-evolving technology to analyze and interpret physical evidence. These professionals specialize in different aspects of forensics, and the technology is constantly evolving.

- Crime lab units are organized by area of expertise i.e. physical science, biological, firearms. They would be responsible for analyzing evidence that falls into their respective category. An employee of these units would be required to have advanced degrees in related topics such as chemistry or biology with specialized training in forensics.

- Professional investigators observe proper procedures for securing, searching, and recording a crime scene. The processes for collecting, handling, documenting, and transporting physical evidence from a crime scene is necessary to maintain chain of custody, insure evidentiary integrity and for the safety of investigators.

- Physical evidence is crucial in linking victims and suspects to a crime scene. Physical evidence can link specific persons or objects to a crime scene, or may contain class characteristics linking a type of object to a crime scene. Physical evidence collected from crime scenes (i.e. fingerprints and DNA) are shared on national databases. This dramatically enhances the role of forensic science in criminal investigation.

- Fingerprints are unique to individuals and can be used as evidence in arguing which individuals were present at a crime scene. Latent fingerprints can be obtained from a crime scene using specific techniques. Additional biometrics such as facial recognition software are used in forensic investigations.

- Serology involves a broad scope of laboratory tests that use specific antigen and serum antibody reactions. Blood type is an inherited trait that is a permanent feature of a person's biological makeup. Blood may link criminals to crime. Individual blood stains can convey the directionality and impact of the blood when it struck a surface. Crime scene reconstruction helps to sort out the events surrounding the occurrence of a crime.

- Human hair is a form of class evidence if no follicle is present. The follicle of a human hair contains DNA. The main function of hair is to help regulate body temperature. Fibers are classified as natural or synthetic. Textiles refer to the weaving patterns of fibers.

- Handwriting becomes personalized almost as soon as students begin learning it. Questioned documents and other collected documents can be analyzed for handwriting comparisons to determine if the author of each is the same. Inks (printer, pen, and photocopier) can be compared to determine if they share a common source. Questioned documents may be analyzed for alterations, obliterations, erasures, or variations in pen inks.

- There are several definitions of death, including the cessation of the heartbeat and brain function. An autopsy is performed if a death is suspicious or unexplained. A forensic entomologist studies the development of insect larvae in a body to estimate the time of death.

COURSE ESSENTIAL QUESTIONS

- What is the role of forensic science in modern society?
- How has the field of forensic science evolved over the past hundred years?
- How have scientific advancements contributed to the evolution of forensic science?
- What are the legal and ethical obligations of a forensic investigator?
- How can physical evidence be used to reconstruct a crime scene?
- What are the proper techniques in order to properly process evidence?
- What information can be gained from the proper processing of evidence at a crime scene?
- Why is it important to collect evidence in a procedural manner?
- What is the difference between the identification and comparison of physical evidence?
- Why is it important that physical evidence collected from a crime scene is shared on national databases?
- How can the various methods for processing,classifying, and identifying fingerprints aid in a criminal investigation?
- How can fingerprints identify a criminal with absolute certainty?
- How are other biometrics used in forensic investigations?
- How is blood analyzed by forensic investigators?
- How can information be inferred based on blood spatter patterns?
- How can crime scene reconstruction assist forensic scientists in solving crimes?
- How is hair used in a criminal investigation?
- How can fibers be used as circumstantial evidence to provide links to the victim, suspect, and the crime scene?
- Why is fiber evidence not always conclusive with suspect identification?
- How can handwriting be used as individual evidence?
- How can the forensic scientist detect forgeries or counterfeits?
- What are the important guidelines necessary to collection of handwriting exemplars?
- What is a “questioned document” and what is the value of a questioned document in forensic investigation?
- How is death defined?
- How can an autopsy help to solve a crime?
- Why is time of death important?
- How can environmental factors influence the time estimate?

COURSE KNOWLEDGE & SKILLS

Students will understand . . .

- Patterns. Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.
- Cause and effect. Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
- Scale, proportion, and quantity. The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.
- Systems and system models. Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.
- Energy and matter. Energy can be transferred between objects in various ways, and the properties of matter determine how different amounts of energy will impact a substance.
- Structure and function. Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.
- Stability and change. Much of science deals with constructing explanations of how things change and how they remain stable.
- Science is a human endeavor. Technological advances have influenced the progress of science and science has influenced advances in technology. Science and engineering are influenced by society and society is influenced by science and engineering.

Students will be able to . . .

- ask questions (for science) and define problems (for engineering).
- develop and use models.
- plan and carry out investigations.
- analyze and interpret data.
- use mathematics and computational thinking.
- construct explanations (for science) and design solutions (for engineering).
- engage in arguments from evidence
- obtain, evaluate, and communicate information

COURSE SYLLABUS

Course Name

Grade 11-12 Forensic Science

Level

Non-leveled

Prerequisites

Successful completion of Grade 10 Biology

Materials Required

None

General Description of the Course

This course is aligned to the Next Generation Science Standards (NGSS) Disciplinary Core Ideas for High School Students (9-12). Through the implementation of the Three Dimensions of NGSS (Disciplinary Core Ideas, Science and Engineering Practices, and Cross Cutting Concepts), students will explore the scientific principles and practices of forensic science. By emphasizing the investigative nature of forensics, scientifically literate students can apply principles of biology, chemistry, and physics to make predictions, analyze evidence, and contribute to the forensic science community.

Assured Assessments

Formative Assessments. *Formative assessments can include, but are not limited to:*

- Career connection activity
- Hands-on evidence comparison
- Microscope work
- Crime scene sketching
- Construction of models
- Lab activities
- Evidence collection and analysis

Summative Assessments:

- End-of-unit projects
- Investigation skills practical assessment
- End-of-unit assessment with multiple-choice questions, free-response questions, and/or interpreting and analyzing data
- Final assessment examination

Core Texts and Resources

- Saferstein, Richard. Forensic Science: An Introduction. Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]
- Google App suite
- Online research databases: Science Online, UConn Databases
- State of Connecticut. *Department of Emergency Services and Public Protection*. https://portal.ct.gov/DESPP/Division-of-Scientific-Services. Accessed July 28, 2023. Web.

UNIT 1

Forensics Overview

Unit Goals
At the completion of this unit, students will be able to:

Primary Standards

NGSS.HS-ETS1-1	**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**
NGSS.HS-LS1-2	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**

Additional Standards

CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.

ISTE Empowered Learner (Standard 1.1c)	Use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
ISTE Empowered Learner (Standard 1.1d)	Understand the fundamental concepts of technology operations, demonstrate the ability to choose, use, and troubleshoot current technologies, and be able to transfer their knowledge to explore emerging technologies.
ISTE Creative Communicator (Standard 1.6a)	Choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
ISTE Creative Communicator (Standard 1.6d)	Students publish or present content that customizes the message and medium for their intended audiences.

Unit Essential Questions

- How does a forensic scientist conduct investigations safely?
- What does a forensic scientist do?
- What type of jobs incorporate forensic science?
- Where do forensic scientists work?
- What is the role of forensic science in modern society?
- How has the field of forensic science evolved over the past hundred years?
- How have scientific advancements contributed to the evolution of forensic science?

Scope and Sequence

1. Lab safety
2. Major disciplines of forensic science
3. Historical contributions to forensic science
4. Scientific advancements in forensics over the past 50 years
5. Admissibility of scientific evidence in the courtroom
6. Roles and responsibilities of the expert witness
7. Careers in forensic science

Assured Assessments

Formative Assessment:

- Lab Safety
- Timeline of forensic science
- Functions of the CT crime lab
- Ethical standards for forensic scientists
- Independent research of jobs in forensics

Summative Assessments:

- Students will participate in an assessment consisting of multiple-choice questions related to

safety in the science lab. Students must score a 100% on the assessment before performing a lab experiment in the classroom.
- Students will complete an independent research project about careers in forensic science.
- Students will demonstrate understanding of the purpose, history, and ethics of forensic science in a summative assessment, which includes multiple-choice and free-response questions.

Vocabulary:

American Academy of Forensic Sciences
Chain of Custody
Crime Scene Investigator
Criminalistics
Ethics
Expert Witness
Firearm Examiner
Forensic Computer Science
Forensic Engineering
Forensic Entomologist
Forensic Odontology
Forensic Pathology
Forensic Photographer
Forensic Science
Forensic Serologist/Forensic Biologist
Forensic Toxicologist
Impartiality
Latent Print Examiner
Physical evidence
Preservation
Questioned Document Examiner
Rules of Evidence
Testimony
Trace Evidence Examiner

Resources

Core

- *Flinn Scientific Safety Contract*. Print.
- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- *Online research sites:* Science Online, UConn Databases
- State of Connecticut. *Department of Emergency Services and Public Protection*. https://portal.ct.gov/DESPP/Division-of-Scientific-Services. Accessed July 28, 2023. Web.
- Online interactive review and reinforcement questions.
- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 15 periods

UNIT 2

Crime Scene

Unit Goals

At the completion of this unit, students will:

Primary Standards

NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
NGSS-HS-ETS1-3	**Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.**
NGSS.HS-ETS1-4	**Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.**

Additional Standards

CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.

ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How do experts secure, record, and search a crime scene?
- What are proper techniques for packaging physical evidence?
- How can physical evidence be used to reconstruct a crime scene?
- How do investigators maintain the chain of custody?
- What steps must be taken to maintain health and security at a crime scene?

Scope and Sequence

1. Securing and processing a crime scene
2. Packaging evidence
3. Crime scene sketches
4. Crime scene photography
5. Searching a crime scene
6. Crime scene safety
7. Recreating/reconstructing a crime scene
8. Chain of custody

Assured Assessments

Formative Assessment:

- Making a crime scene sketch
- Making measurements & handling measurement units
- Crime scene photography
- Evidence gathering

Summative Assessment:

- Students will be evaluated in their ability to process, search, and record a mock crime scene

- Students will take an assessment consisting of multiple-choice questions, free- response questions, and interpreting and analyzing data, related to crime scene.

Vocabulary:

Buccal swab
Chain-of-Custody
Command Center
Conditional evidence
Crime scene
Detective
Finished/Rough Sketch
First responding officer
Lead investigator
Locard's Exchange Principle
Medical Examiner
Paper bindle
Primary crime scene
Secondary crime scene
Specialist
Substrate control
Trace evidence

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Online interactive review and reinforcement questions
- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 12 periods

UNIT 3

Physical Evidence

Unit Goals
At the completion of this unit, students will:

Primary Standards	
NGSS.HS-PS4-1	**Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.**
NGSS.HS-ETS1-1	**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
NGSS-HS-ETS1-3	**Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.**
Additional Standards	
CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- Why is it important to collect evidence in a procedural manner?
- What is the difference between the identification and comparison of physical evidence?
- Why is it important that physical evidence collected from a crime scene is shared on national databases?

Scope and Sequence

1. Locard's Exchange Principle
2. Linking physical evidence from a crime scene to victims and suspects.
3. Collection and documentation of physical evidence
4. Evaluation of class characteristics of physical evidence

5. Comparison vs. identification of physical evidence
6. Avoiding tampering or contamination
7. National evidence databases

Assured Assessments

Formative Assessment:

- Locard's Exchange Principle lab activity. Students will compare trace evidence to potential sources.
- Activity on class vs individual characteristics
- Exploring evidence databases

Summative Assessment:

- Forensic databases research poster/presentation
- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to physical evidence.

Vocabulary:

Class characteristics	Genealogy databases	Product rule
Comparison	Identification	Rapid DNA
Forensic databases	Individual characteristics	

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Online interactive review and reinforcement questions
- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 8 periods

UNIT 4

Biometrics: Fingerprints and Facial Recognition

Unit Goals
At the completion of this unit, students will:

Primary Standards

NGSS.HS-LS1-2	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
NGSS.HS-LS2-7	**Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.**
NGSS.HS-ETS1-1	**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
NGSS-HS-ETS1-3	**Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.**

Additional Standards

CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How can the various methods for processing, classifying, and identifying fingerprints aid in a criminal investigation?
- How can fingerprints identify a criminal with absolute certainty?
- What are other biometrics used in identification, and what are their limitations?

Scope and Sequence

1. Types of biometrics
2. Fundamental principles of fingerprints

3. Classification system of fingerprints
4. Automated fingerprint identification systems (AFIS)
5. Techniques for developing latent fingerprints
6. Preserving latent fingerprints
7. Facial recognition and other biometrics

Assured Assessments

Formative Assessment:

- Hands-on fingerprinting lab, including development of latent fingerprints for analysis and comparison.
- Check-in on the basics of fingerprinting.
- Ongoing written and online assessments to monitor progress

Summative Assessment:

- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to electrons and the periodic table organization.
- Students will engage in an independent research project about the use of biometrics in forensic science.

Vocabulary:

anthropometry
arch
biometrics
digital imaging
facial recognition technology
fluoresce
iodine fuming
latent fingerprint
livescan
loop
ninhydrin
Physical Developer
pixel
plastic print
portrait parle
ridge characteristics
sublimation
superglue fuming
visible print
whorl

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 12 class periods

UNIT 5

Serology

Unit Goals
At the completion of this unit, students will:

Primary Standards

NGSS.HS-LS1-2	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
NGSS.HS-LS3-2	**Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.**
NGSS.HS-PS1-2	**Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.**
NGSS.HS-ETS1-1	**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**

Additional Standards

CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How is blood analyzed by forensic investigators?
- How can information be inferred based on blood spatter patterns?
- How can crime scene reconstruction assist forensic scientists in solving crimes?

Scope and Sequence

1. Bodily fluids - types and origins
2. Antigen and serum antibody reactions
3. Blood typing
4. Using blood to link a criminal to a crime
5. DNA profiling
6. Blood spatter

Assured Assessments

Formative Assessment:

- Blood analysis for properties, comparison categories, reactions
- DNA comparison activity
- Blood spatter activity
- Ongoing written and online assessments to monitor progress [TBD]

Summative Assessment:

- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to blood and DNA.

Vocabulary:

Acid phosphatase
Agglutination
Alleles
Antibodies
Antigens
Aspermia
Buccal cells
Chromosome
CODIS
Complementary base pairing
Convergence
DNA
Erythrocytes
Gel electrophoresis
Gene
Genome
Hemoglobin
Hybridization
Immunoassay
Locus
Low copy number
Luminal
Mitochondrial DNA
Nucleotide
Oligospermia
Pictogram
Plasma
Polymerase Chain Reaction

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]
- Blood spatter analysis lab

Supplemental

- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 15 class periods

UNIT 6

Hair & Fibers

Unit Goals
At the completion of this unit, students will:

Primary Standards

NGSS.HS-LS1-2	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
NGSS.HS-PS1-2	**Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**

Additional Standards

CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How is hair used in a criminal investigation?
- How can fibers be used as circumstantial evidence to provide links to the victim, suspect, and the crime scene?
- Why is fiber evidence not always conclusive with suspect identification?

Scope and Sequence

1. Anatomy/physiology of hair
2. Follicle DNA.
3. Fiber construction
4. Microscopic analysis

Assured Assessments

Formative Assessment:

- Fiber comparison lab
- Hair analysis lab
- Ongoing written and online assessments to monitor progress [TBD]

Summative Assessment:

- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to hair and fibers.

Vocabulary

anagen phase
catagen phase
cortex
cuticle
folliular tag
macromolecule
manufactured fibers
medulla
mitochondrial DNA
molecule
monomer
natural fibers
nuclear DNA
polymer
telogen phase

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 8 class periods

UNIT 7

Questioned Documents

Unit Goals
At the completion of this unit, students will:

Primary Standards	
NGSS.HS-LS1-3	**Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.**
NGSS.HS-LS1-5	**Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.**
NGSS.HS-LS1-6	**Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
Additional Standards	
CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How can handwriting be used as individual evidence?
- How can the forensic scientist detect forgeries or counterfeits?
- What are the important guidelines necessary to collection of handwriting exemplars?
- What is a “questioned document” and what is the value of a questioned document in forensic investigation?

Scope and Sequence

1. Handwriting analysis & comparison
2. Ink (printer, pen, and photocopier) comparison
3. Document analysis (alterations, obliterations, erasures, variations in pen inks).

Assured Assessments

Formative Assessment:

- Ongoing written and online assessments to monitor progress [TBD]

Summative Assessment:

- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to documents.

Vocabulary

charred document	indented writings	obliteration
erasure	infrared luminescence	questioned document
exemplar	natural variations	

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 8 class periods

UNIT 8

Death and Decomposition

Unit Goals
At the completion of this unit, students will:

Primary Standards	
NGSS.HS-LS1-2	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
NGSS.HS-ETS1-2	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
Additional Standards	
CCS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CCS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept,resolving conflicting information when possible.
ISTE Innovative Designer (Standard 1.4.a)	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
ISTE Innovative Designer (Standard 1.4.d)	Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
ISTE Computational Thinker (Standard 1.5b)	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
ISTE Computational Thinker (Standard 1.5c)	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
ISTE Creative Communicator (Standard 1.6c)	Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Unit Essential Questions

- How is death defined?
- How can an autopsy help to solve a crime?
- Why is time of death important?
- How can environmental factors influence the time estimate?

Scope and Sequence

1. Role of forensic pathologist
2. Autopsy
3. Cause of death
4. Manner of death
5. Estimating time of death
6. Forensic anthropology
7. Forensic entomology

Assured Assessments

Formative Assessment:

- Ongoing written and online assessments to monitor progress [TBD]

Summative Assessment:

- Students will participate in an assessment consisting of multiple-choice questions, free-response questions, and interpreting and analyzing data, related to death and decomposition.

Vocabulary

algor mortis
autopsy
cause of death
forensic anthropology
forensic entomology
forensic pathologist
livor mortis
manner of death
petechiae
postmortem interval (PMI)
rigor mortis

Resources

Core

- Saferstein, Richard. *Forensic Science: An Introduction.* Upper Saddle River, NJ: Prentice Hall, 2022. [PENDING]

Supplemental

- Capri, Diane. *Crime Puzzles.* Beverly, MA: Quarto Publishing Group, 2020.
- Pantera, Paul D. *Lateral Thinking Lessons And Puzzles to Unlock Creativity and Leadership Ability.* Coppell, TX: Panterax, 2022.
- High, Suzanne. *50 Logic Puzzles.* Tavistock, England: Luscious Books, 2018.

Time Allotment

- Approximately 8 class period

COURSE CREDIT

0.5 credits in science

ASSURED STUDENT PERFORMANCE RUBRICS

- Trumbull High School School-Wide Writing Rubric (attached)
- Trumbull High School School-Wide Problem-Solving Rubric (attached)
- Trumbull High School School-Wide Independent Learning and Thinking Rubric (attached)
- Trumbull High School School-Wide Vision of the Graduate Rubric (will be included, pending approval)

Trumbull High School
School-Wide Writing Rubric

Category / Weight	Exemplary 4 Student work:	Goal 3 Student work:	Working Toward Goal 2 Student work:	Needs Support 1-0 Student work:
Purpose X_____	● Establishes and maintains a clear purpose ● Demonstrates an insightful understanding of audience and task	● Establishes and maintains a purpose ● Demonstrates an accurate awareness of audience and task	● Establishes a purpose ● Demonstrates an awareness of audience and task	● Does not establish a clear purpose ● Demonstrates limited/no awareness of audience and task
Organization X_____	● Reflects sophisticated organization throughout ● Demonstrates logical progression of ideas ● Maintains a clear focus ● Utilizes effective transitions	● Reflects organization throughout ● Demonstrates logical progression of ideas ● Maintains a focus ● Utilizes transitions	● Reflects some organization throughout ● Demonstrates logical progression of ideas at times ● Maintains a vague focus ● May utilize some ineffective transitions	● Reflects little/no organization ● Lacks logical progression of ideas ● Maintains little/no focus ● Utilizes ineffective or no transitions
Content X_____	● Is accurate, explicit, and vivid ● Exhibits ideas that are highly developed and enhanced by specific details and examples	● Is accurate and relevant ● Exhibits ideas that are developed and supported by details and examples	● May contain some inaccuracies ● Exhibits ideas that are partially supported by details and examples	● Is inaccurate and unclear ● Exhibits limited/no ideas supported by specific details and examples
Use of Language X_____	● Demonstrates excellent use of language ● Demonstrates a highly effective use of standard writing that enhances communication ● Contains few or no errors. Errors do not detract from meaning	● Demonstrates competent use of language ● Demonstrates effective use of standard writing conventions ● Contains few errors Most errors do not detract from meaning	● Demonstrates use of language ● Demonstrates use of standard writing conventions ● Contains errors that detract from meaning	● Demonstrates limited competency in use of language ● Demonstrates limited use of standard writing conventions ● Contains errors that make it difficult to determine meaning

Trumbull High School
School-Wide Problem-Solving Rubric

Category / Weight	Exemplary 4	Goal 3	Working Toward Goal 2	Needs Support 1-0
Understanding X_____	● Student demonstrates clear understanding of the problem and the complexities of the task	● Student demonstrates sufficient understanding of the problem and most of the complexities of the task	● Student demonstrates some understanding of the problem but requires assistance to complete the task	● Student demonstrates limited or no understanding of the fundamental problem after assistance with the task
Research X_____	● Student gathers compelling information from multiple sources including digital, print, and interpersonal	● Student gathers sufficient information from multiple sources including digital, print, and interpersonal	● Student gathers some information from few sources including digital, print, and interpersonal	● Student gathers limited or no information
Reasoning and Strategies X_____	● Student demonstrates strong critical thinking skills to develop a comprehensive plan integrating multiple strategies	● Student demonstrates sufficient critical thinking skills to develop a cohesive plan integrating strategies	● Student demonstrates some critical thinking skills to develop a plan integrating some strategies	● Student demonstrates limited or no critical thinking skills and no plan
Final Product and/or Presentation X_____	● Solution shows deep understanding of the problem and its components ● Solution shows extensive use of 21st-century technology skills	● Solution shows sufficient understanding of the problem and its components ● Solution shows sufficient use of 21st-century technology skills	● Solution shows some understanding of the problem and its components ● Solution shows some use of 21st-century technology skills	● Solution shows limited or no understanding of the problem and its components ● Solution shows limited or no use of 21st-century technology skills

Trumbull High School
School-Wide Independent Learning and Thinking Rubric

Category/ Weight	Exemplary 4	Goal 3	Working Toward Goal 2	Needs Support 1-0
Proposal X _____	● Student demonstrates a strong sense of initiative by generating compelling questions, creating uniquely original projects/work	● Student demonstrates initiative by generating appropriate questions, creating original projects/work	● Student demonstrates some initiative by generating questions, creating appropriate projects/work	● Student demonstrates limited or no initiative by generating few questions and creating projects/work
Independent Research & Development X_____	● Student is analytical, insightful, and works independently to reach a solution	● Student is analytical, and works productively to reach a solution	● Student reaches a solution with direction	● Student is unable to reach a solution without consistent assistance
Presentation of Final Product X_____	● Presentation shows compelling evidence of an independent learner and thinker ● Solution shows deep understanding of the problem and its components ● Solution shows extensive and appropriate application of 21st-century skills	● Presentation shows clear evidence of an independent learner and thinker ● Solution shows adequate understanding of the problem and its components ● Solution shows adequate application of 21st-century skills	● Presentation shows some evidence of an independent learner and thinker ● Solution shows some understanding of the problem and its components ● Solution shows some application of 21st-century skills	● Presentation shows limited or no evidence of an independent learner and thinker ● Solution shows limited or no understanding of the problem and its components ● Solution shows limited or no application of 21st-century skills