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5-E Classroom STEM Activity:
Cause of Death

Dr. Alexandra Owens

A Career in Health Care

Helps Her Crack the Case

By Dorothy Crouch

The role of a forensics professional is often shown on television as helping to catch a guilty criminal, but for D'Michelle P. DuPre, M.D., uncovering important details to find justice is most important.

Despite her interest in watching cop-drama television shows during the 1980s, after entering the health care field as a forensic pathologist, she quickly discovered that there is more to her job than Hollywood's version of studying a crime scene. Thinking back on her career, Dr. DuPre spoke with STEM Jobs to explain how she has grown to recognize the importance of her role in finding truth in crime.

STEM JOBS: What sparked your interest in pursuing a career in health care?
D'MICHELLE DUPRE, M.D.: I think the '80s cop shows got me started. I realized that I love figuring things out, helping other people, and solving problems. When I'm in court testifying, I'm actually helping the court understand the medicine, the science, and the forensics in the case.

SJ: What type of education is needed to be qualified for your position?
DD: Four years of college—preferably with a science major; four years of medical school; four to five years of residency depending on whether you major in anatomic and clinical pathology or just anatomic pathology; and one to two years of advanced forensic fellowship training where you just study forensic medicine. Whew!

SJ: What is your current role? What does that encompass?
DD: My current role is mostly faculty and teaching at a small college. I also do a great deal of public speaking at conferences and events. My previous career has been as a forensic pathologist and also as a police officer. I'm retired from practice but I still consult on cases and serve as a forensic expert for real-life television and radio shows.

SJ: What STEM skills are required in your job?
DD: All of them! We use math for pharmacy calculations, science in medicine and diagnosis, physics for blood spatter analysis and biomechanics to figure out whether an object or person could have done something, and technology to research data and help us analyze and diagnose diseases.

I've had several cases I can remember where I found evidence either at the crime scene or on the body examination that actually made the case and ***helped identify the killer****.*

D'MICHELLE P. DUPRE, M.D.
CHAIR, HEALTH CARE PROGRAMS
DEGREE: MEDICAL DOCTORATE DEGREE
YEARS IN THE INDUSTRY: 20+
STEM TYPE: ADVISOR

SJ: What professional accomplishments are you especially proud of?
DD: Being the first person in my family to have a college degree, much less a physician! I've had several cases I can remember where I found evidence either at the crime scene or on the body examination that actually made the case and helped identify the killer. I've also been on the other side. Sometimes there is a misinterpretation of evidence. In some cases, my job and testimony has either freed, or kept an innocent person from jail. That, too, is rewarding because my job is to help find the truth.

SJ: What advice would you give to high school students who are interested in a career in health care?
DD: Explore, explore, explore! When you find a health care career you think you would like, ask yourself, "What is it about that job that I really like?" and, "Can I see myself doing this for a long time?" Investigate the educational requirements, the training required, and expected growth for that job in the future. Most importantly, once you get started, don't just do it—do it with passion!

The health care industry is changing, which means unique STEM careers in this field are being added constantly. D'Michelle believes these new jobs will also increase employee responsibilities and employer expectations, leading to a higher need for skilled workers—even those who have entry-level positions. In addition to her own role, D'Michelle noted that there are a variety of STEM roles in the health care industry to fit every interest. Lab careers, such as blood banking, phlebotomist, pathologist, and microbiologist complement the work that a forensic professional performs.

Photo: PeopleImages / Getty Images

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5-E Classroom STEM Activity: Cause of Death

Here are some ideas for how high school teachers could use this story as a launching point for integrated STEM learning. Our activities follow the 5-E Learning Cycle Model.

Part 1: Engage

1. Ask students to reflect on forensic television shows they may have seen.
   a. What is the role of the medical examiner?
   b. What occurs during an autopsy?
   c. What evidence can an autopsy provide?
2. Have students read the article "A Career in Health Care Helps Her Crack the Case" in *STEM Jobs*℠ magazine. Discuss the following questions:
   a. What education is needed to be a forensic pathologist?
   b. What STEM skills are required?
   c. Why would a forensic pathologist need to testify in court?
   d. What other careers complement the field of forensic pathology?
3. Show students the "Interactive Autopsy" found at edu.STEMjobs.com/teacher-resources in order to introduce what a forensic pathologist does day to day to help solve a crime.
   Note: Warn students that this interactive is virtual, but includes information about what occurs during an autopsy. During the Explore portion of the lesson, there will be photographs of dissected organs.
4. Explain that in today's lesson, students research evidence collected during an autopsy in order to determine the cause of death in a case.

Part 2: Explore

1. Break students into groups of two or three. Each student will need an internet-connected device.
2. Ask students to research evidence that is collected during an autopsy that can be used to determine cause of death in a forensics case. One such site is "Medical Views" found at edu.STEMjobs.com/teacher-resources. Students may take any notes that can be used to determine the cause of death in their assigned case.
3. Assign a case number from the "Virtual Autopsy" found at edu.STEMjobs.com/teacher-resources for each team to determine the cause of death. Ensure that no two groups are investigating the same case. Additional research may need to be conducted for any terminology that is unfamiliar to students.
4. Ask students to determine the cause of death and provide evidence to support their claim.

Part 3: Explain

1. Have groups create a short presentation of their research and case to share with the class. Presentations should include a summary of the case, the evidence collected, and a report of the cause of death. Each member should share the information for which they were responsible. Students should use presentation software such as PowerPoint or Google Slides.
2. When ready, have students share their presentations with the class.
3. Allow classmates to ask clarifying questions following each presentation.

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Part 4: Elaborate

1. Explain that forensic pathologists are sometimes called to testify in a court case to act as an expert witness. They will now conduct a mock trial to see what this may be like.
2. Select a case not used during the Explore portion of the lesson. Divide the class into three teams: the prosecution, the defense, and the expert witness.
3. Allow each team to explore the case and conduct any research needed. The prosecution and defense should both create a series of questions to ask the expert witness pertaining to the cause of death. The expert witness should prepare their claims and evidence.
4. Have each team select one representative for the mock trial and set up the room like a court. The teacher will act as the moderator. Representatives may confer with their team as needed.
5. When the mock trial begins, have the prosecution ask their questions first, followed by the defense. If time permits, allow the prosecution and defense ask follow-up questions determined by the team.
6. If possible, have local law enforcement, lawyers, or forensic scientists visit your classroom to share their experiences and watch the mock trial.

Part 5: Evaluate

Students will be evaluated for their presentations and participation using the following rubric. Provide the rubric at the beginning of the lesson to clarify expectations and objectives. Each group will be graded, therefore all students in the group will receive the same score.

Scoring Rubric

____ /20 Cause of Death Presentation
Was information presented accurate?
Did the presentation include a case summary, evidence collection, and cause of death?
Was the presentation clean and easy to understand?

____ /20 Mock Trial
Were the questions and statements clear and based on the case?
Was it clear that research took place to create valid claims and insightful questions?

____ /10 Participation
Did each student contribute to the overall project?
Did each student assist in research, presentation, and mock trial?

____ /50 Total

Standards Addressed:

Common Core State Standards - Math

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.
CCSS.MATH.PRACTICE.MP4 Model with mathematics.

Common Core State Standards - ELA

CCSS.ELA-LITERACY.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.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.
CCSS.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.
CCSS.ELA-LITERACY.SL.9-10/11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10/11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Next Generation Science Standards

HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Science and Engineering Practices
Planning and Carrying Out Investigations. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.
Disciplinary Core Ideas
Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
Crosscutting Concepts
Stability and Change. Feedback (negative or positive) can stabilize or destabilize a system.

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
Science and Engineering Practices
Analyzing and Interpreting Data. Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
Disciplinary Core Ideas
PS2.A: Forces and Motion. Newton's second law accurately predicts changes in the motion of macroscopic objects.
Crosscutting Concepts
Cause and Effect. Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

ISTE Standards for Students

3c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.
3d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.
6a Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Texas Essential Knowledge and Skills - Math

A.1.A apply mathematics to problems arising in everyday life, society, and the workplace.
A.1.B use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.
A.1.D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.

Texas Essential Knowledge and Skills - Science

B.3, C.3, P.3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.
B.11.A Describe the role of internal feedback mechanisms in the maintenance of homeostasis.
P.4.D Calculate the effect of forces on objects, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects.