AI - Human Teaming and The Scientific Method
(7 - 45 min class blocks)

Authors

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SUBJECT/GRADE LEVEL

Subject Area: Science

Grade Level: Middle School

Easily adaptable to High School and Elementary School and multiple topics. SimuLab can generate data for any science topic.

Materials

- List materials needed:
  - Video player / Internet access
  - Handouts
  - Balloon
  - Ruler and meter stick
  - SimuLab Website access
  - Presentation supplies (computer, whiteboard, large-format paper, markers, pens)
- SimuLab Link https://studio--simulab-vy62s.us-central1.hosted.app/
- Plan for a class of 30 students.
- AI - Human Teaming and The Scientific Method…

STANDARDS

Next Generation Science Standards

Students who demonstrate understanding can:

- MS-ETS1-1. - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2. - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3 - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to meet the criteria for success better
- 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.

Mathematics Standards | Common Core State Standards

- CCSS.MATH.CONTENT. HSS-ID.A.1 - Summarize, represent, and interpret data on a single count or measurement variable. Represent data with plots on the real number line (dot plots, histograms,
- 7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
- 7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

English Language Arts Standards | Common Core State

- CCSS.ELA-Literacy.RI.6.7 - Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
- CCSS.ELA-Literacy.RI.9-10.7 - Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

LESSON OBJECTIVE(S)

The purpose of this lesson is to introduce SimuLab, which uses the scientific method with AI to generate simulated data sets, teach students about the role of AI in our world, educate students about AI biases and AI-generated fake news, and how to identify them.

Students will practice using the scientific method through conducting a hands-on experiment and by teaming with AI to generate simulated data. Students will be able to understand and implement the scientific method in designing an experiment. Students will practice hands-on data collection and data analysis with AI-generated data, comparing the two.

CAREER CONNECTION(S)

Mentor Background: Steven Thurman is a neuroscientist from the US DEVCOM Army Research Laboratory. He received a B.S in Cognitive Science from UCSD and PhD in Cognitive Science from UC Irvine. His research has focused on visual perception, eye tracking, cognition, and the development of next-generation technologies that adapt in real-time to human states. His recent research focuses on the emerging intersection between human cognition and machine intelligence, aiming to enable novel real-world applications.

STEM Careers:

Machine Learning Engineer - Machine learning engineers develop and deploy algorithms that allow machines to learn from data and make decisions without explicit programming. They work on projects such as recommendation systems, predictive analytics, and fraud detection. This role requires strong programming skills, knowledge of frameworks like TensorFlow and PyTorch, and expertise in data structures and algorithm optimization.

Data Scientist - Data scientists analyze and interpret complex datasets to uncover actionable insights that inform business decisions. They use machine learning models to predict trends, optimize operations, and drive innovation. Proficiency in programming languages like Python and R, as well as expertise in visualization tools such as Tableau, is required for success in this role.

AI Research Scientist - AI research scientists push the boundaries of AI technologies by conducting experiments and developing innovative algorithms. They often specialize in fields like applied mathematics, deep learning, and computational statistics. An advanced degree in computer science or a related field is typically required, along with hands-on experience in research and development.

Natural Language Processing Engineer - What kind of AI jobs involve language processing? Natural Language Processing (NLP) engineers create systems that interact with human language, powering tools like chatbots, translation services, and sentiment analysis software. This role requires skills in text mining and machine learning and familiarity with NLP libraries like spaCy and Hugging Face. These engineers bridge the gap between machine learning models and linguistic understanding.

ENGAGEMENT - 1-45 min class block

Brief Description: In this section, we will be reading a short story about a science mystery - solved using the scientific method and AI followed by learning about the scientific method and how students can implement it successfully. Teachers can use the series of 5 videos below to introduce each step and have a discussion with the class to reinforce each concept.

Topic	Original Resource	Edpuzzle Link (if you use this resource)
Get your idea and do some research	**YouTube Video:** **DIY Space: How to Do a Scie…** **Get your idea and do some r…**	**https://edpuzzle.com/media/6844d3d38c7aa4eb2cc0e5ce**
Objective of 5 min. Discussion: Students and teachers will watch or play the video for their class and have a discussion on how to get a research idea from the world around them. At the end of the video, have students look around the room and practice formulating open-ended questions.		
Ask a testable question.	**YouTube Video:** **DIY Space: How to Do a Scie…** **Ask a Testable Science Ques…**	https://edpuzzle.com/media/6844da02068617dd486c661b
Objective of 5 min. Discussion: Students and teachers will watch or play the video for their class and engage in a discussion on how to formulate a testable question. At the end of the video, have		

<table>
<tr><td colspan="3">students use their questions from above and write a testable question.</td></tr>
<tr><td>Design and conduct your experiment</td><td><u>YouTube Video:</u>
DIY Space: How to Do a Scie...
Design and conduct your ex...</td><td>https://edpuzzle.com/media/6844dedd49c8b509654e88ec</td></tr>
<tr><td colspan="3">Objective of 5 min. Discussion: Using the testable question developed by the students above, have the students develop a theoretical experiment they could conduct. Answer the question - what data would they collect and why?</td></tr>
<tr><td>Examine your results</td><td><u>YouTube Video:</u>
DIY Space: How to Do a Scie...
Examining Experimental Re...</td><td>https://edpuzzle.com/media/6844df57e96eaade511ba5ae</td></tr>
<tr><td colspan="3">Objective of 5 min. Discussion: Thinking about the experiment above, what might they anticipate the outcome of the experiment to be? Why?</td></tr>
<tr><td>How to write a scientific report</td><td><u>YouTube Video:</u>
<u>Middle school</u>
DIY Space: How to Do a Science...
Creating an Engaging Science o...

<u>High School</u>
How To Write A Scientific Report
How to Write a Scientific Repor...</td><td>https://edpuzzle.com/media/6845994004026f437f8e3dca

https://edpuzzle.com/media/684627767b04e4ef0f32ca31</td></tr>
<tr><td colspan="3">Objective of 5 min. Discussion: Review this video with students. Using the discussion information above, discuss how it might fit into a scientific paper. What might be possible sources of error?</td></tr>
</table>

Procedures:

Have the students watch the videos above and answer the questions assigned in edPuzzle. If you're not able to use edpuzzle, use the YouTube link and the associated handout. These videos can take as long or be as short as a 45-minute block with discussion, depending on the age and student abilities (e.g., middle school vs. high school).

Background: To have the most meaningful experience in understanding SimuLab, students will need to have a firm grasp of the scientific method and its associated vocabulary. This section of the 5E model is designed to teach/review this foundational information.

Teacher and student actions: This activity can be completed as a class group or adapted and assigned to individual students to watch at their own pace. Students may find the most benefit through having collaborative discussions in class.

Formative/summative assessments: The edpuzzle videos have formative assessments built in that are self-grading for students. The classroom discussions will also be used as formative assessments. The YouTube videos/handouts can be used as a formative assessment (or as a summative assessment, since they are not self-graded).

Individual learners and/or virtual options: Since the edpuzzles are links, they can be individually assigned and used for virtual learners as well as for students with disabilities.

EXPLORATION - 2-45 min class blocks

Brief Description: Hands-on lab experiment **Measuring Lung Capacity** - Students will measure their lung capacity using a balloon, string or yarn, a ruler, and meter sticks. Watch this video Measuring Lung Capacity.mp4 for a quick overview of this lab.
Student Pre Lab worksheet: **Prelab worksheet for Balloon Experiment**
Student Lab worksheet: **Lab_Worksheet**
Teacher Version: **Measuring Lung Capacity - Teacher Copy**

Procedures:
Background: Students will practice developing and identifying the Hypothesis, Independent Variable (IV), Dependent Variable (DV), Controls, and Constants by exploring how to measure lung capacity with simple tools. Students will collect data with a partner that they can then analyze using the CER (Claim, Evidence, Reasoning) method. Check out this Bozeman Science video if you need a refresher. **Teacher Pro Tip:** This section can be replaced with almost any lab of choice as students are really practicing the scientific method and AI-Human teaming with SimuLab.

Teacher and student actions: This activity is best completed as a class group, where they can support each other in the learning process. Students will find the most benefit if everyone on their team is participating fully in the project. Teachers should be prepared to help guide student teams who may get lost in the process. **Teacher Pro-tip**: Discard the balloons at the end of class to avoid disruptions.

Formative/summative assessments: Teachers can use the pre-lab as a formative assessment, and the scientific report can be a summative assessment.

Individual learners and/or virtual options: Students can still participate by completing the prelab, watching the video, and collecting their data at home or using the teacher-provided sample data to do the analysis. Students with disabilities can use these same resources to work at a slower pace. Gifted students can take a step further and calculate the actual volume.

EXPLANATION - 1 -45 min class block

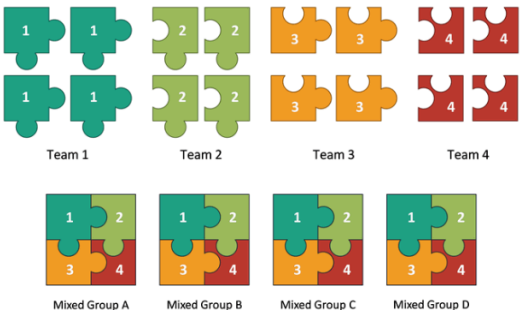
Brief Description: This section consists of three parts:

1. **Scientific Method Review and Reflection - (15 min)** Now that students have learned about the scientific method and practiced experimenting, they will work together in pairs to complete a peer review of their scientific method and CER reflection of the lung capacity experiment. Teachers will circulate to support students in completing the peer review and reinforce the scientific method/CER.
2. **AI activity (10 min) -** Teachers will lead a discussion on AI in our world, how AI-Human Teaming works and benefits us as a society, as well as how we identify AI. Using the image below, have

students look at both and try to determine which one is real. Have students justify why they selected the image as being real. **Remind them they need to be detectives and make careful observations**.

3. **AI Jigsaw (20 min)** - Teachers may use the links below to explore further the AI-human teaming. While all students are welcome to use any link, some are easier than others and cover a wide variety of AI topics. Teachers should use the articles/videos that best fit their class.

   The Jigsaw method is a cooperative learning technique where students work in small groups to become experts on different aspects of a topic and then share their knowledge with the rest of the class. This method encourages collaboration, improves comprehension, and fosters empathy among students. To create a jigsaw, divide the group into teams and have each team analyze one source. Students should review the source, take notes, and be prepared to explain what they learned to other classmates. Now, students will all switch to new teams, each team having one person from each assigned source. Students then take turns presenting their new information to classmates. Below are articles and videos that discuss the positives and negatives of using AI and how it may change our world. Wrap up this activity by bringing the class together and having an overall class discussion. **Teachers can let people know that in the next class, they will get to have first-hand experience using AI**.



Middle School Resources	High School Resources
[What is a 'deep fake'?](#) [Identifying "Fake" News/ Common Sense Education](#)	[Facebook AI Launches Its Deepfake Detection Challenge](#) [Generative AI in a Nutshell](#) [It takes a few dollars and 8 minutes to create a deep fake.](#)

Links for All Students

[Humans and AI: Do they work better together or alone?](#)
[The Impact of AI: How Artificial Intelligence is Transforming Society](#)
[AI: A Tectonic Shift in Human Society](#)
[How AI is impacting society and shaping the future](#)

The link below goes with the photo to the right.

[AI vs. Human Brain: Is AI Dominance About to Come?](#)



Ethan Mollick, a business professor at the University of Pennsylvania's Wharton School, used a photo of himself

Procedures:

Background: During this explanation section of this lesson, students will prepare to participate in their own AI-human teaming exercise using the SimuLab app by understanding AI, what AI is, and its broader positive and potential negative impacts on our society.

It is important to educate students that AI is not 100% reliable. While AI systems can perform tasks with high degrees of accuracy and efficiency, they are capable of making mistakes. Factors such as biased training data, system design flaws, and any number of unforeseen scenarios can lead to errors. AI programs, especially Large Language Models (LLMs), have automated many aspects of fake news generation. SimuLab has built in AI functionality, as AI can democratize the use of simulation by making it more accessible to non-experts through user-friendly web-based applications. The purpose of this lesson is to introduce SimuLab, teach students about the role of AI in our world, educate students about AI biases and AI-generated fake news, and how to identify them.

Students will start the class by doing a short wrap-up of the lung capacity lab, making a connection to the hands-on data they previously collected and will use to compare to the simulated AI-generated data. Teachers will lead a discussion on AI in our world, how AI-Human Teaming works, the benefits to us as a society, and how we identify AI. Teachers can go as in-depth as they feel is needed for their students.

Teacher and student actions: Students will complete a peer review of their lung measurement data with classmates. They will then be active participants in a discussion about AI and how AI is changing our society. **Teachers will highlight the benefits of AI, such as AI-human teaming, while discussing the potential concerns for AI use in our society.**

Formative/summative assessments: This section is a discussion - the teacher will make observations of student participation for a formative assessment.

Individual learners and/or virtual options: Students can complete the peer review virtually with another student, teacher, or parent. They can then review all the AI resources and write a reflection about the benefits of AI-teaming and the potential concerns of using AI.

ELABORATE - 1 -45 min class block

Brief Description: Teachers will lead the students in setting up the SimuLab. SimuLab is an app that uses AI and the scientific method to generate data sets specific to the students' hypotheses. SimuLab asks students to input their hypothesis, IV, DC, Controls, and constants. This process allows students to generate an AI(simulated) database that they can manipulate and analyze. A well-constructed hypothesis is needed to generate a good dataset from the SimuLab. This challenges students to refine their skills in designing scientific hypotheses.

Teacher / Student Handout: **How to set up Simulab** **SimuLab RESET Lesson.mp4**

Procedures:

Background: Teachers will first start the class by inviting students to open their live data from the lung capacity lab. Then, they will introduce the SimuLab and review the student document. Teachers may choose to give the whole document to the students and have them work independently or go through the document step by step, depending on class dynamics. **Teacher Pro Tip**: Make sure your tech department "whitelists" the SimuLab link so it will work on the school computers.

Teacher and student actions: Students will go through the document and generate the datasets from the SimuLab. They will plug in the simulated and their live data in the table provided in the document, create a graph comparing both datasets, and write their conclusions.

Formative/summative assessments: This section involves independent student work. Formative assessment is based on the teacher's observation of the students' collaboration with classmates. The summative assessment is the completed Simulab document, including the table, graph, and conclusions (CER).

Individual learners and/or virtual options: Students working individually / virtually can easily complete these activities at home through the use of SimuLab and a computer.

EVALUATION - 2 - 45 min class blocks

Brief Description: Using the SimuLab data, students will create an analysis of the data/experiment. Part of this analysis will include their thoughts on the expected outcome vs the simulated outcome. This will be presented to their peers through a report, slide show, or poster (gallery walk) where they will receive Peer Feedback and Teacher Feedback.

SimuLab Lung Capacity Presentation Rubric

Procedures:

Background: During the first block, teachers will start the class by reminding students to open their completed document and work with partners to create a report, slide show, or poster for the gallery walk. During the second block, students will present their final report to receive their peer and teacher feedback.

Teacher and student actions: Students will revisit their original Lung capacity Lab and their SimuLab assignment, pulling all their data, tables, and graphs together to create a meaningful presentation on the use of AI in scientific studies. As part of this assignment, they will emphasize their conclusions on comparing both datasets. The teacher may use a choice board for students to choose their method of presentation, or they may assign one method. During the second class, students will present their work to their peers and teachers to get their feedback

Formative/summative assessments: This section involves independent student work. Formative assessment is based on the teacher's observation of the students' collaboration with classmates. The summative assessment is the students' completed presentation.

Individual learners and/or virtual options: Students working individually / virtually can easily complete these activities at home through the use of a computer.

REFERENCES

Andersen, P. (2017, January 9). CER - Claim Evidence Reasoning. YouTube. https://www.youtube.com/watch?v=5KKsLuRPsvU

Bond, S. (2023, March 23). It takes a few dollars and 8 minutes to create a deep fake. And that's only the start. http://www.capradio.org/news/npr/story?storyid=1165146797

Fell, A. (2024, October 8). Ai: A tectonic shift in human society. UC Davis. https://www.ucdavis.edu/news/ai-tectonic-shift-human-society

Goodyear, A. (2025, May 24). Simulab. https://studio--simulab-vy62s.us-central1.hosted.app/

HighSchoolScience101. (2017, December 26). How To Write A Scientific Report. YouTube. https://www.youtube.com/watch?v=Yqioa8Njhhk&feature=youtu.be

How AI is impacting society and shaping the future | Impact of AI on society and business. (2024, October 8). Lumenalta. https://lumenalta.com/insights/how-ai-is-impacting-society-and-shaping-the-future

Humans and AI: Do they work better together or alone? | MIT Sloan. (2024, October 28). https://mitsloan.mit.edu/press/humans-and-ai-do-they-work-better-together-or-alone

Identifying "fake" news | common sense education. (n.d.). PBS LearningMedia. Retrieved June 14, 2025, from https://www.pbslearningmedia.org/resource/nmlit17-ela-idfakenews/identifying-fake-news/

Kniberg, H. (2024, January 20). - Youtube. Generative AI in a Nutshell - How to Survive and Thrive in the Age of AI. https://www.youtube.com/watch?v=2IK3DFHRFfw

Le, V. (2024, June 6). Ai vs. Human brain: Is ai dominance about to come? https://www.orientsoftware.com/blog/ai-vs-human-brain/

Muskopf, S. (2019, February 23). Investigation: Measuring lung capacity. Biology LibreTexts. https://bio.libretexts.org/Learning_Objects/Worksheets/Book%3A_The_Biology_Corner_(Worksheets)/Anatomy_Worksheets/Investigation%3A_Measuring_Lung_Capacity

NASA JPL Edu. (2015a, April 29). DIY Space: How to Do a Science Fair Project—Step 1. YouTube; NASAJPL Edu. https://www.youtube.com/watch?v=APQXjxliYsY&feature=youtu.be

NASA JPL Edu. (2015b, April 29). DIY Space: How to Do a Science Fair Project—Step 2. YouTube; NASAJPL Edu. https://www.youtube.com/watch?v=zyhtiwcTMzE&feature=youtu.be

NASA JPL Edu. (2015c, April 29). DIY Space: How to Do a Science Fair Project—Step 3. YouTube; NASAJPL Edu. https://www.youtube.com/watch?v=mjhyUM4JmJo&feature=youtu.be

NASA JPL Edu. (2015a, April 29). DIY Space: How to Do a Science Fair Project—Step 4. YouTube; NASAJPL Edu. https://www.youtube.com/watch?v=ZfHG42bPFkQ&feature=youtu.be

NASA JPL Edu. (2015b, April 29). DIY Space: How to Do a Science Fair Project—Step 5. YouTube; NASAJPL Edu. https://www.youtube.com/watch?v=0qFliKEamHo

News, A. B. C. (2019, July 29). Video What is a "deep fake"? ABC News. https://abcnews.go.com/US/video/deep-fake-64636606

Pekka, S. (March 7). The impact of ai: How artificial intelligence is transforming society. 3DBear. https://www.3dbear.io/blog/the-impact-of-ai-how-artificial-intelligence-is-transforming-society

Strickland, E. (2019, December 11). Facebook AI launches its deepfake detection challenge—Ieee spectrum. https://spectrum.ieee.org/facebook-ai-launches-its-deepfake-detection-challenge