UTICA CITY SCHOOL DISTRICT

Improving Health with AI
Health Professionals Module 2
7th Grade

Essential Question: How can we design an AI system to improve a healthcare (health-related) process and minimize bias?

Project Background

Artificial Intelligence (AI) can be a powerful tool for analyzing large amounts of data and making quick, health-related analyses. However, the data we use and the process we use to teach AI systems can cause those systems to give biased results. This can lead to people receiving inaccurate diagnoses, and poor or delayed treatment unrelated to their conditions. This project is designed to develop an understanding of what AI is and how it is used within the healthcare industry. Students will also explore how the data that is used to teach an AI system can lead to biased results.

Preparation Scenario

You are part of a software development design firm that wants to develop the next generation of apps to help address healthcare needs. You are faced with identifying a healthcare-related need that can be improved with Artificial intelligence (AI). Your firm is also interested in creating apps that minimize machine-learning bias. You will determine a problem to solve and design a potential app to help solve the problem. You will also need to determine the data you will need to teach your AI system that minimizes machine learning bias. You will present your idea to local members of the healthcare community for their feedback to improve your design idea should your idea be chosen for further development.

Your team will create a 5-minute pitch to share your idea with the vice president of the company along with the local health community partners. Your pitch needs to include the problem you are attempting to solve, a description and visual of your app, how your app will solve your identified problem, and a description of your machine learning protocol using a model card format. Along with your presentation, you will include a summary report with professional visuals for each screen of your app, an app spec sheet, and the machine learning protocol.

Preparation Notes

Determine how you want students to keep track of and document their process. It is recommended they have a composition notebook that they will write in each day and tape or paste graphic organizers or other helpful details throughout the project. To support this, we have included in this unit professional notebook Instructions, a self-checklist for students, and a teacher checklist that can be used for journal checks. Other options could include loose leaf with binders, student or team folders kept in the class, or a digital journal (however, you will need a way to take and upload pictures for students to track their sketching and/or prototypes). Choose the best option for your students. We will reference this as the professional notebook in the lesson plans below.

Determine how you want students to collaborate. We recommend teams of 2 – 4 students. It is helpful to consider student strengths when developing teams such as organization, creativity, leadership, and research skills.

Within this project, students will also need to access lessons through code.org. You may need to create an account, but it will be a free account as an instructor. You can access the materials through the following navigation tree: www.code.org > Teach at the top left > Full Course Catalog for High School (scroll down a little and on the right-hand side) > Explore the AI Module. We will be incorporating several lessons within this module throughout the project. Students will also need to create an account to access the materials. Contact your IT department to see if there will be any problems. Each student will need access to their computer.

Content Standards

The 7th-grade health science module dives students into learning more about possible careers in health science through solving a health-related problem. In particular, this project focuses on an emerging problem within the health science area and the careers that may help solve this problem alongside health professionals. As students work to solve this problem, students will explore skills and concepts from the *NYSDE CTE FACS Middle School Standards* from the following modules and topics:

- *Individual Growth and Life Readiness*: Personal Development, Employability, Goal Setting (with setting and accomplishing goals within this project) and Career Pathways
- *Nutrition and Wellness*: Nutrition Across the Lifespan and Career Pathways (especially if their project focuses on better nutrition in our local communities)

Students can also learn concepts found in various modules of the *NYSDE CTE FACS Middle School* modules based on the focus of their project. Some ideas include:

- Developing a food tracker for a specific dietary issue (Nutrition and Wellness: Nutrition Across the Lifespans)
- Developing an app to develop a shopping list and budget based on a dietary issue (Nutrition and Wellness: Nutrition Across the Lifespans and Consumer Resources and Finance)
- Develop an app that gives recipe ideas based on what is in the house and supports a specific diet (Nutrition and Wellness: Culinary Management)
- Develop an app to support mental health and positive self-worth (Human Relationships: Self-concept and self-image)
- Develop an app to support reduction of stress (Human Relationships: Peer Influence and Stress Management)

Since students are learning about health careers through problem-solving, they will also learn skills and concepts from NYSED CTE Theme Modules of *Communication and Interpersonal Relationships* and *Problem-Solving and Innovation*. Finally, this module aims to introduce students to career opportunities in the health science careers by engaging students in solving problems unique or related to that industry; therefore, it incorporates concepts and standards in the NTSDE CTE Theme Module of *Career and Community Opportunities*.

UTICA CITY SCHOOL DISTRICT

The unit overview below connects Utica's CTE Career Ready Practices and NYSE Computer Science and Digital Fluency Standards (CSDF). Throughout the unit of study, students will need their Power Skills to fully engage in the project; these have been indicated on the Map of Student Learning.

Unit Overview

Unit Phase	Career Ready Practices and Digital Fluency Standards (CSDF)	Skills/Topics	Assessments	Resources and Texts
Ask **7 Days**	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence.	Project Launch, Task Analysis, and Know/NTK Chart	Know/NTK Chart Professional Notebook	Project Scenario Question Builder Chart Team Contract AI games or App ● OpenArt ● Quick Draw ● Thing Translator ● Freddiemeter
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 12. Work productively in teams while using cultural global competence. CSDF 7-8.IC.3 Identify and discuss issues of ethics surrounding computing technologies and current events. 7-8.DL.5 Transfer knowledge of technology in order to explore new technologies.	Lesson: What is AI? Determine a focus problem	GIST Organizer Professional Notebook	What is AI PPT Slides Articles: ● Machine Learning in Sports ● High Tech AI Partner ● AI in Health Care ● AI: Thoughts into Action
	Career Ready Practice:	Lesson: Refining Research Questions –	Inquiry Chart	Refining Questions PPT Slides

	1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 5. Consider the environmental, social, and economic impacts of decisions. 7. Employ valid and reliable research strategies 8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence. CSDF 7-8.DL.3 Compare types of search tools, choose a search tool for effectiveness and efficiency, and evaluate the quality of search tools based on returned results.	Background research for identified problem		
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 5. Consider the environmental, social, and economic impacts of decisions. 6. Demonstrate creativity and innovation. 8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence.	Lesson: Empathy Maps	Persona Canvas Empathy Map Design Thinking Tool	Empathy Map PPT Slides What is your perspective? Video: “What is an Empathy Map?”

UTICA CITY SCHOOL DISTRICT

	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence. CSDF 7-8.CT.10 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences. (Define Problem)	Develop a problem statement	Professional Notebook – Team Notes from brainstorming and determining a focus problem Updated K/NTK Chart Problem Statement	Health Chalk Talk 7 Rules of Brainstorming
Imagine **12 Days**	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 6. Demonstrate creativity and innovation. 8. Utilize critical thinking to make sense of problems and persevere in solving them. 12. Work productively in teams while using cultural global competence. CSDF 7-8.CT.10 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences. (Brainstorming)	Team Brainstorming Sessions (held throughout this phase of the project)	Professional Notebook notes	7 Rules of Brainstorming App Prototype Tool
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason.	Lesson: Teaching Machines to Think	Professional Notebook notes from lesson Small and whole group discussions	Teaching Machines to Think PPT Slides Code.org: Intro to AI – Lesson 2: Introduction of

	5. Consider the environmental, social, and economic impacts of decisions. 6. Demonstrate creativity and innovation. 9. Model integrity, ethical leadership, and effective management. 11. Use technology to enhance productivity. 12. Work productively in teams while using cultural global competence. CSDF 7-8.IC.4 Identify and discuss issues related to the collection and use of public and private data. 7-8.DL.5 Transfer knowledge of technology in order to explore new technologies.		Updated K/NTK Chart	Machine Learning – Recognizing Fish
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 5. Consider the environmental, social, and economic impacts of decisions. 6. Demonstrate creativity and innovation. 8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence. CSDF 7-8.IC.3 Identify and discuss issues of ethics surrounding computing technologies and current events.	Lesson: Machine Learning Bias	Professional Notebook notes from lesson Small and whole group discussions Updated K/NTK Chart	Machine Learning Bias Slides Code.org: Intro to AI - Lesson 9: Machine Learning Video: "Ethics & AI: Equal Access and Algorithmic Bias" Articles ● Machine Learning Bias ● AI Can Remedy Racial Disparities in Health Care ● Algorithms Can Help Us Combat Racial Bias ● AI and Health Equity Infographic

	7-8.IC.5 Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals. 7-8.CT.1 Compare the results of alternative models or simulations to determine and evaluate how the input data and assumptions change the results. 7-8.DL.5 Transfer knowledge of technology in order to explore new technologies.			Text Coding – reading strategy Sentence stems for discussion
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 5. Consider the environmental, social, and economic impacts of decisions. 11. Use technology to enhance productivity. CSF 7-8.IC.5 Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals. 7-8.IC.6 Assess the accessibility of a computing device or software application in terms of user needs.	Artificial Intelligence Experiments Exploration	Professional Notebook Notes Updated K/NTK Chart	AI Experiments with Google 10 AI Experiments to Try Online
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 5. Consider the environmental, social, and economic impacts of decisions. 6. Demonstrate creativity and innovation.	Lesson: Artificial Intelligence Data	Data Collection Tools Professional Notebook notes from lesson Updated K/NTK Chart	AI Data PPT Slides Big Data Sites • Kaggle • CORGIS

	8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 11. Use technology to enhance productivity. 12. Work productively in teams while using cultural global competence. CSDF 7-8.IC.5 Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals. 7-8.CT.2 Collect and use digital data in a computational artifact. 7-8.CT.3 Refine and visualize a data set in order to persuade an audience.			
Plan/Create/ Improve/ Communicate **6 Days**	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 4. Communicate clearly and effectively and with reason. 8. Utilize critical thinking to make sense of problems and persevere in solving them. 9. Model integrity, ethical leadership, and effective management. 12. Work productively in teams while using cultural global competence. CSDF 4-6.CT.4 Decompose a problem into smaller named tasks, some of which can themselves be decomposed into smaller steps. 7-8.DL.2 Communicate and collaborate with others using a variety of digital tools to create and revise a collaborative product.	Team meetings and work time throughout this phase for students to: ● Finalize idea for their App ● Develop their Model Card ● Develop their final presentation	Team meetings and other design notes in professional notebook	App Prototype Tool Code.org Lesson: Intro to App Lab Model Card Organizer

	7-8.DL.4 Select and use digital tools to create, revise, and publish digital artifacts. 7-8.CT.10 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences.			
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason. 12. Work productively in teams while using cultural global competence. CSDF 7-8.IC.5 Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals. 7-8.CT.10 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences. (planning & communication)	Lesson: Model Cards	Model Card Organizer	Model Card PPT Slides Example Model Cards ● LLaMA Model Card ● GPT-3 Model Card ● Face Detection ● Object Detection
	Career Ready Practice: 1. Act as a responsible and contributing citizen and employee. 2. Apply appropriate academic and technical skills. 4. Communicate clearly and effectively and with reason.	Final Presentation	Presentation Comment Cards Presentation Scoring Guide	

	5. Consider the environmental, social, and economic impacts of decisions. 6. Demonstrate creativity and innovation. 9. Model integrity, ethical leadership, and effective management. 11. Use technology to enhance productivity. 12. Work productively in teams while using cultural global competence. CSDF 7-8.CT.10 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences. (describe the whole process)			

UTICA CITY SCHOOL DISTRICT

Improving Health with AI: Ask Phase

Goal of Phase

In this phase, students will be introduced to the problem, set up their know/need-to-know chart, conduct some initial reading and research on artificial intelligence, consider their app's end user, and develop a problem statement for the type of app they want to design.

Teacher Notes & Preparation

Key Concepts and Big Ideas:

- Artificial Intelligence (AI) is an incredible tool for healthcare practitioners and people seeking to improve their health.
- AI relies on being "taught" using a process called machine learning (students will learn more about this in the next phase but be exposed to it a little in this phase).
- Empathy is an important part of the design process when we are designing solutions for people to use. Empathy Maps help us to think through what a person might need from a design solution. This unit will introduce Empathy Maps, which may be used for future projects.

Preparation Notes

- Determine how you want students to collaborate. We recommend teams of 2 – 4 students. It is helpful to consider student strengths when developing teams such as organization, creativity, leadership, and research skills.
- Students will need access to a computer and the internet for performing research.

Key Questions

- What is artificial intelligence?
- How is artificial intelligence used in our daily lives?
- How is artificial intelligence used in the healthcare industry?
- What is a health-related problem I can solve?
- Who experiences the problem I have?
- What additional information do I need to better understand this problem?
- How does my end-user experience this problem?
- What might an end-user need from a solution to this problem?
- What is the problem I am trying to solve?

Key Vocabulary

Artificial Intelligence - the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

Health – a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

Empathy – being aware of and sharing other people's emotions. To empathize we take on another's perspective, stay out of judgment, and recognize emotion.

Persona – a representation of your target user—their typical characteristics, challenges, and desires

Empathy Map – This is a collaborative exercise to gain a deeper understanding of the thoughts, needs, feelings, and desires of an individual or a group of people. This forces the investigating team to focus on the target group's requirements, rather than its own.

UTICA CITY SCHOOL DISTRICT

Map of Student Learning

Day	Learning Goals	Student Learning Tasks	Teacher Supports
1	Learning Targets: ● Project Launch and Task Analysis Career Ready Practice: 1, 9, 12 Power Skills Needed: ● Collaboration ● Self-Management ● Initiative ● Communication	**Project Launch** Lead students through the Lesson Plan: Project Launch. The goal is to excite and introduce students to artificial intelligence through something they may have already heard about or experienced. Students will be exploring AI-generated art and other AI apps. **Task Analysis & K/NTK** ● **Goal:** To introduce the problem, assign students to their design teams, and start capturing our knows and need-to-knows for this project. The Know/Need-to-Know (K/NTK) chart is a living document where students will track their learning throughout the project. ● Introduce the main goals of the project: To create an app that will solve a health-related problem using AI and machine learning technology such as the one they just explored. ● Give students the project scenario. ● Have them individually read the scenario and highlight key facts they will need for this project. ● Either give each student a copy of the Know/Need-To-Know chart or have them copy the chart into their professional notebooks. ● Teams will complete the K-NTK charts as a team, but everyone should write their information individually on their chart. ● Student teams first complete the Know column, “What do you know that will help solve this problem?” First, they start by sharing important facts from the project scenario, then add their personal background knowledge about the topic. ● You may want to pause and have each student group share one thing on their KNOW column that gets collected on a class K/NTK Chart ● Student teams then develop questions for their project, “What will you need to know to solve this project?”	If time is short, consider using the games in the Lesson Plan: Project Launch to start a conversation about AI and what it can do. The lesson will have students either explore an online AI art generator or play with other AI tools. You will need to determine which direction is best for your school's internet constraints and rules. As students work through the K/NTK chart, help them pull out information from the project scenario they need to solve the problem and put this in their Know column. Help students bring in prior knowledge they may have about artificial intelligence and different health apps they may have used or heard about. Encourage students to be curious and ask questions as they fill out the NTK column. “What information might we need to know to develop a health-related app that uses AI?” Students will revisit this chart several times throughout the project to track their learning and progress. It also helps to have a class Know/NTK chart

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
		o If students struggle with developing questions, you can use a question chart to support them in developing questions. ● Ask students to go through their questions and pick the top three questions that will need to be answered right away. ● Have each group share one question. If their top question was answered, they can share their 2nd most important question, and so on. ● After each group has shared one question, open it up for anyone to share questions relating to the project. ● Ask students to write any questions they did not consider on their NTK chart. **Team Contracts**: Team contracts can help student groups consider how they will work together and give the teacher a starting point for helping groups work through issues that may arise. ● Introduce the concept of a team contract. ● Give each team a copy of the team contract to complete. ● Students will work within their team to write up the contract in how they will work together. In each section, ideas are provided, however, students can write on their own. ● Students will submit their contracts for teacher approval then each student will sign them. ● If possible, make copies of the contract so each student has a copy and the teacher keeps a copy. When there are issues, refer to the contract and help students work through their challenges based on what they decided they would do.	on a wall or on a class Learning Management System (such as Google Classroom) that can be a class visual for their progress through the project. Use the NTK to see what questions students are asking and how future activities will help them to answer those questions. A team contract with example roles and ideas for collaboration. Feel free to change roles or ideas that best fit your students and the learning culture of your classroom.
2	Learning Targets: ● Define artificial intelligence (AI). ● Explain how AI is used in our daily life. ● Explain how AI is used	Lead students through the Lesson Plan: What is AI? – Students will develop a connected definition of Artificial Intelligence by reading and exploring various resources. The goal of this lesson is for students to develop a working definition of artificial intelligence and summarize how artificial intelligence is used in the healthcare industry.	If you can't get the Art Bot Game to work on your school computers. Skip it. The readings are helpful to focus on because they give positive aspects AI in health Care.

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
	in the healthcare industry. Career Ready Practice: 1, 2, 4, 12 Power Skills Needed: ● Perseverance (especially as it relates to reading technical articles) ● Collaboration ● Self-Management ● Communication ● Adaptability		Students will engage in academic reading and discourse with texts on AI in different health-related contexts. The reading strategies presented in the lesson plan are Jigsaw Reading, GIST Summary, and Literacy Group Discussions.
3	Learning Targets: ● Determine a health-related problem to solve. ● Research potential health-related problems to solve in their local community. Career Ready Practice: 1, 3, 8, 9, 12 Power Skills Needed: ● Collaboration ● Professionalism ● Problem-solving (beginning stages) ● Self-Management ● Initiative ● Communication	**Health Chalk Talk** (visit the link for more information on the "Chalk Talk" Protocol) ● **Goal:** To engage students in thinking about all things related to health so they can brainstorm possible problems to solve. ● Write the word health on two pieces of banner paper and hang it in the room or along the hallway where students can easily access it and write on it. ● Divide the class in half and give them a marker or other writing utensil. Half the class will start at one banner, and the other at the other banner. ● Ask students to silently write or draw anything that comes to mind when they think of "Health". They can write or draw anywhere on the banner. Encourage them to read or connect to what other students are saying. ● After 5 minutes, ask students to switch banners. This time they need to add to what other students said on the chart or write about a topic that is not already up on the chart. ● Lead a whole class discussion on themes that came up. (Examples include: fitness, food, doctors, diseases, etc).	The Chalk Talk is a protocol to get students' thinking on paper while also sharing ideas with the rest of the class. As students brainstorm, circulate and engage students to write down all ideas. Remind students of the 7 Rules of Brainstorming introduced to them in the Community Health Plan Project. As students choose a direction for a problem to solve, they may consider choosing one of the community health problems they focused on in the first project and expanding on that for this project. For example, if a problem was motivating people to exercise more, they

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
		Team Brainstorming – Determining a Focus Problem ● In their design teams, considering all the different topics they came up with in the chalk talk activity, students brainstorm possible problems they would like to solve relating to health. ● If they need some help, give them some examples such as: o Front office triage o Athlete training o Nutrition o Healthy Goals o Mental health (Chatbot for advice) o Behavioral Health (For example Diabetes - monitor blood sure and make decisions on diet) ● After they have come up with at least 5 ideas (or more), have students rank them in order of excitement (what are they more passionate about solving, what are they least passionate about solving) ● Ask students to choose one of the ideas they want to explore further. ● Students share the idea they want to explore further with the class and submit it to the teacher for approval. **Revisit K/NTK** ● Once their idea is approved by the teacher, students revisit their Know/NTK chart. ● To their Know column students add: o What new knowledge do we have about artificial intelligence? (Based on previous lessons) o What knowledge do we have about our chosen problem? ● In their NTK Column students: o Check off questions that have been answered. o Add new questions they will need to answer to better understand their problem.	may consider an AI-infused health motivator app.
4 – 5	Learning Targets:	Lead students through the Refining Research Questions Lesson Plan. Students will learn a technique for developing research questions. They	This lesson will build upon the research skills from the first

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
	• Research potential health-related problems to solve in their local community. • Understand the needs of a person who is connected to the problem being solved. Career Ready Practice: 1, 2 (literacy), 4, 5, 7, 8 (research stage), 9, 12 Power Skills Needed: • Perseverance • Collaboration • Professionalism • Problem-Solving • Self-Management • Integrity • Communication	will use these to learn more about their problem and how people are affected by the problem. This research will be used in the next lesson on Empathy Maps.	project in this health professions module. Students will use the same Inquiry Chart and can use their skills of keywords, Boolean search strings, and reliable sources.
6 – 7	Learning Targets: • Understand the needs of a person who is connected to the problem being solved. • Develop a problem statement for a health-related problem. Career Ready Practice: 1, 8, 9, 12 Power Skills Needed: • Perseverance	Lead Students through the Empathy Map Lesson Plan. This will guide students to unpack their research and develop an understanding of what people may need in an App. **Defining their Problem** • In student teams, students revisit their K/NTK Chart: o Add new Knows o Check-off answered questions or Need-To-Knows o Add new questions or Need-To-Knows • Students develop a problem statement for their app. If needed, give them the following sentence prompt to help them frame their words, *"We are designing an app for <insert a description for who the app is for>. The app will solve the problem of <insert*	This lesson will help students unpack their research and give them another design thinking tool to use in future projects.

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
	• Collaboration • Problem-Solving • Self-Management • Initiative • Communication • Self-Awareness	*description of the problem>."* • Students turn in the problem statement for feedback and approval from the teacher.	

UTICA CITY SCHOOL DISTRICT

Improving Health with AI: Imagine Phase

Goal of Phase

In this phase, students will be introduced to machine learning and how bias can creep into machines based on the data. Students will brainstorm ideas for their app and begin considering what data they will need to "teach" their app to minimize bias.

Teacher Notes & Preparation

Key Concepts and Big Ideas:

- AI systems learn by being fed data and given guidance on how to use that data.
- AI systems use data analysis algorithms to analyze and process data to make decisions.
- Bias can creep into AI systems because the data used to teach the AI system initially may rely on human decisions. They may also become biased due to not having the right data or faulty initial assumptions.
- Bias in health-care-related systems can lead to improper treatments and poor health outcomes for marginalized groups of people.

Preparation Notes:
Throughout the next few lessons, students will engage in a cycle of brainstorming ideas, learning more about AI, and adding to their brainstorms. Students will need encouragement to add to their ideas and not get stuck on their first idea. A Prototype Graphic Organizer has been provided for students to start capturing the look of their app or different screens of their app. You may want to have enough printed for students to use as needed and tape or glue it into their notebooks. It is also recommended that students have access to colored pencils or markers so they can get as creative as they want with their designs.

This phase is where students will use two lessons from code.org to learn more about machine learning and bias in medical systems. If you have not already set up accounts, you will need to provide time for your students to do so in class. You can access the materials through the following navigation tree: www.code.org > Teach at the top left > Full Course Catalog for High School (scroll down a little and on the right-hand side) > Explore the AI Module. Students will also need to create an account to access the materials.

Key Questions

- How do machines learn?
- What are ideas that I have about my health-related app?
- What is bias?
- What are examples of bias within the AI and programming fields?
- How do artificial intelligence systems become biased?
- How can we minimize bias in our designs?
- How do artificial intelligence systems use data to learn?
- What data might we need to collect to help our machine learn?
- Where can we find potential data sources?

Key Vocabulary

Machine Learning – the use and development of computer systems that can learn and adapt without following explicit instructions, by using algorithms and statistical models to analyze and draw inferences from patterns in data.

Bias – When a decision favors some things and de-prioritizes or excludes others (code.org); a phenomenon that occurs when an algorithm produces results that are systemically prejudiced due to erroneous assumptions in the machine learning process.

• How can I safeguard against bias in my machine-learning model?	**Data** – the quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media. **Big Data** – larger, more complex data sets, especially from new data sources. **X-Y plot (also known as a scatter plot)** – graphs numerical data pairs, with one variable on each axis, show their relationship. **Bar Graph** – a diagram in which the numerical values of variables are represented by the height or length of lines or rectangles of equal width. **Algorithm** – a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer

Map of Student Learning

Day	Learning Goals	Student Learning Tasks	Teacher Supports
7 - 8	Learning Targets: • Define machine learning. • Compare and contrast different methods of teaching an app. • Describe a process for how data is used to teach an app. • Apply their knowledge to brainstorming ideas for their app. Career Ready Practice: 1, 2, 4, 5, 6, 9, 11, 12 Power Skills Needed: • Collaboration • Professionalism	**Team Brainstorming Session 1** • **Goal**: Give students time to draw and write down initial ideas they currently have for or about their app. • Students meet in their design teams and brainstorm ideas for their app. This may take different forms depending on where the group is in their thinking. • Student groups who are wanting to plan what the app will look like or what elements they want in their app, can use this App Prototype Canvas. • Some student groups may prefer to write ideas in a list format in their professional notebooks about what they want to include in their app. Lead students through the Teaching Machines to Think Lesson plan. This lesson is meant to help students develop an understanding of how machines learn about how user input can guide the learning process	This initial brainstorm is to get some initial ideas on paper. It will be important to remind students they will add to their ideas as they learn more about machine learning and AI. In the Teaching Machines to Think Lesson, students will use a lesson from the Code.org AI course to better understand how machines learn. Students will also use small group discussions to process through aspects of machine learning. This is a good lesson to break up design groups and have students work with other students.

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
	• Self-Management • Communication • Self-Awareness		Teaching Machines to Think requires Code.org. This one uses the Fish Lesson which is a good one to introduce students to AI in general.
9 – 10	Learning Targets: • Explore an example healthcare app and determine the bias within the system. • Explain how artificial intelligence systems become biased as part of the machine learning process. • Explain the problem with bias in health-related AI systems. • Brainstorm ideas for how to prevent bias in their systems. Career Ready Practice: 1, 2, 4, 5, 6, 8, 9, 12 Power Skills Needed: • Perseverance (reading difficult texts) • Collaboration • Professionalism • Self-Management • Communication • Self-Awareness	**Team Brainstorming Session 2** • After learning about how machines learn, students return to their brainstorming ideas and add, "What are things our app will need to learn? What data or information might we need to teach our machine?" • Use the App Prototype Canvas as needed to help students visualize their design ideas. Lead students through the Machine Learning Bias Lesson Plan. The goal of this lesson is for students to understand how artificial intelligence systems become biased and develop an understanding of the bigger problem of bias in current healthcare systems	As students brainstorm encourage them to add information from the previous lesson. They should start thinking about data they might need to collect or reference or what might be a way to teach their app. In the Machine Learning Bias Lesson plan, students may delve into sensitive conversations about social and racial inequities that mirror machine learning bias in AI Health-Related Systems. This link provides some sentence stems for agreeing and disagreeing with each other respectfully. These can help teach students how to have productive discussions around sensitive topics. This lesson also relies on access to another lesson in the AI course on Code.org Machine Learning Bias Lesson uses the Triage App which helps students understand

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
			where bias creeps into AI systems. Also the articles in here are worth exploring because they give the cautions with using AI in health care and can be a good contrast to the earlier articles.
10	Learning Targets: ● Apply their knowledge to brainstorming ideas for their app. Career Ready Practice: 1, 5, 6, 8, 11 Power Skills Needed: ● Collaboration ● Professionalism ● Self-Management	**Artificial Intelligence Experiments Exploration** ● **Goal:** At this point, students have explored some AI apps but still may lack some experience. This is meant to give them some fun after deep conversations while building their experience with AI apps that are out there and what they can do. ● Note: Most of these apps are not health-related but will be interesting for students to play and allow them to discover what might be possible with artificial intelligence. ● Have students explore some current Artificial Intelligence Experiments. Encourage them to have fun with this. o AI Experiments with Google o 10 AI Experiments to Try Online ● In their professional notebooks, students pick 1 or 2 apps to record the following information: o What problem do you think the app is trying to solve? o What data do you think is the app using to learn? o Is there a potential for bias? If so, what? ● Students search online for health-related apps that solve the problem they are looking to solve. They each should find one example and take notes in their professional notebooks about the app. **Team Brainstorming Session 3** ● After learning about how bias can develop in an AI system and doing some exploration of apps online, students return to their brainstorming ideas and add, “What type of data might we need	This is meant to give students more experience with AI apps and have some fun to break up the monotony of the project. As students are exploring and having “Aha” moments, encourage them to write down their ideas and thoughts. These give great games and experiments for students to try out some new AI tools.

UTICA CITY SCHOOL DISTRICT

Day	Learning Goals	Student Learning Tasks	Teacher Supports
		to collect? What are the possible scenarios of how people will use our app? What do we need to be careful of to represent all potential users? • Use the App Prototype Canvas as needed to help students visualize their design ideas.	
11 – 12	Learning Targets: • Collect example health-related data and use a graph to visually represent the data. • Analyze data visually to make inferences. • Explain how AI systems use data to learn and make decisions. • Explore big data sets that might be used to teach their AI system. Career Ready Practice: 1, 2, 4, 5, 6, 8, 9, 11, 12 Power Skills Needed: • Perseverance (with math) • Collaboration • Professionalism • Self-Management • Communication	Lead students through the Artificial Intelligence Data Lesson Plan. This lesson gives students a simulation of how AI systems use data through pattern recognition. Students will practice data collection and graphing skills. Students will then explore data banks that can be used for their AI systems. **Team Brainstorming Session 4** – Final Brainstorming session before moving on to the planning and creating phase. • After learning about data, students discuss and brainstorm what data they will need to collect to teach their app. • Students use the App Prototype Canvas to brainstorm how their app will look. **Revisit K/NTK Chart** • In student teams, students revisit their K/NTK Chart: o Add new Knows. o Check-off answered questions or Need-To-Knows. o Add new questions or Need-To-Knows.	This is another lesson where student teams can be mixed up and they can work with students outside their design team. This is a math-focused lesson so be mindful of how students relate to math. It is recommended to put students in like-ability math groups so you may target student groups who need more help.

UTICA CITY SCHOOL DISTRICT

Improving Health with AI: Plan/Create/Improve Communicate Phase

Goal of Phase

Students will learn about model cards and how they are helping to provide transparency to the “brains” of an AI-embedded system or App. Students will finalize their App ideas and get ready for their final presentations. Finally, students will present their App ideas to an authentic audience.

Teacher Notes & Preparation

Key Concepts and Big Ideas:

- Model cards are an industry-standard document that details what goes into an AI-embedded system or App. These are helping the industry to have some transparency in how they are working to minimize bias within AI systems.

Preparation Notes:

In this part of the process, student teams may be at different points and may have different needs or expectations for an end product. This project intends to give students experience with how designers develop artificial intelligence systems and use data to teach those systems. Moreover, the project helps students to develop an understanding of how bias can develop within a system and consider factors for how this can happen and what can be done to prevent it. It is not expected for students to code their apps, but rather for students to be able to communicate their ideas as though they are seeking the “go ahead” from a supervisor to develop the app further. At the beginning of this phase, students will be asked to develop a to-do list to finalize their app idea and develop their pitch along with who will be responsible for each item.

On the last day students will present their work to their classmates and, if possible, an outside audience. Possible outside audiences include students from other classrooms, other teachers or administrators in the building or district, or business or community partners. Since this is an IT-and health-related project, you might consider involving your IT department, or school nurse, or reaching out to a local high school that has an IT, Computer Science, or health career pathways and invite the teacher/s and a selection of students to come to your school as an audience.

Key Questions	Key Vocabulary
● What will our look and feel like? ● What will our app do? ● How do model cards help to minimize bias? ● What information will I need to put on my model card to explain my App Idea? ● How can we best communicate our design ideas to an outside audience?	**Model Card** – It provides a concise, holistic picture of a machine learning model. A model card explains what a model does, its intended audience, and who maintains it. A model card also provides insight into the construction of the model, including its architecture and the training data used.

UTICA CITY SCHOOL DISTRICT

Map of Student Learning

Day	Learning Goals	Student Learning Tasks	Teacher Supports
13	Learning Targets: ● Narrow down design ideas and develop one pathway forward to develop their app. Career Ready Practice: 1, 4, 8, 9, 12 Power Skills Needed: ● Perseverance ● Collaboration ● Professionalism ● Problem-Solving ● Self-Management ● Initiative ● Communication	**Team Meeting – Finalize Ideas for their App** ● **Goal**: This is a time for students to reconnect as a team, narrow ideas down to one direction, and start working on tasks to communicate their model. ● Students meet in their design teams and review their brainstorming and notes from the prior phase. As a team, students need to plan a direction for their app. They will need to determine: o What will the app look like? This may include sketches of each page of the app. If they have several connecting pages, students will need to show the connections on their plans. They can use the App Prototype Canvas to show their final plans with arrows and notes showing the connection between pages. o What inputs will they need to get from the user? (i.e. What information will the app need to collect to provide the outcome). Students may want to discuss and plan using sticky notes so they can sort through their thinking. o What outputs will the app give to the user? (i.e., What will the app do? What decisions will the app need to perform with the data?). Students may want to discuss and plan using sticky notes so they can sort through their thinking. o Students take notes in their professional notebooks. If they use sticky notes to write down and sort ideas. Their final ideas can be taped into their professional notebook. They will use this information in the lesson on Model Cards.	Depending on your students, you may need to provide more whole-group guidance such as setting a timer and expectations for each of the tasks that need to be discussed. Or you can set the expectations and rotate around and support groups who need extra help thinking through each bullet.

UTICA CITY SCHOOL DISTRICT

14	Learning Targets: ● Understand how model cards are used by the AI industry to communicate the design of their AI systems. ● Determine what information will need to go into their model card to communicate their App idea. Career Ready Practice: 1, 2, 4, 12 Power Skills Needed: ● Perseverance ● Collaboration ● Professionalism ● Self-Management ● Communication	**Model Card Lesson** ● **Goal:** Model Cards are used in the AI industry to provide transparent communication on how their AI systems operate, what data they provide for machine learning, and how that data is used to improve processes.	This lesson will introduce Model Cards to students. They will explore some examples and be introduced to what is expected to write their model card.
15 – 17	Learning Targets: ● Develop a polished visual of my app design. ● Determine the data needed to teach your AI system. ● Write a model card to communicate the design of your app. ● Develop a pitch to communicate your	**Team Meeting & Worktime** ● Once they have a consensus on what their app will be and will do, students need to determine who will lead each task to communicate their idea. o Task 1: Take the team's notes and produce a final, polished visual of the app to show in their presentation. This can be a digital drawing using a tool such as PPT, word, publisher, MS Paint, or a similar tool. If students are comfortable with coding or want to stretch themselves, they may want to try Code.org's App Lab. Once they log in and go to App Lab, students can click on "design" to access visual tools to create a rendering	This project does not require students to code or develop their App beyond visuals; however, you may have some groups who want to go deeper. Code.org's App Lab is a great tool for creating professional visuals of their app and creating basic commands. Code.org's Introductory lesson on their App Lab can be an additional resource for students to work through and learn how the App Lab works.

	design idea to an outside audience. Career Ready Practice: 1, 2, 4, 5, 6, 8, 9, 11, 12 Power Skills Needed: ● Perseverance ● Collaboration ● Professionalism ● Problem-Solving ● Self-Management ● Integrity ● Initiative ● Communication ● Adaptability ● Self-Awareness	of their app. o Task 2: Explore data sites to see if there is data that can be used for their machine learning, or determine how and whom they will collect data from to minimize bias in their app. o Task 3: Complete the model card in paragraph format including any visuals about or relating to their App idea. Students may use this model card graphic organizer to help plan what information will need to be included in each section of their model card. Students can also add their section as needed to better explain their unique app and problem. ○ Task 3: Write the 3 – 5-minute pitch for their design idea and develop slides or other visuals for their final presentation. The presentation should include: a summary of the problem, their final solution, and an explanation of the data they will need to collect (Each person will still be responsible for presenting) ● Remind students that while each student in a team owns one part of the work, they are all expected to help each other. There may be a point when they are waiting on materials from one student before they can finish their task. In that case, they will need to check in with that student to see what they need and how they can help.	
18	Learning Targets: ● Deliver a pitch of your design idea to an outside audience. Career Ready Practice: 1, 2, 4, 5, 6, 9, 11, 12 Power Skills Needed: ● Perseverance	**Presentation** ● The original scenario has students presenting their app to the “Vice President of the software company” (you) and the local health community. Ideas for who this might be are included in the teacher’s notes. ● Presentation Comment Cards – these cards are provided to give informal feedback to students about their design and how they might improve their design ideas should they move toward creating their app. These can be used by you and any visiting partners to provide feedback to students on their design ideas.	

	● Collaboration ● Professionalism ● Self-Management ● Communication	● You may also use this presentation rubric to provide more formal feedback to students on their presentation skills. **Celebration** Students have worked hard, so do something that celebrates the hard work they have put into this project. This is also a good time to have students share verbally what they liked about this learning experience and what can be improved upon for next time.	