

AI Dearborn Capstone Project

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Guiding Question: Does air affect animal populations in Dearborn?

Grade Level/Subject: 6th Grade Science

Science Learning Objectives:

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Source: [Michigan Science Standards](#)

Technology Learning Objectives:

- **Empowered Learner:** Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.
- **Knowledge Constructor:** Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

Source: [Michigan Technology Standards \(MITECS\)](#)

Source: [ISTE Standards for Students](#)

Background: Dearborn was founded in 1786 and later incorporated as a city in 1929. It is the 8th largest city in the state and the second largest in Wayne County - only Detroit is larger. There are more than 109,000 residents in Dearborn. Dearborn is recognized historically as the birthplace of Henry Ford. Henry Ford helped to bring auto and steel manufacturing to this region, and most prominently, the city of Dearborn as it is the world headquarters for the Ford Motor Company.

Source: <https://cityofdearborn.org/about-dearborn>

During the late 1990's and early 2000's, Dearborn looked deep into the impact that industry and business was having on the local environment. Two major focus areas

were targeted for improvement - air quality and water pollution. In 1992, Dearborn industries released approximately 20, 660 pounds of toxic waste directly into the Rouge River. The Rouge River runs through Dearborn and is home to numerous species. Pollution to this river has had a negative impact on living things in this habitat. Consequently, several grassroots organizations became involved in cleaning up the Rouge River in order to help the living things that are a part of this ecosystem. While this type of pollution can be visible with its effects, the impact of air pollution might be more difficult to see.

Source: Hassoun, Rosina. 1995. ACCESS Environmental Program: Major Industrial Sources of Pollution in Dearborn, Toxic Release Inventory Data, Preliminary Report.
(<http://websites.umich.edu/~snre492/berry.html>)

As a result of the industrialization in Dearborn, air pollution levels increased over time. Despite the passing of the Clean Air Act, Dearborn is still a part of Wayne County, which has been recognized as having higher than normal levels of air pollution. Several types of particulate matter and ozone are the major contributors to the air pollution in Dearborn. The Air Quality Index has been used to track the air quality in the city of Dearborn and provides updates on the major causes of air pollution.

Source:

<https://arabamericannews.com/2020/02/21/dearborn-listed-among-most-polluted-cities-in-the-u-s/>

While there has been some debate about the improvement or worsening of the water pollution and air pollution, many citizens are concerned about their health as well as the health of organisms living in the native habitats around the city of Dearborn. In this unit, we will explore the health of the organisms living in Dearborn using Artificial Intelligence to support our investigation!

Unit Goal: We will use Artificial Intelligence and hands-on learning experiences to explore how air pollution affects animal populations in Dearborn.

Artificial Intelligence is an emerging field of study that combines elements of computer science, mathematics, the arts, speech & language processing and response, behavior analysis, and engineering. These elements are combined to create intelligent systems that can learn and adapt over time, as well as use available data and information to interact with humans in natural ways. AI systems can be used for a variety of tasks, including problem solving, pattern recognition, decision making, and even autonomous learning. We will be using several of these AI systems to enhance and extend learning about the impact of air pollution on organisms living in Dearborn's habitats.

Students will explore each of the activities below during the project in order to learn more about the impact of air pollution on organisms in our city and create a Google Slides Presentation as they go through each activity in this unit.

Whole Class Activity: Investigating air pollution in our community

1. Using a blank notecard, carefully apply petroleum jelly on one side of the notecard. On the other side of the notecard, use tape so that it can stick to a window. Affix the notecard to the window outside in an undisturbed area.
2. Using a blank notecard, carefully apply petroleum jelly on one side of the notecard. On the other side of the notecard, use tape so that it can stick to the air handlers in the classroom. Affix the notecard to an area close to the air handlers in an undisturbed area.
3. Students will predict what they might see collected in the petroleum jelly outside and inside. They will consider if there is any particulate matter or natural pollution. Students will also predict if the air quality is worse inside or outside.
4. After 2 days, the teacher will show students the notecards and will place a cross section of each notecard under a microscope so students can look for any particulate matter or natural pollutants from each area. Students will write in their [Google Slides](#) presentation about what they see from the microscope view of each notecard and describe their findings.

Activity 1: Using Chat GPT to determine what impact might air pollution have on living things

1. Students will go to Chat GPT and type in the following question:

A. *What impact does air pollution have on living things?*

A sample response from this prompt is indicated below:

Air pollution can have a wide range of negative impacts on living things, including humans, animals, and plants. Some of the impacts of air pollution include:

1. Respiratory problems: Air pollution can cause a range of respiratory problems, including asthma, bronchitis, and lung cancer. The fine particles and gasses in polluted air can irritate and damage the lungs, making it harder for people to breathe.
2. Cardiovascular disease: Exposure to air pollution has been linked to an increased risk of cardiovascular disease, including heart attacks and strokes. This is because air pollution can cause inflammation and damage to the blood vessels, making it harder for blood to flow through the body.
3. Cognitive impairment: Air pollution has also been linked to cognitive impairment, including memory loss and reduced attention span. This is because air pollution can cause inflammation and damage to the brain.
4. Damage to crops and forests: Air pollution can also harm crops and forests, reducing

their growth and productivity. This is because pollutants can damage plant cells and interfere with photosynthesis.

5. Harm to wildlife: Air pollution can also harm wildlife, including birds, fish, and insects. Polluted air can contaminate water and soil, reducing the availability of food and habitat for wildlife.

Overall, air pollution can have significant negative impacts on living things, affecting their health, growth, and survival. It is important to take steps to reduce air pollution in order to protect the health of people, animals, and the environment.

Source: <https://chat.openai.com/?model=text-davinci-002-render-sha>

2. Students will read and review the response they received. Students will examine the accuracy of the indicated impact.
3. After reviewing the information on the impact on living things, they will briefly indicate 3 facts that they learned that would apply to living things that live in Dearborn by identifying which animals/species and how they would be impacted in their [Google Slides](#) Presentation.

Activity 2: Trends in Air Pollution

1. Students will go to [Google Trends](#).
2. Students will type in Air pollution impact pollution impact for the search. Students will also focus their search on Michigan.
3. Students will respond to the following:
 - a. Are there any trends in air pollution currently impacting Dearborn?
 - b. What level of interest is there in air pollution in Michigan?
 - c. Were there any related topics that relate to potential issues in Dearborn?
4. Students will respond to the questions above in their [Google Slides](#) Presentation.

Activity 3: Machine Learning: The Impact of Global Warming

1. Students will go to [Planetary Rescue](#). This teachable machine is an instructional game that allows students to build an understanding as they train an intelligent teachable machine to make decisions about global warming.
2. The teacher will demonstrate how to make connections between topics to teach the machine how global warming impacts the food web and animal migration.
3. The teacher will state that machine learning from the teachable machine takes place when a computer is given a sample set of data so that it can use the data provided to find patterns and make associations between data imputed and then draw conclusions without the user providing specific instructions.
4. Students will explore the use of the Planetary Rescue teachable machine in order to build on their understanding of the food web and migration due to the

impact of global warming.

5. Students will record their key learning points in their [Google Slides](#) presentation.

Activity 4: Teachable Machine for Air and Water Pollution

Google's **Teachable Machine** will be used by students to train their own machine learning model using images to distinguish between air and water pollution. The teacher will explain that Google's Teachable Machine is a **machine learning model**. A machine learning model represents mathematically a dataset with content added by the user, which can be used to support AI reasoning and problem solving.

1. Students will watch the video to learn what a teachable machine is.
2. Students will locate and add 2 classes of pollution: air pollution and water pollution in the teachable machine.
3. In each class, students will add at least 5 different pictures representing each type of pollution.
4. Students will test their teachable machine by using other pictures of air and/or water pollution.
5. Discussion (Students will also respond in their [Google Slides](#) presentation): Was your teachable machine able to accurately distinguish between test pictures of air pollution and water pollution? Was there any bias towards one type of pollution picture used as a test? Why do you think Google's Teachable Machine might misidentify a type of pollution?
 - a. Be prepared to discuss image sample size and image stereotypes as examples of bias.
 - b. A sample of this teachable machine is located here:
https://teachablemachine.withgoogle.com/models/u_9WmYqDS/

Activity 5: Predict the future impact of pollution in the city of Dearborn

1. Students will go to <https://deeplearninggenerator.com/>.
2. The teacher will explain that Deep Dream Generator is an AI-powered text-to-image tool.
3. Students will create a picture of the impact of pollution on the City of Dearborn some time in the future. The students will need to choose key words to have in the picture along with the style and should focus on living things impacted by air pollution.
4. Students will generate their picture and copy it into their [Google Slides](#) presentation. Students will analyze their output to determine if the picture looks plausible or not and should indicate what makes the picture plausible or why it is not accurate.



5. Example:

Students will use the linked [Google Slides template](#) to respond to each of the activities.

Rubric:

Content: Impact of Air Pollution			
Advanced (4)	Proficient (3)	Partially Proficient (2)	Not Proficient (1)
Air pollution impact analysis contains a significant number of key details. Responses to prompts are logical and are cited from the research and accurate use of AI technology. Additional research is conducted and other sources are cited and accurate for content.	Air pollution impact analysis contains several key details. Responses are logical and are cited from the research and accurate use of AI technology.	Air pollution impact analysis contains minimal details. Some of the responses to prompts may be incomplete and source content may contain some errors.	Off topic or no air pollution impact analysis given.

Product: Impact of Air Pollution

Advanced (4)	Proficient (3)	Partially Proficient (2)	Not Proficient (1)
<p>Project is highly detailed and contains proper formatting, grammar, and content is on-topic. There is evidence the content was researched through the product and additional research beyond the provided links were used. Charts, graphs, graphics, sound effects, interviews, and/or other source material is added to enhance the final product.</p>	<p>Project is detailed and contains proper formatting, grammar, and content is on-topic. There is evidence the content was researched throughout the product and AI technology was used to assist with content creation.</p>	<p>Product contains minimal details. Writing, slides, or AI generated media may be incomplete or partially complete.</p>	<p>Product is topic or no content is related to the project objectives.</p>