AI FOUNDATIONS

CURRICULUM OVERVIEW

13 Lessons

Grades 3-9 | Ages 8-14

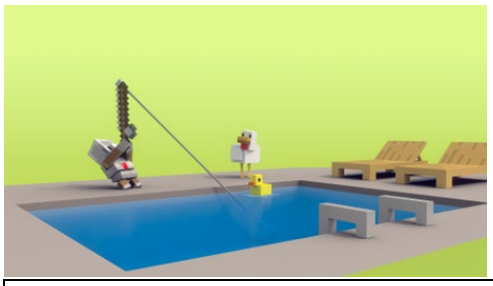
Includes:

- Summary
- Framework and learning objectives
- Lesson design and instructional materials
- Curriculum overview
- Instructional sequence
- Educational standards
- Computer Science concepts
- AI Foundations glossary
- More resources

AI FOUNDATIONS

In an era where artificial intelligence (AI) is rapidly transforming every aspect of our society, from healthcare and education to entertainment and personal communication, AI literacy has become an essential skill for the 21st century. **AI Foundations is an AI Literacy collection** for students in Grades 3-9 | Ages 8-14. Students will learn, practice, and apply relevant AI skills and concepts in both unplugged and digital experiences.

AI Foundations is designed to empower students with learning experiences and activities to gain ***the knowledge, skills, and critical thinking abilities necessary to understand, use, and evaluate AI technologies responsibly and effectively.*** The AI Literacy learning resources within the AI Foundations learning progression align to the progression and framework of competencies below.

INTRODUCE AI	INTEGRATE INTO CURRICULUM	CONNECT TO COMPUTER SCIENCE
		
AI Adventurers Build understanding and curiosity with this animated video series & guides for educators and families/ • 3 short videos • Parent discussion guide • 3 classroom-ready lesson plans	**AI for Earth** Explore applications of AI in real-world scenarios with **AI for Earth**. Use AI to preserve wildlife and ecosystems, helping people in remote areas and research climate change.: • 5 standards-aligned lesson plans • 5 immersive worlds	**AI for Hour of Code** Explore responsible AI and solve puzzles in two **one-hour coding tutorials** • 2 coding tutorials created with Code.org in Block or Python • Teacher guides and lesson plans • Video walkthroughs and fun trailers

UNDERSTAND HOW AI WORKS

PRACTICE PROBLEM SOLVING WITH AI

SAFETY & RESPONSIBLE AI

BUILD CREATIVITY, COLLABORATION, CRITICAL THINKING SKILLS

MAKE COMPUTER SCIENCE CONNECTIONS

FRAMEWORK & LEARNING OBJECTIVES

AI literacy is essential for K-12 educators to guide students in a world increasingly shaped by AI. It equips them to prepare students for future careers, foster critical thinking about AI's implications, and empower ethical and responsible AI use. With AI Foundations. educators can integrate AI Literacy into their teaching, inspiring innovation and preparing students to navigate an AI-driven future.

The learning objectives are built **on three fundamental pillars**:

1. Understanding AI: Grasping the core concepts, history, and potential future developments of AI.
2. Using AI: Developing practical skills in data literacy, safe and responsible AI tool usage
3. Evaluating AI: Cultivating critical thinking skills to assess the ethics, impact, and reliability of AI systems.

By addressing these three areas, AI Foundations aims to create well-rounded AI-literate youth who can navigate and contribute to an increasingly AI-driven world.

Learning Objectives:

Understanding AI	Using AI		Evaluating AI
Define AI • Explain what AI is in simple terms • Identify common AI applications in everyday life	Explore AI Applications • Analyze real-world uses of AI in various fields • Discuss how AI can address global challenges	Develop Coding Skills • Write simple algorithms • Debug basic code • Use loops and conditionals in programming	Evaluate AI's Impact • Discuss how AI is changing different industries • Consider AI's influence on future careers • Reflect on personal experiences with AI

Understand Key AI Concepts	Practice Data Skills	Create AI Projects	Apply Ethical Thinking
• Describe pattern recognition and its role in AI • Explain basic machine learning principles • Identify different types of AI	• Collect and organize data for AI use • Interpret simple data visualizations • Use data to make basic predictions	• Design a simple AI solution for a real-world problem • Collaborate with peers on AI-related tasks • Present AI project ideas effectively	• Identify potential biases in AI systems • Discuss responsible AI practice • Consider privacy and safety in AI applications

LESSON DESIGN

Each EDU guide contains multiple activities that are intended to be taught over the specified number of sessions (explained in the **Instructional Sequence** part of this document); however, you should use discretion and modify/adapt the lesson activities based on your students' needs and abilities. Within the lessons, the instructional sequence will contain three parts correlating with the gradual release model:

Direct Instruction—Teacher-Directed, "I Do"	In the first step, the teacher introduces and models the appropriate way of performing the skills included in the new concept being taught.
Guided Instruction—Teacher Modelling, "We Do"	After the teacher models the correct way to understand or perform the new concept being taught, the teacher will guide the students as they work through some examples together.
Independent Practice—Teacher Support, "You Do"	This step is where students demonstrate their initial level of understanding of the new concept being taught through independent practice.

INSTRUCTIONAL MATERIALS

Curriculum Overview	That is this document you are reading now! This will provide you with insight into the curriculum and what is taught within the curriculum.
Educator Guides (EDU Guides)	An educator's guide is provided for each of the lessons. The guide provides a high-level overview of the lesson, learning goals, standards addressed, required preparation for the activities, the lesson plans for the activities, and any additional materials needed.
Classroom Presentations	Each unit is supported by its own PowerPoint presentation to provide structure and guide the educator through the activities for the lesson.
Formative Assessments	After each lesson in the EDU guide, there is an opportunity to check for student understanding of the concept taught within the lesson.

	These formative assessments are typically comprised of 3-5 questions directly related to the learning that just took place.
Summative Assessment	At the end of the entire lesson sequence, students will be provided with a performance-based task to demonstrate their new knowledge and skills learned throughout the AI Foundations unit. This performance-based task can be assessed using the provided rubric.

CURRICULUM OVERVIEW

Level: Grades 3-12 | Ages 8-18

Essential Question: How is AI impacting our current lives and how will it impact our future?

Overview

Artificial intelligence is a computer or software that mimics the human way of thinking, such as learning and problem-solving. From driverless cars to robots who beat humans at Chess and Jeopardy, the field of artificial intelligence is one of the most exciting and promising areas of computer science. The art and science of crafting programs that mimic, and even surpass human intelligence, is tremendously important. However, there are also some ethical questions, and fears when it comes to AI. There have been many science fiction books and futuristic movies made about machines and robots that take over the world.

In this unit, students will start by working with unplugged activities with the AI Literacy lessons. Then, students will then have immersive learning experiences using the AI for Earth maps, which integrate AI concepts and skills into other areas of the curriculum. Students will then connect artificial intelligence with computer science through the utilization of the Hour of Code experiences. Finally, they will complete this unit by participating in the culminating project, AI for Good.

Pacing: 13 hours (could be more or less time depending on the needs of students)

Materials

Hardware	• The teacher will need a laptop or tablet with a projector for the plugged-in coding lessons. • Internet access will be required for a portion of the lessons and activities. • Each student will need a device to complete the plugged-in coding activities.

Software	• Minecraft Education needs to be deployed on the devices utilized within these lessons. • Use this link to find information about Getting Started with Minecraft Education and review the Licensing & Deployment Guide.
Other Materials	• Any additional handouts needed will be included within the individual EDU guides • Grid Paper for sketch plans (optional)

INSTRUCTIONAL SEQUENCE

This section will provide you with an overview of the activities included in this lesson sequence. The lesson sequence is presented in chronological order—we suggest working in order, as the content will build upon skills presented in the previous session. A session is equivalent to one class period, or a 45–60-minute session. However, educators should feel empowered to modify and adapt the lesson sequence to best meet the needs of their students.

Lesson Sequence Overview

SESSION	OBJECTIVES	TEACHER WILL	STUDENTS WILL	RESOURCES
*1**	*Students will learn what artificial intelligence is, how AI is created, and how AI works.*	*Explain the foundations of AI (i.e., AI Literacy)*	*Students will practice identifying ways to detect if information from AI tools is correct.*	***AI Adventurers 1 – What is AI? Building the Basics***
*2**	*Students will identify different types of AI tools, recognize how AI is changing the world, and explore ways AI can be used to address global issues.*	*Provide an overview of old and new types of AI; introduce students to the concept of machine learning*	*Students will identify a global issue and brainstorm ways that AI tools could be utilized to solve the problem.*	***AI Adventurers 2 – AI All Around Us (Solving Problems with AI)***
*3**	*Students will explore generative AI and chatbots, how these AI tools help us with tasks, and how to use AI responsibly.*	*Facilitate a discussion around using AI tools responsibly based on the principles of responsible AI*	*Students will practice creating precise algorithms to train AI and chatbots.*	***AI Adventurers 3 – Learning with AI (AI in Action)***

*4**	*Students will utilize semi-supervised machine learning to recognize patterns on ocelots' coats to compile a dataset for keep track of endangered animals.*	*Introduce artificial intelligence to students and lead the coding activities*	*Students will code an AI to use current data to compare and match it to a dataset of patterns to track ocelots.*	***AI Lesson 1: Who is that Ocelot?***
*5**	*Students will learn how to use machine learning algorithms to detect anomalies in geographical data.*	*Introduce artificial intelligence to students and lead the coding activities*	*Students will code a dataset using pictures of the terrain and then create a geographical map of the entire area and then code the AI to detect anomalies in the forest.*	***AI Lesson 2: Mapping Terrain***
*6**	*Students will use machine learning algorithms to improve crop yields and soil efficiency in developing countries.*	*Review artificial intelligence with students and lead the coding activities*	*Students will gather and prepare satellites data for a dataset and then code the AI to use predictive analysis to find areas with the right weather and terrain conditions to optimize farming.*	***AI Lesson 3: Sustainable Farming***
*7**	*Students will use sensors and gather a large volume of live data for an AI to map the ocean reef.*	*Review artificial intelligence with students and lead the coding activities*	*Students will write code that combines different data streams from the sensors into one live dataset to create an autonomous navigation algorithm for the Agent to safely travel through the generated map of the ocean floor.*	***AI Lesson 4: Ocean Observations***
*8**	*Students will use of machine learning algorithms in water quality testing and anti-pollution efforts.*	*Review artificial intelligence with students and lead the coding activities*	*Students will collect water samples from rivers to create a database; then students will code a machine learning algorithm to find sources of pollution.*	***AI Lesson 5: Water Quality***
*9**	*Students will practice data analysis in different fields*	*Review the foundations of AI, provide opportunities to explore ethical*	*Students will practice using their AI assistant to help identify and repair the pavilions at the world's fair.*	***Fantastic Fairgrounds***

		dilemmas in AI, and identify careers in AI		
*10**	*Students will gain high-level understanding about how AI can be used to collect data about forest fires.*	*Introduce artificial intelligence to students and support students as needed through the self-paced coding journey*	*Students will create coding solutions to solve the 8 different quests: Open the Gate, Meet the Agent, Agent Move, Gather Data, Eliminate the Hazards, First Mission, Save the Village, and Reforestation.*	***Hour of Code 2019 (AI)***
*11**	*Students will learn the principles of responsible AI.*	*Facilitate the discussion of responsible AI with students; support students as needed through the self-paced coding journey*	*Students will solve coding puzzles to effectively train the Ais to act responsibly based on the principles of responsible AI.*	***Hour of Code 2023 – Generation AI***
*12-13**	*Students will utilize effective research skills to participate in collaborative projects on exploring technologies specific to AI.*	*Model effective research practices to create an informative writing piece*	*Students will research about artificial intelligence to create background knowledge for the upcoming AI for Good Project.*	***Exploring Technologies***
*14-18**	*Students will collaborate with peers to create a computational artifact.*	*Explain the summative task and provide success criteria and guidance to collaborative groups.*	*Students will work together to plan, design, test, and present their AI for Good Project*	***AI for Good Project***

*Educators should modify and adapt the number of sessions based on students' needs.

EDUCATIONAL STANDARDS

CSTA Standards

K-2	3-5	6-8	9-10
• **1A-IC-16** Compare how people live and work before and after the implementation or adoption of new computing technology. • **1A-DA-07** Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. • 1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. • **1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. • **1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.	• **1B-IC-18** Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices. • **1B-IC-20** Seek diverse perspectives for the purpose of improving computational artifacts. • **1B-AP-08** Compare and refine multiple algorithms for the same task and determine which is the most appropriate. • **1B-AP-11** Decompose (break down) problems into smaller, more manageable subproblems to facilitate the program development process. • **1B-AP-15** Test and debug (identify and fix errors) a	• **2-IC-20** Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. • **2-IC-21** Discuss issues of bias and accessibility in the design of existing technologies. • **2-AP-10** Use flowcharts and/or pseudocode to address complex problems as algorithms. • **2-AP-12** Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. • **2-AP-13** Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	• **3A-IC-24** Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. • **3A-IC-25** Test and refine computational artifacts to reduce bias and equity deficits. • **3A-IC-27** Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields. • **3A-IC-28** Explain the beneficial and harmful effects that intellectual property laws can have on innovation. • **3A-IC-29** Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.

• **1A-AP-12** Develop plans that describe a program's sequence of events, goals, and expected outcomes. • **1A-AP-14** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.	program or algorithm to ensure it runs as intended. • **1B-AP-17** Describe choices made during program development using code comments, presentations, and demonstrations.	• **2-AP-17** Systematically test and refine programs using a range of test cases. • **2-AP-18** Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. • **2-AP-19** Document programs in order to make them easier to follow, test, and debug.	• **3A-IC-30** Evaluate the social and economic implications of privacy in the context of safety, law, or ethics. • **3A-DA-11** Create interactive data visualizations using software tools to help others better understand real-world phenomena.

ISTE Standards

- **1.1.d** Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
- **1.3.a** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
- **1.4.a** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- **1.5.b** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
- **1.6.c** Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations.
- **1.7.c** Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
- **1.7.d** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.

UK National Curriculum: Computing – Key Stage 2

- Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.
- Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.
- Use sequence, selection, and repetition in programs, work with variables and various forms of input and output.
- Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.
- Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.
- Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.

UK National Curriculum: Computing – Key Stage 3

- understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
- use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions
- undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
- understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concern

Australian f-10 Curriculum: Digital Technologies

Year 7 and 8

- Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical, sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures.
    - investigating how ethics, social values, profitability and sustainability considerations impact on design and technologies
    - identifying needs and new opportunities for design and enterprise (ACTDEK029)

- Investigating and designing some common algorithms (**ACTDIP029)**
- Developing and modifying digital solutions by implementing instructions contained in algorithms through programs **(ACTDIP030)**
- Identifying that problems can be decomposed into sub elements **(ACTDIP027)**
- Checking the accuracy of an algorithm before it is implemented **(ACTDIP029)**

Year 9 and 10

- Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (ACTDEK041)
    - considering how creativity, innovation and enterprise contribute to how products, services and environments evolve
    - explaining the consequences of social, ethical and sustainability decisions for products, services and environments
    - predicting the impact of emerging technologies for preferred futures
    - constructing scenarios of how the future may unfold (forecasting) and what impacts there may be for society and particular groups, and back casting from preferred futures

COMPUTER SCIENCE CONCEPTS

LESSON	CONCEPTS
AI Introduction – AI Literacy **Chapter 1 – Building the Basics**	• Artificial Intelligence • Pattern Recognition • Machine Learning • Predictive Models
AI Introduction – AI Literacy **Chapter 2 – Problem Solving with AI**	• Algorithmic Bias • Facial Recognition • Classical AI
AI Introduction – AI Literacy **Chapter 3 – AI in Action**	• Automation • Algorithms • Chatbots • Prompts • Generative AI
AI-1: Who is that Ocelot?	• Pattern Recognition • Data Sets • Data Analysis
AI-2: Mapping Terrain	• Data Sets • Pattern Recognition • Machine Learning
AI-3: Sustainable Farming	• Data Sets • Data Analysis • Algorithms
AI-4: Ocean Observations	• Data Sets • Sensors (input/output) • Automation
AI-5: Water Quality	• Data Sets • Data Analysis • Algorithms

AI-6: Fantastic Fairgrounds	Debugging Data Sets Data Analysis AI Career Exploration
Hour of Code 2019: AI for Good	Data Collection Sequencing Events Loops Conditionals
Hour of Code 2023: Generation AI	Principles of Responsible AI Language Models Data Privacy Generative AI
Exploring Technologies	Laws & Regulations Ethical Considerations
AI for Good Project (Summative Task)	Program Development Peer Feedback Collaboration Debugging

AI FOUNDATIONS GLOSSARY

algorithm: refers to programs or machines that simulate tasks that typically require human intelligence, such as: recognizing patterns, making predictions, and generating new content.

algorithmic bias: is the lack of fairness in the outputs generated by an algorithm. Or repeated errors that provide privilege to one group of users over another.

Artificial intelligence (AI): refers to programs or machines that imitate tasks that typically require human intelligence.

AI Foundations (AI Literacy): AI literacy involves having the skills and competencies required to use AI technologies and applications effectively and ethically.

AI Model: a computer model designed to perform tasks that normally require human intelligence.

automate: to have a machine or device carry out a task.

chatbot: A chatbot is a type of generative AI that can create new content, such as images, text, or music, based on patterns and data it has been trained on.

classical AI: This type of AI is not new and has been in our everyday lives for quite some time. It can solve problems, but this type of AI does not learn from data like newer AI.

facial recognition technology: is a form of artificial intelligence (AI) that copies a human's ability to recognize human faces.

generative AI: is a powerful category of AI that includes models that generate text, images, videos, or music.

machine learning: a subset of AI that deals with the ability of machines to learn from data and patterns without being programmed to do so.

pattern recognition: the ability of machines to identify patterns in data, and then use those patterns to make decisions or predictions using computer algorithms.

prediction: A statement that something might happen or is expected to happen, such as the weather.

predictive model: (AI) models predict something based on a set of features.

programmer: A person who writes programs (instructions) for a computer. The instructions come in different languages; they are called programming languages.

prompt: is a set of instructions given to an AI tool to help it focus on a specific topic, task, or purpose.

MORE RESOURCES

Professional Development: Minecraft Education professional learning helps educators build the skills and knowledge to integrate Minecraft into their teaching practice effectively. The goal is a more effective, engaging, and empowering learning experience for all your students—topped off with a healthy dose of fun!

Impact and Research Learn how Minecraft Education is transforming education around the world