

MINECRAFT EDUCATION



Computer Science

7 Lessons

Ages 8-14



Artificial Intelligence

[EDUCATION.MINECRAFT.NET](https://education.minecraft.net)

Table of Contents

GETTING STARTED WITH MINECRAFT	3
CURRICULUM SUMMARY	4
INTRODUCTION	5
COMPUTER SCIENCE CONCEPTS	6
INSTRUCTIONAL SEQUENCE	7
EDUCATIONAL STANDARDS	9
ADDITIONAL RESOURCES: MINECRAFT EDUCATION CS PROGRESSION	11
ADDITIONAL RESOURCES: TEACHING & LEARNING FRAMEWORK	12
VISUAL GLOSSARY	13

Getting Started with Minecraft

Install Minecraft Education

Minecraft: Education Edition can be installed on Chromebook, iPad, Mac, and PC. To ensure your experience with Minecraft Education is top-notch, make sure your devices meet the minimum system requirements. To check if your device supports Minecraft Education, see [System Requirements](#).

If you have questions about setting up Minecraft Education, the following link will provide you with some [frequently asked questions and additional information](#) about set-up. On this page, you will find assistance for:

- Get Started
- Purchase Licenses
- Administration and License Management
- Installation
- Troubleshooting

Preparing to Teach with Minecraft Education

Teachers do not need to have any prior computer science experience; however, they should familiarize themselves with a basic understanding of what is Minecraft Education. Support for building out teacher knowledge can be found here:

[Minecraft Education: Teacher Academy](#)

[Minecraft Education: Webinar Series](#)

Curriculum Summary

Artificial Intelligence is specially designed computer science content for students in Upper Primary/Grades 3-5/Ages 8-11. Students will learn, practice, and apply relevant computer science skills and concepts as well as literacy skills in both unplugged and digital experiences. The lessons are designed to provide students with an opportunity to build knowledge of the concept(s) in an unplugged version (i.e., demonstrate the concept on paper), practice the concept with the direct support of their teacher in the Minecraft world, and then finally by completing the task independently.

Lesson Design

Each EDU guide contains multiple activities that are intended to be taught over the specified amount 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.

Instructional Materials

Curriculum Overview	That is this document you are reading now! This will provide you with insight about the curriculum and what is taught within the curriculum.
Educator's 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 2-4 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 computer science unit, Coding Fundamentals Part 3: Running Out of Time. This performance-based task can be assessed using the provided rubric.
Minecraft World Files	The specific world files needed to experience the instructional activities have been linked directly within the Educator's Guides.

Introduction

Level: Upper Primary | Grades 3-5 | Ages 8-11

Essential Question: How will artificial intelligence and machine learning impact our future?

Overview

Exactly what is artificial intelligence (AI)?

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 off immersing themselves into the Hour of Code 2019 and 2023 to get an idea about how AI can actually be used for good. Students will then explore five different examples of how AI can be beneficial to help our communities and positively impact the future.

Pacing: 14 hours (could be more if tutorials and/or supplemental lessons are included)

Materials

Hardware	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Minecraft: Education Edition needs to be deployed on the devices utilized within these lessons. Use this link to find information about Deploying Minecraft Education.• The teacher and students will need the relevant MCworld files downloaded for each lesson (or they can be accessed from the in-game library).
Other Materials	<ul style="list-style-type: none">• Grid Paper (for sketch plans)• Any additional handouts needed will be included within the individual EDU guides

Computer Science Concepts: Artificial Intelligence

Lesson	Concept(s)
Hour of Code 2019: AI for Good Hour of Code 2023: Generation AI	Data Collection Sequencing Events Loops Conditionals
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
Exploring Technologies	Laws & Regulations Ethical Considerations
AI for Good Project (Summative Task)	Program Development Peer Feedback Collaboration Debugging

Instructional Sequence

This next 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*	<i>Students will learn high-level understanding about how AI can be used to collect data about forest fires.</i>	<i>Introduce artificial intelligence to students and support students as needed through the self-paced coding journey</i>	<i>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.</i>	Hour of Code 2023 (Generation AI) Hour of Code 2019 (AI for Good)
2*	<i>Students will utilize semi-supervised machine learning to recognize patterns on ocelots' coats to compile a dataset for keep track of endangered animals.</i>	<i>Introduce artificial intelligence to students and lead the coding activities</i>	<i>Students will code an AI to use current data to compare and match it to a dataset of patterns to track ocelots.</i>	AI Lesson 1: Who is that Ocelot?
3*	<i>Students will learn how to use machine learning algorithms to detect anomalies in geographical data.</i>	<i>Introduce artificial intelligence to students and lead the coding activities</i>	<i>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.</i>	AI Lesson 2: Mapping Terrain
4*	<i>Students will use machine learning algorithms to improve crop yields and soil efficiency in developing countries.</i>	<i>Review artificial intelligence with students and lead the coding activities</i>	<i>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</i>	AI Lesson 3: Sustainable Farming

			terrain conditions to optimize farming.	
5*	<i>Students will use sensors and gather a large volume of live data for an AI to map the ocean reef.</i>	<i>Review artificial intelligence with students and lead the coding activities</i>	<i>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.</i>	<i>AI Lesson 4: Ocean Observations</i>
6*	<i>Students will use of machine learning algorithms in water quality testing and anti-pollution efforts.</i>	<i>Review artificial intelligence with students and lead the coding activities</i>	<i>Students will collect water samples from rivers to create a database; then students will code a machine learning algorithm to find sources of pollution.</i>	<i>AI Lesson 5: Water Quality</i>
7-8*	<i>Students will utilize effective research skills to participate in collaborative projects on exploring technologies specific to AI.</i>	<i>Model effective research practices to create an informative writing piece</i>	<i>Students will research about artificial intelligence to create background knowledge for the upcoming M:EE AI for Good Project.</i>	<i>Exploring Technologies</i>
9-13*	<i>Students will collaborate with peers to create a computational artifact.</i>	<i>Explain the summative task and provide success criteria and guidance to collaborative groups.</i>	<i>Students will work together to plan, design, test, and present their AI for Good Project</i>	<i>AI for Good Project</i>

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

Educational Standards

CSTA Standards

- **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 program or algorithm to ensure it runs as intended.
- **1B-AP-17** Describe choices made during program development using code comments, presentations, and demonstrations.

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.

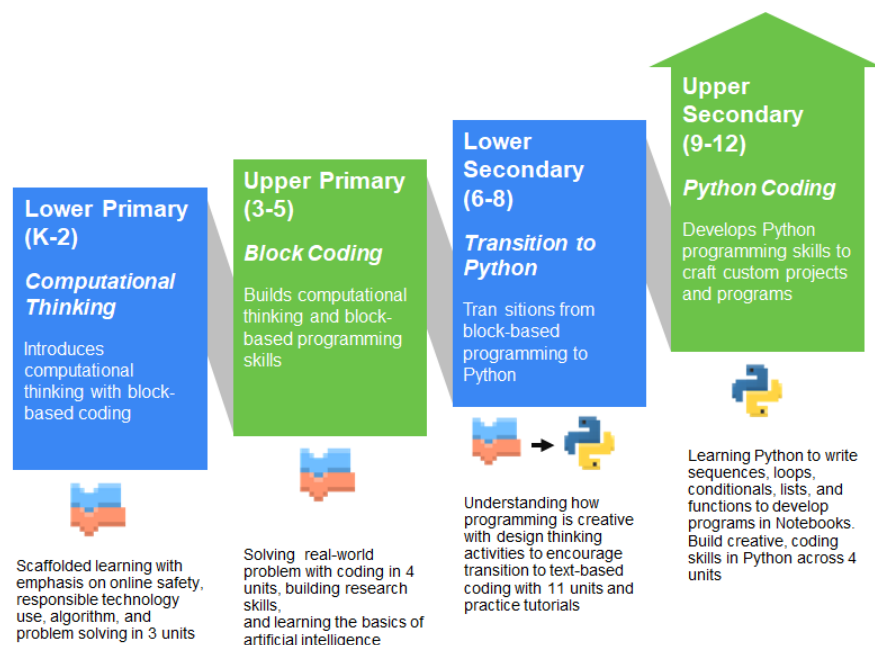
UK National Curriculum: Computing - Key Stage 2

- 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

Australian F-10 Curriculum: Digital Technologies - Year 3 and Year 4

- **(ACTDIK008)** Recognising that numbers, text, images, sounds, animations and videos are all forms of data when stored or viewed using a digital system
- **(ACTDIP009)** Using software to sort and calculate data when solving problems
- **(ACTDIP010)** Explaining what the problem is and some features of the problem, such as what need is associated with the problem, who has the problem and why
- **(ACTDIP010)** Designing and implementing a simple interactive digital solution using a visual programming language

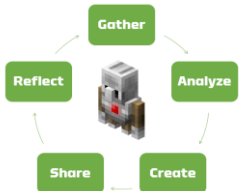
Computer Science Pathway Progression



Artificial Intelligence is a part of the Upper Primary (Grades 3-5 | Ages 8-11) computer science progression. In this part of the progression, students are focusing in on exploring the concepts of artificial intelligence and machine learning. Students will participate in immersive experiences as they learn how to collect data sets, analyze the data sets created by artificial intelligence/machine learning, and even consider the implications (both good and bad!) of artificial intelligence.

Students will also have the opportunity to research other cutting-edge technologies emerging into our society. Can we use the power of AI and machine learning for good?! Let's find out!

Minecraft Education Teaching and Learning Framework

GOAL: Provide students with the necessary skills to become creative coders and content creators	
<p>Coding Mindset</p> <p>Although Minecraft: Education Edition provides rigorous and engaging academics, we also deliver a holistic education- providing instruction for the social, emotional, and physical needs for our students. We want to foster a distinctive set of attributes. These qualities prepare our students to make exceptional contributions both in school and outside of school.</p> <p>CURIOUS COMMITTED COOPERATIVE CONSIDERATE CONFIDENT</p>	<p>Computational Thinking Skills</p> <p>Computational thinking provides a vital skill set in which students must possess in order to fulfill the industry's needs in the jobs of tomorrow. Our ever-changing workforce creates a critical need for innovation. Our students need computational thinking skills not just to solve the problems within their educational journey, but to also meet the challenges of adapting to our constantly changing workforce.</p> <p>DECOMPOSITION PATTERN RECOGNITION ABSTRACTION ALGORITHMS</p>
<p>Computer Science Units of Study</p> <p>Minecraft: Education Edition provides meaningful, relevant, and engaging units of study. The units of study will possess a conceptual lens to allow for depth and complexity to develop conceptual understanding—knowledge which transfers through time, across cultures, and across situations.</p> <p>DIGITAL CITIZENSHIP PROGRAMMING CYBERSECURITY IMPACTS OF COMPUTING</p>	<p>Community</p> <p>As students gain and possess new knowledge and skills, we strive for them to find a greater purpose of “why do I need to know this” or more importantly, “how can I use this information?”. We aim to empower students, develop confidence and self-efficacy into a commitment to serve the community in which we live in and beyond.</p>  <pre> graph TD Gather --> Analyze Analyze --> Create Create --> Share Share --> Reflect Reflect --> Gather </pre>

This unit will focus on **impacts of computing**, as students will investigate the global effects, both beneficial and harmful, on people and society as they explore artificial intelligence.

This unit will focus on the coding mindset of being **considerate**, as they examine the effects of artificial intelligence. They will consider how the development and modification of computing technology is driven by people's needs and wants and can affect groups differently.

This unit will focus on **pattern recognition** as students create programs to utilize pattern recognition through machine learning.

This unit will provide students with the opportunity to consider how they can utilize their new knowledge of artificial intelligence to bring awareness to the **community**. Students can explore how artificial intelligence is presently being used in their communities and reflect on artificial intelligence can enhance their communities or even solve a present problem within their community through their AI for Good Project.

MINECRAFT VISUAL GLOSSARY

Agent

personal robot in Minecraft



Blocks

the basic units of structure in Minecraft that make up the game's world



Chest

a place to store items outside of your inventory



Camera

allows you to take screenshots and selfies in Minecraft: Education Edition



Chalkboards

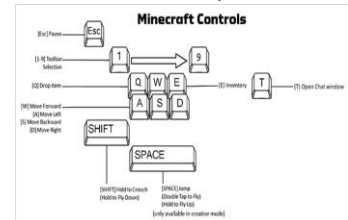
special blocks that allow you to write and display text in Minecraft



Controls

(keyboard)

keyboard buttons that help you move around and complete tasks



Controls

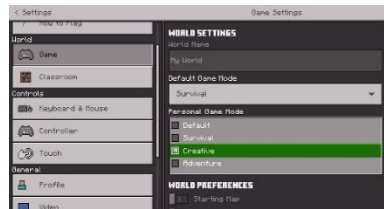
(touch)

the touch pad that helps you move around and complete tasks



Creative

game mode that gives you unlimited resources, ability to fly, and lets you destroy blocks instantly when mining



Hotbar

selection bar that appears on the bottom of the screen



Inventory

pop-up menu the player (or Agent) uses to manage the items they carry



Minecraft Education

a game-based learning platform



Ocelot

a rare cat-like game character found in Minecraft



Portfolio

saves all of the photos that you have taken with a camera; allows you to add captions



NPC

non-player character



Spawn Point

the location where a player begins game play



COMPUTER SCIENCE GLOSSARY

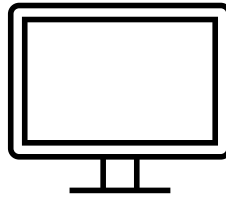
Algorithm

a sequence of defined steps



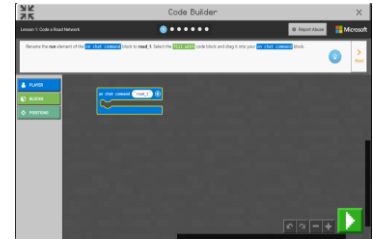
Artificial Intelligence

a computer or software that mimics the human way of thinking



Code Builder

coding editor used to create programs



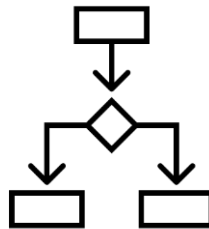
Code (Coding)

the method of giving a computer instructions to perform a specific task



Conditional

an action that occurs if something specific happens



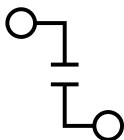
Debugging

process of finding and resolving errors within computer programs



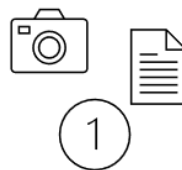
Decomposition

breaking down a complex problem into smaller, manageable, and easy-to-understand parts



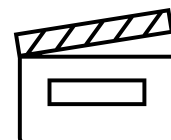
Dataset

a collection of data (data types can include text, images, numbers, etc.)



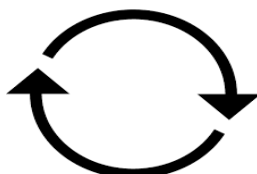
Event

the change in the state of the object; this change is brought as a result of some sort of user interaction



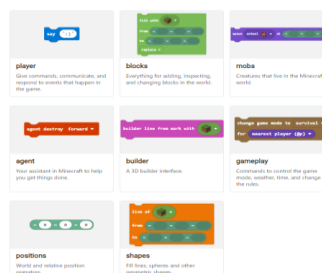
Loop

sequence that repeats a portion of code a set number of times until the desired task is complete



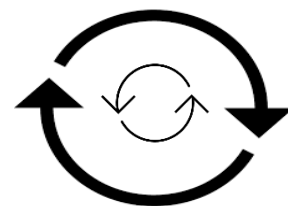
MakeCode Blocks

blocks used to create code



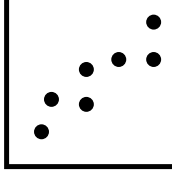
Nested Loop

a loop inside a loop



Pattern Recognition

a process of finding the similarities (patterns) among smaller, decomposed problems



Testing

the process of running the program to see if runs as intended



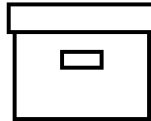
Program Development

process of creating a program with a description of the sequence of events, goals, and expected outcomes



Variable

the places in which computers store values in a computer program



Sequence

instructions presented in a specific, correct order to a computer



While Loop

repeats the code if a defined condition is met

