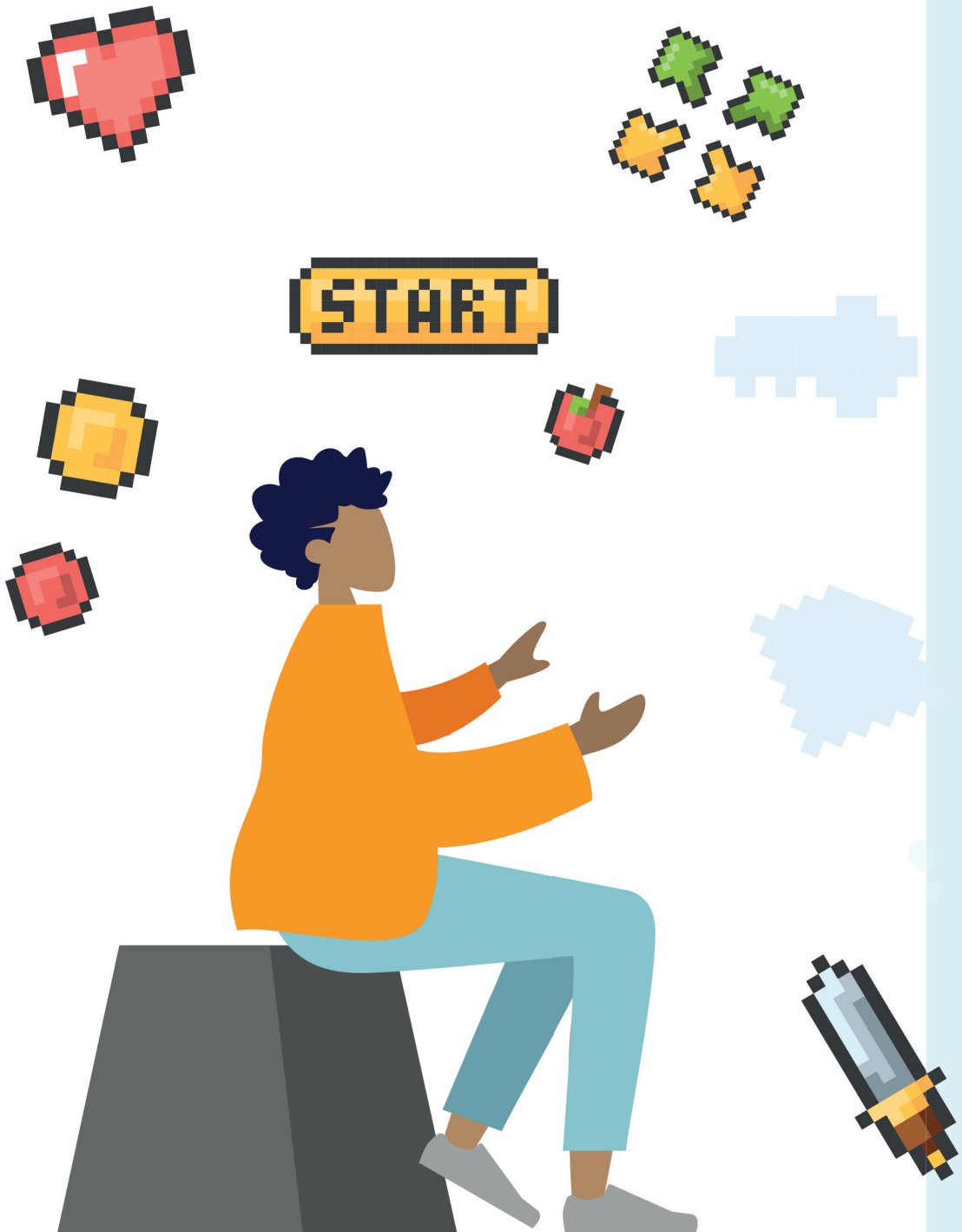

PRIMARY + STEM

Teaching Resource

ACTIVITY:

Bringing Video Games to Life

ACTIVITY OVERVIEW

We love video games, but how much do we think about the programming, the instructions hidden inside our games? Every video game has many different sequences of instructions within its code, combining to create the fun gameplay that we experience. From the design of the clothes that our character wears to the complex calculations involved in the movement of items in the game, these are all controlled by algorithms, sets of instructions that are specific to each function. These game mechanics work together to create our favourite video games.

Use this activity to get students looking beneath the surface of their favourite video games, describing the instructions that control the gameplay that they enjoy, then getting up and about moving around in a real-world version of their game.

SYNOPSIS

We love video games, but how much do we think about the programming, the instructions hidden inside our games? Every video game has many different sequences of instructions within its code, combining to create the fun gameplay that we experience. From the design of the clothes that our character wears to the complex calculations involved in the movement of items in the game, these are all controlled by algorithms, sets of instructions that are specific to each function. These game mechanics work together to create our favourite video games.

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Foundation – Year 2

- Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems. (VCDTCD017)

Year 3 – 4

- Define simple problems, and describe and follow a sequence of steps and decisions involving branching and user input (algorithms) needed to solve them. (VCDTCD023)

Year 5 - 6

- Design, modify and follow simple algorithms represented diagrammatically and in English, involving sequences of steps, branching, and iteration. (VCDTCD032)

ACTIVITY, MATERIALS AND INSTRUCTIONS

Activity

Create a real-life version of one of your favourite video games. Students will show their understanding of the instructions that make up game mechanics by explaining algorithms used to control their games, then setting up a real-life version of a game to play at school.

Materials for 30 students

- examples of computer games (depending on the gaming experience of your students)
- pencils/paper
- PE equipment (e.g. balls, hoops, mats, skipping ropes)
- easily portable furniture to use to make scenery (e.g. chairs)
- cardboard boxes

Students work in small groups to create a scene from a video game. For example, a car race from Mario Kart, catching some Pokémon.

Instructions

1. Students choose a video game scene that they would like to recreate in real-life. Teacher to approve.
2. Students will need to list:
- Equipment needed to create their real-life game (the size of the game will depend on the space available). It may be outdoors, or just on a tabletop.
- What is the aim of your game? What does the player have to do (player objective)?
- Algorithms involved in this game scene (rules of the game)
3. Construct your game!

Younger students may need more guidance. It may be more appropriate to complete this as a whole class activity, allocating different tasks to groups of students (e.g. build scenery, make costumes for characters). You may need to show students some examples of video games.

Example using a car racing game (like Mario Kart)

- equipment needed – chairs, cardboard boxes, paper to draw on, markers, tape
- students draw a track on an outdoor basketball court using chalk, set up scenery and obstacles using chairs and boxes
- students can run/walk or ride bikes/scooters around the track

Rules of the game (game mechanics):

- the game can start when there are from two-four players
- if the player touches an obstacle/scenery, the player must jump on the spot five times before continuing
- if the player reaches the end of the track in greater than 30 seconds, the player must return to start of track
- if the player reaches the end of the track in less than 30 seconds, the player completes this level
- if a player is touched by another player, both players must jump on the spot for five seconds

HOW TO USE THIS ACTIVITY WITH YOUR STUDENTS

Foundation - Year 2

As noted above, younger students may need assistance to complete this activity. Options for this include working together as a class or guiding students further before beginning the activity. For example, small groups of students work together to draw a racetrack from a car racing game. Students can identify obstacles that players need to move around, and what happens if the player bumps an obstacle or leaves the track (perhaps making players return to start of the track, or enforcing a time penalty). They can describe the controls that the player uses and the movements that are possible in the game. All of these contribute to their understanding of game mechanics and the hidden algorithms in video games.

Extend this activity by including a robot as part of your gameplay. For example, make Sphero into Pac-Man or Bee Bot into a Mario racer. Give your robot instructions (programming) to complete part of your game's objective. Your robot could be racing. or may be a ghost trying to eat you!

Years 3/4

Use this activity to get kids moving in a real-life game, after taking part in a process that shows their understanding of the algorithms and decision making hidden within video game code. Students at this year level may have had experience with simple visual coding software (e.g. Scratch), and programming robots, but through this activity, step away from the screens and get them running and jumping around obstacles, or aiming balls at a target, after showing that they can explain the controls and decisions in game mechanics.

Extend this activity by filming an advertisement for your real-life video game. Show how much fun it is to play, introduce the characters and explain the game objectives.

Years 5/6

Students at this level can be challenged to explore as much as they can about the game mechanics of their chosen video game. These students can be expected to discuss elements including movement controls, interactions with objects/characters, timing, and scoring. After this, they can use plenty of creativity to build their own game scenes. You may consider inviting a younger class to be the players in your real-life games. Once the game has been played, there will likely be bugs or issues with the rules that become apparent to your game makers. This is why testing is also a crucial part of video game development.

Extend this activity by playing an episode of Good Game Spawn Point (ABC Me) for your class. Review your real-life video game as if it was appearing on GGSP. You could do this as a live performance in front of your class (with a video of gameplay), or a filmed review that is watched later. Video game reviews usually include information about what the players liked/disliked and a review of the gameplay (Are the controls easy to use? Does the story make sense? Can a player actually complete task?). An overall rating out of five (rubber chickens on GGSP) is given to easily let viewers know the opinion of the reviewer.

DISCUSSION SECTION AND KEY THEMES

KEY THEMES

Gameplay

How the player interacts with the game, including rules, plot, and objectives.

Game mechanics

In video games, the algorithms that control the game are called game mechanics. Game mechanics include in what order things appear on the screen, how things are moved, what movements are possible, and how scores or achievements are reached. Every aspect of the game will have steps and decisions that govern what will happen when a player makes a choice.

Coding

Once the algorithms (set of step-by-step instructions) have been established, programmers input them into the computer using programming languages. This process is known as coding or writing code, and it is what the computer reads and executes. Python, Java, and C++ are popular programming languages to code for video games.

Algorithms

Algorithms are sets of instructions that are specific to a function. Examples of algorithms that students are familiar with include steps to tie a shoelace or the steps taken to multiply two-digit numbers. People have been using algorithms for many years. Here are a few important examples.

Sieve of Eratosthenes (200BC)

An algorithm that finds all the prime numbers in a given table or list.

- Find all numbers > two. Cross out those divisible by two.
- Find all numbers > three. Cross out those divisible by three.
- Continue until all composite numbers are crossed out.

Boolean algebra (1845)

A variable can only be true or false (usually the binary code of zero or one).

Quicksort algorithm (1962)

Sorts lists alphabetically or numerically by picking one pivot letter/number and sorting the others as bigger or smaller, then repeats.

JPEG and other data compression algorithms (1992 onwards)

These algorithms are used frequently to reduce the size of a file without removing information. The original file can be transferred or stored, recreated, and then used later. (Morse code is an early example of data compression, the most common letters are shorter signals). When an audio file is compressed into an MP3 file, sounds that humans can't hear are removed, reducing the size of the file but not altering the sound to our ears.

PageRank by Google (1996)

Puts search results in order, based on relative importance or popularity (is influenced by how many links a page has to it).

History of video games

A brief timeline of video game development.

1950s and 60s – the only video games are in research labs of scientists

1970s – home video game console

- Arcade video games (Pong was the first)
- Atari home console with joysticks, game cartridges, coloured screens
- Games include Space invaders, Pac-Man, Donkey Kong

1980s – Nintendo game console with improved graphics, colour, sound and gameplay

- GameBoy (Nintendo) for handheld gaming (included Tetris)

1990s – Sega vs. Nintendo

- Introduction of game ratings (in response to violence in video games, like Street Fighter and Mortal Kombat)
- Movies based on video games
- Sony PlayStation

2000s – high-definition gaming

- Microsoft Xbox
- Motion-sensing in remotes of Wii
- Video games spread to Facebook and Smartphones

2010s – Nintendo Switch (tv and handheld gaming)

Now – virtual reality gaming

QUESTIONS AND ANSWERS

Why are there some video games that my parents won't let me play?

In Australia, we have a video game rating system, which was introduced in response to an increase in violent video games. These are the same categories used for movies. Our classification system includes:

Advisory categories:

- (G) General – suitable for everyone
- (PG) Parental Guidance – may contain content that children find confusing or upsetting. Not recommended for people under the age of 15 without guidance from a parent, teacher, or guardian.
- (M) Mature – not recommended for children under the age of 15. May include violence and themes that require a mature outlook. However, this category is advisory only, so children under 15 can legally play these games.

Restricted categories (these are legal requirements):

- (MA 15+) Mature Accompanied – contains strong content, such as sex scenes and drug use. You may have to show proof of age to buy an MA 15+ video game. It is ok for children under 15 years to view or play MA 15+ games, if they are accompanied by an adult (who should have checked out the game content before allowing a child to play).

- (R 18+) Restricted - adults only (but can include content that may be offensive to some adults). You may have to show proof of age to buy an R 18+ game. These are not suitable for children.

What are the different types of video games that people play?

Video games are sorted into different genres, including some that fit into more than one category. Here's a summary of some of the main types of video games:

Sandbox – an open-ended game where you have many tasks to complete and less limits on your actions (e.g. Minecraft creative mode). Named sandbox, from the American word for sandpit, where kids can play in whatever way they want to.

Real-Time Strategy (RTS) – the player controls an army battling another army. It may involve vehicles, money, and buildings, and usually has a view from above. Everything happens straight away, there is no taking turns. For example, Starcraft.

Shooter – made up of first-person shooters (FPS) where you see what the character can see, and third-person shooters (TPS) where you see the whole character and surrounding environment (e.g. Splatoon).

Multiplayer Online Battle Arena (MOBA) – Similar to RTS, but you are typically only controlling one character, while you play in an online real-time competition between players (e.g. Pokemon Unite, Fortnite, Plants vs. Zombies Battle for Neighborville).

Role-Playing (RPG) – Usually single-player games where you create or control a character and you level them up through experiences (e.g. Legend of Zelda, Pokemon Legends: Arceus).

Massively Multiplayer Online Role Playing (MMORPG) – Play online with many other people (e.g. World of Warcraft), usually not suitable for children.

Simulation/Sport – recreations of real-life sports (e.g. Mario & Sonic at the Olympics, Vehicle racing games).

Puzzlers – solving puzzles either on their own or as mini games included in a larger game (e.g. Tetris, Candy Crush, Portal).

Adventure – combat game with a plot (e.g. Lego games).

Survival – you must manage resources and keep your character alive (e.g. Minecraft survival mode).

Platformer – game with running, climbing, jumping, usually side view with simple controls (e.g. Super Mario Bros, Sonic the Hedgehog, Donkey Kong).

These are not the only genres but are a good selection of different types of games that children may have experienced.

How much screen time should children have?

The Australian 24-hour movement guidelines include recommended screen time.

- Age < two years = no screen time
- Age two – five years = one hour per day
- Age five – 17 years = two hours per day (not including schoolwork)

Most Australian children spend more time on screens than recommended. Why is too much screen time bad? Research has shown negative effects on weight, diet, motor and cognitive development, behaviour, and social and psychological wellbeing. There are many scientists researching the effects of screentime, including the impact of the COVID lockdowns.

Why are there always ads popping up in my games?

The game developer needs to be paid for their work, but they want to make their game free for players. So instead of players paying, the advertisers pay the developer to put their ads in the game. If you pay for a game, you shouldn't have to watch ads.

What elements do I need to make a video game?

Whether it's a simple game in Scratch or a complicated game for a console with amazing graphics, video games all need the same elements:

- Story
- Graphics
- Movement (actions and objects)
- Interactions
- Coding
- Sound

Each piece of game logic needs to have its own code written. Games need to be tested thoroughly after development to ensure that the game mechanics and gameplay are entertaining and work well.

Can we go on a video game excursion?

ACMI (Australian Centre for the Moving Image), located in Federation Square, Melbourne, has exhibitions and school programs focused on video games .

What do I need to study at university to become a games developer?

If you want to actually write the code for games you might study:

- Bachelor of Games and Interactivity
- Bachelor of Computer Science (with major in Games Development)
- Bachelor of Design (Games)
- Certificate IV in Digital and Interactive Games

But remember that video games are not just code! You might also study:

- Art
- Animation
- Music
- Storytelling

Do games developers get paid well?

On average, a game developer earns about the same amount as a teacher with a few years of experience, with an average salary of $75,000 per year. However, game developer salaries can eventually be much higher than teachers'.

Are some types of people better at playing video games?

Some people enjoy video games more than others. But, if you practise something a lot, your performance will improve. Video games are for all ages, abilities, and interests.

What does video game code look like?

There are many different programming languages that are used to write the instructions for video games. Examples include Python, Java, C+, and Scratch. You can learn more about programming languages at this website

https://www.w3schools.com/default.asp

OUTSIDE OR SUPPLEMENTARY READING

15 of the most important algorithms

- https://interestingengineering.com/15-of-the-most-important-algorithms-that-helped-define-mathematics-computing-and-physics

ACMI Story of the Moving Image: video games

- https://www.acmi.net.au/story-of-the-moving-image/videogames/

ACMI Scratch coder resource

- https://www.acmi.net.au/education/school-program-and-resources/scratch-coder-learning-resource/

ACMI Game builder resource

- https://www.acmi.net.au/education/school-program-and-resources/game-lessons/game-builder-level-1/

This is a beautiful resource for beginner game developers.

Basic game mechanics

- https://www.gamedesigning.org/learn/basic-game-mechanics/

Free coding programs for kids

- https://www.coderkids.com/blog/top-10-free-coding-programs-for-kids
- Learn today, build a brighter tomorrow. | Code.org
- Pencil Code
- Scratch - Imagine, Program, Share (mit.edu)
- Blockly Games

TOPIC WORDS

- Programming
- Coding
- Graphics
- Sound
- Player
- Game mechanics
- Gameplay
- Algorithm
- Instructions
- Sequence

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