

# Minecraft + MS Makecode / Tynker



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# Minecraft for Education

Available to all Sapienza students/teachers

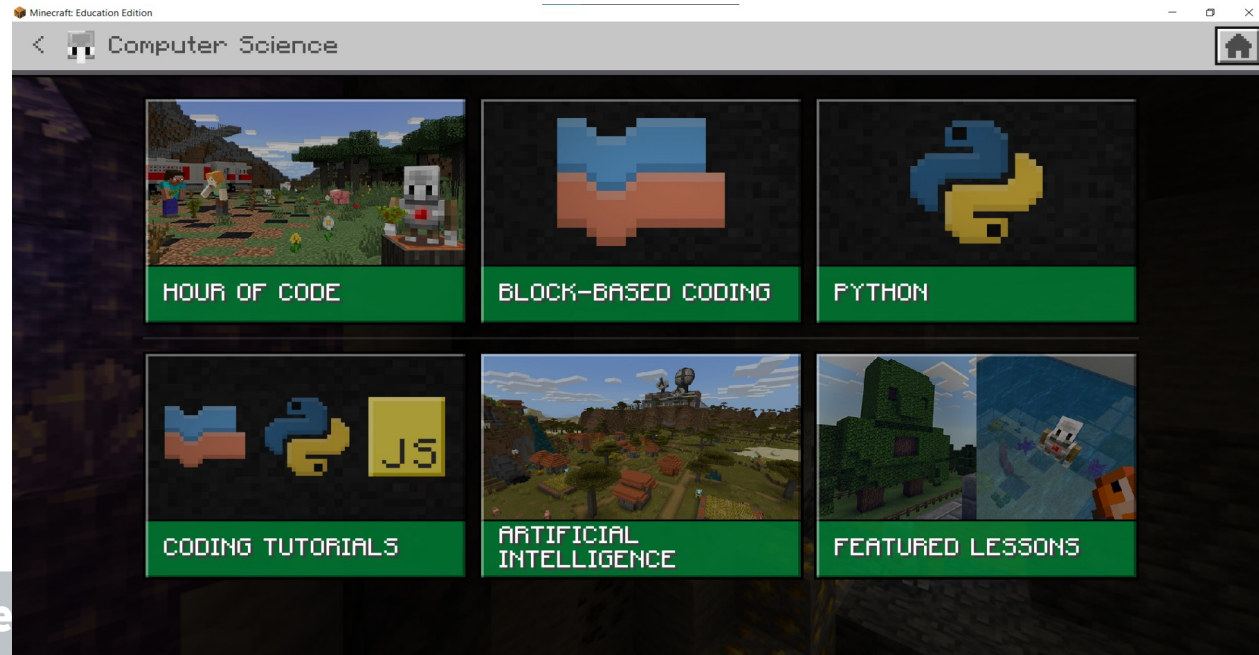
Download it from MS Store

Use your official email/password to authenticate (@uniroma1.it)

Programmable with:

- MS Makecode  
(Blocks/TypeScript)
- Tynker (Blocks)
- Python!

Methods in Computer Science



# Minecraft programming with MS Makecode

Define new Events associated to:

- the player:

- when hearing someone saying something
- when writing chat commands (with numeric args)
- when action done  
(walk, swim water/lava, fall, climb, fly, ride, sneak, sprint, bounce)
- when using tools/arrows
- when dying/teleporting

- when blocks are placed/broken
  - when animals are killed
- many more .....



# Control blocks

## External blocks:

- Forever loop (MANY allowed?)
- OnStart (only one allowed)
- RunInBackground NEW!!! (only one allowed)

Loops: repeat N times, counted loop, foreach, while-do

## Function definition:

- WITH parameters NEW!!! (text, number, bool, position)
- WITH return value (untyped)

TypeScript: typed Javascript

```
<Andrea5> f 10  
[Andrea5] 3628800
```

## Script interactions

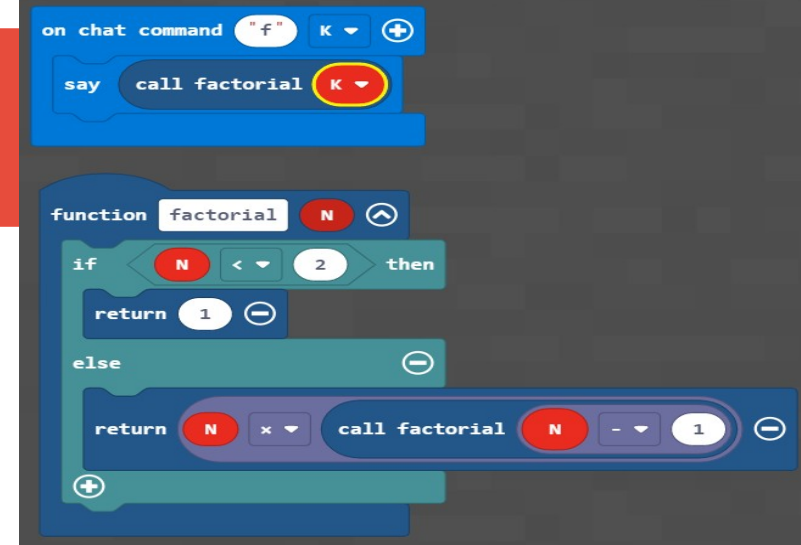
Text commands (with parameters) translated to event callbacks

### Javascript

```
player.onChat("f", function (K) {  
    player.say(factorial(K))  
})  
function factorial (N: number): any {  
    if (N < 2)  
        return 1  
    else  
        return N * factorial(N - 1)  
}
```

### Python

```
def on_on_chat(K):  
    player.say(factorial(K))  
player.on_chat("f", on_on_chat)  
  
def factorial(N: number):  
    if N < 2:  
        return 1  
    else:  
        return N * factorial(N - 1)
```



# Programming style

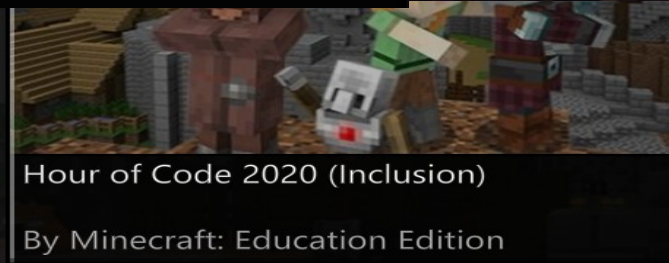
## Event-based programming

ONE foreground thread	(onStart)
ONE background thread	(but MANY forever loops !?!)
Functional?	(only in JavaScript/Python)
Object-oriented?	(only in JavaScript/Python)
Threads?	NO
Messages?	ONLY TO PLAYERS (Say XXX to player YYY)

## Minecraft-specific elements

Player:	position and chat commands
Player's Agent (robot):	move/teleport/destroy/collect/carry
Other Entities:	teleport/enchant/give/apply effect/execute command
Blocks:	fill/clone block in layer/volume, test for block
Mobs:	spawn/kill animals
Gameplay:	set weather/difficulty/time/game rules survival/creative/adventure
Builders:	for building big structures
Reporters for:	positions, nearest entities, named players, ...
Shapes:	lines/circles/spheres of blocks

# Hour of Code



2019: Firefighter scenario (AI)

Town full of puzzles to solve

2020: Interaction between two villages (Inclusion)

2021: Time travel to fix broken events

2022: Puzzles and role play

Very simple coding tasks with a limited number of blocks available



# More Examples



BIOMES



MONTHLY BUILD CHALLENGES



WORLDS

Meth



DIGITAL  
CITIZENS



HOW TO PLAY

Y AND  
SION

necraft/Tynker

# Minecraft programming with Tynker

Events:	onStart		
	when XXX/Any	Block	Placed/Broken
	when XXX/Any	Item	Acquired/Dropped/Used
	when XXX/Any	Received	Chat Message/Tell
	when	Player	Travels/Dies/Teleported/Bounced
	when XXX	Mob	Killed/Spawned
Agent	move/turn/place/detect/attack/destroy		
	collect/till/drop/teleport		
TynkerBot	test		
	start/run/clear buffer		
	move/turn/point to/checkpoint		

# Programming style

NO JavaScript edit

~~(but you can view it read-only)~~

Event-based programming

Sending/receiving/waiting for messages (with parameter)  
the receiver gets: SOURCE and PARAMETER

Functions WITH args and WITH return statement  
(they can be used both as block or as reporters if needed)

BEWARE! name changes of vars/functions are NOT updated everywhere!!!

## Other actors

World:

- give XXX/kill/enchant player/entity
- weather ...

Agent: (visible agent)

TynkerBot: (invisible agent) NEW!

# Block Language properties

Types: numbers, strings, lists, items, mobs, blocks

Messages with values (and wait)

Loops with BREAK and CONTINUE

Functions with arguments and return

Local variables (to function, actor or global) with initializer

Object properties, “keys of” → dictionary?

NO print/say/drawtext ?

# Minecraft programming

## PROS

and

## CONS

Good for Adventures/  
Exploration-based games

Appealing to Minecraft fans (duh!)

Appealing to BUILDERS

So many events and options!!!

Difficult to solve/represent interdisciplinary problems

A lot of work to build the scenery  
(but you can build stuff with programs)

Hard on 3D-sick people!!!

A lot of work just to FIND stuff  
(an easy guide is needed)  
(new activities show breadcrumbs to next place)

# Demo

<http://minecraft.makecode.com>

DEMO

<http://tynker.com>