

**Workshop @ University of Teacher Education, Graz**

**sCool**

**Learning object-oriented programming with bugs?!**

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Version 1.0

# sCool - Game Types

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# sCool Story

- Player is in the role of a teenager rescuing astronaut
- Stranded on a hostile planet
- Various space-related tasks in this world
- Player interacts with environment by coding



# Overview of Game Types

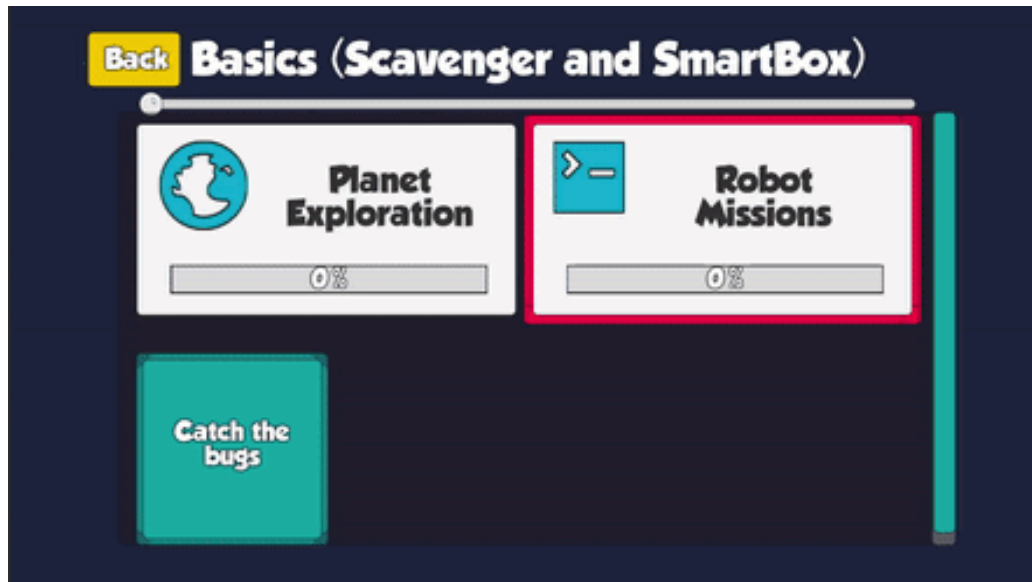
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- Explorative game types
  - Explorer
  - Platformer
  - Scavenger
- Practical missions
  - Robot missions
  - Smart box missions
  - Box builder



# Overview of Game Types

- Explorative game types → Learn concepts
- Practical missions → Apply concepts



# Overview of Game Types

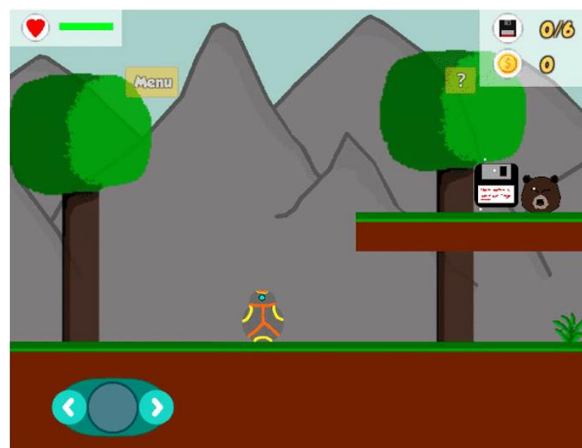




# Overview of Game Types



# Overview of Game Types





# Game Type | Planet Exploration

## Exploring and collecting



# Game Type | Planet Exploration

Learning concepts in a textual way

The image shows two screenshots of a game interface. The top screenshot displays a text-based description of Python programming language. The bottom screenshot shows a multiple-choice question about Python.

**Repair the disks** **Total € 150**

Python is a high-level programming language, with applications in numerous areas, including web programming, scripting, scientific computing, and artificial intelligence.

It is very popular and used by organizations such as Google, NASA, the CIA, and Disney.

**Next**

**Repair the disks** **Total € 150**

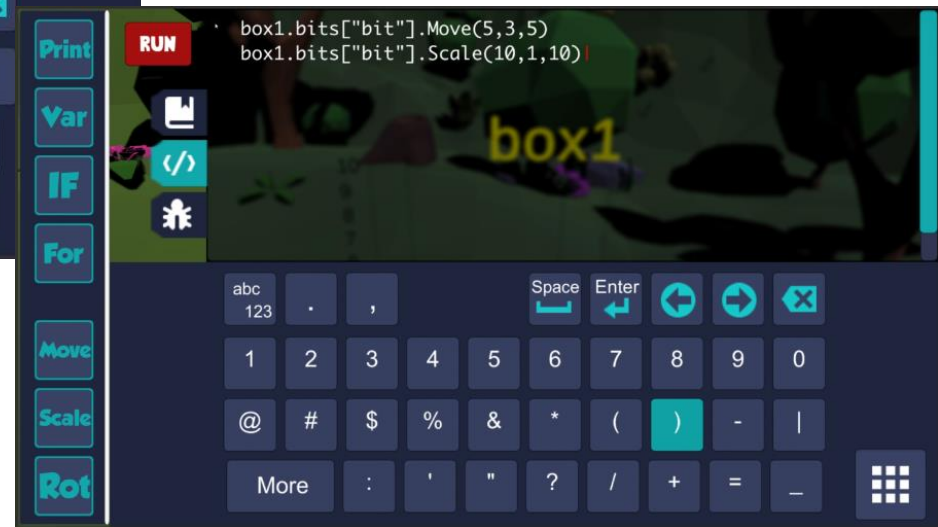
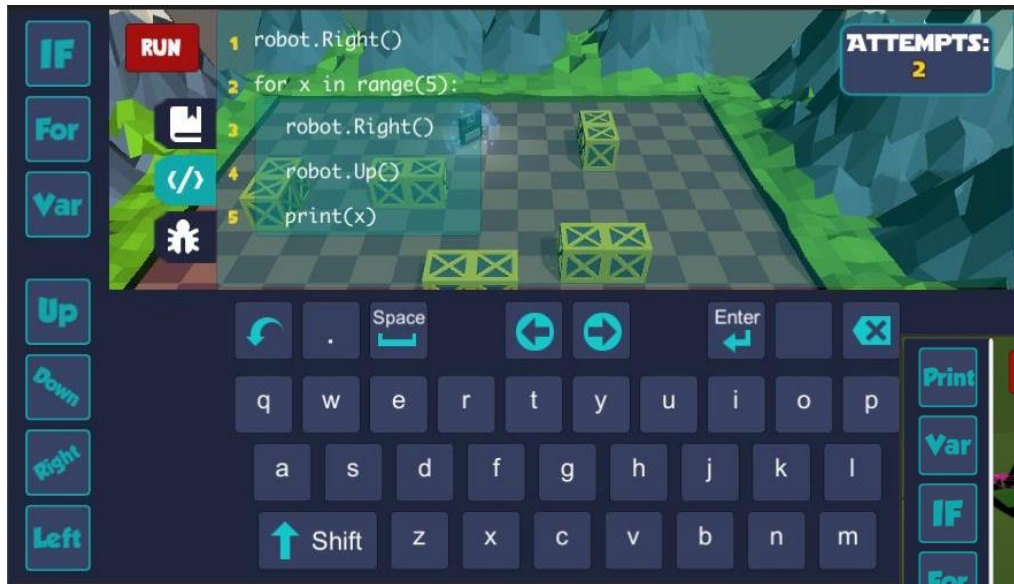
**What is Python?**

- ☐ Type of snake
- ☒ Programming language
- ☐ Editing tool

**Submit**

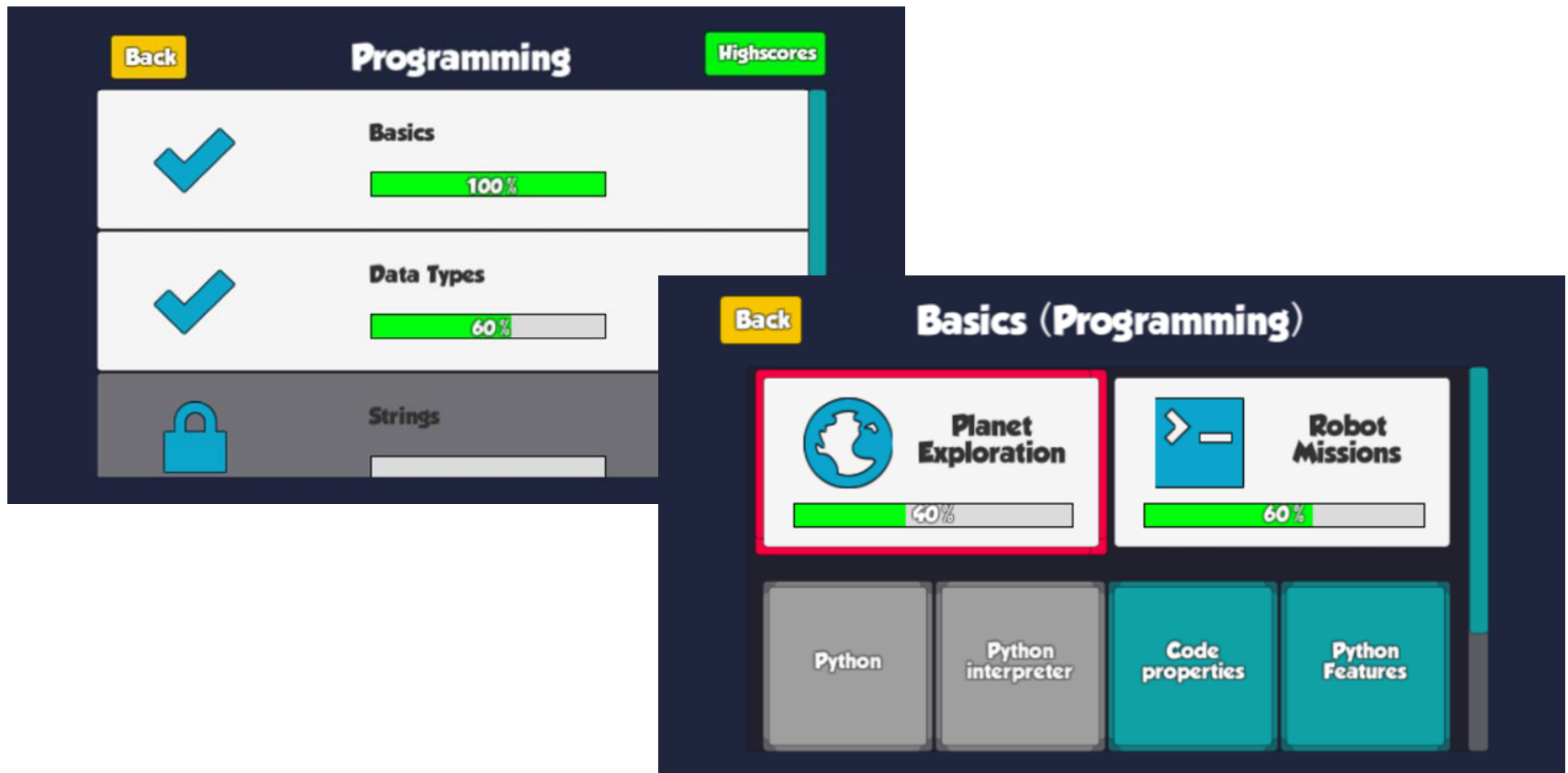
# Game Type | Practical

## Applying (coding) learned concepts



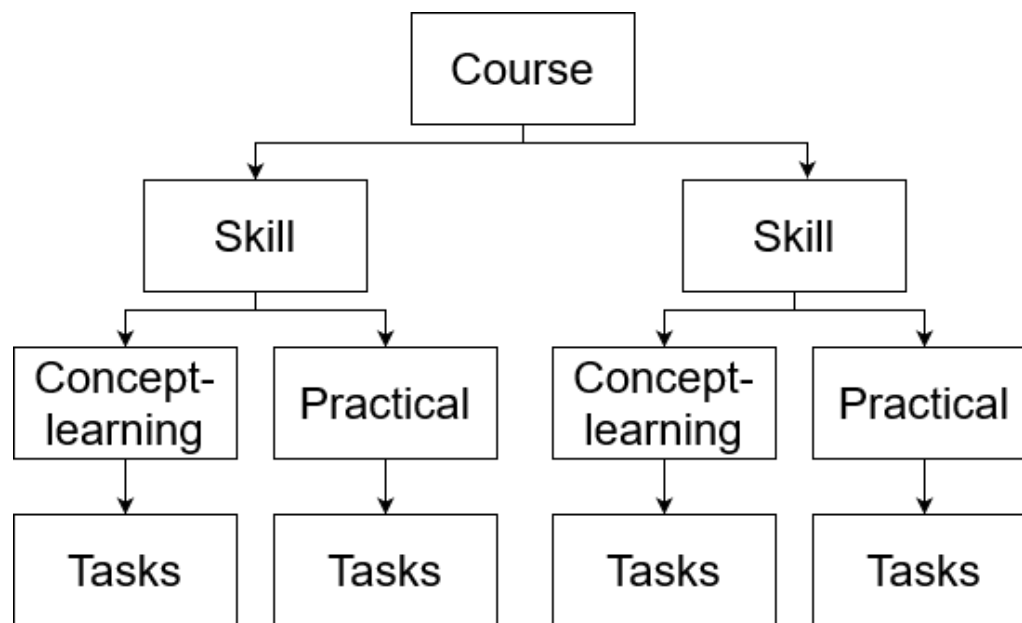
# Skill Tree

## Skill tree and progress detail



# Skill Tree

## Skill Tree and Progress Detail





# Game Design

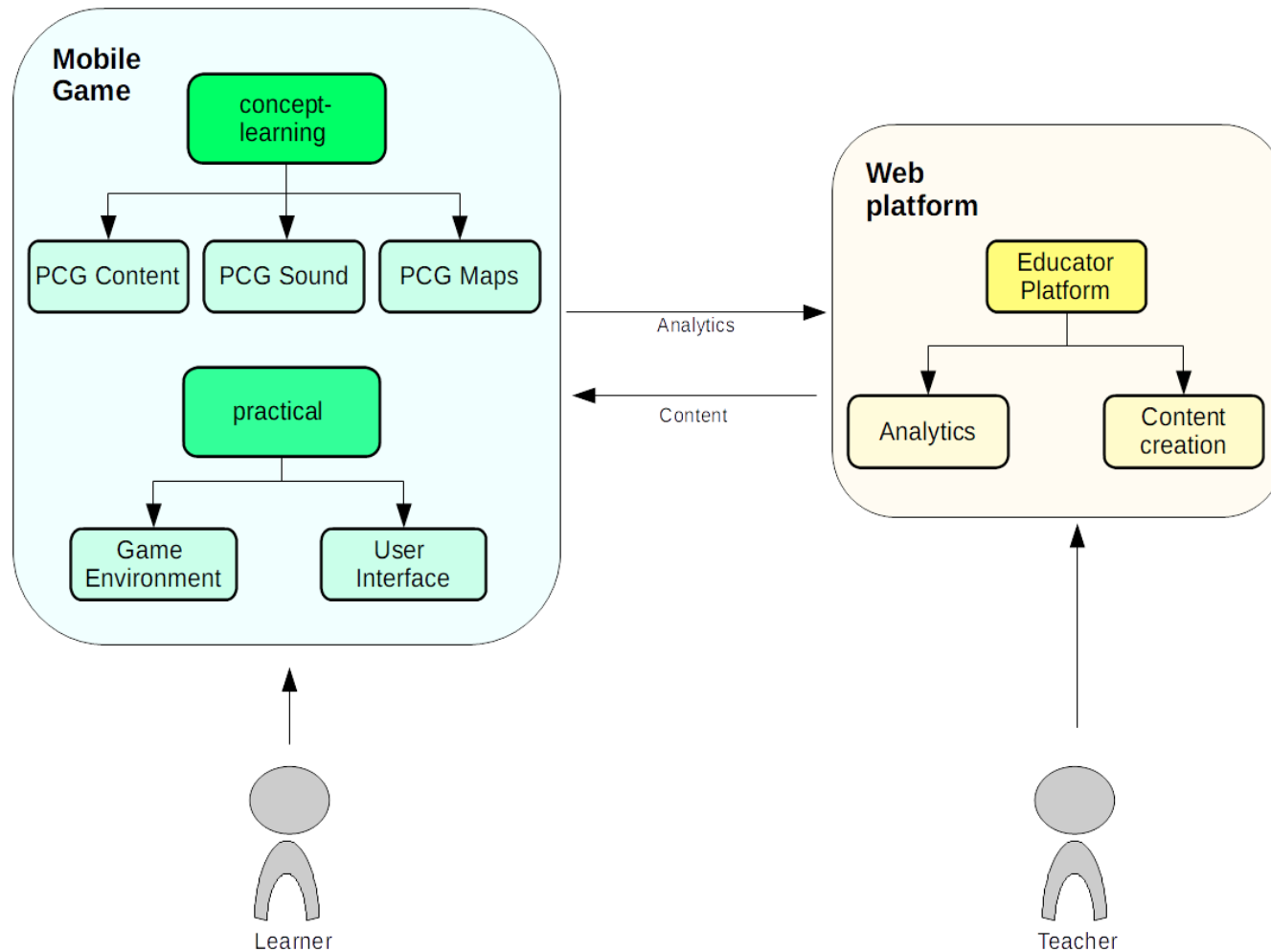
## Player customization and shop



# sCool - System Architecture

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# System Architecture









# Game Administration

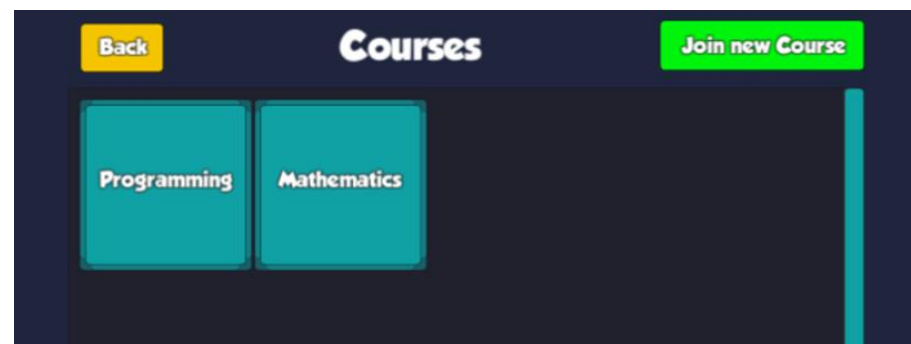
## Flexible Game/Course Design

### Course Management

New Course +

Users are able to create, update and delete courses. These courses are afterwards loaded into the video game and shown to players.

Title	Description	Edit
Programming	Programming course	  
Mathematics	Mathematics course	  
Physics	Physics course	



# Game Administration

## Manage Exploring and Programming Tasks

Theoretical Tasks

New Theoretical Task +

Title	Description	Difficulty (%)	
Commands	A command is a single instruction ...	10	<div></div> <div></div> <div></div>
Rob's Storage	Rob has an integrated memory wh...	30	<div></div> <div></div> <div></div>
Talk with Rob	In many cases it would be very use...	55	<div></div> <div></div> <div></div>

Practical Tasks

New Practical Task +

Title	Description	Difficulty (%)	
Collect the disk	In the first task simply collect the ...	10	<div></div> <div></div> <div></div>
Hello Rob	Your mission is to reach the disk ...	55	<div></div> <div></div> <div></div>
Simple Calculation	Help Rob doing a calculation. He...	60	<div></div> <div></div> <div></div>



# Game Administration

## Designing Theoretical Learning Tasks

Title	<input type="text" value="Commands"/>
Description	<div>A command is a single instruction a program should do. It is mostly a verb followed by a bracket that describes the action (e.g. walk_ahead() or delete_letter()).</div>
Task/Question	<input type="text" value="What is a valid command in Python?"/>
Correct Answer	<input type="text" value="robot.left()"/>
Incorrect Answer 1	<input type="text" value="robot.left"/>
Incorrect Answer 2	<input type="text" value="robot.left{"/>
Hint	<input type="text"/>
Difficulty	<input type="text" value="10"/>

Save

# Game Administration

## Designing Practical Programming Challenge

Title	<input type="text" value="Collect the disk"/>
Description	<input type="text" value="In the first task simply collect the disk by using the command blocks (arrows) for controlling. Drag and drop them into the editor and Rob will move."/>
Task/Question	<input type="text" value="Collect the disk"/>
Solution	<input type="text"/>
Difficulty	<input type="text" value="10"/>
Robot Storage	<input type="text"/>

Choose which additional fields in the game should be visible.

Number of boxes	<input type="text" value="2"/>
Number of coins	<input type="text" value="2"/>
Number of hidden fields	<input type="text" value="4"/>

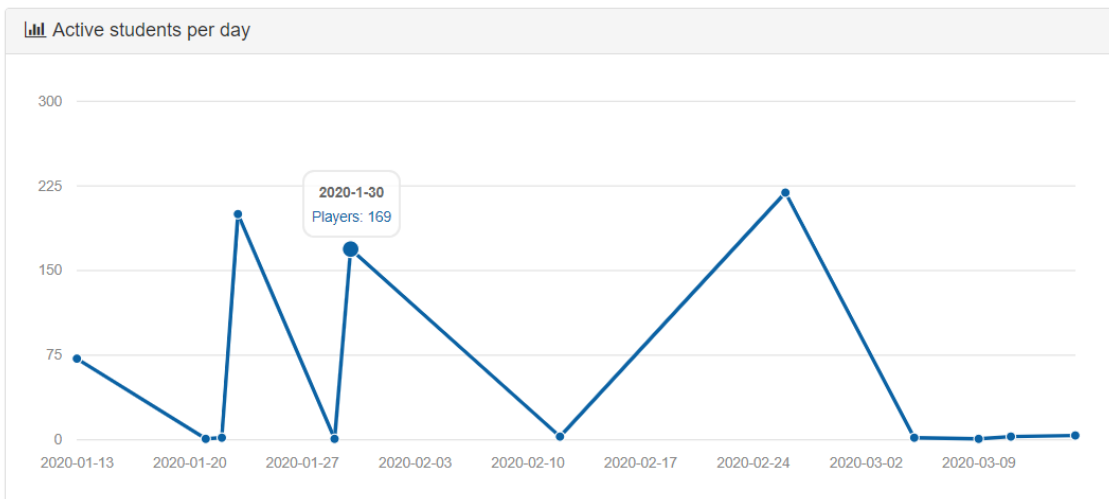
Enable/Disable code shortcuts in the video game

- Print ☐
- If statement ☐
- Variable ☐
- For loop ☐
- Move Left ☒
- Move Right ☒
- Move Up ☒
- Move Down ☒

 Save

# Game Administration

## Learning Analytics



Course Unlocked (%)



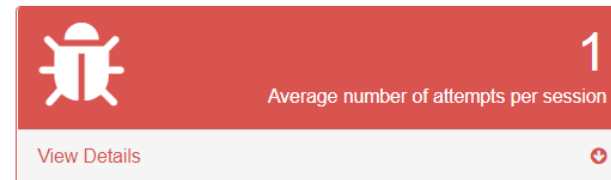
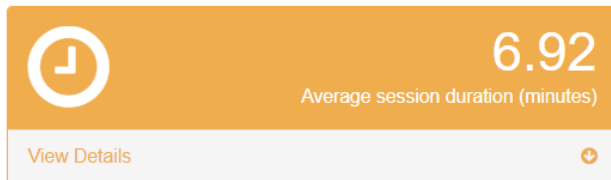
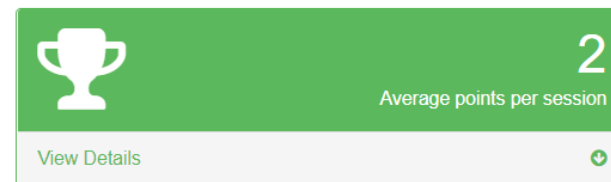
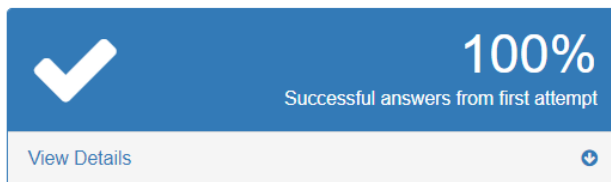
Skill Tree Overview

Skill	Statistics	Unlocked	Skill Mastered (%)
Basics	<a href="#">Theory</a> <a href="#">Practice</a>		

# Game Administration

## Learning Analytics

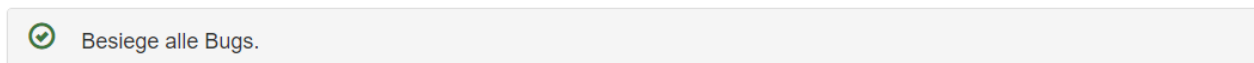
### Practice Statistics



### Skill Mastered (%)



### Details



# sCool - OOP

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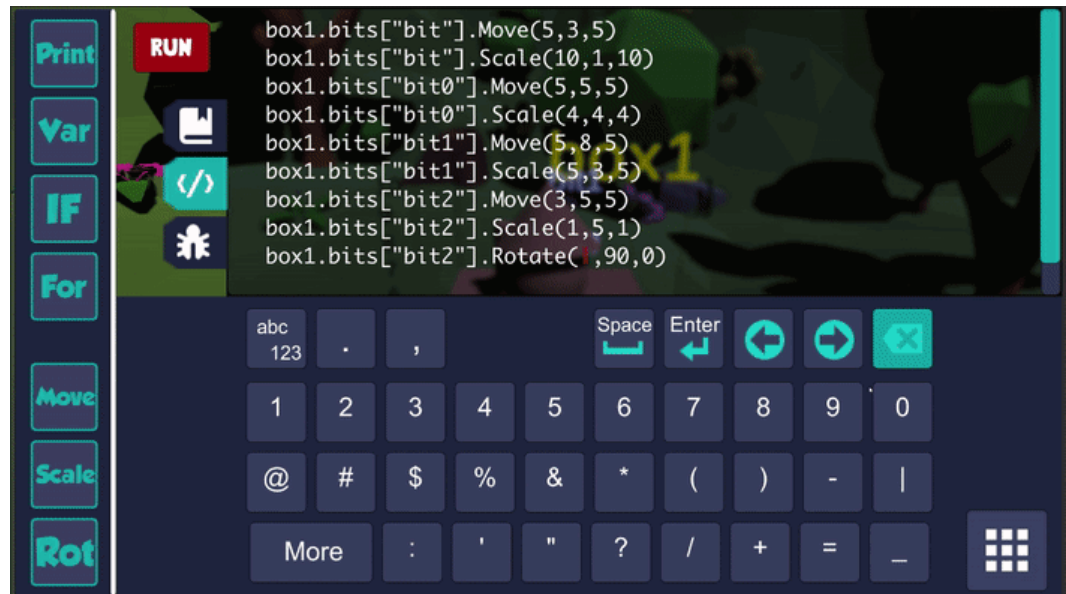
# Object-orientated programming

- New game types
  - Smart box missions
  - Box builder
- Focusing object-orientated
- Interacting with objects (Python)
  - Methods
  - Properties



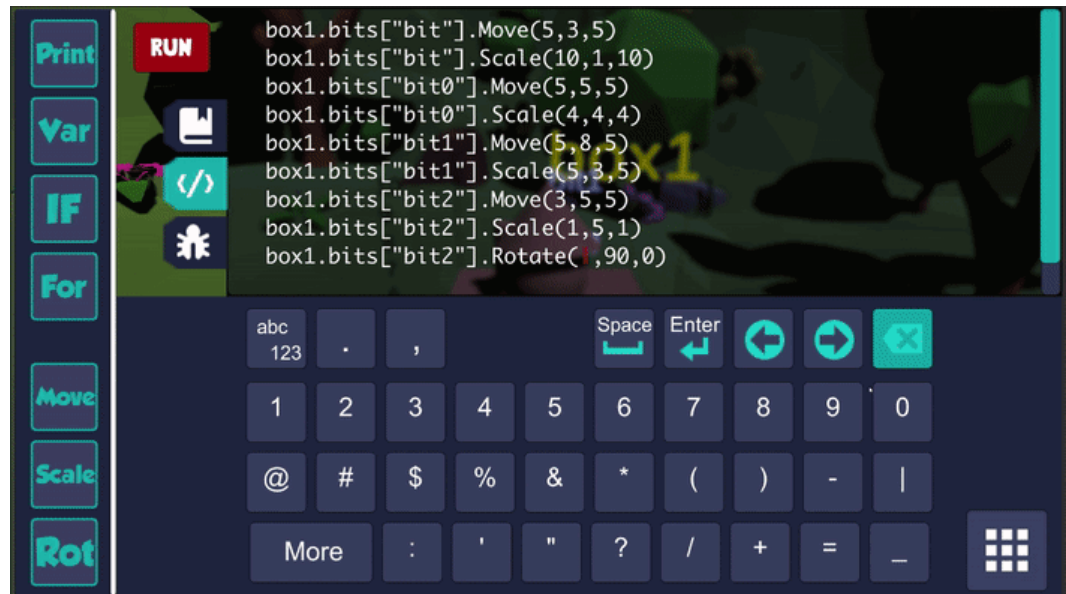
# Box builder

- Basic shapes (square, cylinder, pyramid, sphere)
- Combine shapes to build object
- Build complex objects



# Box builder

- Use methods and properties
- Three operations on objects: move, scale, rotate



# Smart boxes

- Defeat the bugs!
- Re-use built objects (box builder)
- Interact with objects



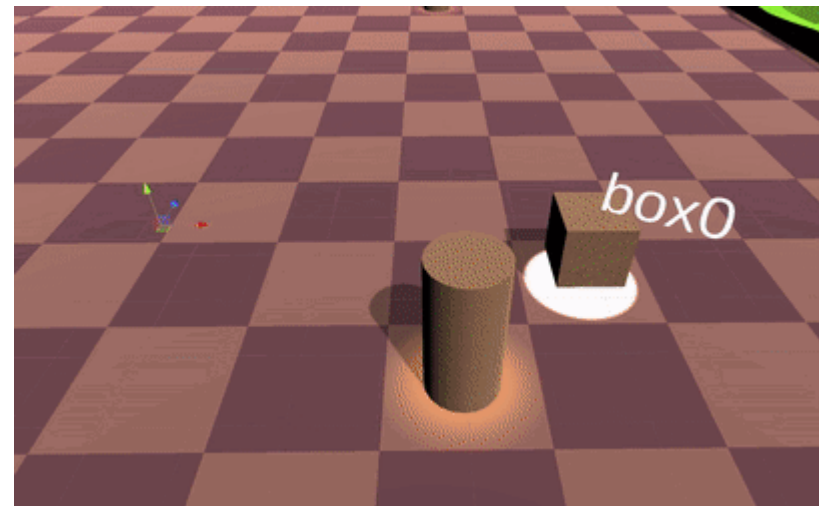
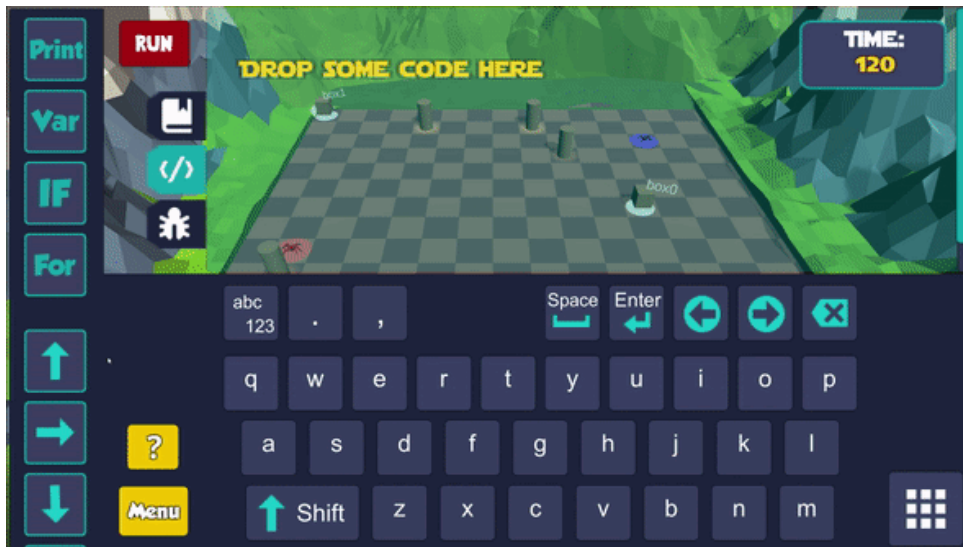
# Smart boxes

- Hit bugs using the objects



# Smart boxes

- Change properties



# Possibilities in Teaching

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# Coding Concepts

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- Fundamentals (commands, sequencing, data types)
- Conditions
- Loops/Repeating
- Arrays (basic field-based algorithms)
- Object-orientation
- Complex data types (lists)



# Content

- Worksheets online available for various topics
- English/German
- Constantly growing content



### Rob's Delivery Service

The crew of the spaceship has been on a foreign planet for a few days now. The food supplies are slowly running out and it is time to get some food. The team commits Rob to collect the food on the planet and bring it back to the astronauts. Can you help him pick up the food first and then bring it to the right person? The cereal bar belongs to the yellow astronaut and the noodle bowl to the red one.

Commands

### Rob the Mechanic

During the space shuttles crash some parts got lost. All these parts are widely scattered now, and they seem to be lost. Can you help Rob to collect the pieces and then bring them back to the spaceship? Try to avoid the obstacles in the field (rocks and boxes) because Rob cannot pass them.

Commands

# sCool - Contact

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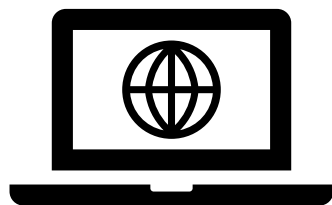
# Further information?

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- Visit our project website for ...
    - information about sCool,
    - teaching content,
    - research,
    - and trying sCool!
  - If you are interested in
    - a workshop with your students,
    - using sCool in your class or
    - any other kind of cooperation
- feel free to contact us

# Further information?

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<https://steinmaurer.cc/sCool/>



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