TINKER BOTS®

Curriculum

MY FIRST ROBOT

MINT
EDUCATION PRODUKTE

Table of Content

Part A – Introduction and Preparation

1. This is Tinkerbots

The history of Tinkerbots began back in 2005 at the Bauhaus University in Weimar, where Leonhard Oschütz and Christian Guder met during their joint university studies.

As part of their product design studies, the two had to devote their time to a “Dream-machine” in 2009. During that year, Leo built the first functional prototype of what would later become the Tinkerbot: kinetic, user programmable modules with connectors.

When their mutual friend Matthias Bürger, who was writing his doctoral thesis on innovation economics, joined the project in 2011, the cornerstone was laid for the creation of a GmbH (limited liability company). By 2013, the three had found their first sponsors and the project progressed. The first successful campaign on the Crowdfunding platform Indiegogo followed in 2014.

After the first construction kits were delivered in 2015, things progressed steadily. The idea of making kinetics, robotics and programming playfully accessible for children and adolescents and ensuring fun and creativity is still the driving force behind our work today.

The second generation of Tinkerbots was launched two years later, offering some improvements and better tailored to educational needs.

Kinematics was set to become international in 2017. We went to trade fairs around the world, gathered new insights and began to focus on the educational market.

We want to use Tinkerbots to offer children, young people and other interested parties the opportunity to meet where they learn for their lives: in schools, kindergartens and other educational institutions.

The modularity, the growing possibilities and the programmability make Tinkerbots a unique construction kit, which covers many MINT aspects from the beginnings of computational thinking to programming with Python in a playful, creative and yet educational way.

2. Learning with Tinkerbots

Tinkerbots allow to "grasp" the basics of computational thinking, robotics and programming. We want to make these topics as easy, exciting, playful and educational as possible for teachers and students.

But why Tinkerbots?
Tinkerbots do combine playing and learning in a unique way. The Tinkerbots are robust, intuitive to use and grow with you due to their modularity. The simple and child-friendly design takes away right from the start pupils' inhibitions to deal with new technology and makes it easier for teachers to get started with the new material.

'My First Robot' offers a good access to the world of the Tinkerbots due to the 2 modules limitation. It is easy to assemble and has a very simple visual programming. Through the use of symbols, words can be almost completely omitted in the app, which also allows children and learners who cannot read to get started. The appearance of the small robot offers the chance to invent different stories revolving around the robot. These enable the teacher to define tasks that go beyond

robotics and at the same time to bind the children's attention more strongly.

The tasks related to 'My First Robot' are all aimed towards computational thinking. Students are encouraged to learn how to think, and use the Robotics series to find solutions more intuitively and easily.

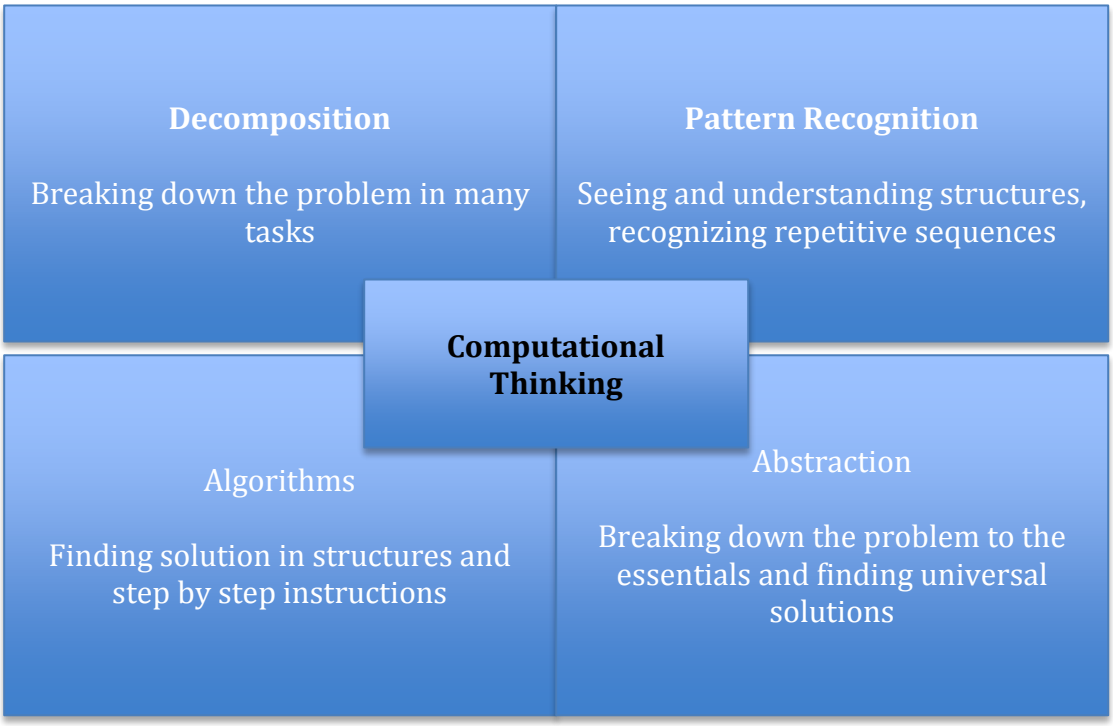


Figure 1 Computational Thinking

Computational thinking mainly relies on the four pillars of decomposition, pattern recognition, algorithms and abstraction (see Figure 1 Computational Thinking).
With these four tools, students will be able to comprehend complex problems, divide them into smaller parts, recognize repetitions, and apply problem-solving approaches from what they have already learned.
However, these skills not only help in programming, they also enable solutions to be found in many situations. Therefore, attention has been paid to refer to real-life problems in these materials.
The Robotics series is intended for advanced users. It offers greater complexity and freedom. Students can learn more about algorithms, programming and sensor technology. The Robotics series also allows models to grow with their users. From the simple Teach-In, to the Blockly connection and the Python based programming, the Tinkerbots are able to guide the path of the young programmers.

3. Teacher Training

3.1 Basic Setup

First we recommend that you become familiar with the kit and its contents. All units and their functions are described here:

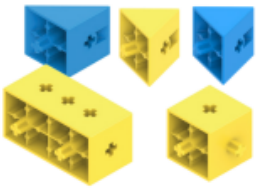
Module	Function
Powerbrain	
	Power supply & Bluetooth interface The red block is actually more than just the brain of the Tinkerbots. The Powerbrain combines the functions of the most important organs required by humans and robots. So other modules do not only receive information on which actions they should perform. The Powerbrain also supplies the entire robot with the necessary energy via its lithium-ion battery. The device has to

be charged before first use. The Powerbrain also includes a Bluetooth 4.0 interface that provides a connection to your smartphone or tablet. This allows you to take charge by using the Tinkerbot app. The LED/button interface can also be used to operate the Tinkerbots in other ways. The recording function allows the robot to capture certain movements, which can be reproduced with the touch of a button. A loudspeaker for acoustic signals is also included.
Communication with all Tinkerbots' modules.
The built-in charging port ensures charging of your Powerbrains battery. Similar to the way the human brain transmits information to other body organs, the Powerbrain can communicate with all the other connected modules thanks to the wireless connector that transmits data and power. For example, the Grabber module can be controlled by simply touching a button.

Double Motor

Machines, assembly lines, chain drives or vehicles need motors and mobility. The two motor shafts rotate independently forwards or backwards. The double motor allows Tinkerbots to endlessly move in one direction until it is stopped by an object or remotely controlled by app.

Cubie



Cubies refer to the passive cross-axis building blocks developed by Kinematics.

The controls:
There are different ways to control the Tinkerbot. Nothing is easier than bringing Tinkerbots® to life. Their controlling is just as creative as building the robots themselves. Children can decide on how they want to operate their robots. They can perform standard movements, teach their

creations their own movements by hand and replay them, set them in motion using a smartphone or tablet (Android, iOS) or even program them themselves.

1. Build a model and simply press "Play"
If movement modules are installed in the model, the programmed standard motion will be performed after pressing the Play button.

2. Speed control
As the model moves, the speed can be adjusted using the "Plus" and "Minus" buttons. A total of 5 speed levels are available

3. The recording function / the teaching
By pressing the "Record" button the Powerbrains recording mode is activated (red LED blinking). Now you can move the model as you like. If you press the "Record" button a second time, the recording stops (red LED light's on) and can be reproduced via the "Play" button.

4. "The Tinkerbots World" App
With the "*Tinkerbots World*" app you can control all models designed by us.
The Smartphone/ Tablet works as a remote control.

Figure 2 Screenshot Tinkerbots World

With the Tinkerbots World's creative mode, there are no limits. Connect the Control Elements to the Powerbrain modules and start piloting your very own robot.

5. The "My First Robot" App
Start in gaming mode. The function blocks have to be unlocked first.
Open the app, start the gaming mode and press the small robot on the upper right corner. 'My First Robot' will then move. This motion (1 x to forward) has to be replayed with the help of the existing function blocks. To do this, simply move into the blue area below.

If you correctly inserted the blocks from the blue area to the top of the game area, check by pressing the green question mark BEFORE the blocks. The app will verify your input and give you a visual indicator if it was correct.
More and more function blocks will be unlocked gradually allowing you to use them in creative mode. Also a purple area will be added next - these are the sound effects of the robot.

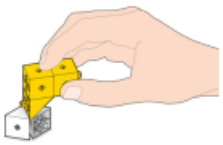
Figure 3 Screenshot Creative Modus

The Creative Mode is designed as follows: > I Command > Robot Executes. If you are in creative mode, please go to the green area at the bottom of the screen. The blocks with the "Play" button and the "Circle" movement have their purpose. You start with the play button and move it into the field first. Then switch back to the blue area at the bottom of the screen and add as many blocks as you like by dragging them next to the play button. Once you are done, touch the "Play" button and the robot executes the movement to the building blocks. The "circle movement button" in the green area can be placed at the end of the block row. The robot will then loop the movements over and over again.

3.2 Important terms and explanations

In order for you to be able to safely use the most important terms, we have compiled a small glossary here:

Instruction	In programming, an instruction is a command or order that defines the sequence of a program and is interpretable by the compiler.
Condition	A condition defines a command more precisely and influences the flow of a program. Conditions can be based on counting loops, sensor values, environmental values or other variables.
Blocky	Blockly is a library developed by Google to create visual code editors. It is often developed using JavaScript or Python code. Users do not have to worry about the spelling or syntax of programming languages.
Bluetooth	Bluetooth or BT is the industry standard for transmitting data between devices over a short wireless link. BT 4.0 is required to control the Tinkerbots.

Bootloader	The Bootloader refers to the part of the firmware on a device (e.g. the Powerbrain) that is required for the launch process and cannot be changed. It is responsible for loading the correct software at startup.
Code-block	To control the My First Robot or use the Blockly Code Editor, colorful graphical blocks are used to write a program. These blocks are referred to as code blocks.
Compiler	The compiler is some sort of translator that translates the programming code into computer-readable machine code.
DC Box	The DC box refers to the charging socket with plug connector built into the Powerbrain.
Editor	The editor is the section in a program (whether My First Robot App or Blocky or Python context) in which the program code is edited.
Firmware	The firmware of a device designates the device-specific software which can only be exchanged using auxiliary tools and which defines and controls the functions of the device.
Function	A function is an embedded series of instructions and sequences that give back the result of the instructions.
Hardware	Hardware is the physical component of a device. It is the collection of mechanical and electronic components of a system. The software is executed from the hardware.
Interface	The interface of a device is its control unit. It is defined by a collection of buttons, displays, touch screens, sensors or microphones and loudspeakers.
LED	An LED is a small component that is stimulated by electricity to glow. Depending on the technical construction, the material and the power used, different wavelengths and colors can be generated. The LED is considered to be long lasting and energy saving.
Location Service	The Location Service helps to determine the approximate location of a device by using a smartphone or tablet. Our apps require access to these services to establish a stable Bluetooth connection. However, we do not store or share this information.
Python	Python is a programming language developed in Amsterdam, which is characterized by a simple syntax and a short programming style.
Reset	Reset is a process to bring electronic devices back to a defined initial state. It is mainly used to reactivate devices that no longer react to inputs or have a malfunction.
Separator	The separator is used to separate cubies from each other, from modules or axes, should these be too tight. 

Sequence	A sequence is a succession of instructions.
Software	Software is a collection of programs and data that define the function of a device. It is executed on the hardware.
Teaching	Teaching is a form of robot programming that is frequently used in the industry. Therefore, the robot is instructed by a tutor. The acquired knowledge is stored and repeated. Some parameters such as speed can be changed afterwards.
Update	An update is a software or firmware upgrade.
Restoration	During the restoration of a device, faulty software is overwritten with a software stored as a backup. This software is usually used if the devices do not have their own firmware (like our modules) and present malfunctions.

3.2 Before each hour

Before each lesson the following points must be checked or prepared in order to use the Tinkerbots sets correctly:

- ☐ One building kit available for 2-3 students each
- ☐ Charge Powerbrains
- ☐ Check weather all modules are available for the planned unit
- ☐ Tablets/PCs/ Smart devices need to be switched on and loaded
- ☐ Worksheets/ teaching aids at hand
- ☐ Spare modules (in case one should break)
- ☐ Videos ready

Once these points have been worked through, nothing should stand in the way of a successful teaching unit. You will find this checklist and other small aids for teachers in the appendix.

4. Structure of the Curriculum

The aim of these manuals is, on the one hand, to provide you as a teacher with material for the first seven lessons. We want to make it easier for you and your students to enter the world of My First Robot.
On the other hand, we also aim to enable you to develop your own units afterwards and to give the students individual tasks. Within the units, small ideas and support for comprehensive projects as well as a continuation of the tasks are given.
To begin with, the My First Robot will be introduced and brought closer to the students. Who is he? What does it do? How does he live?

Teaching units follow, which deal with the fundamentals below:

- Problem solving
- Algorithms
- Program sequences
- Structures

There will always be a mixture of digital and analogue content, to ensure that students don't just deal with digital media.

Part B – Teaching Unit

5. Hello little Robot

In this first teaching unit the students shall get to know the robot. They learn how to use the modules and have the opportunity to test the remote control via app.

PLANNING	TIME	45 – 60 Min
	REQUIRED MATERIAL	1 My First Robot per 2-3 students Individual modules Worksheet 1 - Hello little robot
	SPECIFIC PREPARATION	Separate modules on the table A complete My First Robot Videos 1-4

FOKUS	LEARNING CONTENTS	Names and functions of the modules Chain drives Plug-in connection Controlling the Tinkerbots modules
	REQUIRED VOCABULARY	Module Powerbrain App Motion component

Procedure	Organization	Introduce the My First Robot and its components: • Powerbrain as control unit (heart and brain) of the robot • The motor module with 2 motors that can move in different directions • The chains as a drive (advantages on uneven ground and the need to only operate 2 axles to generate steering) Demonstrate how the parts are plugged together.
	Introductory Remarks	Welcome to the world of robots. We want to explore the world of robots, see what we know about robots and get to know My First Robot. The little My First Robot is a research robot that has set itself the task of developing a syrup that makes all food delicious and beautiful. So he lives and works in his small laboratory on all kinds of chemical reactions and with a lot of equipment.
	Problem Definition	The students are supposed to become acquainted with robots and their tasks and possibilities.

	Assignments Task 1	Collect robots you know together with the students.

	Task 2	How does a robot differ from a human being? Define with the students what characteristics robots have.
	Task 3	Explain the 'My First Robot' modules and show how the connector works
	Task 4	Each group shall now build a robot. Let assumptions be made as to why the robot has a chain drive.
	Task 5	If time permits, let the students make their first play attempts with tablet and robot.
	Presentation	Visualize the robots, named by the students, and hand out worksheets to explain the components of My First Robot.
	Thinking	What functions does the robot have? Show videos 1-4 that show the robot in action.

6. Self Help

The purpose of this unit is to make it easier for you and the students to access and understand the robot in such a way that you can help yourself in case of minor malfunctions.

Planning	Time	45 Min
	Required Material	1 My First Robot per group of tablets/ smartphones
	Specific Preparation	Charge My First Robot Charge Tablets Prepare Cubies

Focus	Learning Content	Helping people to help themselves How can I handle small malfunctions correctly? Correct use of the app Behavior development with other technical devices as well
	Required Vocabulary	Engine Module Cubie Interface LED Bluetooth

Procedure	Organization	First, the components of the My First Robot are repeated with the students. Possible error situations are then gathered and compiled in class or group settings. You will then discuss the solutions and procedures with the students. Rules for handling the My First Robot and the tablets will be established and eventually recorded for all to see.

	Introductory Remarks	Errors may occur with any device or machine, either caused by the user or by technical conditions. In order to avoid that students have to come to the teachers for every small error, and in order to empower students in the use of the My First Robot, a self-help tutorial is an ideal option.
	Problem Definition	Recognizing and remedying malfunctions
	Assignments Task 1 Task 2 Task 3 Task 4 Task 5	 Attempt module recovery Assistance with Bluetooth problems: • Turning Bluetooth on and off on your Smartphone • App Access rights control • Control website accesses Powerbrain Reset • Hold down '+' and '-' simultaneously for a long time when the Powerbrain behaves strangely • Observing the behavior of the Powerbrain Engine stops or rotates only in one direction • Push the engine with a Cubie • Test through standard movement in play mode Testing the Bootloader If the Powerbrain fails completely or the update failed: • Keep record pressed

		• Plug in charging cable • Perform update again
	Presentation	Students shall describe the misconduct for each task and provide a solution. Possibly create a flowchart for the topic with the teacher's help.
	Thinking	Let the students summarize how they should behave in case the robot fails and what the possible causes might be. Ask the students if they feel more confident and if they have ever been in a situation where they did not know how to help themselves with technical equipment. Collect ideas on how to approach such problems in the future.

7. Exploring the Laboratory

This unit serves to internalize the code blocks of the app, to understand why robots work with instructions and what computer programs consist of. The students should get a first impression of what the world of robotics looks like and may try themselves first in small sequences.

Planning	Time	60 Min
	Required Material	1 My First Robot per group Tablets/ Smartphones Worksheet 2 - Code Blocks Worksheet 3 - Code Blocks 2
	Specific Preparation	Charge My First Robot Charge Tablets Code block images

Focus	Learning Content	Defining Rules and Instructions Abstraction of statements Creating small everyday algorithms
	Required Vocabulary	Instruction Algorithm Sequence Code block

Procedure	Organization	Distribute the robots and repeat each component and its function. Gather with the students the methods to control a robot. Start with programming and explain how programmers work and what tools they use on a daily basis. Keywords: Programming / Programming languages / Program building Define the words 'instructions' and 'sequence' and how they relate to the programs' algorithms.

		Which instructions might the robot recognize? Collect suggestions and compare them with the real code blocks. In a collaborative effort, students are asked to find ways and develop algorithms.
	Introductory Remarks	Explain the definition of 'instructions' Why do instructions have to be described very precisely? How can instructions be described as generally as possible? Instructions must be short and concise. They should only contain one action at a time. The action must be precisely defined. Start with a verb. A succession of instructions is called an algorithm or sequence. Example: Description Recipe
	Problem Definition	How do I teach the robot exactly what I want it to do / where it should go?
	Assignment Task 1 Task 2	 What instructions might the robot know in order to move? Forward Reverse Turn to the left Turn to the right Drive fast Drive slowly Introduce the different code blocks in the app and connect them to the collected instructions. Divide the students into groups, each group will be given a starting point in the lab and a common goal.

		The students should describe the path as follows: • Literally, with instructions • Summarize instructions to sequences • Algorithm in the form of code blocks Use the app and the code blocks to control the students' solutions.
	Presentation	Each group is allowed to present their own path and perform the algorithm. Together they can decide if there is a shorter way or if there are other ways to simplify the algorithm.
	Thinking	Repeat what the students have learned today about instructions, their structure and function. Show how important instructions and defined action algorithms are in everyday life and where we encounter them. Students can compile their own algorithms (everyday/ school or robot).

8. Auxiliaries and resources

In the following lesson the students are exposed with resources such as auxiliaries, functions and looping.

Planning	Time	60 Min
	Required Material	Cookbook Video 5-7
	Specific Preparation	Students have to bring a recipe from home or via the Internet

Focus	Learning Content	What are programming auxiliaries? Looping Conditions of use Repetitions
	Required Vocabulary	Instructions Looping Conditions of use Function Counter

Procedure	Organization	Show videos 5 and 6. Show which tools the robot uses and briefly explain what to do with a magnifying lens and Petri dish. Repeat what has already been learned about sequences and instructions. Gather ideas with the students on which tools to use when programming. Work with students to define grinding, condition, and

		function. Assign these tools to everyday situations.
	Introductory Remarks	Just like the robot in the laboratory, programmers also make use of certain tools: • Repetitions with counters (loops): Counters are used to execute exactly a certain instruction or sequence x times. To do this, a counter is determined and reduced by one after each cycle. As soon as the counter is zero, the instruction is no longer executed. • Conditions: A sequence or instruction is executed until a condition is fulfilled. This is not only about counters, but also about sensor queries such as colors or recognized gestures, statuses or environmental values. • Function: Sequences that are needed frequently and in different programs can be stored in functions. In the program itself, this function is repeatedly called up in order to use these instructions. This makes programs clearer and saves programmers a lot of work.
	Problem Definition	What do programmers' auxiliaries look like and what can I use them for?
	Assignments Task 1 Task 2	 Have the students search for conditions and functions in their cookbooks/recipes. Collect them and assign them to the tools. Let the students write a first small function: The function is called 'magnifying lens'. The pupils should describe in short instructions what a 'magnifying lens' does (possibly with conditions).

	Task 3 Task 4	Run video 6 again and summarize with the students what is happening. Where is the Magnifying lens's function used? Watch Video 7 with the students and describe with them what the food looks like before and after the syrup treatment. Have the students write a 'syrup' function that describes the behavior with the conditions. Let the students think beforehand about what happens to food that's already tasty and pretty.
	Presentation	Collect the solutions and evaluate them together with the students. Are all cases covered? What happens to other foods? What happens to things that are not food? What happens to living creatures?
	Thinking	Repeat what resources have been learned, what they are used for and how they are used. Collect examples with the students from everyday life where such aids are also used.

9. Design and disassembly

The students learn how to divide a task into sub-problems and how to use the repetitions.

Planning	Time	60 Min
	Required Material	Videos 8 and 9 1 My First Robot per group Tablets/ Smartphones Worksheet 4 - Sample
	Specific Preparation	Charge My First Robot Charge Tablets Sample files

Focus	Learning Content	Pattern recognition Task decomposition Creation of algorithms with the 'My First Robot' App
	Required Vocabulary	Pattern Code blocks

Procedure	Organization	Show videos 8 and 9 as an introduction. Show the patterns and let the students try to follow them as accurately as possible. The students should capture the programs via screenshot and then present them.
	Introductory Remarks	Describe this situation in the lab: It's dirty, there's syrup everywhere and it’s sticky.

		The robot has to drive through the laboratory without driving into the syrup puddles, which would cause the chains to stick together.
	Problem Definition	Take the patterns apart in order to follow them as effectively as possible.
	Assignments Task 1 Task 2	 Let 'My First Robot' follow the three upper patterns. Also use the loop function of the app. Save the programs in a screenshot. Create your own pattern and let 'My First Robot' follow that pattern.
	Presentation	The students may present their samples and the corresponding program.
	Thinking	Discuss with the students how they proceeded to disassemble the patterns and how the repetition points were determined. If there are different approaches, gather and discuss them. What would students do differently next time and which other approaches did they find?

10. Barrel Shifter

The students get to know another requirement. In addition, they learn to interact with each other and to commit to common rules.

Planning	Time	60 Min
	Required Material	Videos 10-12 1 My First Robot per group Tablets/ Smartphones Worksheet 5 - Laboratory
	Specific Preparation	Charge My First Robot Charge Tablets Code block images Lab plan

Focus	Learning Content	Wait - Command Social interaction to define common rules Fine motor skills
	Required Vocabulary	

Procedure	Organization	Show the videos 10-12 as an introduction Decide which rules have to be applied in order for a robot to find its way in the laboratory without driving into the syrup puddles. Set up these rules and visualize them. Are you discussing which additional rules need to be applied if there are several robots in the lab? Let the students find a way in the lab for their group. Draw the paths and check whether critical situations can occur.

		What additional blocks can mitigate these critical situations? Let the students find together for all robots a way to avoid these critical situations.
	Introductory Remarks	The syrup is in the special containers. Now the containers have to be carried away. A barrel pusher is needed for this purpose. Several robots are now also working together.
	Problem Definition	How can several robots work together? Which rule differences are there?
	Assignment Task 1 Task 2 Task 3 Task 4 Task 5	 Gather with the students the necessary conditions for finding the way in the laboratory, e.g. at the cupboard/table: turn right, drive forwards, turn left, drive forwards Assemble groups, have the barrel shifter built and position one robot each on the plan. Now set a target for each robot. Have the students find their ways. Gather the paths and check for critical situations (crossroads of passageways). Acquire rules that could help ease these critical situations. What additional building blocks could students use? Find all paths without critical situations together with the students, have these paths programmed.
	Presentation	Have all robots start at the same time. Is everything going well? Or are there accidents?
	Thinking	Which rules apply to several participants? Why do we need rules? What options do we have in programming to implement such conditions?

11. Penholder

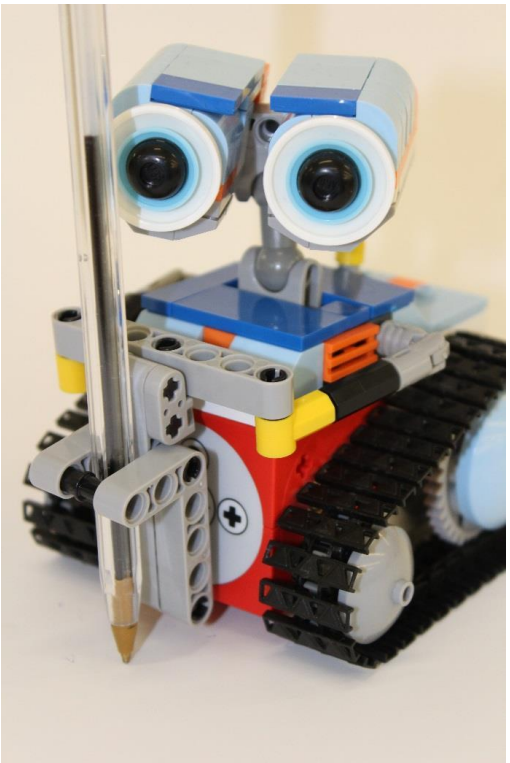
The students get to know another requirement. In addition, they learn to interact with each other and to commit to common rules.

Planning	Time	60 Min
	Required material	Video 13 1 My First Robot Tablets/Smartphones
	Specific Preparation	Charge My First Robot Charge Tablets Code Block images Lab Plan

Focus	Learning Content	Combination of all previously learned commands Pattern decomposition Fine motor skills
	Required Vocabulary	

Procedure	Organization	Watch Video No.13 together Think about what this penholder can be used for. The students are then asked how to write the first letter of their name with the penholder. Let the students program their letters.
	Introductory Remarks	We've learned all the orders we need. Now we will try to write our first letter with the penholder.

	Problem Definition	Cut the lines of the letters so that they can be traced. In addition, consider how the processes of writing a letter can be done with the robot, e.g. pause, command to lift the pen, move, command to lower the pen again.
	Assignments Task 1 Task 2	 Have the students document their path and visualize it with code blocks. Students shall now program and perform their path.
	Presentation	Compare the results. Are there different methods for the same letters?
	Thinking	What insights do the students gain? What else can be programmed?



Part C – Contact Information

12. Further Options

With these seven teaching units you can successfully introduce your students to the world of computational thinking and programming. The experience you gained with My First Robot allows you to develop your own tasks.

Projects for reading and writing practice, arithmetic or science teaching are also conceivable. My First Robot is a versatile and helpful tool that can help you in many areas.

For additional content about My First Robot or information on how to build on the knowledge you have gained with the Robotics series, please contact us. You can also share your ideas with us by using our email address or social media.

Contact us:

Kinematics GmbH
Education Team
Spreeallee 2
16321 Bernau

Tel.: +49 (0)3338 – 61 99 102
Email: education@tinkerbots.com

https://twitter.com/Tinker_Bots
https://www.facebook.com/tinkerbots.world/
https://www.instagram.com/tinkerbots/

Part D – Appendix

13. Checklists

Preparation

- ☐ One construction kit available for 2-3 students each
- ☐ Charge Powerbrain
- ☐ Check whether all modules are present for the planned unit.
- ☐ Are all modules up to date with the latest software version?
- ☐ Tablets/ PCs/ Smart Devices have to be switched on and charged
- ☐ Are the apps updated
- ☐ Worksheets/ Teaching aids at hand
- ☐ Spare modules (in case one should be damaged)
- ☐ Videos ready to play

Follow Up

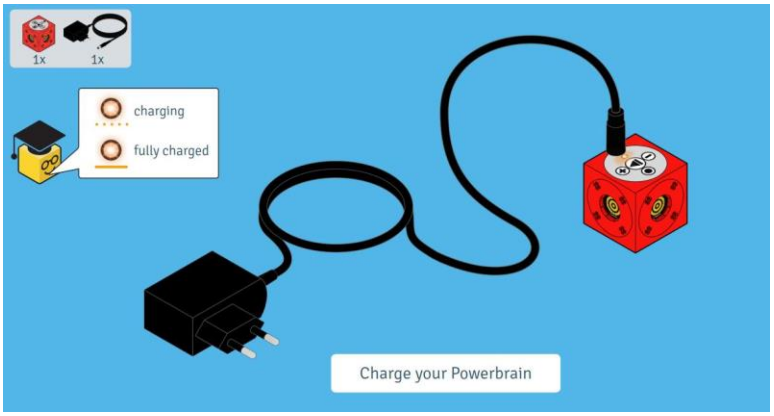
- ☐ Is the kit complete again?
- ☐ Restitution of all Tablets
- ☐ Are faulty modules placed separately?
- ☐ Modules that require an update placed separately (or already updated?)
- ☐ Worksheets collected?
- ☐ Screenshots saved?

14. Teacher's Help

Here you get the answers to the most important questions.

How do I charge the Powerbrain?

The Powerbrain is charged using the supplied DC plug charger. The LED on the Powerbrain indicates the current status.



How long does the battery last and how long does it take to recharge?

The battery runtime depends entirely on how many modules you use on your Powerbrain. With 2 modules, a full charged battery with continuous remote control lasts approx. 2 hours; with 4 modules approx. 1 hour. It takes less than an hour to fully recharge your Powerbrain.

Why does my Powerbrain not charge?

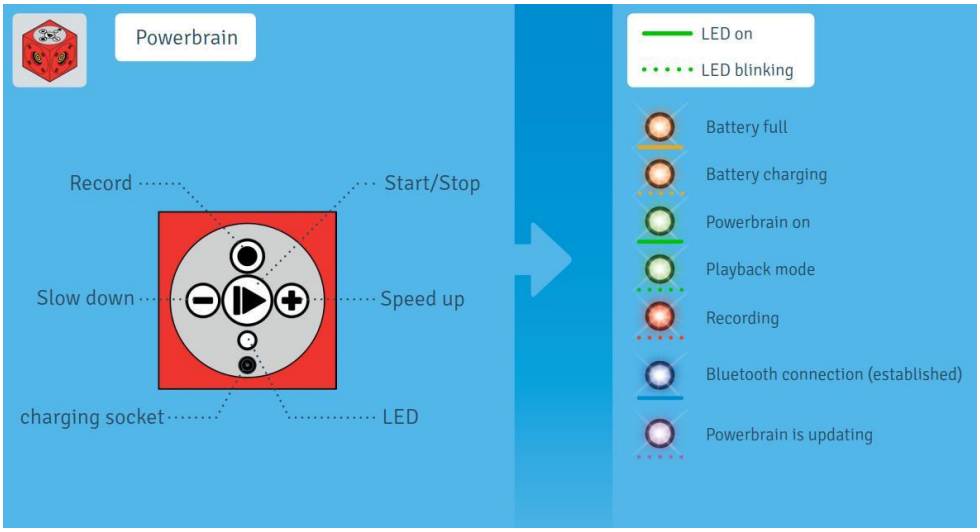
The Powerbrain may not have been properly connected to the included power supply. Please check if the power supply cable is plugged in correctly to the socket on the Powerbrain. When using the kit for the first time, you may have to use a little more force to insert the plug into the socket. When the battery is being charged, the status LED on the Powerbrain blinks yellow. When the Powerbrain is fully charged, the status LED will glow yellow throughout.

Why does the LED light on the Powerbrain not indicate the charging status?

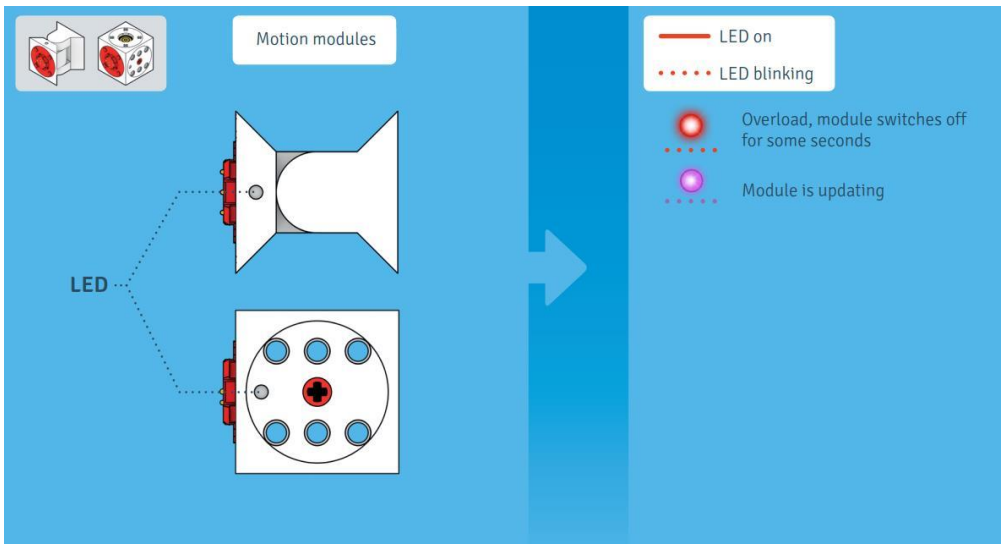
The Powerbrain can only be charged with the supplied plug adapter. Please do not use any other power supplies to charge the Powerbrain! If you use the supplied mains adapter and the battery still does not charge, please check first whether the plug is plugged in correctly. In a few cases it may happen that the Powerbrain is completely uncharged after a longer period of storage (several months). In this case, please try to charge the Powerbrain for 3 - 4 hours. Often the problem can be

solved this way. If the battery of your Powerbrain still doesn't charge, please contact our customer service.

What do the different LED colors mean and what buttons are provided on the Powerbrain?



What do the different LED colors on the modules mean?



In addition, the LED may glow red after starting the Powerbrain, which means that the module has not been registered correctly on the Powerbrain. Close the module again and reconnect it to the Powerbrain. The connection should now work.

As a model connects to the app's Creative mode, all modules light up in different colors to make assigning modules to controls easier.

I just received my Tinkerbots kit and can't turn on my Powerbrain. Why is that?

When designing the packaging, we placed great emphasis on the safe transport of the modules. Unfortunately, it has been shown that not all packaging can cope with the enormous demands and long distances. Sometimes, for example, a Powerbrain switches on and empties its batterie during transport. You will then notice that the Powerbrain cannot be switched on after unpacking. In this case, please charge the Powerbrain's battery first.

My Powerbrain does not react to keystrokes or the app remote control when switched on. What do I have to do?

To reset your Powerbrain, please press the "+" and "-" buttons simultaneously for 10 seconds. The Powerbrain will then switch off. After switching the Powerbrain on again, no error condition should occur.

My Powerbrain emits a continuous sound and does not respond to a keystroke. What do I have to do?

To reset your Powerbrain, please press the "+" and "-" buttons simultaneously for 10 seconds. The Powerbrain will then switch off. After switching the Powerbrain on again, no error condition should occur.

The "Record-and-Play" mode does not work after unpacking the Tinkerbots modules. What can I do?

With the purchase of a Tinkerbots set, only a basic version of the Tinkerbots firmware is present on the Tinkerbots modules. To use all operating modes of the Tinkerbots modular system, download the My First Robot App or the Tinkerbots World App from the Google Play Store or Apple Store. Open the app and connect it to your Powerbrain or motion modules. Then follow the instructions provided by the app. During the first use the latest firmware version will be downloaded and installed. Afterwards you can use all operating modes of the Tinkerbots construction kit.

Why does one of my modules not move?

It is possible that the plug connection does not supply power or data.
Troubleshooting: Please check whether the module is correctly inserted into the plug connection and whether the contact surfaces of the plug connection are dirty. If so, clean them carefully with a clean and dry cloth, taking care not to scratch the gold surfaces.
Furthermore gently press the four springy contact pins on each module in and out or tap them carefully on a hard surface.

Do I have to update the firmware on my modules?

Since we constantly improve the firmware of the Tinkerbots products it is worthwhile to update the firmware of your modules. Practical: A firmware update is automatically performed on your modules as soon as you connect the My First Robot App or the Tinkerbots World App to your Powerbrain.

The modules are no longer recognized or moving after the firmware update. What can I do?

Something seems to have gone wrong with the automatic software update. Please download and install the My First Robot App or the Tinkerbots World App from the Play Store or App Store and install on your smartphone or tablet. Now switch on your Powerbrain and plug a defective module into your Powerbrain and start the module recovery process by using the settings menu of the respective app (gear button in the main menu). Now a new firmware will be installed on your module.

Note: Please do not disconnect the module from the Powerbrain during the update. The update process runs as long as the status LED on the motion module flashes purple!

After a successful firmware update (via the My First Robot App or Tinkerbots World App) I am no longer able to connect to my robot or its remote control does not work anymore. What can I do?

This problem can occur with some Smartphones / Tablets. But the solution is quite simple. Please turn off your robot, close the Tinkerbots app and deactivate and reactivate the Bluetooth on your smartphone/tablet. Open the Tinkerbots app and follow the instructions. The problem should now be solved.

Why does my app not connect to the Powerbrain?

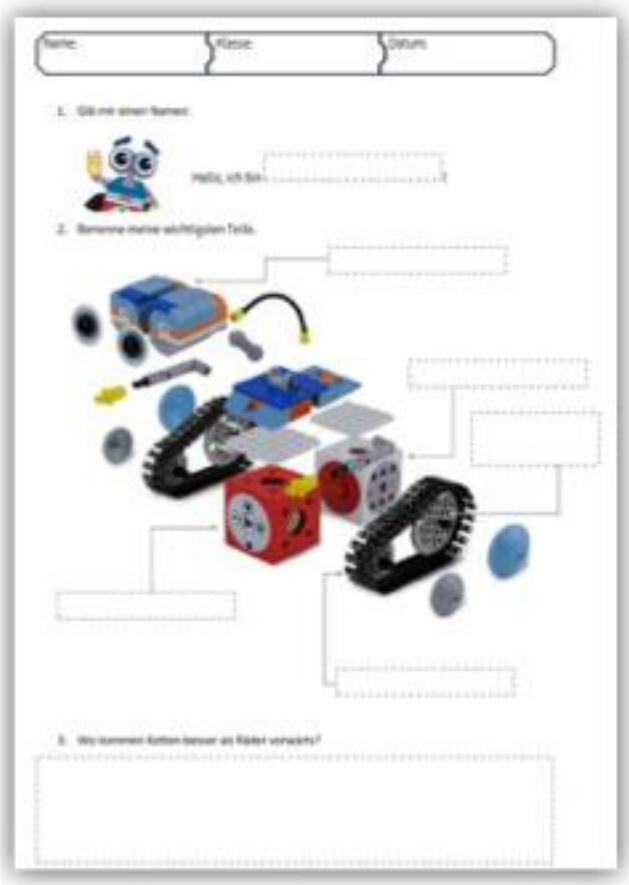
Please make sure that you have built the model you selected in the App menu. Please also make sure that your smartphone or tablet has the location service and Bluetooth are activated. This is the only way the app can connect to the Powerbrain. If you have assembled the model correctly and are still unable to connect, restarting the Powerbrain and switching the Bluetooth function on your smartphone or tablet on and off often helps.

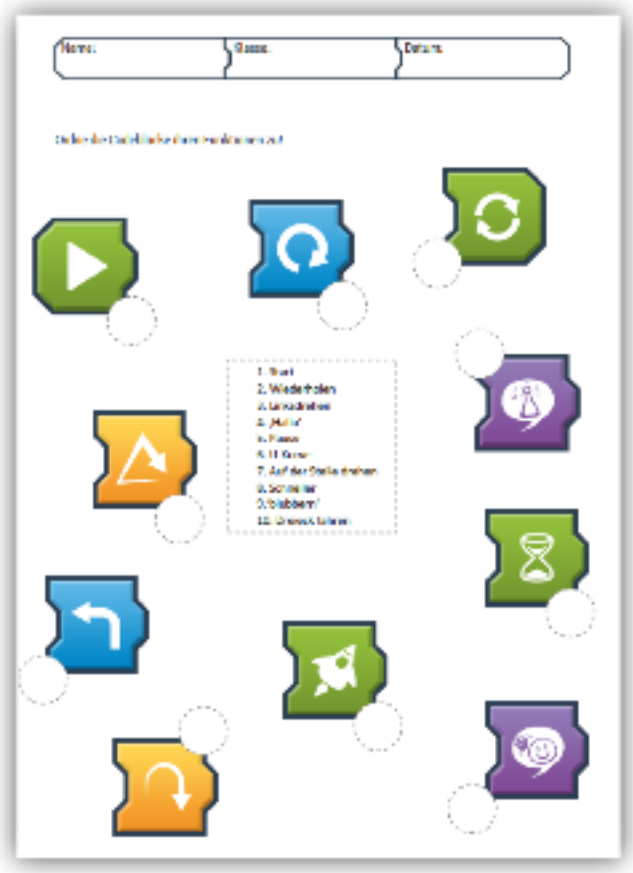
Connecting to my robot the app freezes on the "Bluetooth connection" screen. What can I do?

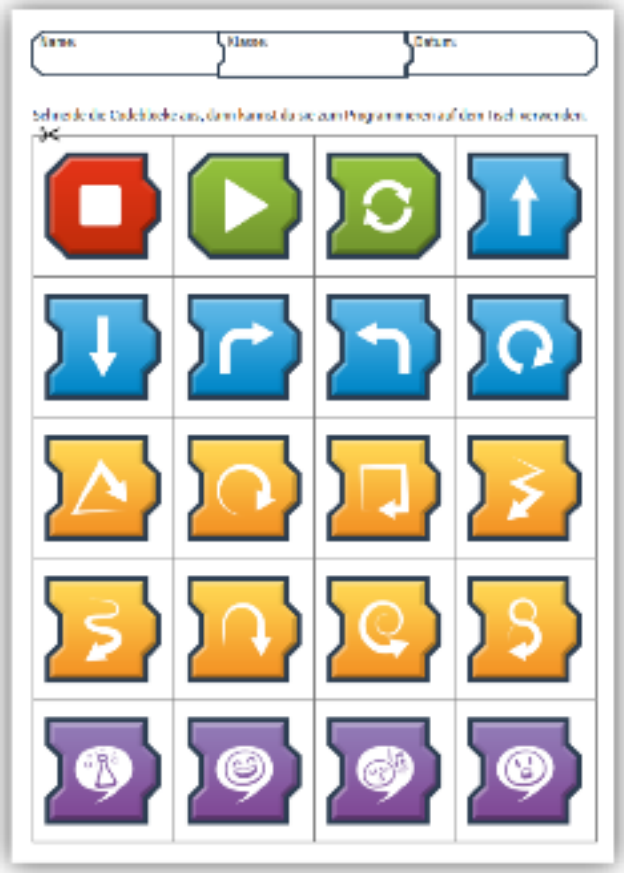
The problem may occur with a slow Internet connection. But the solution is simple. Please switch your Powerbrain briefly off and on again and try to reconnect. At the 2nd try it should work without problems.

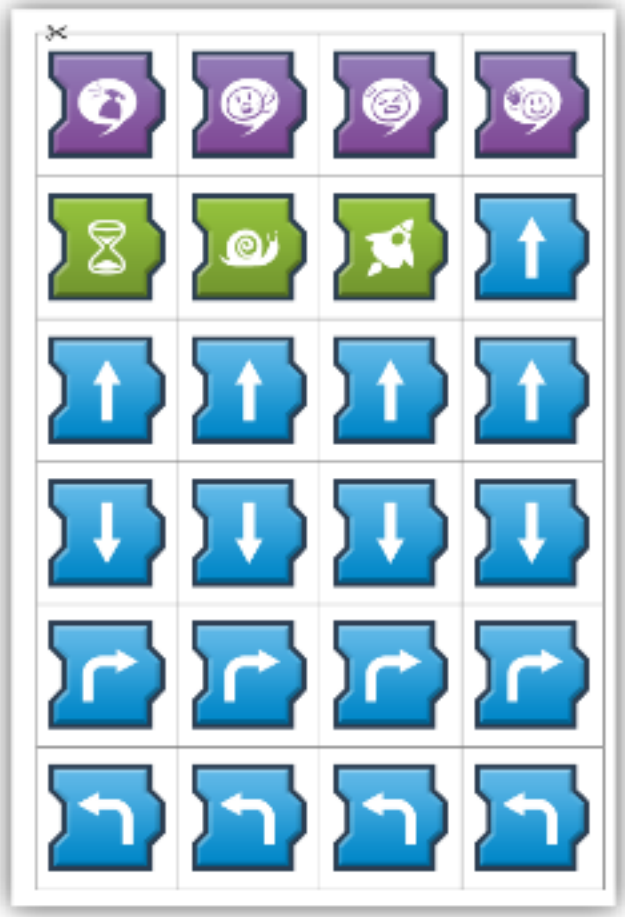
15. Worksheets with solutions

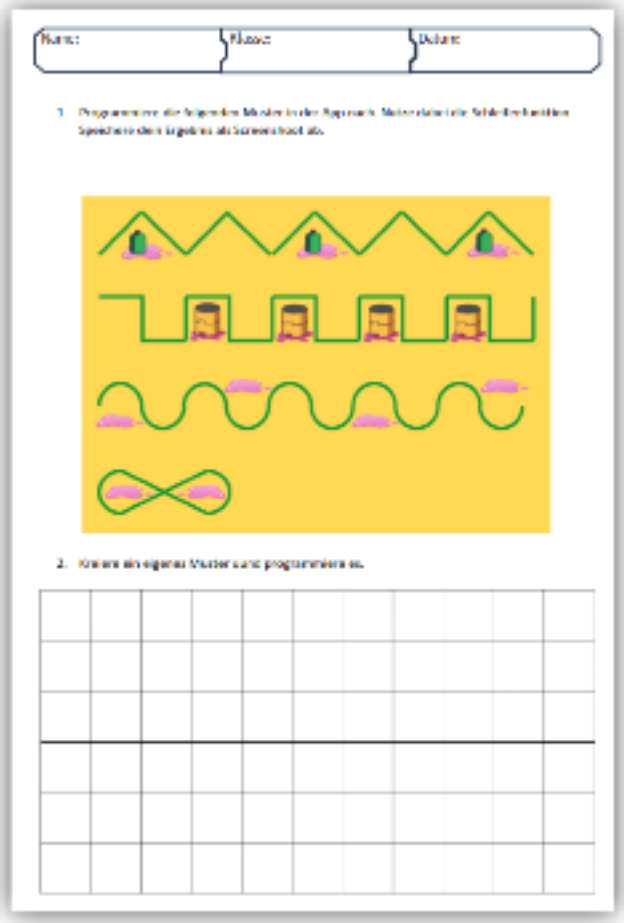
Here you will find a small collection of possible worksheets for the learning units. They are templates. Solution sheets are also available for some of them. The A4 templates can be found at the end of the curriculum.

Worksheet	Learn Unit
	Hello little Robot • Knowing the Robot • Find access • Naming the parts and their functions

	Explore the Lab • Matching the code blocks to the motions/noises • Stabilization of possible movements

	Explore the Lab • Code block overview • For cutting out in order to work on the table. • Code block visualization

	Explore the Lab • Code block overview • For cutting out in order to work on the table. • Code block visualization

	Patterns and disassembly • Recognize and disassemble patterns • Creative thinking to come up with your own patterns • Programming with the Loop

Barrel Shifter

- Rules and conditions formulation
- Find ways
- Programming with different conditions

16. Additional Working Materials

Among additional working materials we have summarized which other materials you need in order to design your lessons using Tinkerbots.

What tablet/smartphone features do you need?

All smartphones and tablets that support the Bluetooth 4.0 standard (Bluetooth Low Energy, Bluetooth LE, BLE, Bluetooth Smart) are compatible with our app. The Android operating system supports BLE starting with version 4.4, Apple devices support BLE beginning with iOS 8 (at least iPhone 5).

ATTENTION with iOS 9.5.3. A problem with the app currently exists.

Where can I find the videos?

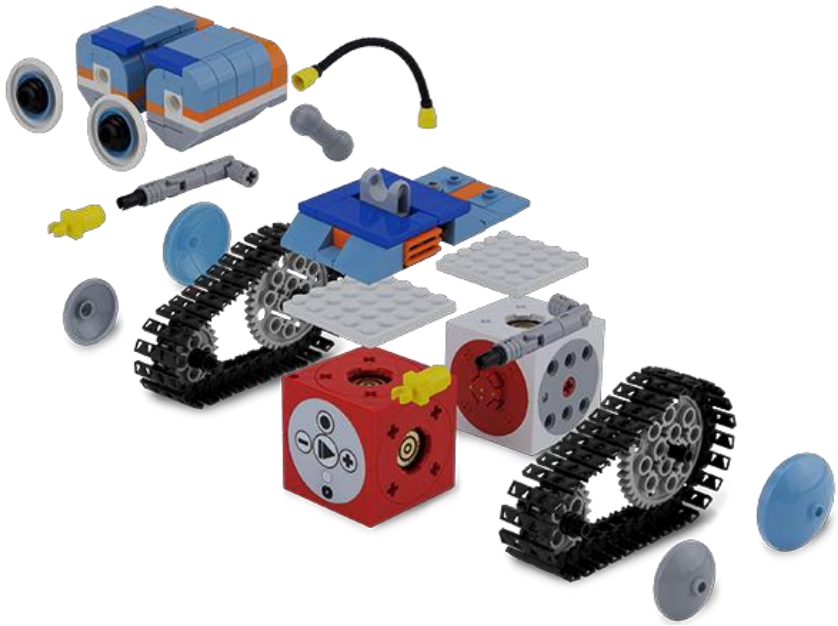
We are happy to provide the videos mentioned in the script. Please contact us via Email. The videos show the history of the My First Robot and its assembly.

Name:	Class:	Date:

1. Give me a name:

Hello, my name is _____ !

2. Name my most important Parts

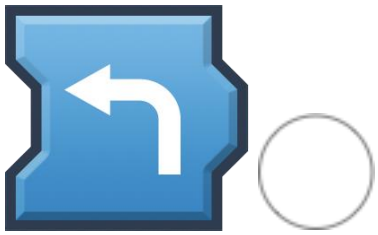


3. Where do chains get better forward than wheels?

Name:	Class:	Date:

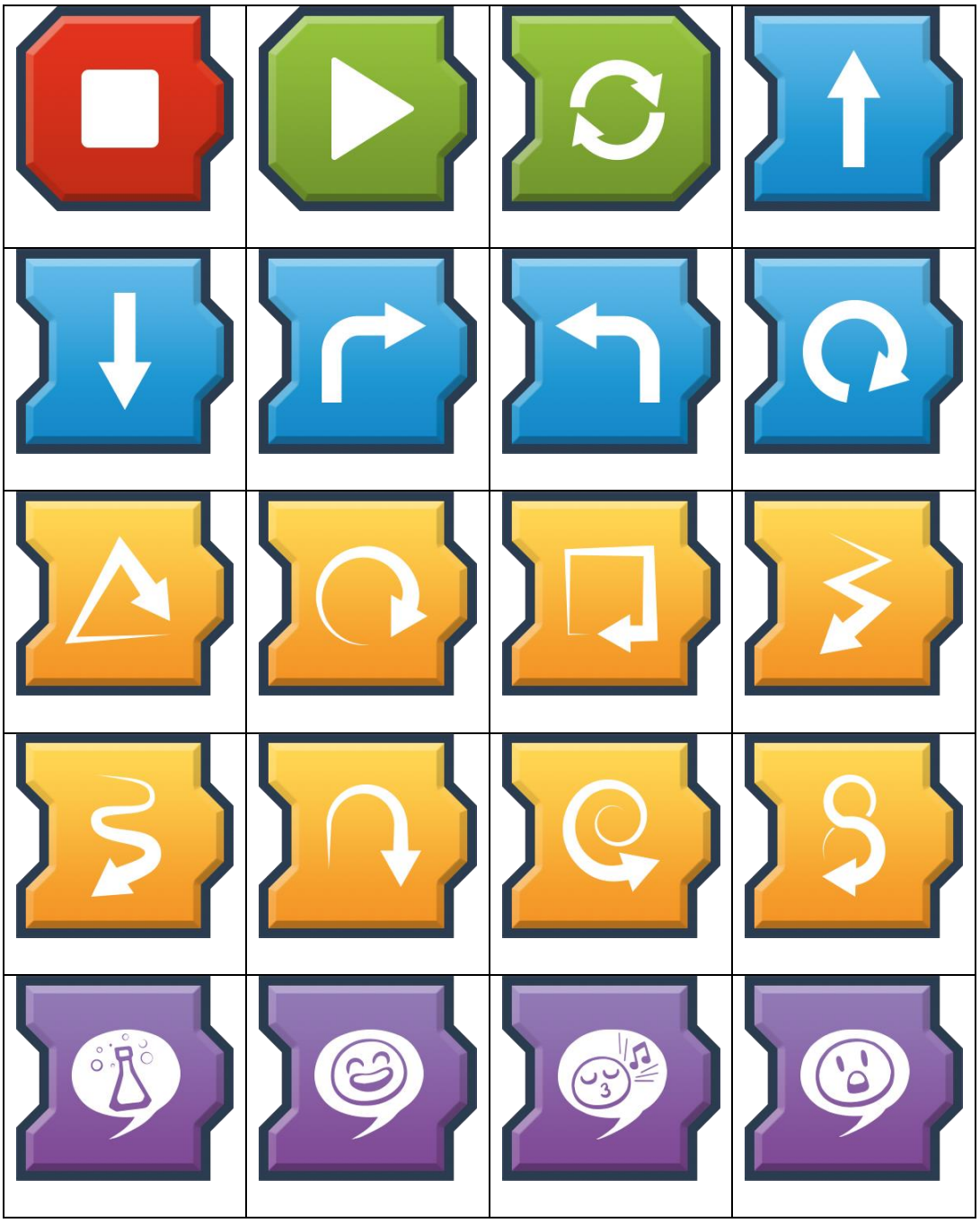
Assign the code blocks to their functions!

1. Start
2. Repeat
3. Turn Left
4. Hello
5. Pause
6. U – Turn
7. Turn on the spot
8. Faster
9. Bubbling
10. Triangle driving



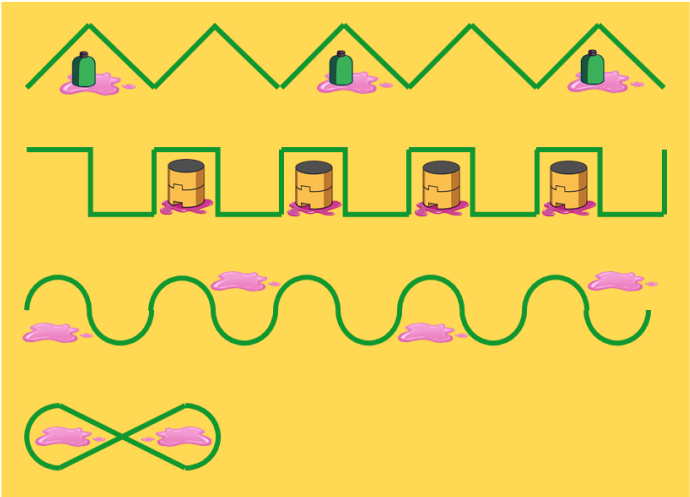
Name:	Class:	Date:

Cut the code blocks out, use them to program on the table.



Name:	Class:	Date:

1. Create the following patterns in the app. Use the loop function. Save your result with a screenshot.



2. Create your own pattern and program it.

Name:	Class:	Date:

1. Find a common target and enter the coordinates:

2. Where is your Start

3. Find a rapid path to your destination and draw it. Consider the code blocks you have available.

4. Insert your way in the app, are there shortcuts?