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ALAPÍTVÁNY

ROBOT-ASSISTED THERAPIES IN
THE DEVELOPMENT OF
CHILDREN WITH DISABILITIES

BASICS OF ROBOT-ASSISTED THERAPIES

- Manual for robot-assisted therapies

caritas

Talentum Cassoviensis

ROBOOKS

Erasmus+

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Manual for robot-assisted therapies

Contents

Who is it for? 3
Skills development 4
Floor robots in the education of children with SEN 4
General pedagogical and methodological principles 5
The principle of personalisation - or taking account of individual specificities 5
The principle of diversity 5
Principle of gradualness 6
Active learning or the use of activity-based methods 6
What skills can we use floor robots to develop? 6
What kind of teacher training is required to use floor robots? 8
Technical conditions 8
Technical guide 10
Learning to operate a robot 16
Designing the structure of content 20
Types of floor robot toys 26
The auxiliary materials 28
The images 28
The track 34
Annex 1 - Robooks website 38
Annex 2 - Evaluation of the testing of professionals 40
Annex 3 – Tekbot 48

Introduction

The educational landscape of the 21st century is constantly evolving and expanding. Teaching-learning processes are emphasised in education and development. Teachers' toolboxes are expanding to include more and more technical and digital tools. Information and communication technologies offer a range of new opportunities for professionals. Today's generation is naturally drawn to the use of technological tools. Let's capitalise on this interest!

Include innovative technological tools in our developments to make our activities more attractive and varied for children.

Educational floor robots are the tools that can achieve this goal.

These robots will be involved in the development of robot-assisted therapies. Certain types of tasks are solved with the help of the device, creating a new alternative for the child to develop as effectively as possible.

Who is it for?

With our handbook, we help teachers get started with floor robots from the basics. Our guide is aimed at professionals who are just getting to know this tool. We would like to stimulate the interest of as many professionals as possible in therapies with this device. We hope that with our help more and more people will get to know and like floor robots. Our aim is to help you plan and implement improvements with the device. In this way, we will help to promote the spread of robot-assisted therapies.

Our handbook is primarily intended for special education teachers, developmental teachers, kindergarten teachers and teachers who work with children aged 3 to 10 with special educational needs and typically developing pupils.

Our aim is to give professionals the opportunity to organise their work and development in a more interesting and varied way, to motivate children, to keep their attention for as long as possible, and to make their development as effective as possible. We hope that with our guidance, and with the help of the Robooks site, more and more teachers will create their own activities and enjoy the joy of creating.

Skills development

Skills development is an essential element of an effective learning process. The development of cognitive abilities determines the process of problem solving, the recognition of relationships and the mechanisms of thinking. Successful skill development requires a child's motivation, a variety of visual aids, the use of playful tasks and activity-based methods.
In our developments, we must strive to respect the principle of complexity - the combined impact of several functions..

Floor robots in the education of children with SEN

Playful teaching and activities embedded in action are the primary aspects of the development of children with SEN. In the design of developmental tasks, we can apply the principle of progress in small steps.

The cute little robot figure will make your child more enthusiastic about learning and can be easily involved in repetitive tasks. As robots usually have several possible solutions, they allow children to use their imagination and develop creativity. Using robots requires concentration, thus increasing attention. Decision-making in solving tasks also provides a platform for learning independence. Their use creates new pedagogical situations. Using floor robots can develop a range of skills through algorithmic thinking. Logical thinking, spatial and temporal orientation, observation skills, working memory, auditory and visual attention can all be integrated in a playful framework. When planning the execution of tasks, the development of the ability to analyse and synthesise also appears as a goal and a tool, since when planning the route, the child tries to see, follow and constantly check the succession of steps. The development of fine motor skills can also be facilitated by pressing the buttons on the floor robot. Last but not least, its use also has an impact on social behaviour, and in the context of small group development, the use of the device encourages cooperation.

The robot programming involved in the sessions is not an end but a means to development. The robot is not a substitute for traditional developmental methods, but it is an effective aid to complement their therapeutic effects.

General pedagogical and methodological principles

As with any learning or development process, it is essential to consider and adhere to some pedagogical and didactic principles during robot-assisted therapy sessions.

The principle of personalisation - or taking account of individual specificities

When designing development sessions, choose tools that capture and hold the child's attention, based on what they like and are interested in. Depending on the child's abilities and interests, we can choose objects or pictures or both, use a slide that can be fitted to the robot or even a pen holder (for example, for a graphomotor task). In the case of children with disabilities, a mini camera can be attached to the robot, which can be coordinated with a computer to display the robot's progress and movements on the monitor, so that children can monitor the progress of the task. What is close to the child and what he or she enjoys doing will definitely increase motivation and maintain attention. The amount of new knowledge or skills to be developed should not depend on how much time we can allocate to the activity, but on how long the child can pay attention and cooperate. Research has shown that learning with a positive emotional charge is more effective, and that the acquisition of knowledge is faster, more accurate and longer lasting.

The principle of diversity

In the planned robot game, make sure to give the child images and sequences of images that are accompanied by experiences the child has already had, which help to increase the rate and rhythm of acquisition. It is essential to look for such connections, or to provide opportunities for the knowledge and skills to be acquired in the course of the activity to be linked not only to the visual and auditory stimuli received during the robot game, but also to other sensory experiences and, if possible, to manipulative and motor experiences. These can be integrated into other activities of the development session, contributing to a multisensory learning process.

Use a wide variety of toys, creating a series of ever-expanding pictures, paying attention to what the child **already knows** and what he or she **still needs to practise**. These known and practised concepts are constantly being added to those **not yet known**. New things can arouse his curiosity and interest and keep him motivated to play together.

Principle of gradualness

When we talk about a development or learning process, it is essential to respect the principle of gradualness. It is important to strike a balance between the level of development of the child, the amount of knowledge or skills to be acquired and the specificity of the individual. According to experts, what interests and engages the child, what he or she likes to play with, is an accurate indicator of the stage of development and what he or she still needs to practise. If a child gets bored with a toy, it is usually because it no longer provides the type or amount of stimulation that he or she needs at the right time for his or her developmental stage. There are also stages of mastery in the use and programming of floor robots. Care should therefore be taken to ensure that, although he may be interested in the tool, he does not lose interest in the activity because of the volume of tasks and the initial programming difficulties. When developing skills and abilities, pay attention to the stages of perception, recognition and diversification.

Active learning or the use of activity-based methods

The idea is that the child should be as active as possible, with as little help or guidance as possible in the robot activity. A motivated child will mobilise all his/her knowledge, skills and abilities to achieve the goal. This increases the rate of acquisition of new skills, the quality of the process and thus also creates another source of motivation for the child through his or her experience of success.

What skills can we use floor robots to develop?

Developing spatial orientation

Poorly developing motor skills affect the development of spatial orientation. Its consequences in the process of spatial orientation are in the areas of perception and execution. If the ability to solve spatial tasks is absent or inaccurate, spatial images and concepts become unformed. A lack of spatial memory, imagination, thinking and verbal communication skills in the areas of spatial orientation may result in inadequate functioning in several learning areas. When developing with robots, we reinforce the concepts of in front, behind, right and left. Spatial memory and directional orientation are improved. We influence algorithmic thinking and logical thinking.

Developing attention

Attention, memory, imagination and thinking work together, supporting each other. If we want to learn something, we use these skills simultaneously. The effectiveness of teaching/learning is fundamentally determined by the level of attentional functioning.

When developing with robots, we reinforce visual attention. Auditory attention is improved. Increase attention span, attention duration, ability to focus. We affect memory, algorithmic thinking and logical thinking.

Problem-solving thinking

Problem-solving as applied thinking is a complex cognitive process in which critical thinking to apply existing knowledge and creative thinking to acquire new knowledge play a specific role.

Development with robots gives children direct experience through creative and critical thinking. It is an effective way to develop observation skills. Improves the ability to analyse and synthesise. Attention, memory, algorithmic thinking and logical reasoning are influenced.

Developing communication skills

Communication skills are a key factor in school achievement. They play an important role in learning, but they are also present in our everyday lives and activities. Developing with robots expands a child's vocabulary. It improves their acoustic listening skills and speech comprehension. We have an impact on their ability to communicate, to inform and to think.

Developing numeracy skills

Elementary numeracy is one of the most fundamental skills of pre-primary and primary school, and plays an important role in both general intellectual development and learning mathematics at school. Numeracy is the result of a complex thinking process. The child needs to pay attention to the number, operation and order. They need to learn to transform the number they hear or see, to remember sequences of numbers. The development of counting skills itself is a long process that takes years. Just as counting itself is a complex process, its development will be effective if it is carried out through as many channels as possible. Development with robots reinforces number concepts and quantity concepts. Spatial orientation, attention and memory are improved. We influence algorithmic thinking and logical thinking.

Whichever area of development you look at, generally speaking, development embedded in a playful situation increases a child's confidence and belief in their own success and achievement. It improves their willingness to perform tasks and their level of motivation. As a result of the work with the robot, children gradually become able to correct their own thought processes during the sessions. For children, through developmental tasks, teachers can provide reinforcement in their skill areas and allow them to experience play as a pleasure/success experience.

What kind of teacher training is required to use floor robots?

The use of floor robots does not require IT knowledge or IT qualifications.
Expectations for professionals using floor robots:

- have a positive attitude towards ICT tools;
- be receptive to innovative tools;
- have up-to-date pedagogical knowledge;
- be open to collaborative forms of work that build on student activity/creativity.

Technical conditions

Commercially available floor robots work on a similar principle. They are colourful, easy to use and attractive to children. Programming is done using clearly visible control buttons.
The robots can move on any flat surface. They usually move in steps of 15 cm and can turn 90 degrees or 45 degrees.

The robots differ in the number of steps they can be programmed to perform, and in the power supply - most are battery-powered, but some are battery-operated.
The two most popular educational robots are Bee Bot and Blue Bot. We use these robots in our development work.

Bee Bot

The name Bee-Bot refers to the colour of the robot bee. Its friendly and cheerful design may appeal to younger children of pre-school and school age. It is basically designed with them in mind.

- can take 40 pre-programmed steps;
- It can turn 90 degrees to the right and left,
- each step is 15 cm;
- makes a sound and blinks at the end of the programme;
- The built-in battery can be charged via USB;
- can work for about 8 hours on a single charge (about 2 hours in continuous operation).

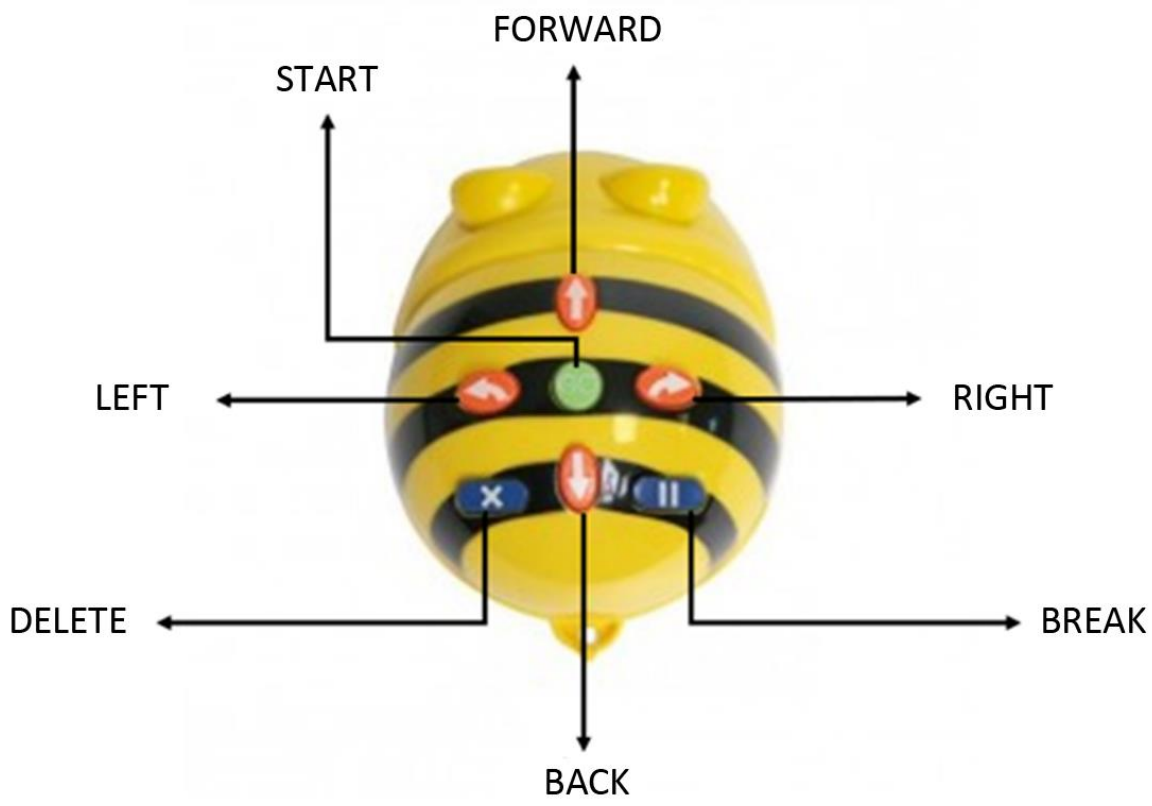
Blue Bot

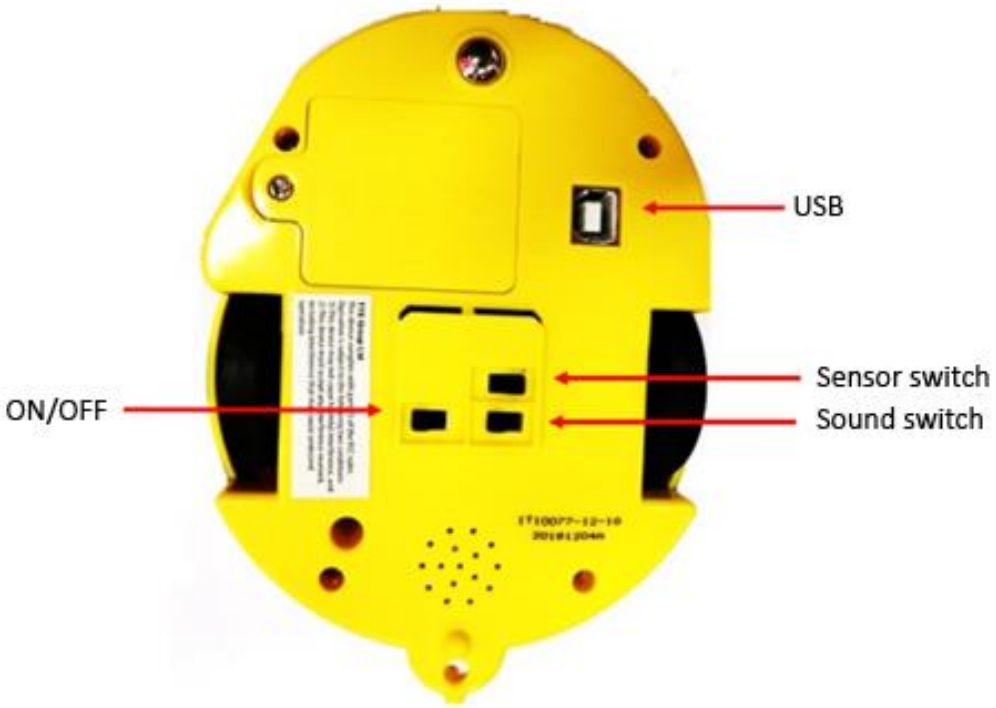
The big brother of the Bee-Bot. It is named after its bluish hue. Its transparent casing reveals the parts behind, giving it a more robotic look. This floor robot has been developed for older children.

- number of programmable steps: 200;
- It can also be controlled from a computer, smartphone or tablet via Bluetooth, with a range of around 10 metres;
- can also perform 45 degree turns with the external control;
- in the mobile app, instructions can be accompanied by sounds;
- in the case of external control, the steps can be repeated;
- the programs created can be saved/restored and modified;
- t also works in "Bee-bot mode".

Technical guide

The buttons on the back of the robots are used to control the device. One instruction is equivalent to pressing a button. The floor robot moves left-right, backwards-forwards or stops. After the robot executes the programmed command, an acoustic signal is emitted and the robot's eyes light up to indicate that the movement program has been executed.
Important: Once Bee-Bot executes a command sequence, it is not automatically deleted. Therefore, you must use the delete key before entering each new command sequence.


FORWARD
START
LEFT
RIGHT
DELETE
BREAK
BACK



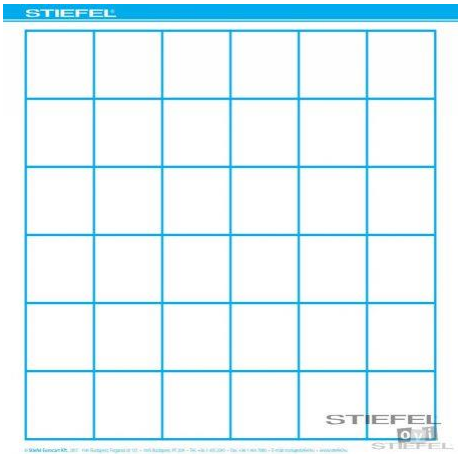
Both Bee and Blue Bot have rechargeable batteries. If the Bee-Bot is not used for 2 minutes, it will play a beep and turn itself off to conserve battery power. When the batteries start to run low, the robots are slowing down, resulting in a reduction in the distance they can travel at the touch of a button and the degree to which they can turn, making it impossible for them to perform tasks accurately.

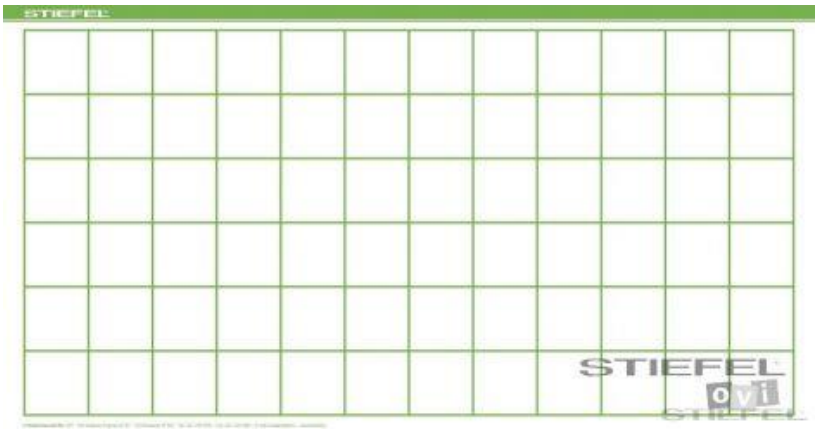
If necessary, the Bee Bot can be cleaned with a damp cloth and a wipe. However, care must be taken to avoid getting water or moisture inside the robot. Also keep it away from sunlight and heat. Bee-Bot is tough and durable, but not indestructible. Be careful not to drop it or hit it.

Floor robots can also work on their own, so you can plan tasks for them. But typically you need to guide the robot from one place to another along predefined paths. In this case, you need a square grid board (15cm x 15cm) of any size, which you can make yourself or which is also commercially available. On the board you will place the pictures corresponding to the task. The tasks can be made more complex and difficult by adding more pictures and

making the rules more difficult, so that they can be a challenge for children of different ages and at different levels of development.

Commercially available track:





A self-made track:

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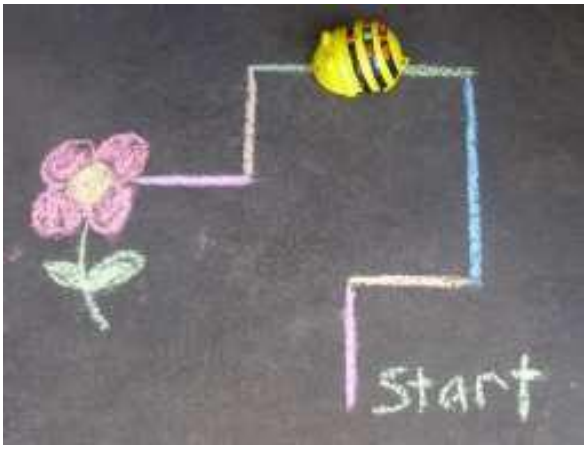
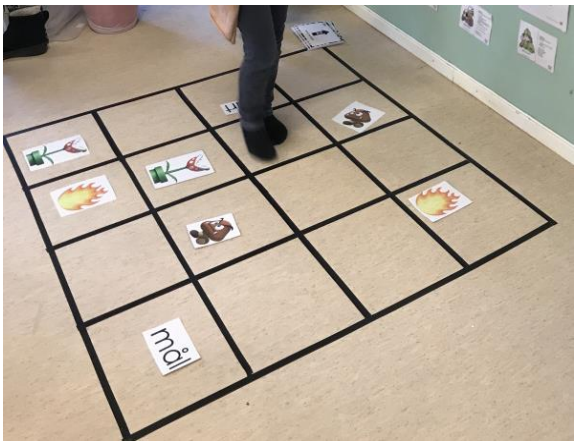
Robots need a smooth surface to move. It is advisable to plot the path on a harder/thicker surface to eliminate any unevenness in the surface. The track shown in the picture is made from a chair floor mat. Its disadvantage is that it cannot be divided into too many parts due to its size. The size of the track can influence the design of the exercise.

The surface is divided into 15cm X 15cm squares. On the "empty" track you can place the pictures and texts for your tasks. To ensure that the pictures on the track do not move during the robot's movement, it is advisable to fix them to the track in some way. A transparent wax canvas may be suitable, but a simpler, more cost-effective solution is also possible.

Other ideas for creating robot tracks:



(source: Hutte Sience – WelTec Bee-Bots-Teacher-Manual.pdf 8.pg)



(source: https://eliseundervisar.wordpress.com/2018/04/24/lektion-5-programmering/)
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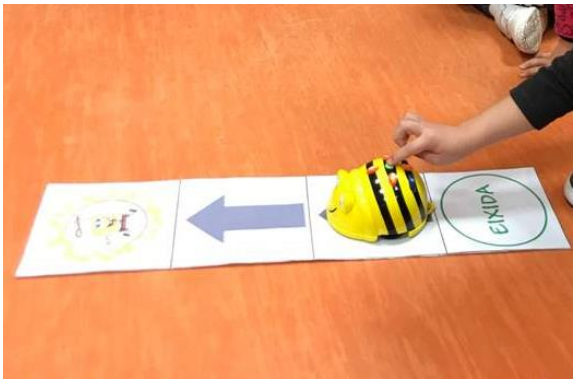

http://laclasedemiren.blogspot.com/2019/02/nos-iniciamos-en-la-robotica-con-bee.html
(last download: 2021.05.16.)

(source: https://kodujemyzruby.wordpress.com/2017/09/25/pierwsze-zajecia-z-pszczolkami-bee-bot/)
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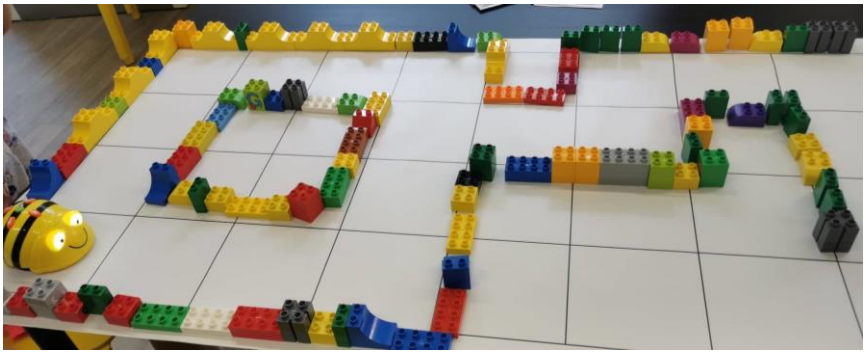
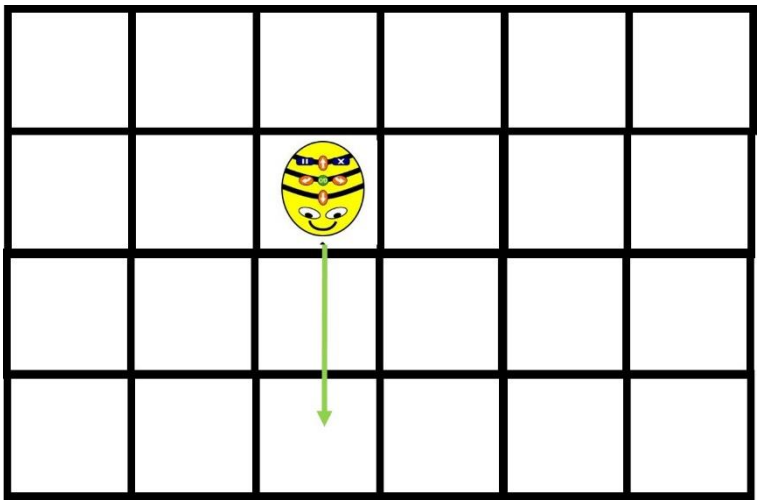


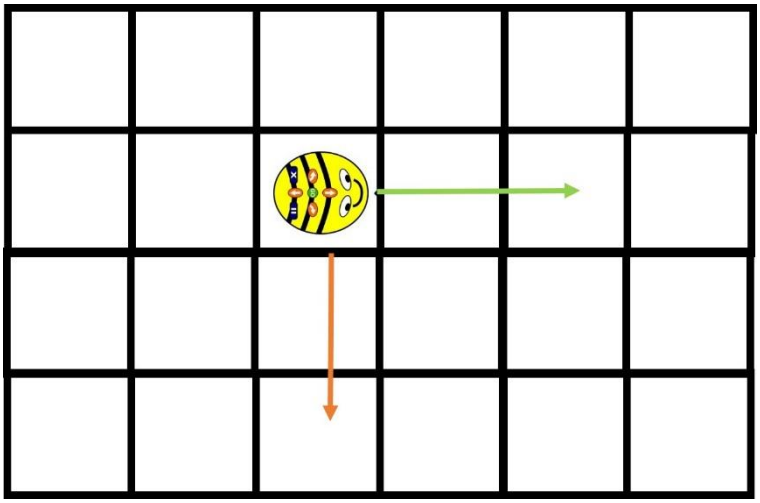
Learning to operate a robot

Learning to control and program robots depends on the age and ability level of the child. Remember that children need to learn several steps to operate robots.

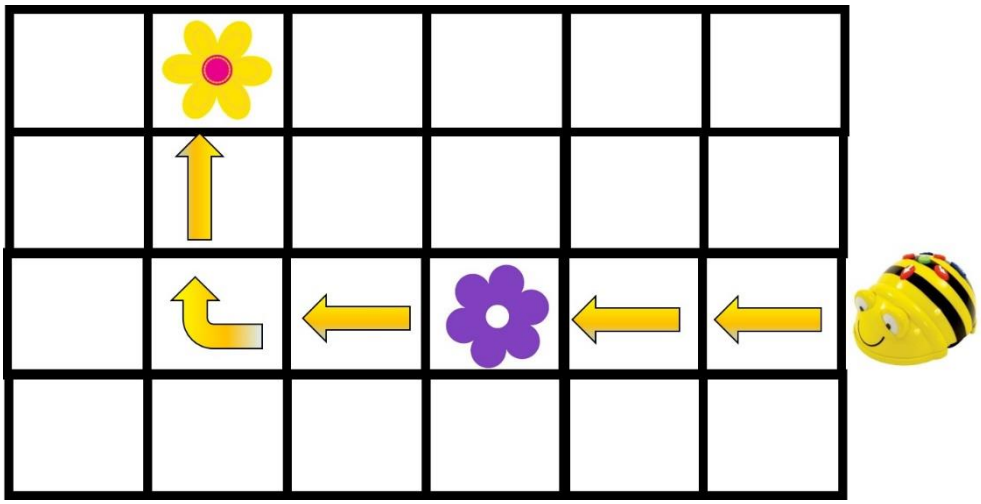
- First, program the robot to take one step forward at a time.
- Program the robot to take one step backwards at a time.
- Program the robot to move forward several squares at a time before pressing the GO button.
- Program the robot to take several steps backwards and forwards before pressing the GO button.
- Program the robot to make a left or right turn.
  Make sure the turn is in the same place, inside the square. The robot cannot go forward and turn at the same time. (That would be two instructions.)



Turn left:



- Program the robot to take several steps backwards and forwards, including turning, before pressing GO.
- Add pauses to the sequence to stop the robot for a moment.



Whatever the difficulty of the task, we can help to plan the steps and to make it easier to follow the instructions, according to the age and development of the children.

t can be expected that the more skilled they become in planning and programming, the less they will need help. However, we should not rush to abandon help. It is up to the individual how long it takes children to reach, if they would even reach, the highest level of planning in their heads.

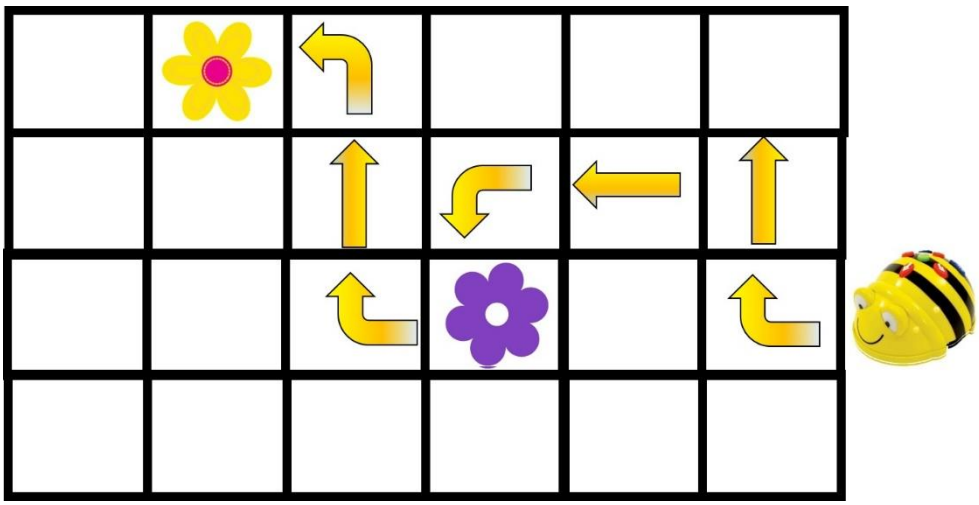
Help in designing and programming:

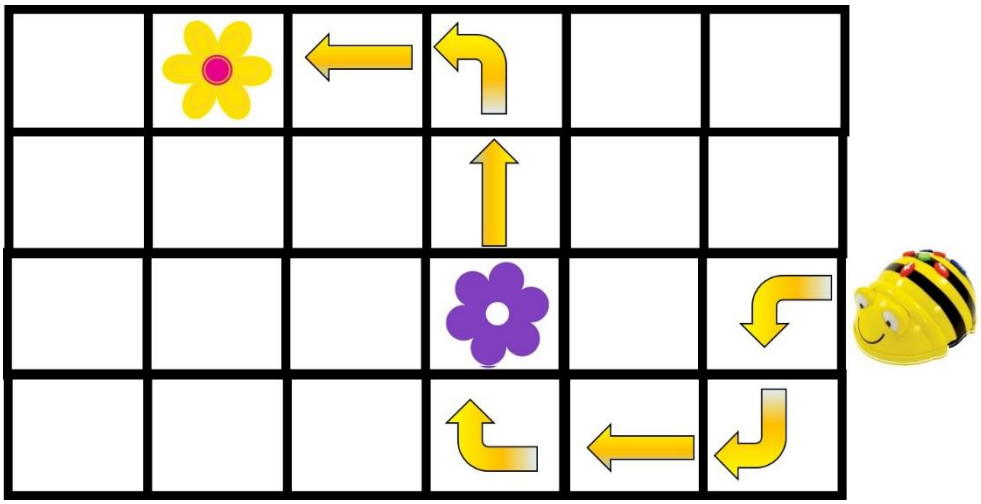
- programming the steps one by one, frame by frame,
- to mark the path of the steps with arrows on the track,
- stepping the robot along the track, frame by frame, while the child gives the instructions,
- to mark the path of the steps with arrows along the track,
- planning the steps "out loud".

It is useful if children start the robot from the same point each time they start it.

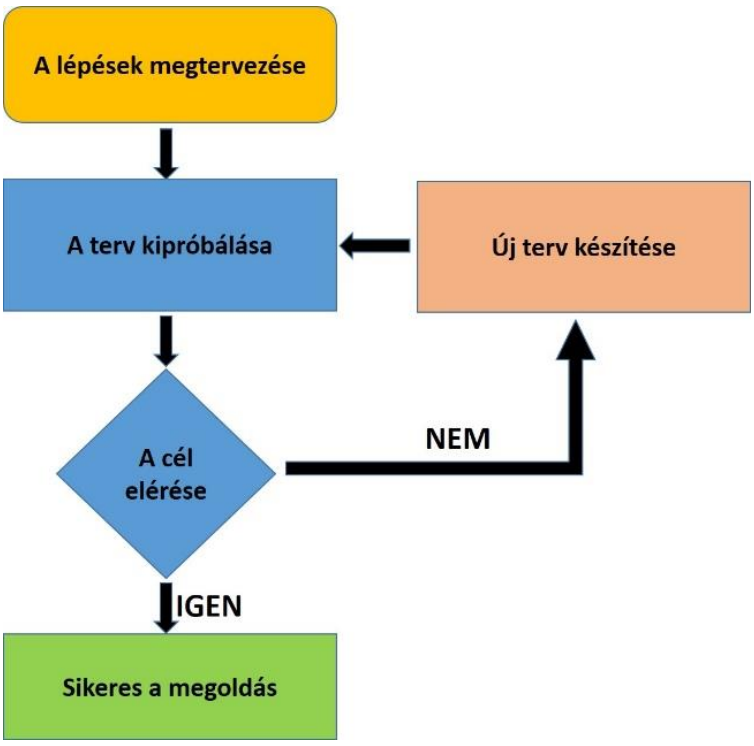
Remember to give children enough time to learn programming. Use the principle of "one step at a time" when learning to control the robot.

There can be more than one good solution to a problem. Therefore, when designing the task, it is worthwhile for us to think about the possible paths that can be programmed.





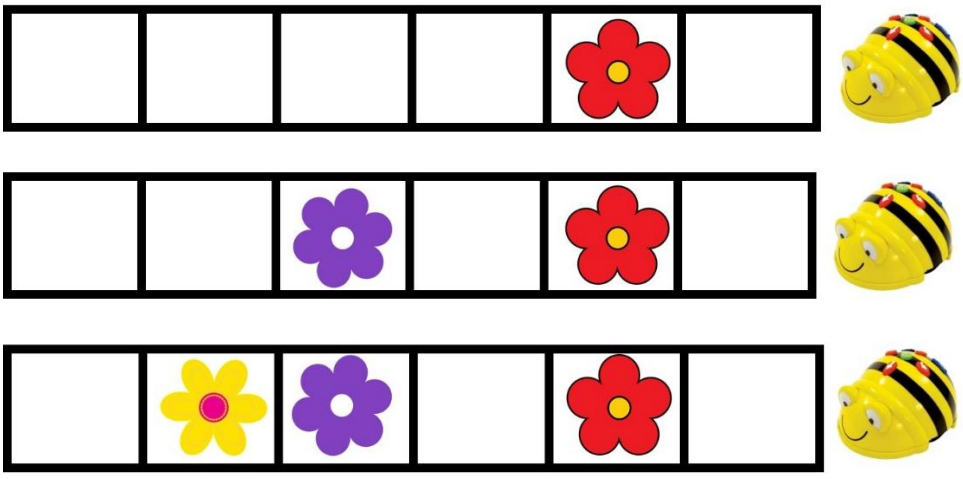
To solve the problems independently, children learn to apply the following cycle:



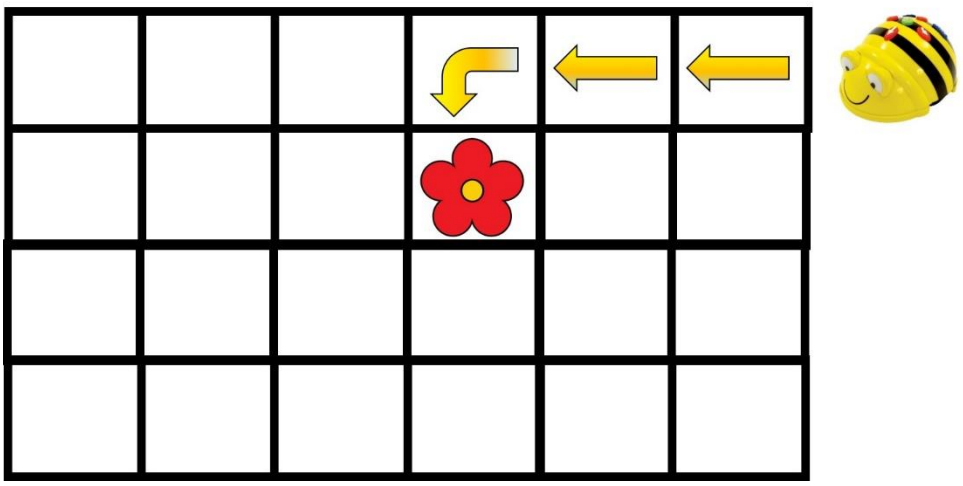
Designing the structure of content

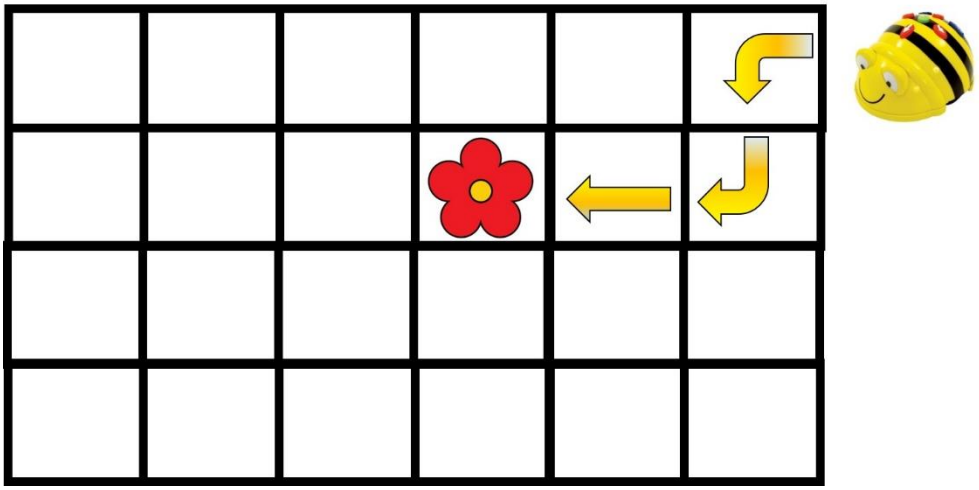
A child develops well when he or she gets the developmental influences he or she needs.
So design is just as important in the use of educational robots as in other developments. It is essential to take into account the age specificity, the individual's level of knowledge, skills and abilities, as well as the individual's rate of progress when designing tasks.
In order to apply therapy, we need to take a complex approach to the area or areas of development we want to address. The complexity of the tasks that can be performed with floor robots can be both an advantage and a disadvantage. It can be an advantage to strengthen and develop several skills with one task. On the other hand, it can be a disadvantage if the task does not focus enough on the area that is primarily to be developed.
If you can, it's a good idea to design a series of tasks, from the simple to the more complex.
The simplicity of the tasks is represented by the straight track (the robot can move forward and backward in only one line), and the simple placement of images and tasks on the multi-square track, accessible in one or two steps.

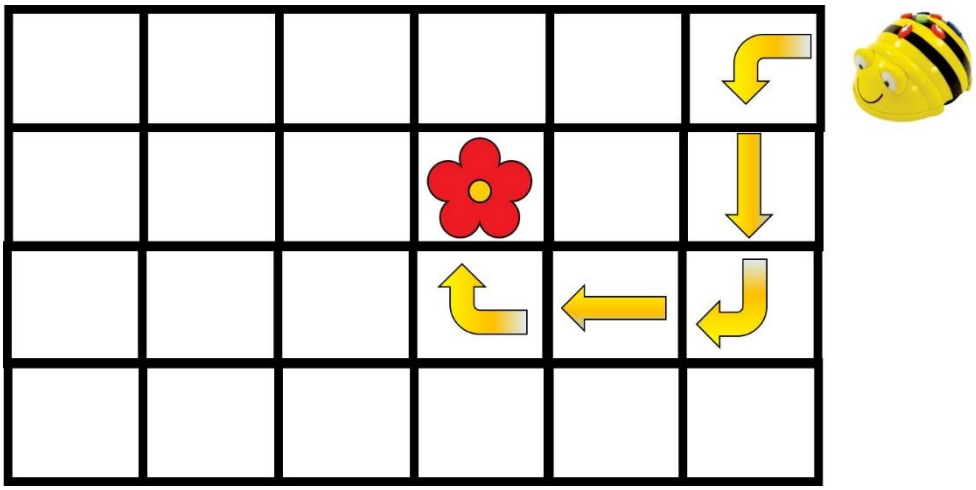
Example of a straight path:



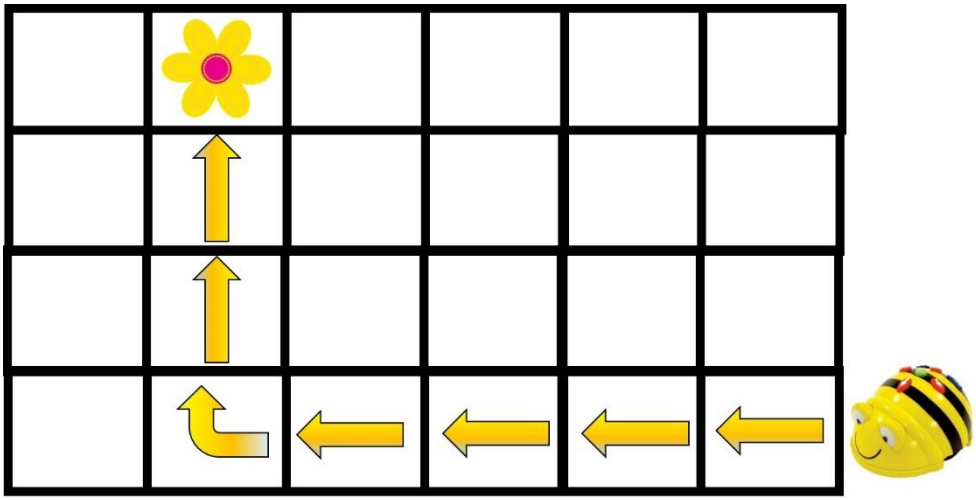
Turning on the track should also be introduced gradually. Plan shorter distances with one or two turns. One of the most difficult tasks is to specify the number of turns it takes the bee to reach the finish.



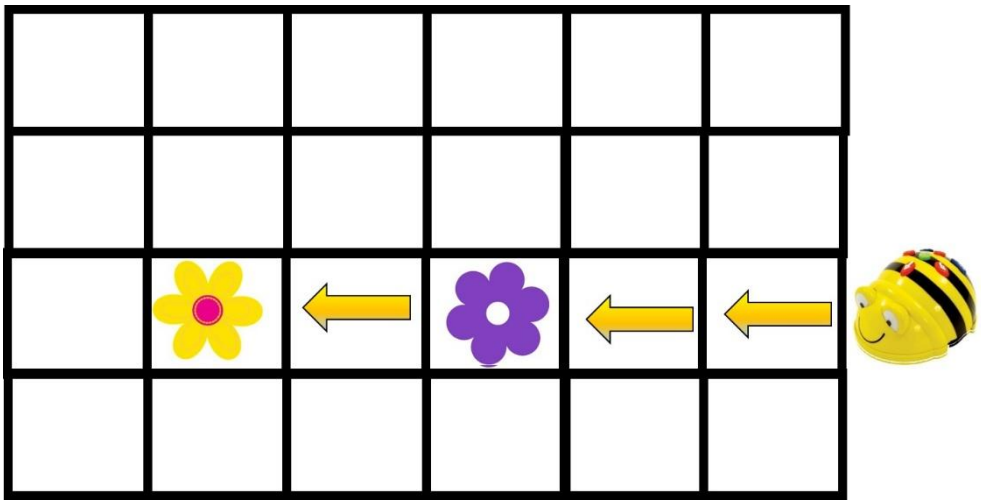


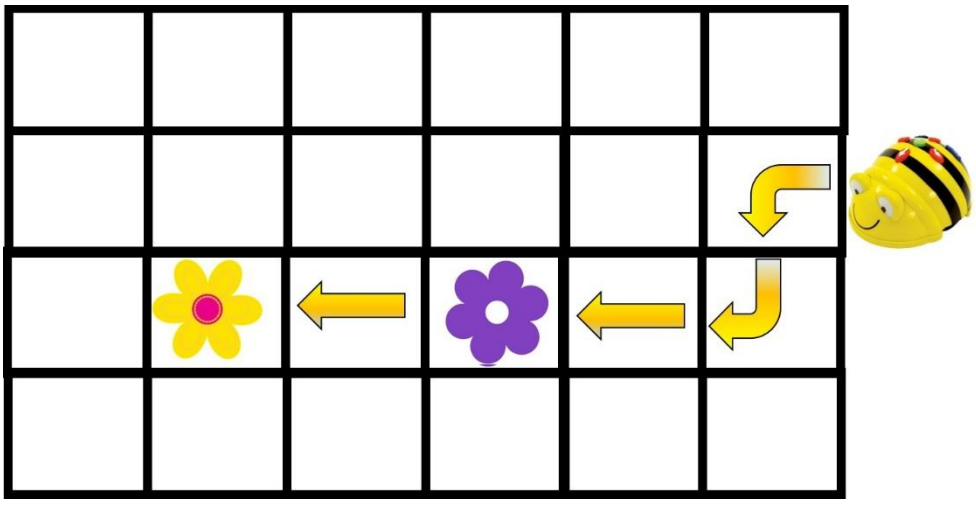


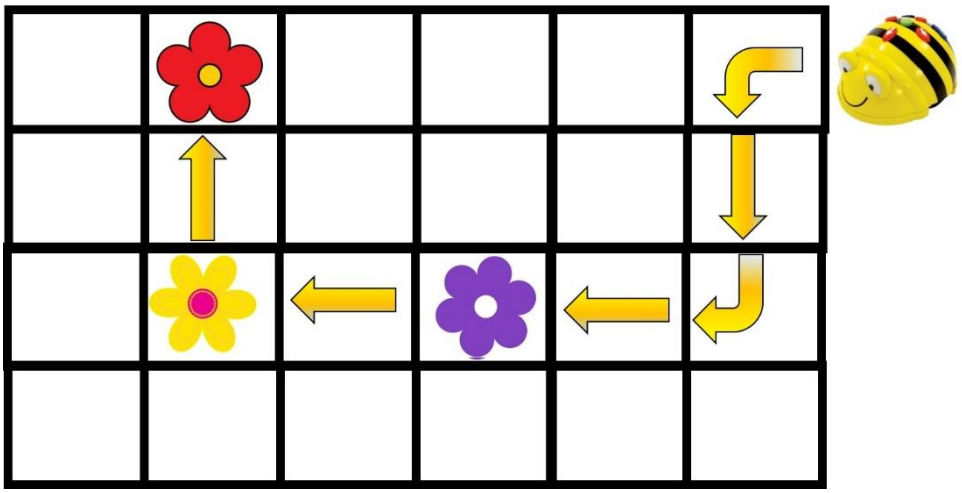
The difficulty of the tasks can be increased if the solution can be reached in several steps, with children having to plan longer distances and more rounds.



A level increase is given if a track consists of several sub-tasks.

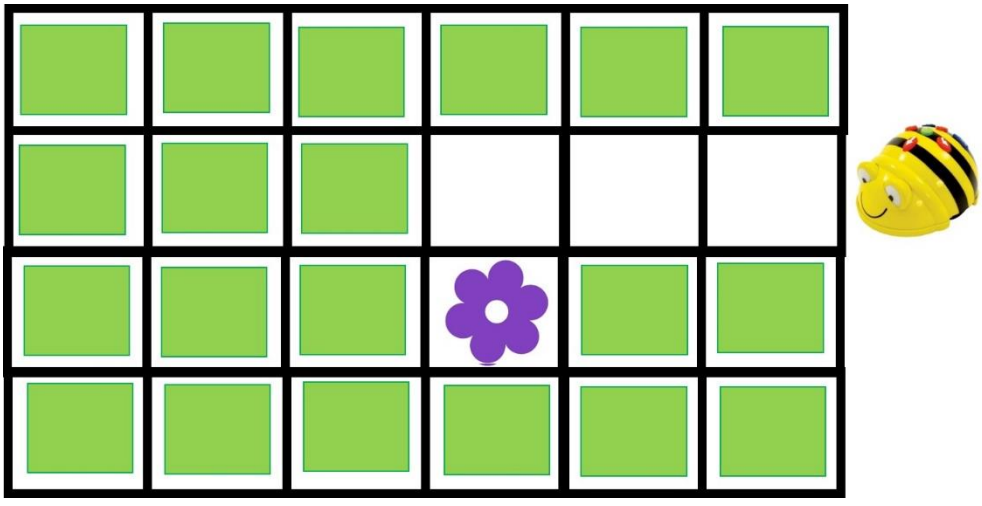


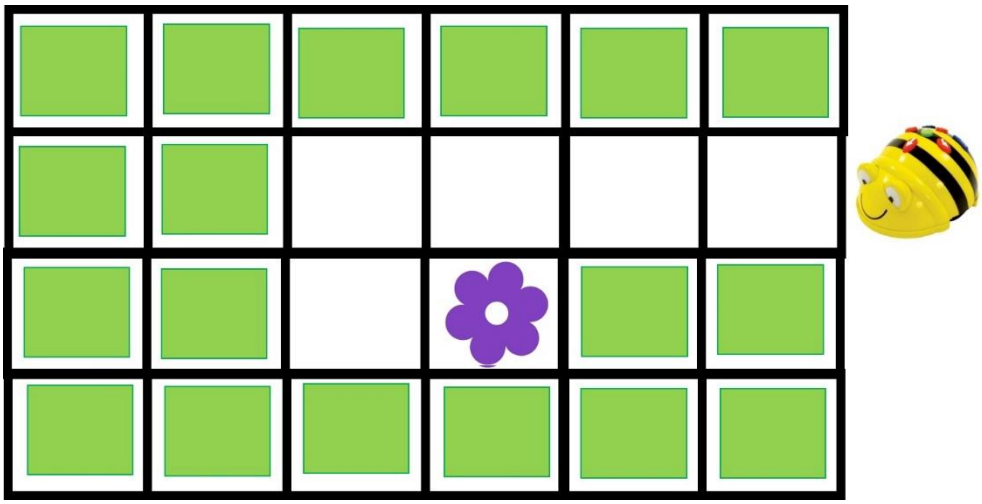


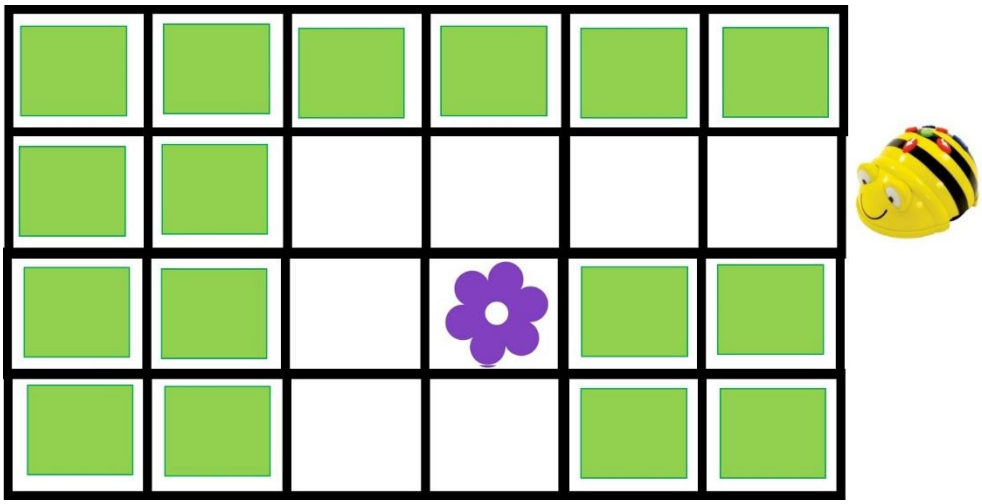


The most difficult paths can be designed so that, for example, your robot can only touch each square once, or only step on empty squares, or touch the highlighted squares in a certain order, or even walk through a maze.

Example of a maze:







The courses and tasks can be made more complex and difficult with special rules, so they can be challenging for children of different ages and levels of development.

The development tool offers an infinite range of possibilities to design our own tracks according to our students' needs. And the joy of creation can be an inspiring experience for us too.

Types of floor robot toys

Matching - pairs of images are matched according to a specific criterion, for example:

- completely identical pictures;
- images that depict the same object or action in different ways;
- pictures of the same quantity;

logically related images such as: animal and its habitat or food, occupations and their associated tools, implements, etc.

Collector – collect pictures belonging to a specific category or concept, for example: fruits, animals, vehicles, etc.

Cuckoo's egg – find the picture that does not match the given criterion, e.g. different colour, different quantity, different conceptual category, etc.

Seeker – a more difficult version of the pairing game, where pictures on the board are matched with sound strings and the child has to find the picture that corresponds to the sound, sound, syllable or word they hear.

Sequencing - using a series of images of one or more events/stories, these are collected in chronological order, posted and then told.

Matchmaking – using colour dice or traditional dotted dice, the aim is to move the robot to a specific target square by moving along a route you have created, according to the colour or quantity you roll.

Placer (or pusher) –this is done by placing a pusher on the robot; the task is to sort and place objects in different places according to the aim of the game.

Letter finder, word finder, word puzzle – you can collect letters, syllables, words, either by visual matching (see pairing game), by sound (find the letter/word you hear) or by word analysis (walk the track looking for the letters that make up a word).

Puzzle - the pictures collected according to a given criterion must be put together like a puzzle to form a whole picture.

The auxiliary materials

The images

In order to work effectively with floor robots and to implement our development plans, we need a number of tasks. And to do them, we need pictures. If we plan our tasks carefully, we can solve several tasks with a single set of images.

Even if you are only making assignments for your own use, make sure the quality of the images is good.

The quality of the images has a big impact on the experience and information content. An image with details lost in the printing process is much more confusing to view and interpret than one with small and visible details.

Larger, better quality images can be printed at larger sizes.

Image size is measured in pixels. Pixel sizes define how many pixels an image is wide and how many pixels it is tall. Resolution is the amount of detail in an image, expressed in pixels (ppi=pixel per inch). The higher the number of pixels, the higher the resolution. A higher resolution image will generally have a better quality printed image.

An image file size is the digital size of an image file in kilobytes (Kb), megabytes (MB) or gigabytes (GB). The file size is proportional to the size of the pixels that make up the image. Images with more pixels are more detailed for a given print size, but take up more space on the hard disk and take longer to edit and print.

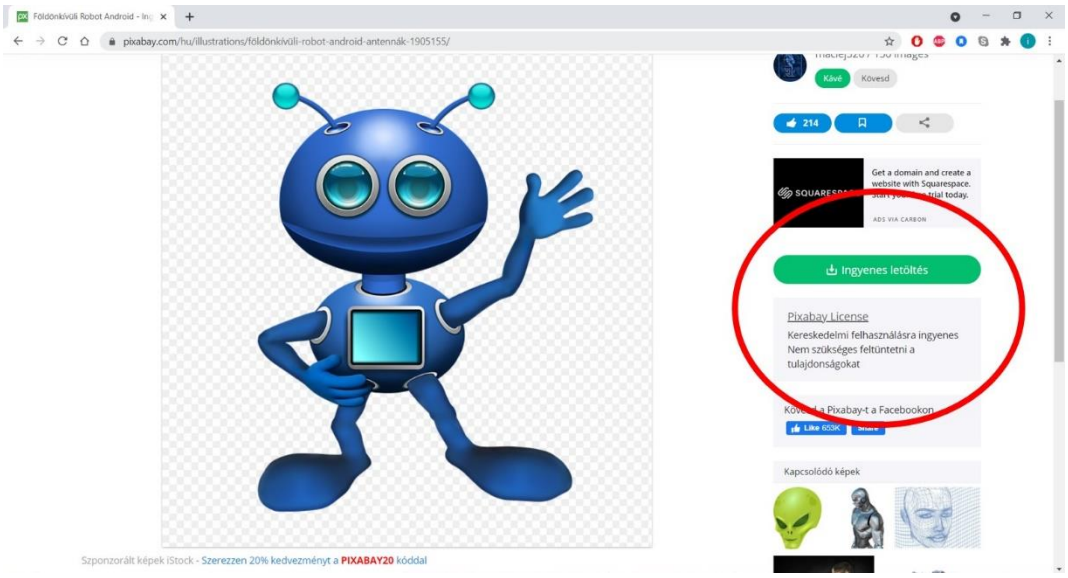
High-quality, aesthetic pictures can make the task more attractive, enjoyable and spectacular for children.

If you are sharing your work in a public place, you should also make sure that you use images that are from royalty free image sharing sites or that you have taken yourself.

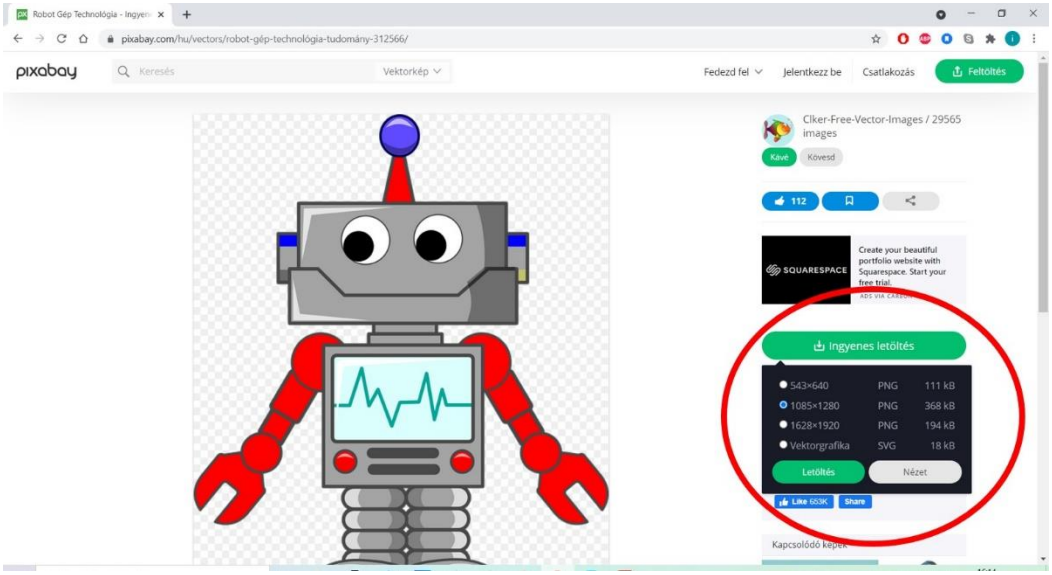
We would like to give you some examples to help.

Free images are available from the following pages:

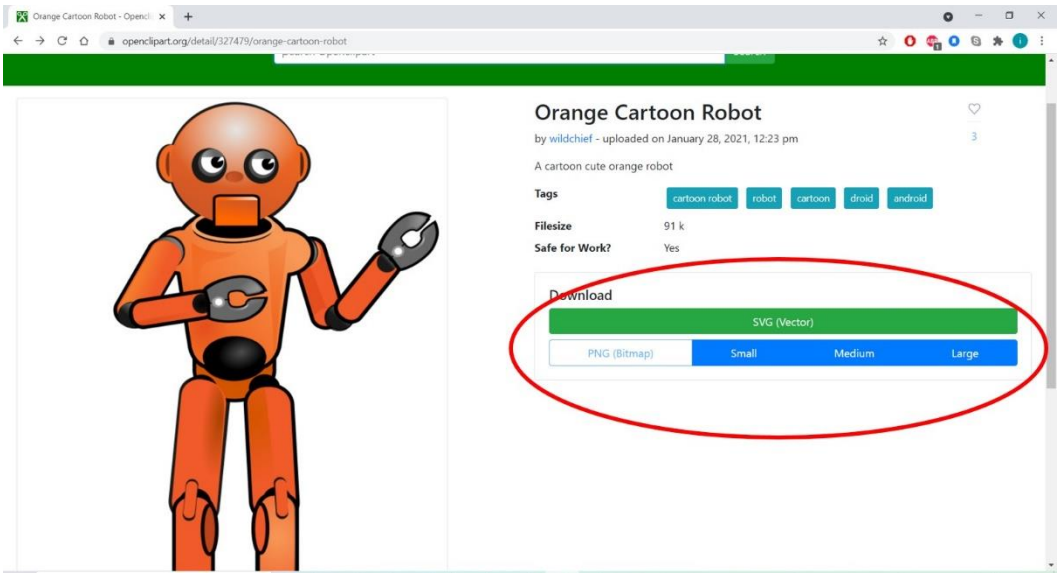
1.) https://pixabay.com/hu/ is a "free stock site", some of the images are free to use. Anyone can download images for free use, no registration required.



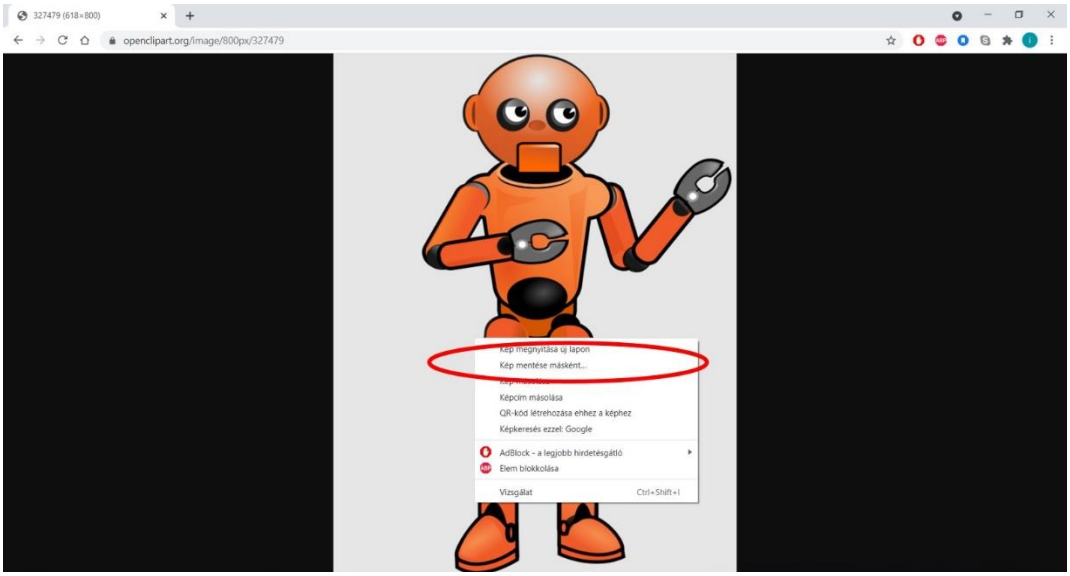
Save the image by downloading it in the largest size available without registration, which the site offers by clicking on the download button.



2.) https://openclipart.org/ is a collection of images that can be freely copied, modified, and you do not need to register to download them. The images are available in different sizes



After choosing the right size, you can download the selected image by using the "Save As" command.

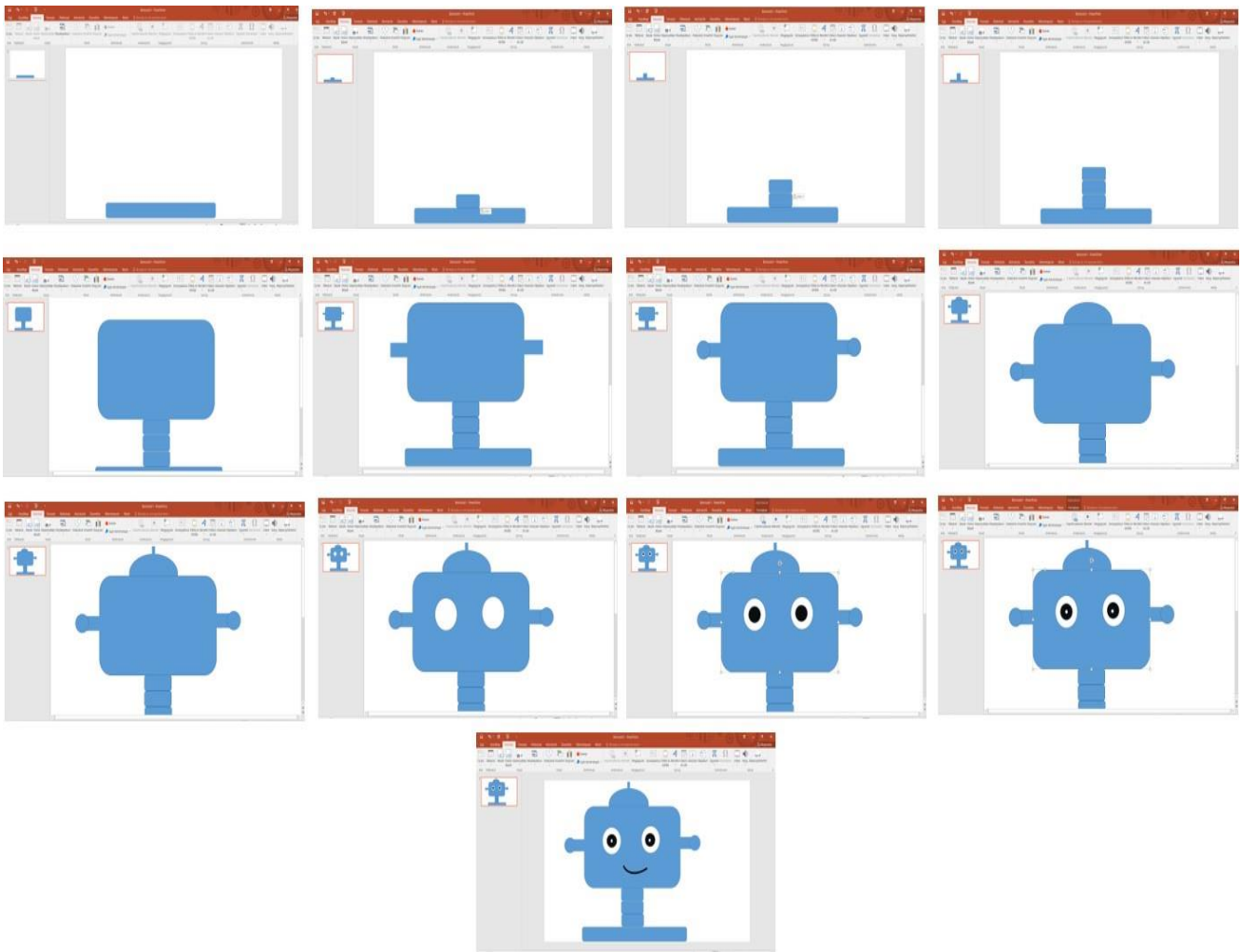


3.) Free graphics, free to use drawings can also be found on:

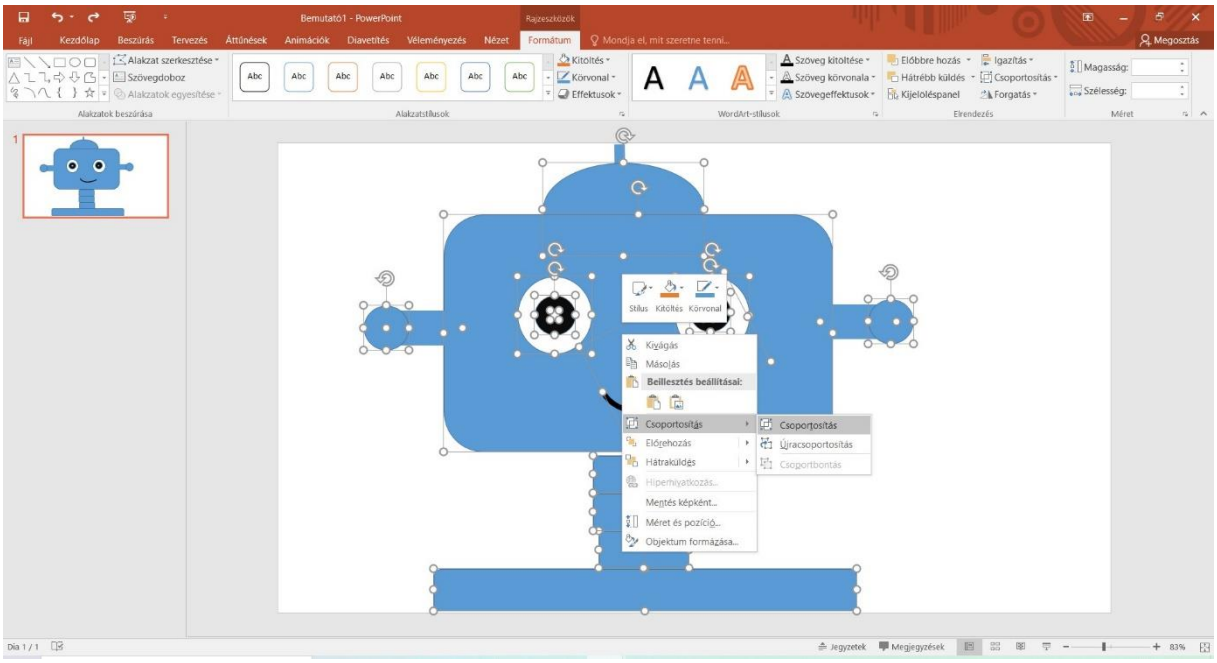
https://www.freepik.com/

https://pngtree.com/

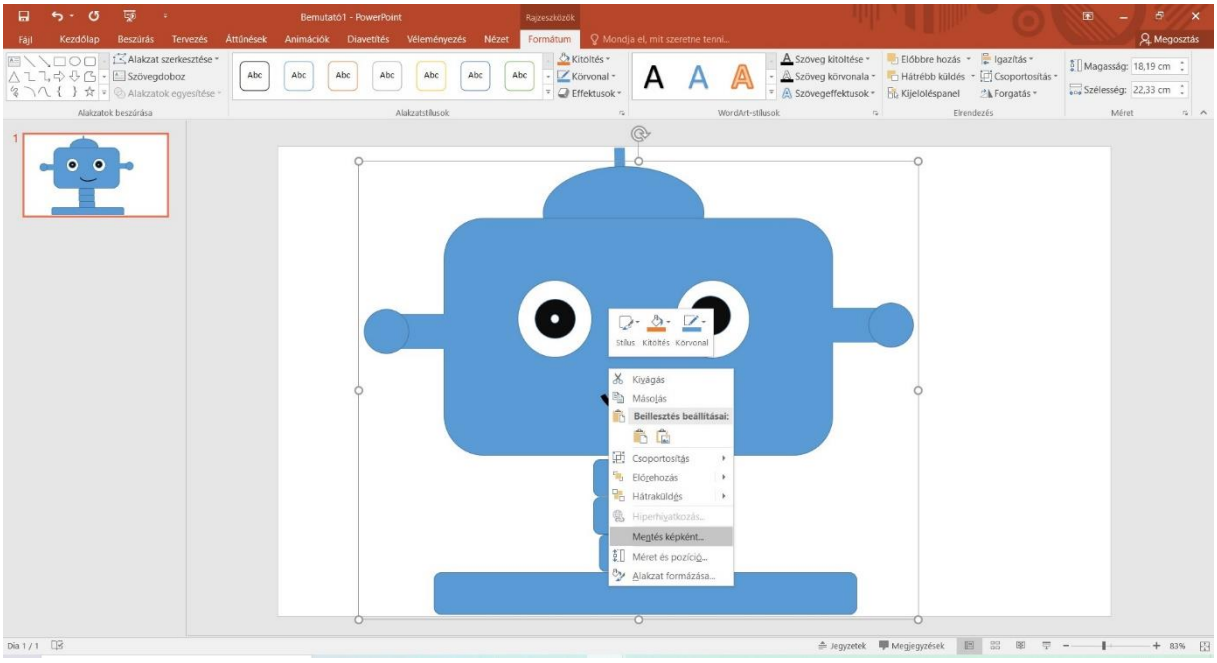
You can also create your own drawings, even simply using shapes.



Group the shapes on the final drawing.



Then save our work as a picture. This way, you'll have a file that's easy to scale and print.



Make sure the quality of the material you download, create and share is printer-friendly. The size of images that can be used on tracks should not be pixelated after printing. Use high resolution (high pixel density) images for uploading.

The size of the images should be large enough to fit in 15x15 cm frames, clearly visible on the track and observable in detail. (In our experience, 15x15 cm images are the most usable.) Laminating our images helps them to be reusable, and they are also easy for robots to pass through, not to collect or push them away.

The track

To do the Bee-boot and Blue-bot do-it-yourself challenges, you need a blank square grid, which you can buy or make yourself.

As the track will be used repeatedly, it is advisable to have it drawn and printed on a durable material. If it is not stored in a fixed location, it is recommended that it is easily "transportable".

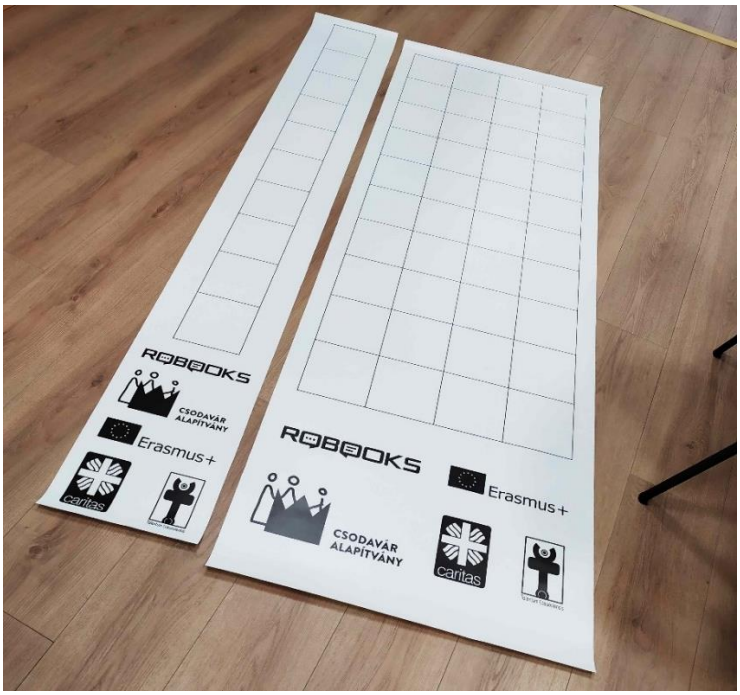
It is not recommended to prepare the tracks on wrapping paper or cardboard, because they tear easily and cannot be straightened properly after rolling, thus hindering the progress of the robots.

The idea is that the tracks are made up of 15cm x 15 cm squares, as the Bee-Bots and Blue-Bots move in 15 cm "steps".

If you are storing your track in a permanent location and do not have a level surface, it is advisable to choose the harder material.

The tracks shown in the picture are made of floor protection chair mat. The advantage is that the robots can move easily on uneven surfaces without jamming. A simple alcohol marker can be used to grid it. The disadvantage is that it is difficult to transport because it cannot be folded. Also, its size limits the extent to which it can be split up.

You can have a spectacular, easy-to-use, long-lasting track if you have it printed on molinos. Another advantage of such tracks is that they can be made in the size you need. A disadvantage is that you have to find the most cost-effective place to produce it.



Once we have our track and our task with the pictures to go with it, let the work begin, robot assisted therapy!

Literature used

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(utolsó letöltés: 2021. március 31

Annex 1 - Robooks website

During the 24 months of our project "Robooks" (Erasmus+ Public Education project 2020-1-HU01-KA201-078731, Robot-Assisted Therapies in the Development of Children with Disabilities), we will create a basic methodology manual, an online interface and downloadable booklets in four languages (Hungarian, Romanian, Slovak, English), which will focus on the development of basic skills and competences of children with disabilities. The robot-assisted therapies will complement the developmental services that children receive in public education institutions, developmental institutions and child rehabilitation institutions, as well as animal-assisted therapies. Our aim is also to create a robot that speaks certain instructions in Hungarian, accompanied by a manual to build a robot and control software with Hungarian voice files.

On our Robooks.hu/Robooks.sk/Robooks.ro/Robooks.eu pages, we would like to help teachers interested in the topic, and provide downloadable content to give guidance and inspiration for planning and implementing developments with the tool. We show you the first steps in the application of robot-assisted therapy.

We would like to encourage everyone to register on this platform and share their own designs and tracks with us and their fellow teachers. This will create a database that will be available to all interested parties..

Register on the robooks website:

Alongside the robot-assisted therapy booklets available on the robooks website, educators interested in the topic can upload their own tasks and share them with other experts. Registration is just a few simple steps:

- click on the arrow next to the PROFILE menu in the top right-hand corner of the website to access the "Register" option
- in the Registration interface, it is necessary to enter your first name, surname, e-mail address, a password of your choice and select the languages spoken, so that the content will be displayed in the language spoken by the registrant

- after accepting the privacy policy, you can proceed by clicking on the "Register" button
- with these few steps the registration is complete

Uploading a booklet/assignment to the website:

After successful registration, you can upload your assignment/booklet again by clicking on the arrow next to the "Profile" menu at the top right.

- you must enter the title of the task in the "Title" field. It is advisable to choose a title that is informative (e.g. Developing communication skills with a floor robot)
- for the task type, you can choose between two types:
    - ask with path and description - in this case the uploader shares only one task on the robooks page
    - Methodological booklet: with a set of tasks for the area to be developed - in this case, the uploader will share a complete set of tasks on the website, based on the booklets seen on robooks site
- in the "Short description" field, a description of the task or booklet of up to 800 characters should be provided, so that when the teacher or parent browses the robooks page, it is clear to them what the task or booklet is about and what area it is good for
- in the "Files" field, a clickable button allows you to upload the specific task you want to share. This file can be in jpg, jpeg, pdf, doc, docx format.
- once you have accepted the Terms and Conditions, you can submit the task to the site administrator by clicking on the "Submit" button
- if the page refreshes and you see the "Thank you! Your Robooks task upload is complete. We will review it and upload it to the site. " message, the upload was successfult
- the robooks site expert receives an e-mail about the upload, after reviewing it the site administrator allows the assignment or booklet to appear on the site

Annex 2 - Evaluation of the testing of professionals

In December 2020, the Csodavár Foundation's Erasmus+ program No. 2020-1-HU01-KA201-078731, titled Robot-assisted therapies in the development of children with disabilities, launched in cooperation with the Caritas Satu Mare Organization in Romania and the Talentum Cassoviensis Foundation in Kosice.

During the 24 months of our "Robooks" program, we create a basic methodology manual, an online interface and downloadable booklets in four languages (Hungarian, Romanian, Slovak, English) that primarily promote the development of the basic skills and competencies of children with disabilities. Therapy with robots will complement animal-assisted therapy in a similar way to the development that children receive in public education institutions, developmental institutions, and child rehabilitation institutions.

The primary target group of the programme is children aged 3-10 with special educational needs and the special education teachers, development teachers, teachers and kindergarten teachers who educate them.

In order to reach the target group, we need to know what support professionals working with children are looking for when they are developing with a new kind of tool – ICT (info communication technology).

In our programme, we offer professionals our methodological booklets on how to develop and use robots as an innovative opportunity.

To ascertain the interest and effectiveness of the robot as a development tool, the usability, usefulness and motivational potential of the methodological booklets we developed, we conducted tests at different stages of the project. At the beginning of our project, we carried out a questionnaire survey in all three countries involved in the project, with a total of 144 professionals completing the questionnaire. The aim was to gauge interest in the robot as a development tool.

A válaszadó 144 fő 56,9 %-a Szlovákiában, 25,7%-a Magyarországin, és 17,4%-a Romániában él. A kitöltők pedagógusok, gyógypedagógusok, óvodapedagógusok és fejlesztőpedagógusok. A projektben meghatározott korú célcsoportot (3-10 év) a kitöltők markáns többsége 82,5 %-a oktatja, fejleszti. Így a kérdésekre kapott válaszok a projekt szempontjából relevánsnak

tekinthetők

56.9% of the 144 respondents live in Slovakia, 25.7% in Hungary and 17.4% in Romania. The fillers are teachers, special needs teachers, nursery teachers and development teachers. The target age group (3-10 years) defined in the project is taught and developed by a clear majority of 82.5% of respondents. The answers to the questions can therefore be considered relevant for the project. As the floor robot can be classified as an ICT device, our questionnaire included a questionnaire on the attitude towards ICT devices. The answers show that a high percentage of respondents (92.4%) use some kind of ICT tool in their work. The project product can therefore reach a wider target audience.

A key question was whether respondents considered the use of ICT tools to be useful for pupils with special educational needs. Only 1.4% of respondents think that pupils with SEN cannot use ICT tools. An overwhelming majority of 79.2% see ICT tools as a new opportunity in the education of pupils with disabilities. It can therefore be reasonably expected that the project's product will find interested user professionals who consider 21st century educational technology tools useful and usable in their work.

The project aims to help professionals to develop the skills and abilities of pupils with special educational needs. An important question is, therefore, which areas of their work they find most useful in using ICT tools.

A projekt produktuma a sajátos nevelési igényű tanulók készség, képesség fejlesztésében kíván segítséget nyújtani a szakembereknek. Fontos kérdés tehát, hogy a megkérdezettek, munkájuk melyik területén tartják a leghasznosabbnak az IKT eszközök használatát.

78.5% of the respondents find ICT tools most useful in the development of skills and competences. And 55.6% prefer to use ICT for individual development.

We have been reaffirmed that the project product to be created will offer opportunities in a field that professionals will find useful. When the questionnaire was compiled, it was asked whether and under what conditions respondents would use the new tool. Overall, respondents were keen to acquire new knowledge by trying out a new tool. Almost two thirds of respondents do not attach any conditions to the acquisition of new knowledge, including the use of a new tool.

In our questionnaire, we also asked respondents what they expect from a new tool. We received a positive response to our question. Most of them think that it makes the sessions more varied, motivates the children better and makes the sessions more attractive for the children. So they

see the use of a new tool as a positive impact for the children. The project aims to promote the use of a new type of ICT tool, floor robots. The figures support the fact that this is a novel device that is not yet widely used.

The final results of our questionnaire survey proved to us the ideas we had set out when we developed the project. The majority of the respondents' opinions are in line with the products to be created by the project. Special needs teachers, educators and developers would like to use a tool that may be new to them and that they would receive appropriate support to use. The answers to the questions suggest that the project is intended to provide teachers with a tool that will enable them to use methodologically supported examples, exercises and images.

The two subsequent phases of the project involved testing our two methodological booklets, based on our Basic Methodological Guide, in two countries.

Our first booklet, Methodological Booklet - Developing Communication Skills with a Floor Robot - Vocabulary Development, was tested with 7 experts.
The professionals involved in the testing were informed about the potential of the tool - novelty of the method, importance of the motivational tool, process design. They were introduced to the methodological booklet and the educational floor robot.

The testing involved completing a 17-question questionnaire. The answers to the questions provide us with feedback on the usability and comprehensibility of the booklet, based on the impressions and experiences of the professionals. The results of the test provide a basis for possible modifications and further development of the project.
We expect the results of the evaluation of our questionnaire to determine the usability of our methodological booklet.
Professionals were asked to rate their answers on a scale of 1 to 6, with the values in ascending order.3 of the professionals who responded to the questionnaire were tested in Romania and 4 in Hungary.
The testers were selected from two groups of experts. 57% of them are development teachers and 43% are special needs teachers working in segregated settings. They typically work with children aged 5 to 7 and 3 to 5 years old. Professionals who are not yet familiar with robotics shared their views with us. For them, almost all the information was new, and using our booklet was their first help in using robots.

Our methodology booklet is divided into 2 major sections - theory and exercises. With the theoretical part, we wanted to give practitioners a brief, comprehensive overview of the area to be developed.

In our questionnaire, we wanted to know how understandable was the theoretical part of the methodology booklet?

Among our questions was how informative and useful was the theoretical part of the methodological booklet? After evaluating the answers, we can say that the theoretical part of our booklet is sufficiently informative and useful for professionals.

The next group of questions was built around the tasks. The responses confirmed that the exercises in the Methodology booklet are informative enough for those who have not yet used educational robots, or have used them only marginally.

The question of whether the professionals were able to find a task or task type in our booklet that was appropriate for their developmental purpose was of paramount importance for the usability of the tasks. Our question was not only related to the task, but also to the task type. After all, vocabulary development is precisely the area where it is difficult to define in advance the vocabulary words to be developed. In this case, the provision of ideas and task types could play a more prominent role. It becomes the task of the practitioner to adapt the vocabulary to the development objectives. This was confirmed by the professionals in their replies.

Summary of the test results

Playful teaching and activities embedded in action are the primary aspects of the development of children with SNI. These conditions are fully met by working with robots, and development with the help of robots.

By creating the methodological booklet, we wanted to provide teachers with a tool in which they could use examples, exercises and images to help them in their development. We also use the tasks in our booklet to inspire users to develop their own tasks.

The majority of testers agree with the usability of the product created by the project. Special needs teachers and developers are keen to use a tool that may be new to them and that they are well supported in using by the tasks in the booklet. The answers to the questions indicate that

the collection of tasks offered by the Methodological Booklet is satisfactory for professionals. They could better and more easily achieve their development objectives by using the robot.
During the testing, the experts also produced a video on the introduction of the use of robots. The videos were accompanied by technical discussions on the experts' experiences and possible implementation difficulties.
Several teachers said that some of the children had problems learning to use the robot because they had to think through the steps when the robot had to perform 2 actions in a frame when the path was curved. All commercially available robots work on this principle. However, some children with disabilities have difficulty in combining 2 steps, e.g. moving forward and turning, while the robot only advances by one unit of cubes - one step.

Our second booklet Developing problem-solving thinking with floor robots was tested by 21 experts. Again, the testing involved completing a 17-question questionnaire. The answers to the questions provide us with feedback on the usability and comprehensibility of the booklet, based on the impressions and experiences of the professionals. The results of the test provide a basis for possible modifications and further development of the project. We expect the results of the evaluation of our questionnaire to determine the usability of our methodological booklet. Professionals were asked to rate their answers on a scale of 1 to 6, with values in ascending order. 11 of the responding professionals had done the testing in Romania and 10 in Hungary. The testing was representative, as the participants represented the professionals who usually carry out development work. Special needs teachers made up the largest percentage, almost 48% of the respondents, the majority of whom were tested in Hungary. The majority of developmental teachers, kindergarten teachers and pedagogues work in Romania, representing 24%, 19% and 9.5% of the respondents respectively.

The teachers involved in the testing typically work with 5-7 and 3-5 year olds. Professionals who are not yet familiar with robotics shared their views with us. For them, almost all the information is new, and using our booklet was their first help in using robots.

The testing also included an evaluation of the theoretical and practical parts of the booklet. The answers in this test also reflect that the theoretical part of our booklet is sufficiently informative and useful for practitioners, and can provide reinforcement, renewal and possibly new information even for experienced practitioners.

From the point of view of the usability of the tasks, an extremely important question for this booklet is also whether the experts managed to find a task or a type of task in our booklet that is appropriate for their developmental goal.

The task types and tasks were rated as good. 66% of respondents found that they were able to select a task or task type that met their objectives to a full extent and 29% to a good extent. There were only two professionals who could find a task that met their objectives to a satisfactory degree

The question was raised as to how clear the descriptions of the games/tasks are in the methodology booklet. Once the practitioner has found a task that he or she likes and that is appropriate for the child he or she is developing, is the description also understandable for those who are not familiar with robotics. Respondents found the descriptions of the tasks to be clear and understandable to a good or full extent. Only 1 professional indicated the correct level. We were also curious to see how well the visual material associated with the tasks helped the understanding of the tasks. All respondents indicated a rating of either full or good. The selection of images was well done, with images that were appropriate for the target audience. The responses also confirmed that the pictures and diagrams associated with the tasks help in the interpretation and clarity of the tasks.

Perhaps the most difficult aspect of task selection is to choose the level of difficulty of the task appropriate to the child's level. An important aspect for the usability of tasks is the adaptability of the task to the level of difficulty. In our question, we were looking for answers to the question: how easy or difficult was it to adapt the difficulty level of the selected task to the child's characteristics and level. The answers show that the majority had no difficulty in choosing the level of difficulty appropriate to the child's needs, 85% of the respondents coped with the task fairly well, only 3 teachers had problems adapting. This may have been due to the teacher's lack of experience in developing with robots, or to the expectation, also expressed in the focus group discussion, that the level of difficulty of the tasks could be indicated.

The next set of questions concerns the development itself. We hypothesize that using our Methodology Booklet, development with robots is more motivating, easier and faster to implement. The answers confirm that the children in the testing were more motivated to develop with the robot than with other tools. There is a strong and clear indication that the motivational effect of the robot is fully realised. The experts also agreed that this type of play was better,

easier and quicker to achieve the aim of the activity. All respondents chose between the options of responding adequately, well and fully.

The aim of our programme is to inspire professionals to invent new challenges. Our questionnaire also asked whether we had been able to arouse the interest of the testing professionals. Whether they were sufficiently inspired by our booklet to invent new tasks. We were very pleased to see that all respondents were motivated and inspired by our booklet and would like to come up with tasks themselves. 66% of them indicated a full response. Which suggests that, after the first steps, professionals will also come up with new exercises, possibly to be shared on our RoBooks website. During the testing, we asked the respondents about the quality of the booklet /editing, quality of pictures/. 76% of the respondents were completely satisfied. 19% gave a rating of 5, while only 5% gave a rating of 4. The quality of our booklet did not receive a lower rating than this. Overall, the quality of the booklet was considered to be very good.

Testing included a focus group discussion with professionals. The focus group discussion resulted in a good atmosphere for a professional discussion. The professionals spoke enthusiastically about the benefits of the tool and their experiences. They all agreed that the tool could be used to diversify development. It makes motivation easier to achieve. However, they also agreed on the need to "protect" this motivating force.

They also agreed that the booklets and the ready-made exercises made their work easier. And although they are enthusiastic about using the robot, working out the tasks and collecting pictures can take a lot of time and effort. That is why they welcome the opportunity to use our website, where they can find not only the ready-made exercises but also the pictures that go with them.

Several teachers said that some of the children had problems learning to use the robot because they had to think through the steps when the robot had to perform 2 actions in a frame when the path was curved. All commercially available robots work on this principle, as they are basically designed to teach robotics and provide a basis for programming. Some children with disabilities, however, have difficulty in combining 2 steps - e.g. moving forward and turning - while the robot only advances by one unit of cubic - one step.

This idea is intrinsically linked to one of the objectives of our project, in which our partner Talentum Foundation is creating a robot that fuses the two steps into one. The command of the turn button on the robot would mean that, by pressing a button, the robot would move forward and turn away at the same time. The robot would be expected to make it easier for children with special needs to control the robot, which would make it easier for them to plan routes.

Final summary

Although the educational floor robot is becoming more widely known among teachers, it is still only rarely used by professionals in the target groups studied. Our ready-made booklets were used by the teachers who tested them. They found them to be of good quality. We can use them as a reference point for the "how to". How to work with the robot? How can they use the robots in their work? How can they incorporate it into their development?

Producing your own tools always requires a lot of energy and time from teachers. That is why they welcome the ready-made exercises in our booklets, giving them the opportunity to combine the images and create new exercises.

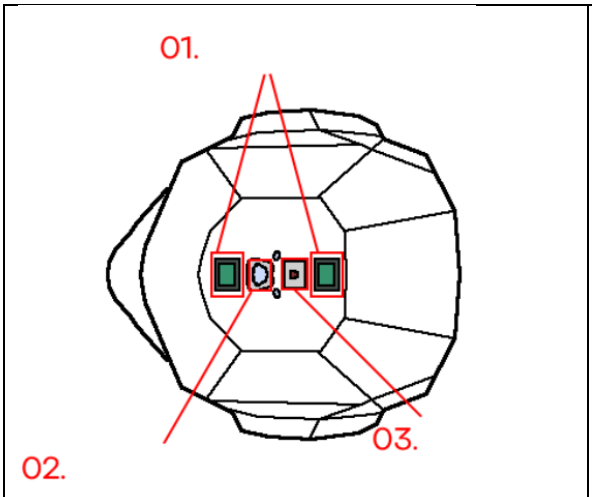
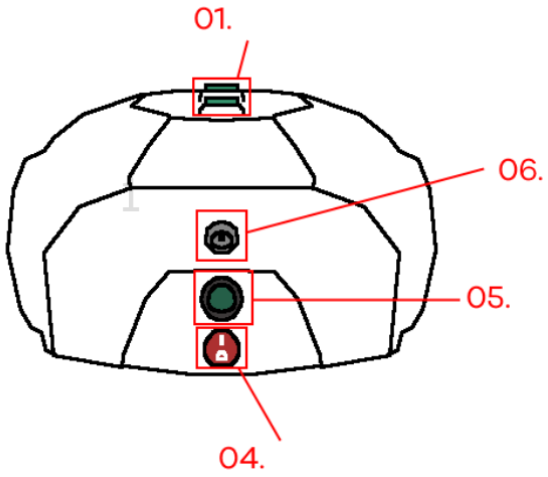
Testing has shown that the motivational power of tasks with robots is very high. It is important to ensure that the task is personalised and of high quality for the children being developed.

This is why the creation of a project website is innovative, where teachers can get a comprehensive overview of the development of robotics support specifically tailored to special educational needs and access visual materials.

Annex 3 – Tekbot

Basic information

Tekbot is a turtle-shaped floor robot whose movements are controlled by colour recognition. The turtle robot is activated by a red switch on the back. Above it is a green push button for language selection and a connector for charging batteries. An LED diode and a colour sensor are located between two protruding push buttons on the top of the turtle's shell. The robot is "programmed" by holding up coloured cards, which are placed one after the other on the buttons on top of the shell, and then holding them down. The robot's chassis is fitted with two motor-driven wheels, which are attached to the turtle's body where the legs are, and the robot's body contains several levels of control electronics, rechargeable batteries and a speaker. All these are bolted to the chassis. A rolling iron ball is glued under the turtle's head.

	
01 – push buttons on top of the armour 02 – colour sensor 03 – LED diode	04 – on-off switch 05 – language selection push button 06 – charger socket

Working principle of the Tekbot prototype

After switching on, the LED diode on top of the robot lights up white. The language can be selected by successively pressing the green push button on the back. After each press, the robot speaks the language in the following order: HU-RO-SK-EN. After switching on, the default language is Hungarian. Then, using the card-sized coloured tiles, press the two push buttons on

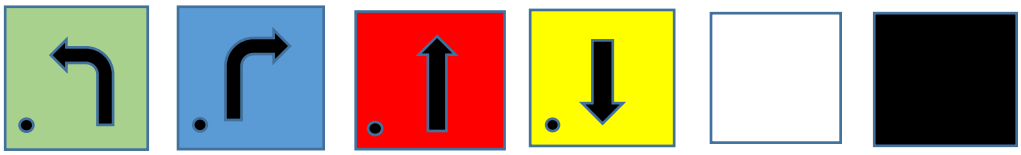
the back of the turtle one after the other. Hold the card down for a few seconds until the robot tells you its colour. By making a sound, you can also check that the colour has been correctly detected. Each colour detected is stored in the memory.

The white card can be used to start the programme by pressing the top buttons, as with the other coloured cards. The robot "says" "white-start" and starts the motors. The turtle starts moving according to the directions assigned to the colours shown, while saying the correct direction of movement.

After the program has run, the robot stops. If you want to continue the program, colour cards are shown again and added to the colours/directions stored in memory. If you want to start the program from the beginning, you can press the black card to reset the program.

Directions and colours

The colours and directions are indicated by arrows on the cards. Forward and backward represent the execution of one action each. Turning is achieved by combining two actions, forward and turning in place. This is different from the Bee-Bot, which does this after entering two separate commands. Treating turning as a complex operation occurs naturally in everyday life, for example when driving a car. This has justified this innovative solution for Tekbot's control. As the turning can be controlled by the SW controlling the motors, it is possible, if required, to modify the program to make the turning a mere stationary turn, so that the Tekbot can operate in the same way as the Bee-Bot.

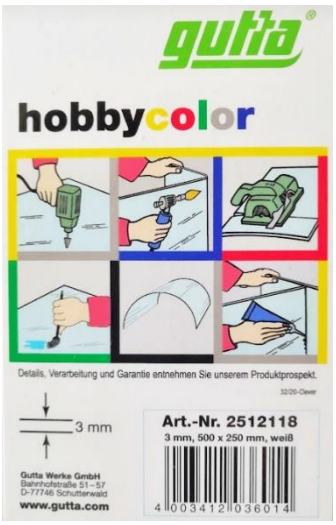


(green = left, blue = right, red = forward, yellow = back, white = start, black = reset)

Playground

Track made of banner material with a 25x25 cm square grid printed on it.

		Finish
Start		



Coloured direction indicator plates

Coloured cards, sheets with directions and turning marks for route planning). Recommended size of the sheets: 120 x 60 mm, thickness 3 mm. We have found commercially available guttagliss®Hobbycolor PVC sheets to work well, which contain all the colours we use and are easy to cut.