Matatalab – Future Classroom Lab Network

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European Schoolnet

Future Classroom Lab

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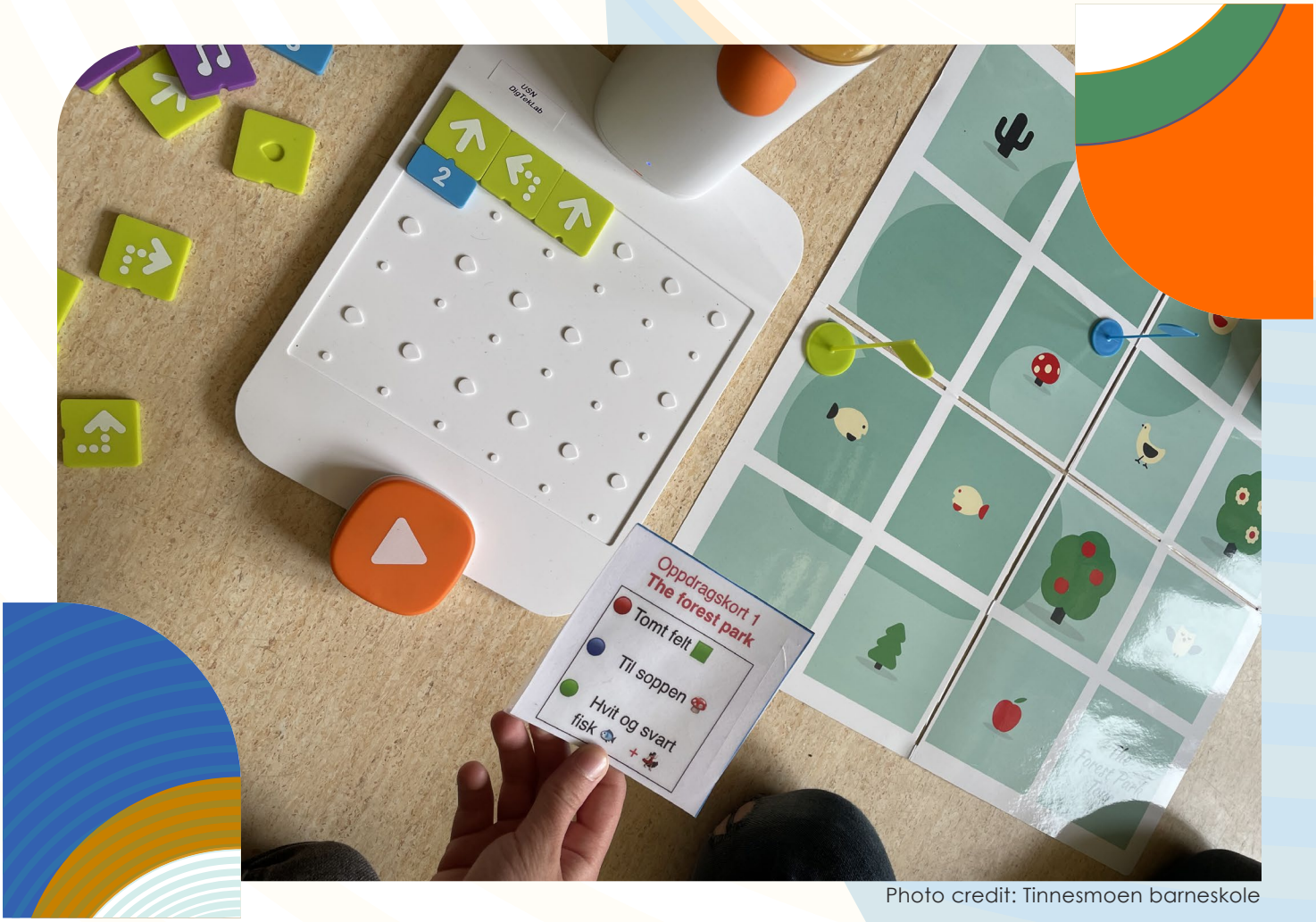

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1. Introduction

This report, compiled by European Schoolnet, looks into the pedagogical value of implementing **Matatalab programming learning tools** to introduce children aged 3-9 to the basic concepts of coding through hands-on gameplays. The School Pilot was a collaboration between European Schoolnet and Matatalab Solutions, conducted between September 2021 and June 2022 with the active engagement of the Future Classroom Lab (FCL) Ambassador network and Innovative Learning Labs (ILL) from 6 European countries.

The purpose of the school pilot was firstly to involve the partner schools' teachers in professional development and specific training activities with the active use of Matatalab solutions; and secondly, after experimenting Matatalab educational equipment in their own classrooms, to provide feedback and practical teaching advice for dissemination purposes.

The report includes **a series of learning scenarios** which consider the potential use cases of the Matatalab bot in pre-primary and primary schools.

The report is released by European Schoolnet for Matatalab Solutions' consideration and can be used as part of its market argumentation. However, EUN does not endorse any claims, findings, or products that have been part of this research. Its findings and conclusions are largely based on the comments, feedback, and recommendations made by the school pilot participants who

carried out the testing activities in their own classrooms. Therefore, any results compiled and analysed by EUN reflect only the subjective opinions of the participants in this project.

Thanks are due in particular to the FCL Ambassadors, the pilot coordinators and teachers from the six European countries participating in the school pilot for their enthusiasm, commitment and professionalism throughout the project, as well as the Matatalab staff who contributed to the initial training and discussions during the project duration.

About European Schoolnet

European Schoolnet (EUN) is a network of 34 Ministries of Education from across Europe, leading educational innovation at European level. EUN works closely with the Ministries of Education, the European Commission and multiple industry partners in order to test resources, methodologies and technology in schools in Europe, organise professional development opportunities for teachers both face to face at the Future Classroom Lab and also online in the EUN Academy, coordinates studies and reports providing updates about the most recent trends and developments in education, etc.

The five focus areas of European Schoolnet are Digital Citizenship, STEM education, capacity building of teachers, new learning environments and scaling innovation.

European Schoolnet has vast experience in supporting EdTech companies to carry out different, small and large-scale validation pilots through methodologies that form part of the Future Classroom Validation Service.

Previous school validation pilots by European Schoolnet:

- Take the action! Piloting LEGO Education® solutions with FCL Ambassadors (2020-2021)
- Triseum validation pilot of learning games (2017-2018)
- Texas Instruments DLP® Products Pilot Program (2016)
- Chromebook Teacher Professional Development and Evaluation Programme (2015)
- Samsung Professional Development Programme (2014-2015)
- Acer Netbook and Tablet pilots (2010-2011; 2011-2012)

2. Methodology

Photo credit: BESST Trnava

Identifying the FCL Ambassadors and the pilot project partner schools

At the centre of the School Pilot was the FCL network of Lead Ambassadors and of ILL labs. In August 2021, EUN proposed an initial call for expression of interest to conduct a testing of Matatalab solutions engaging students, teachers, and local community stakeholders in five partner countries.

The original proposed cooperation framework established by EUN and Matatalab foresaw the selection of 5 FCL Ambassadors, but considering the many applications received, it was extended to include a sixth partner country. EUN therefore selected six Lead Ambassadors who accepted the role of coordinating the testing activities in their own country over a period of seven months.

Consequently, the FCL Ambassadors or their representatives identified one or more Innovative Learning Labs in their own country and selected the partner schools to be actively involved in the school pilot. Each partner school then identified two or more teachers and a number of classes, ranging from pre-school to primary school, in which to experiment the Matatalab learning kits.

The final composition of the school pilot group of participants was approved by Matatalab Solutions.

Country	School pilot participants
Czech Republic	1 school, 2 classes, 2 teachers
Denmark	2 schools, 6 classes, 7 teachers
France	3 schools, 8 classes, 8 teachers
Norway	2 schools, 2 classes, 2 teachers
Portugal	2 schools, 6 classes, 6 teachers
Slovakia	1 school, 3 classes, 1 teacher

Establishing the testing programme

As part of their commitment to developing and improving STEAM practices in education, European Schoolnet and Matatalab jointly set up this school pilot project with the aim to encourage teachers and children to explore their imaginations and combine collaborative thinking with the playful discovery of the world of coding. The ambassadors, the pilot coordinators and teachers

involved were invited to test the programme and to develop activities to be implemented in each of the participating classrooms for a period of 7 months.

To this purpose Matatalab provided 10 sets of educational solutions free of charge to each of the selected countries. The 10 coding sets complete with Musician add-on and Artist add-on were lent to each classroom for a period of four weeks in order to conduct their testing.

All necessary information regarding the pedagogically sound use of Matatalab bots was provided to the FCL Lead Ambassadors or their representatives through an initial online training organised by EUN in collaboration with Matatalab pedagogical team. In some countries, such as Portugal, Slovakia and Norway, the FCL Ambassadors identified an associate coordinator to facilitate the testing activities at local level and disseminate the Matatalab educational guidelines. In Portugal, the project also had the collaboration of the ICT Competence Center of the Higher School of Education of the Polytechnic Institute of Setúbal.

It should be noted that due to the impact of the Covid19 outbreak and a few delivery issues of the Matatalab kits to some of the partner countries, the initial timing for the testing activities had to be adjusted and part of the programme had to be extended to the months of May and June 2022. In particular, the testing activities in Norway had to be postponed because of the insurgence of covid cases which caused prolonged absences of teachers and students from schools. As two of the Norwegian partner schools were obliged to withdraw from the project, a proposal to substitute them with two other schools, and consequently to extend the testing period to the end of September 2022, was submitted by the Norwegian FCL Ambassador and approved by Matatalab.

Online meetings and initial training

Throughout the pilot, European Schoolnet worked as the **contact point** between Matatalab Solutions and the FCL network. A series of online activities were carried out in order to support and guide the school pilot group in coordinating the testing programme at national level.

In total **three online events** were organised by EUN:

1 – First online meeting, 30 September 2021

The meeting was framed in the following two sessions:

- **Project kick-off**: to welcome the group, make informal introductions, and outline immediate next steps in the plan.
- **Initial training**: led by Matatalab Solutions experts focused on presenting the Matatalab educational solutions and providing the necessary training to enable the pilot coordinators to start developing the testing programme. To this end, the Matatalab experts presented and demonstrated Matatalab functionalities with specific focus on the Matatalab Coding Sets with Musician add-on and Artist add-on and Tale-Bot Pro.

The FCL Ambassadors and school pilot national coordinators contributed to disseminate the information received during the initial online training via presentations and exchange of information in their own national languages.

2 – Mid-term online meeting, 13 May 2022

To discuss the project status in each partner country and any issue pertaining the completion of the project activities; to facilitate the authoring process of creating two learning scenarios per each country; to share experiences and first feedback from the schools participating in the pilot.

3 – Final online meeting, 13 July 2022

To give feedback on the preliminary report and raise any further comments on the final output.

Testing activities in the pilot schools

The testing programme within schools was carried out in the period from March to June 2022. Participating FCL Lead Ambassadors/representatives together with the selected teachers developed activities to test the pedagogical value of Matatalab educational coding sets, including 10 Matatalab bots and some Tale Bot Pro, over a period of four weeks.

In most cases, the learning activities implemented with the use of the Matatalab kits aimed at making junior students become familiar with the basics of coding while developing cross-curricular competences in the area of mathematics, foreign languages, self-orienteering and spatial location, computational thinking and robotics. In many cases, the learning activities were developed through an interdisciplinary approach that involved the proposition of challenges aligned with Problem-Based Learning (PBL).

Initially, most teachers used only the free exploration Matatalab kits and the materials included in the package. Subsequently, they started to design their own lesson plans and, in some cases, created support materials (themed mats, 3D characters, geometric solids based on flat plans, etc.) and/or extra resources (challenges, learning stories, escape games, assessment rubrics, etc.) to adapt the learning activities to the reality of their class/group.

As main output of the programme, each participating country developed at least two lesson plans that were tested in the different classrooms and refined over the timespan of the programme with the help of a learning scenario template provided by EUN.

EUN followed the work of participants remotely through the FCL Ambassadors' mediation in order to ensure they could receive the appropriate support to start and advance in their work for the development of the learning scenarios.

Evaluation phase

The testing phase consisted of:

- A final questionnaire for the partner schools' teachers engaged in the testing activities to capture pedagogical appreciation of the Matatalab learning tools and to measure the effectiveness of the intervention.
- A debriefing webinar, in the form of a structured discussion, organised with the FCL Ambassadors to collect in-depth information and qualitative feedback from the partner schools on their experiences implementing the Matatalab kits.
- An evaluation report, summarising the results from the research questionnaires and learning scenarios produced by the participants.

Photo credit: Matatalab website

Summary of findings and brief analysis

The following analysis is based on the inputs collected from ten partner schools through the final questionnaire and the direct feedback provided by FCL Ambassadors and ILL coordinators.

All partner schools evaluated the **initial information and instructions provided for the implementation of the Matatalab kits** as clear and comprehensive, so that no major issues were reported as regards initializing and using the kits during the testing period. The majority of respondents rated their overall experience with the MatataLab kits in their school as very good (6 schools), good (3 schools) or fair (1 school).

At **pedagogical level**, most school pilot teachers appreciated the educational value of the Matatalab coding sets as tools that can help teachers develop engaging learning activities for very young children (aged 3-9) based on playful learning through self-discovery, problem solving, collaborative learning, communication and creativity.

One of the most appreciated benefits of using Matatalab programming tools is that it helps children learn many basic programming principles involving computational thinking without the help of a computer. In particular, the off-screen use of Matatalab robots simplifies the whole process of setting up and working in the classroom with children having limited experience and skills in using a device (PC or tablet). As a result, there is more time to focus on the programming activities rather than troubleshooting the connections with devices and so on.

In particular, the kits were considered useful when moving from pre-programming activities to actual coding and prior to employing other kits that require the use of a screen. In this regard, expansion sets were found beneficial as they increase the range of coding blocks.

No major issues were reported by the pilot teachers using the kits in their classroom. A minor issue may occur when mixing up the towers and robots from various kits. This inconvenience can be solved by labelling the parts. Some children, especially if very young, may encounter difficulties in the correct placing and orientation of the tiles on the coding board. This is however considered to be part of the learning curve and children will eventually learn to master this functionality.

SWOT analysis & evaluation

Based on their experimentation of the Matatalab kits in their classrooms, the school pilot participants highlighted the following SWOT elements (strength, weaknesses, opportunities and threats).

Strenghts

- Simplicity of use with early-age students
- Engaging off-screen experience
- Easy to recharge (USB)
- Easy to adapt to curriculum and learning goals
- Flexibility of use in different situations with expansions allowing for different lessons and experience levels
- The two modules (control tower and moving vehicle) help to clearly visualise the directions of movement taken following the coding
- Having the pieces to write the lines of code allows students to solve the problem more easily
- Quality of the material and appealing features of robots and kits: dimensions of the mat (10x10 squares) with interesting themes and included accessories.
- Easy to check that everything is put back in order after the lesson as each component has its place in the box and cannot be placed elsewhere

Weaknesses

- Limited number of tokens
- Students found difficult to understand how to position arrows and the marks are too small
- It takes a while for the kids to understand the symbols on coding pieces
- There can be problems with many kits together, because the kits may get mixed up and the bricks are easy to lose.
- Boxes are too bulky, taking up too much space for what is inside, especially when it is not possible to keep the sets on dedicated tables permanently.

Opportunities

- Can help the development of self-confidence, scientific vocabulary and scientific approach to better locate oneself in space and in a grid
- Promotes work in autonomy and cooperation with the right to learning by making mistakes
- Encourages learning by doing, problem solving, creativity, collaboration among peers, communication in native and foreign languages

Threats

- It may be difficult to develop a self-discovery concept with very young children if there are not enough Matatalab kits available in a classroom.

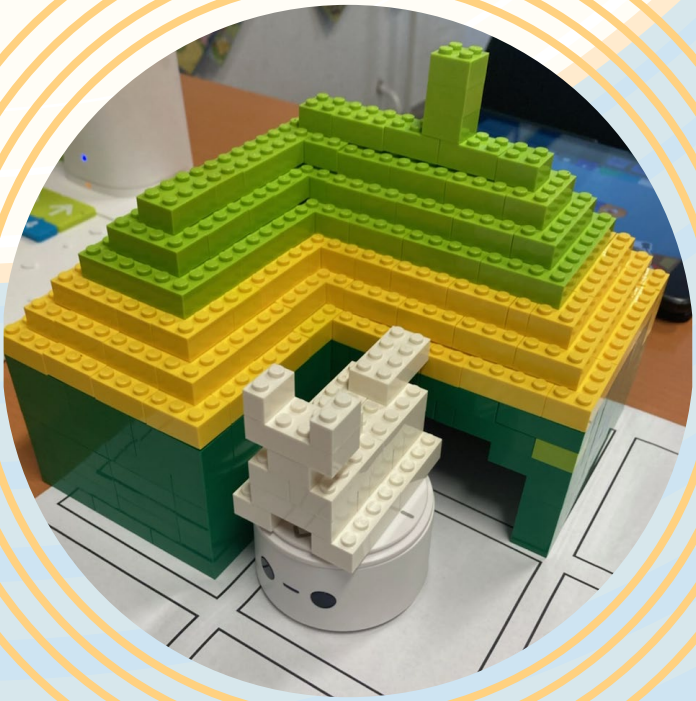

Photo credit: BESST Trnava

3. Use cases

The School Pilot participants designed a series of learning scenarios based on their experimentation of the Matatalab products focusing on their potential uses in pre-school and primary school education.

Learning scenario aims and creation process

The aim of the learning scenarios is to provide an insight on how Matatalab bots can be used in the classroom to help junior students become familiar with coding through hands-on, unplugged learning activities.

To support the learning scenario authoring process by the partner schools and harmonise the final project outputs, EUN provided a specific template which includes the following sections:

- Learning scenario title and authors
- Approach to teaching and learning
- Learning objectives / aspirations
- Teacher and students' roles during the learning activities
- Learning environment and resources
- Benefits and challenges in using the Matatalab kits.

The final versions of the learning scenarios were revised by EUN and shared with the FCL Ambassadors, so that participants could comment and provide feedback in order to improve the final output.

A copy of each learning scenario can be found in the Annex to this report.

Approach to teaching and learning

The pedagogical aim of the learning scenarios is to actively engage students in hands-on coding activities without the need of a computer.

Some of the learning scenarios are developed through an interdisciplinary approach that can involve competences in different subjects and through the proposition of challenges that align with problem-based learning (PBL).

Fairy tales and engaging narratives are often presented to introduce the activities and trigger children's curiosity. Students are first invited to listen and retell the story, and then to work in

groups to solve a problem by experimenting and reflecting on their own mistakes. In some cases, pupils are encouraged to use their own creativity to design and build the characters and to program the robot.

The learning scenarios also include elements of gamification using the concepts of fulfilling missions and breaking out rooms.

Learning objectives and aspirations

The learning scenarios focus on activities that are suitable for pre-school or primary school students and pursue the following learning objectives:

- To explore the world using technical instruments
- To use specific language to communicate and give instructions
- To locate oneself in time and space using tangible landmarks
- To develop abstraction and learn how to anticipate the effect of a particular sequence of instructions before having it executed by the robot or a program
- To learn through self-discovery by trial and error
- To collaborate among peers and use creativity to solve a problem
- To self-evaluate programming accuracy and effective transmission of information

Teachers and students' role during the learning activities

Matatalab coding sets facilitate students' independent learning through self-discovery and collaborative learning.

After introducing the learning activities, teachers act in the classroom mainly as facilitators of the learning process and observers.

More than conveying knowledge, the teacher designs the tasks and then encourages students to actively engage in learning - both individually and in groups - by solving challenges and reflecting on how to break out large problems into smaller parts. This way, pupils are encouraged to discover the material on their own, pass on their knowledge to others and find solutions to challenges together.

Scaffolding and feedback are provided only when necessary.

Learning environment and resources

Activities can be carried out in traditional classrooms or fablabs (when available). There should be sufficient space to contain the Matatalab sets and the play mat. Different dynamics and layouts can be applied to create a playful environment and facilitate students working in small groups to program the robots.

In some cases, print outs of the narrative stories and worksheets are required. Extra themed mats, solid figure, classroom toys or other types of artefacts can be used to make the learning experience more engaging for students.

Benefits and challenges in using Matatalab kits

Matatalab educational kits allow pre-school and primary school students to interact with the bots and learn about many basic programming principles and computational thinking through playful games and engaging stories.

Children gradually learn and develop the notion of abstraction by trying to anticipate the effect of a certain sequence of instructions even before they can make the robot, or their programme execute it.

Students also develop cross-curriculum competences and 21st-century skills (communication, collaboration, critical thinking, problem solving, creativity) while accomplishing engaging activities that facilitate students' active learning.

The coding sets enable students to work on their own sense of argument and develop the ability to work in groups, making it possible for teachers to encourage error awareness in the learning process of very young students and bring more happiness into the classroom.

A potential challenge can arise when using the robots inside a limited area within a school or in the classroom that can impede the bots to find their way according to instructions. Other challenges may be related to a still undeveloped sense of laterality in early-age children; the use of assessment rubrics with younger children or when students are required to write down the algorithms and to identify and correct any coding errors.

Photo credit: BESST Trnava

Photo credit: Tinnesmoen barneskole

4. Dissemination strategy and next steps

Dissemination initiatives

The following dissemination actions have been undertaken by EUN to present the project activities and results to the broader FCL community and promote a programme identity:

- Presentation of the Matatalab Pilot on the Future Classroom website
- Mention of Future Classroom Newsletter n°2 - June 2022
- Specific communication material to support FCL network of ambassadors and ILL coordinators in setting up and developing the programme.

Further dissemination initiatives - starting from September 2022 - will focus on the project outputs and the learning scenarios produced by the pilot partner schools via a series of post on EUN social media and on the Future Classroom website. Participants of the activities will be asked if they want to contribute with their experience and related photographic material for dissemination purposes via EUN channels.

At national level, FCL Ambassadors and ILL coordinators have contributed to the dissemination of the Matatalab pilot project through local on-site workshops and online events both before starting the testing activities and after the conclusion of programme. For example:

- In Portugal: a dissemination webinar was held on 17 May 2022 for other Portuguese schools and was shared via YouTube and other social media. Also, an open educational event was held at "Futuràlià 2022" from 30th March to 2nd April, during which the coding sets were on display and students could interact with the bots.
- In the Czech Republic, the FCL Ambassador published an article on her personal blog and a series of posts on Matatalab Facebook group.

Other initiatives will be locally organised in the next months.

Next steps

After the end of the programme, each classroom participating in the pilot will be able to keep one set as a compensation for their support. The remaining five sets will be at the disposal of the FCL Lead Ambassador to integrate in the activities of their local Innovative Learning Lab (ILL).

The Matatalab programming tools may be also used for teachers' professional development, workshops and further dissemination purposes.

5. Annex

- Czech Republic: Learning Scenario 1 – "Castaway on a Desert Island"
- Czech Republic: Learning Scenario 2 – "Firebird's Journey"
- Denmark: Learning Scenario 1 – "Technology in our society"
- Denmark: Learning Scenario 2 – "Investigating with robots"
- Denmark: Learning Scenario 3 – "Understanding technology"
- France: Learning Scenario 1 – "Get Moving"
- France: Learning Scenario 2 – "Place your Token"
- France: Learning Scenario 3 – "Stay on Track"
- France: Learning Scenario 4 – "Treasure Hunt"
- Norway: Learning Scenario 1 – "Matching Pairs"
- Norway: Learning Scenario 2 – "Draw a Card!"
- Portugal: Learning Scenario 1 – "Curly Hair"
- Portugal: Learning Scenario 2 – "Solid Figures"
- Slovakia: Learning Scenario 1 – "Left or Right?"
- Slovakia: Learning Scenario 2 – "Fairytale Fair"

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