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MY CODING BAG WITHOUT A COMPUTER

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MY CODING BAG WITHOUT A COMPUTER PROJECT ACTIVITY BOOK

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PREFACE

In the digital age, information literacy, problem solving, creativity, production and many others, 21st century competencies are based on understanding computers and computer language. It is a fact that future and many business sectors make coding education as mandatory and important for all individuals as knowing how to read and write. In addition, children who learn coding develop analytical thinking skills, help them think creatively and improve their ability to solve problems, establish connections between events, find solutions, and test the solutions which they find by trying them. Based on this, it is clear that it is important to gain these skills starting from the preschool period.

As highlighted in Council Recommendation2 on high-quality ECEC systems, it is necessary to "track children's interests, nurture their well-being and ensure that the early years curriculum is developed to meet the unique needs and potential of each child, including those with special needs or those who are vulnerable or disadvantaged." The potential that every child has must be supported and nurtured. Many children living in unfavorable conditions are candidates to become future computer engineers and coding experts, and every child has the right to access the opportunities. Coding training has already begun to be given in many countries, starting from the preschool period. In order to promote inclusion, equality and non-discrimination, children with disadvantaged conditions should start this education as soon as possible. The aim of My Coding Without a Computer Project is to minimize the difference between disadvantaged children and other children and to help identify talented children in this field.

The purpose of this book is to explain how to teach coding (programming) steps to preschool students with concrete activities without using computers. Since the abstract thinking skills of children at early childhood age have not yet reached sufficient maturity, application examples enriched with activities and games are presented to make it easier for them to learn coding. Educators are expected to be able to create new activities based on their own needs and resources in the light of the examples and explanations in this book.

Aimed achievements with the activities in the book are:

- To realize that the algorithm is part of life and makes daily life easier.
- To realizes that simple instruction processes related to daily life are algorithms that computers will follow
- To realize that coding is not just done on the computer
- To realize that it improves arithmetic and logical thinking
- To realize how to solve problems with easiest steps by finding solutions to them
- To solve a case or problem using algorithmic thinking;
    - ✓ To explain the situation/event/problem to create an algorithm
    - ✓ To create an algorithm suitable for the objective
    - ✓ To test the accuracy of the algorithm.

- ✓ To fix the bug in the algorithm.
- ✓ To give algorithm examples from daily life

- To do basic coding
  - ✓ To define the rule in simple two- and three-stage coding.
  - ✓ To perform the given coding
  - ✓ To solve a simple problem using coding
  - ✓ To place objects in accordance with the coding
  - ✓ To find the error in the given coding
  - ✓ To fix the error in the given coding

WHAT IS CODING (PROGRAMMING)?

Coding (programming) literally means the whole of the processes that are intended to be carried out according to certain conditions and order. It is simply a series of prompt text written in a language that computers or electronic circuits can understand to perform a process. The foundation of coding is based on the concept of algorithm.

ALGORITHM: It is the step-by-step design of a solution method to solve a certain problem or achieve a certain goal. Algorithm steps have a beginning, one or more processes and an end. How to do these steps in order is stated at each step. Algorithms are used in every aspect of life. Every job we do in daily life requires a certain order.

SEQUENTIAL PROCESSES

The teacher says to the children "I am a robot. Now we will make the robot dance. Everyone will take turns telling the robot to do a dance figure. Let's see how our robot will dance?" and starts to act according to the commands given by the children. The aim is to make children realize that when using digital devices such as robots, these devices carry out the commands given. The teacher can continue the activity by having the children take turns making robots.

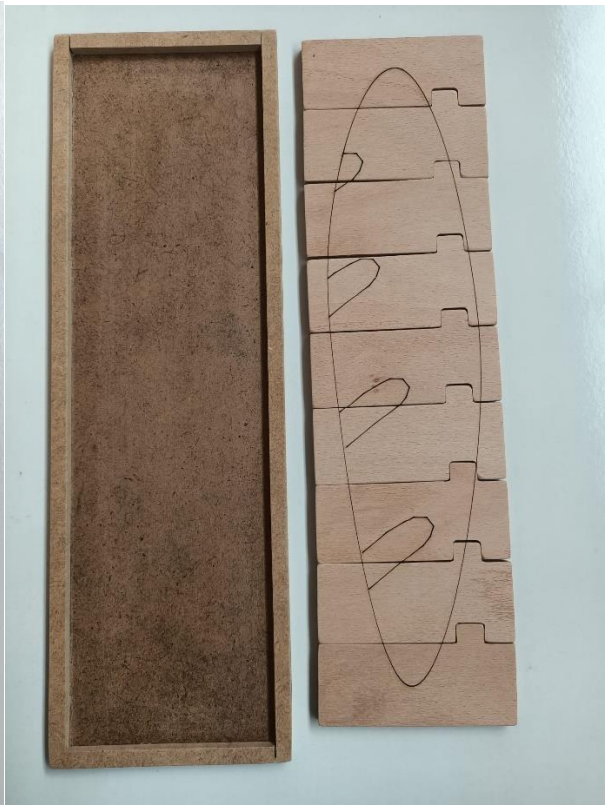
Then the teacher says that the robot's new task is to open the classroom door. The teacher tells "The robot can do this with the commands that you give" and asks a student of his or her choice to give the command. Children will most likely say to the robot: - Open the door. The teacher waits where he or she is without moving. Then the Teacher will ask "Children, why don't our robot open the door? What could be the reason for it?" and gives them opportunity to think. After the children answer, he or she explains that in order to operate electronic circuits such as computers and robots, it is necessary to speak a language that they understand. For this, he or she explains that each step must be said one by one, sequentially. The teacher draws attention to the fact that an action must be taken at each step. He or she asks them to rethink the door opening process and specify the necessary commands to the robot. Then, together with the children, they guide the robot to open the door with the right commands.

- Start
- Proceed to the door
- Extend your right arm
- Hold the door handle
- Lower the arm down.
- Open the door.
- Let go of the door handle
- Finish it

Note: Examples can be developed and gamified by the teacher to make an entertaining start. (Opening the window, brushing teeth, preparing a school bag, putting on clothes, etc.)

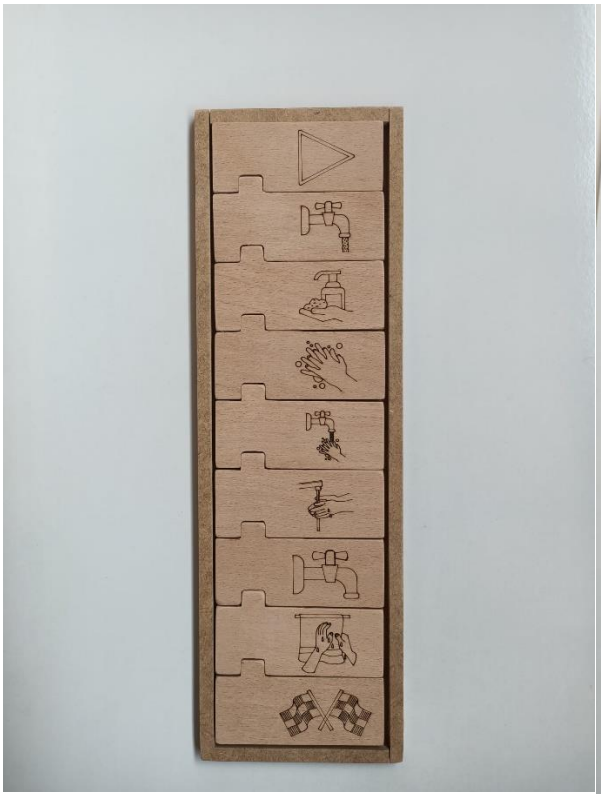
ACTIVITY 1

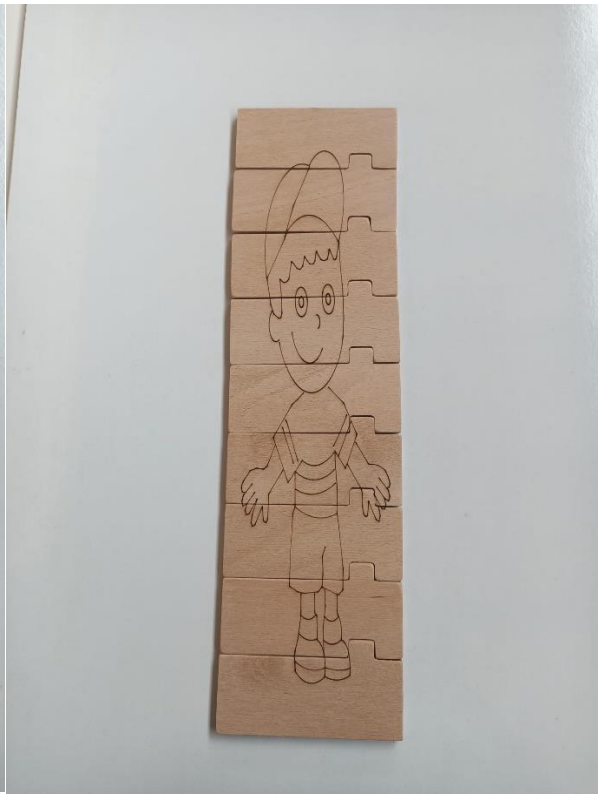
Making Bread: The teacher takes out the bread making stages materials from the bag and keeps them ready on the table. First, he or she shows the bread on his/her hand and then he or she asks "Do you know how bread is made?". After getting the answers, he or she calls the children's attention to the materials on the table. Materials are examined one by one and they talk about the images. The material is completed and the check is done for the right order by turning them over (There is a picture of a child with bread in his hand on the back of the materials). If the picture on the back turns out to be incorrect, the stages are reviewed again and debugging is carried out by finding out where the mistake is made.



ACTIVITY 2

Morning Routine: The teacher takes out the bread making stages material from the bag and keeps them ready on the table. The teacher asks, "Children, what do you do when you wake up every morning?". After listening to the children's answers, drama activity can be done. After getting the answers, he or she calls the children's attention to the material on the table. Materials are examined one by one and they talk about the images. The material is completed and the check is done for the right order by turning them over (There is a picture of a smiling child on the back of the materials. If the picture on the back turns out to be incorrect, the stages are reviewed again and debugging is carried out by finding out where the mistake is made.





TIDY-UP

The teacher asks the children "We make so many decisions every day, even though we don't realize it from the time we wake up in the morning and until that we go to sleep at night, right?" For example, when we play games with our friends in the summer and get thirsty, do we prefer hot drinks or cold drinks? Or would we rather play snowballs in the winter and eat ice cream or drink hot chocolate after we return home? We usually make plans with our family for the weekend. We can't plan a picnic without checking whether the weather forecast is rainy or not. If the weather is rainy, we make plans for indoor activities. Accordingly, we organize our clothes or the materials we will take with us. For example, we do not think of taking our bike or ball with us when we go to the cinema. We prefer to take them with us when we go on a picnic. Can you give examples of the decisions that you make during the day? he or she asks and listens to the answers. Whether it is appropriate or not is discussed in class. Then, the lesson continues with the following explanation: For example, we make some decisions when placing items in our home. After we come home, we do not place the shoes which we take off on the bookshelf. We put our dirty clothes in the laundry basket, not in our closet.

ACTIVITY 1

After free play time, students have a conversation during the gathering. The teacher draw attention to the mess in the classroom, "Children, do you think we can leave our classroom like this without organizing it and move on to next activities?" he or she asks. You know that there are some centers in our classroom that we have created together with you. "Do you remember why we arranged them separately?" he or she asks, then he or she tours the centers one by one and shows them. Children's answers are listened. The teacher reminds them that having toys and materials in their own areas will make their job much easier. For example, when we want to use maracas at a music activity, we can easily reach it by going directly to the music center instead of looking for it. Are the materials at right place in the classroom where they should be? he or she asks. "Now, in order to move more easily in our classroom and not waste time, let's organize our classroom and place all the materials at the center where they should be and move on to the activity" the teacher says.

When the tidy-up process is completed, the centers are visited together to check whether there is any material belonging to the other center. If there is any, the tidy-up is continued by asking where the materials should be and until each material is placed in the right place (In this way, finding misplaced materials and taking them to the right places can also be used for debugging).

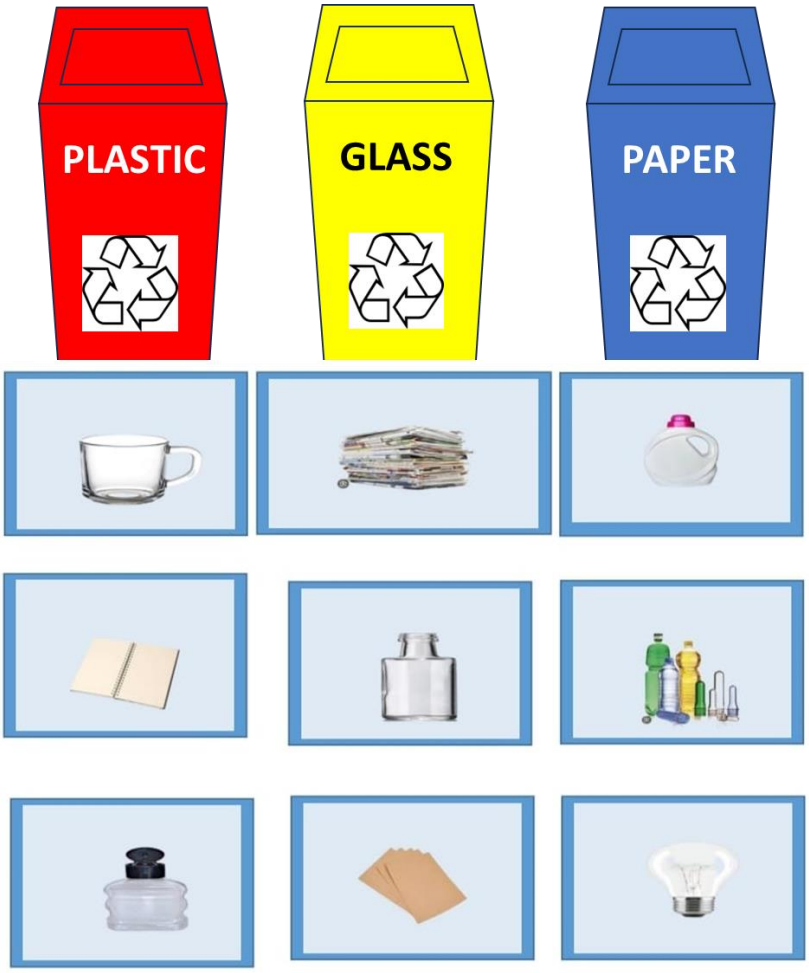
ACTIVITY 2

The teacher chats with the children about professions. He or she draws attention to the fact that the materials used by each profession may differ. Each child is asked what profession he wants to be when he or she grows up. Then according to his or her answer, the teacher asks what materials would be needed to use while doing this profession? After getting answers the teacher places the find and mount materials, astronaut and mechanic from the bag on the table and gives the children the opportunity to examine them. After asking questions “What comes to your mind when you hear the word astronaut? So, what do you think the mechanic uses while doing his job?” the astronaut and mechanic pictures are completed by finding the right order. Then, pictures related to the characters are sorted and they are asked to place them on the relevant profession.

ACTIVITY 3

Before the children arrive, the teacher places waste materials such as plastic, glass and paper on the floor of the classroom (It should be ensured that the leftover materials are used things that will not harm or pose a danger to children's health. If the teacher prefers, he or she can use cards with pictures instead). When the children come to the classroom, the teacher draws the children's attention by saying “ATTENTION PLEASE!” The teacher starts the conversation with questions like: “What happened to our class?”, “What are these?”, “Why are they in our classroom?”, “Where should these be?”. The teacher reminds that garbage should be thrown into trash cans, not on the ground, he or she asks "Where are their buckets?" and then shows the different colored recycling bins placed in the corners of the classroom. The teacher asks whether the garbage has been dumped from them. But they are a little different from trash cans. They have a different marking on them and their colors are also different. The teacher asks “Do you know what this sign is?”. After listening to the children's answers, the teacher introduces the recycling sign to the children. He or she tells “Kids, we can’t throw all the garbage into these bins where we see this sign. Because some materials can be reprocessed and made available to people. In this way, we can protect our nature from more garbage, contribute to the

country's economy and use our resources more efficiently". He or she explains what recyclable materials are and says "Now we have learned which materials are recycled, but since the factories that process them are separate, we also need to sort them". Under the guidance of the teacher, each waste material is thrown into its own recycling bin. Then, activity sheets with pictures of paper, plastic and glass recycling bins and waste are distributed to the children. It is preferred to place the waste under the correct bins.



LOOP

The teacher enters the classroom with a scale in his hand. He or she asks the children if they know what he or has. Based on the answers he or she has got, he or she explains that what he or she has is a scale, a tool used to measure weight. Then he or she introduces the weights one by one. He or she takes a weight and places it on one pan of the scale. He or she draws attention to the unequal balance of the scales and asks why this might be caused. Based on the answers the teacher has got from the children, he or she says "Let's bring the scales back to balance". He or she explains that the weights of the objects placed on both sides must be equal. After that, taking the unit cubes; we have to place them one by one on the other side. After each weight, he or she says, we will check whether the scale pans are equalized. When pans are equalized, we will have achieved our goal. In other words, he or she says there will be equal weight on both sides and starts the activity. Each time, one unit cube is placed in the empty pan and it should be checked whether equality is reached. When the pans reach equal weight, the teacher ends the activity. He or she asks children to count unit cubes. Children are asked to show in numbers with how many unit cubes the equality is reached. With this activity, the

loop concept of coding is explained. The goal is to make repetitive coding tasks easier. Loop codes are used to repeat entire pieces of code within a certain rule loop.

Demonstration of the activity with schema:

Step 1: Start

Repeat cycle until balance is reached

Step 2:

Step 3:

Step 4:

Step 5:

Step 6:

Take one unit cube. Put the unit in the pan of the scale. Has the equality reached? If YES go to 7th step. If NO go to 2nd step.

Step 7: Count the units on the pan of the scale.

Step 8: Show the number of units in numbers.

Step 9: Finish.

ACTIVITY 1:

To carry out the activity, the teacher brings a bucket of water, a large transparent container and as many glasses as the number of the students. A level line is made by drawing a line from the outside in the middle of the transparent container. This container is empty. A toy rubber duck is placed in the container with the children. The teacher says “We will make our duck float by carrying only one glass of water at a time from the water-filled bucket. Our aim is to get our duck to swim above the line. When starting the game, a paper cup has given to each child. The first child takes water from the bucket and pours it into the container with the duck. The child leaves the emptied glass next to the duck's box (If the number of children is small, no cups will be left, instead, a scoreboard can be prepared and marked). The teacher asks if the duck has reached the line. If the answer is no, the second student fills the glass in his hand, brings it and pours it into the duck's container. He or she leaves the empty glass next to the other empty glass. The teacher asks again whether our duck has reached the line. This cycle

continues until the duck reaches over the line. Then, the activity ends by counting how many glasses make ducks be over the line on the container.

ACTIVITY 2:

A large cat shape is made from styrofoam. Toothpicks (pasta sticks or colored counting sticks can also be used) are attached to on it as cactus spines. The aim is to save the injured cat that fell onto the cactus from all the spines thorns using tongs to pull them out. For this, at each step, it is asked whether the cat has gotten rid of all the spines or not, and the process is continued until the cat is completely rid of the spikes. You can also play this game using pom-poms as fleas.

DEBUGGING

Various errors can be made during coding. In this case, the software developer must find the faulty code and fix it. The desired result cannot be achieved without correcting the error. Raising awareness among students is aimed to find and fix the faulty part at the following activities.

ACTIVITY 1:

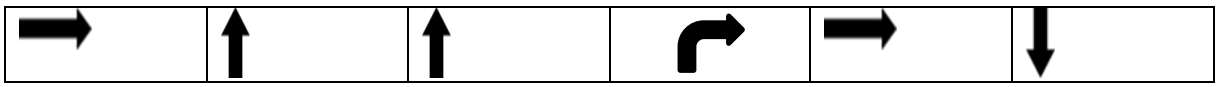
At the beginning of the lesson, the teacher asks to students if they have ever been to a farm and what animals live there. After getting students' guesses, images of animal figures and their habitats are shown. Questions like “I wonder if this cow lives in a coop? Or would it be appropriate if this chicken lived in the barn?” are asked and the animal figures, barn, kennel and coop cards are placed one by one on the square with the start written on the coding mat. The teacher explains that he or she will

separate the class into 3 groups for team working. First, the cow model is placed and it is asked them to follow the arrows and examine whether they have reached the correct habitat. Then, to correct any errors the children are asked to guide the farm animal using the arrows to the right area. If there are obstacles on the coding mat, it should be pointed out that the animals cannot go over the obstacles.

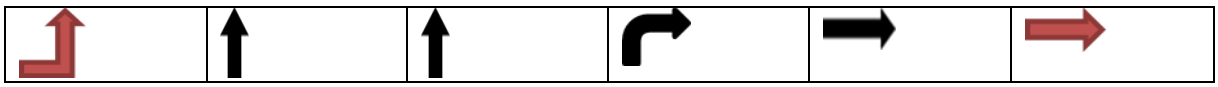
NOTE: Various similar activities in the bag can be planned and implemented on the mat. Below, prepared samples in smaller areas are used for the example.

GROUP 1 (3 years old)

GIVEN PATH



REGULATED ROAD



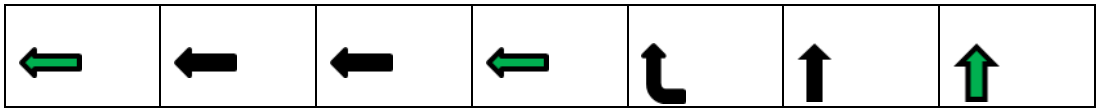
				FINISH 
				
				
BEGINNING 				

GROUP 2 (4 years old)

GIVEN PATH

FINISH 					
					
					
					 BEGINNING

REGULATED ROAD



GROUP 3 (5 years old)

GIVEN PATH

REGULATED ROAD

FINISH 					
					
					
					BEGINNING 

OBSTACLES

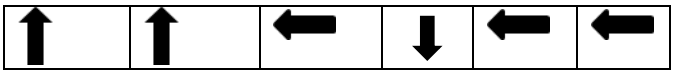
ANIMALS

ACTIVITY 2:

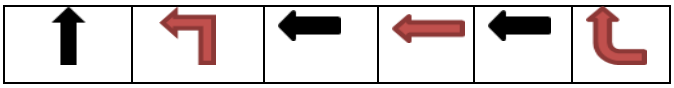
The teacher prepares the garden for the activity in advance. Before going out to the garden with the children, he or she asks the students, "What would you do if you saw a fire in a house on our street?" and gets answers. They go out to the garden together and show the coding carpet laid on the ground and the materials on it. The teacher asks students to form groups of two. The task of the working groups is to find the best solution and bring the fire truck to the fire. Students are given a certain amount of time to find the errors on the instruction sheet given to them and replace the direction codes with the correct ones. Each group in turn; one of the students reads the instructions, and his or her groupmate drives the fire truck and reaches the fire zone. The activity is then completed by determining which group found the most correct path.

NOTE: If there are obstacles on the coding carpet, it should be stated that the fire truck cannot pass over them.

GIVEN PATH:



EDITED PATH:



FINISH 				
				
				
				**BEGINNING** 

ACTIVITY 3:

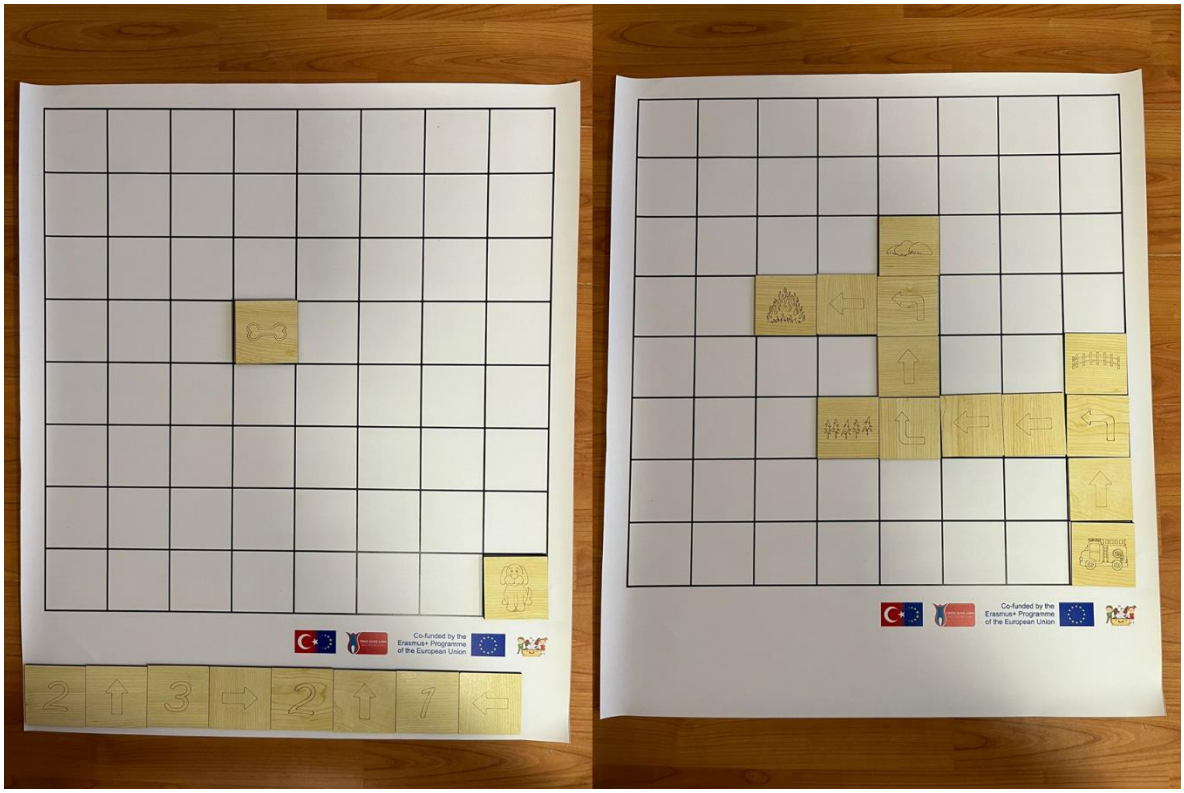
The teacher prepares the garden for the activity in advance. He or she draws a big circle and small circles around it with chalk on the garden ground. He or she places a blue garbage bag in the middle of the large circle and puts some pictures of land and sea animals on it. Likewise, he or she randomly places pictures of land and sea animals inside the small circles which he or she has drawn around the big circle. The teacher go out to the garden with the students. The teacher shows the garden ground to the children and says "Children, the area where the blue garbage bag you see in the middle symbolizes the sea and the small circles drawn around it symbolize the land. The teacher says "In this algorithm, I want you to correct the errors in the algorithm by moving the creatures from the wrong area to the right habitat," and the activity begins.

ACTIVITY 4: See activities 1 and 2 in the sequential processes section.

CREATING AN ALGORITHM

The play mat in the bag is placed on the table so that students can create their own algorithms. Start, finish, target and figure materials, place direction arrows and numbers are arranged in a way that children can see. If desired, you can work in pairs or larger groups. Children are allowed to determine the goal and starting point themselves. After the target and start are determined, children create the path to the target on the mat using the direction arrows. Then, errors are checked and if the correct marking is made, the steps taken from the starting point are written in the area below the mat using numbers and place direction arrows. In the second stage, children are asked to find the shortest path and are expected to create different algorithms leading to the same goal. Among the algorithms they create, the shortest one is determined and applauded.

Depending on the age group, this activity can be made more difficult with obstacle cards. The necessary materials are in the bag.



0 AND 1 ACTIVITY

An activity sheet made of squares is used to teach the binary number system (1 and 0). The number 1 is placed on the squared area to form a shape. The number 0 is written in the remaining boxes. Students are asked to color the fields marked 1 and leave the fields marked 0 blank. When the areas marked 1 are colored, you can chat about the shape that emerges with the children. It is up to the teacher's creativity to diversify the activity and combine it with other activities.

The Sample of the Table

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	1	0	0	1	0	0
0	0	0	0	0	0	0	0
0	1	0	0	0	0	1	0
0	0	1	1	1	1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0