

➤ **The children learn the basic concepts of coding - *algorithm, instruction, sequence and decomposition* - with the help of a simple Origami handicraft tutorial.**

In the project "Coding Without a Computer - Origami" no media technology is needed. A very simple Origami tutorial will be realised in pairs. The essential part of this project is that the "Origami programmer" (child 1) has to explain an algorithm whereas the "computer child" (child 2) does not see the visual Origami tutorial.

Children can be taught the basic concepts of coding with any routine or step-by-step activity. Origami is particularly well suited for teaching coding unplugged - in other words, without the help of a computer. Origami, just like coding, requires focus and precision.

In this project the children learn to communicate precisely and give specific instructions with many details. They soon understand that a computer has no eyes and cannot know the result without these precise instructions. The computer simply does only what it is told. This project also encourages attention, language use and collaboration.

➤ Preparation

Prepare the children for the project "Programming Without a Computer - Origami" and talk to them about what you plan to do. Start by talking about "coding" and its basic concepts, which are also covered in this project - *algorithm, instruction, sequence and decomposition*. Relate it to daily routines that the children know: getting dressed, their journey to the kindergarten, brushing teeth, etc. It does not matter if the children use the specific terms.

In order for the children to know what their task is, you can show them a ready-made Origami, e.g. the famous crane. It is important that the children do not yet see which Origami is to be crafted in this project.

They can fold the crane once together in the group. Try to explain each step to the children as precisely as possible. Also explain the basic concepts of coding: The *algorithm* is the entire flow of tasks to be completed until the goal is reached. A *sequence* puts the individual *instructions/work* steps in the order in which they are needed to complete the task. Usually the sequence is already correctly arranged in Origami tutorials. The idea of *decomposition* is to divide a big problem (the finished crane) into small problems and solve each of these small problems (the individual very specific steps). Only in this way can the big problem be solved.

Age: 4-6 years

Group size: in pairs

Level of difficulty: ● ○ ○ ○ ○

Time and effort: ● ● ○ ○ ○

Materials:

For implementation:

- Coloured, square sheets of paper
- Pencils/markers
- Two chairs
- Two small tables

Area of Education:

- Literacy and communication
- Maths and Natural Sciences
- Media Education

Media pedagogical goals:

- Media grasp, understand and see through
- Playful introduction to the basic concepts of coding - Learn how a computer "thinks"

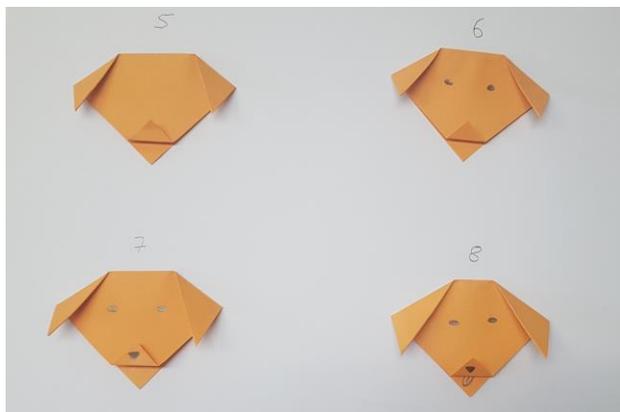
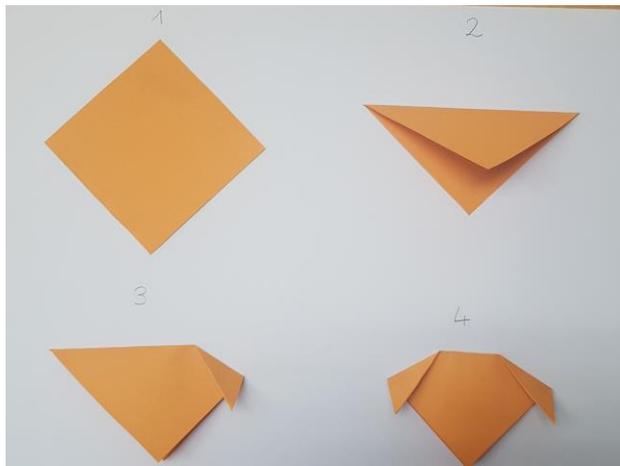
➤ Project Implementation

Divide the children into pairs. We recommend that you should not have too many pairs in the beginning. One or two pairs are a good choice. The other children can either watch the activity or create another Origami (not the one for the project). One child from the pair is the "Computer Programmer" and the other child takes the role of the "Computer".

In the project "Coding Without a Computer - Origami" the Programmer Child will now explain a simple Origami handicraft to the Computer Child. To do this, the Programmer Child will give the Computer Child specific instructions to do the task. The catch is that the children will sit back to back, so the Programmer Child will have to be very specific and detailed with the instructions for the Computer Child to fold the Origami in the right way.

Explain again that it is very important to give the instructions step by step and do it in the same way as a computer. Just like in this project, computers have no idea what the final programme (the finished Origami) should look like. Computers need very precise and detailed instructions to perform a task correctly.

A simple dog face will be made. To make it easy for children to give and follow the instructions, we have chosen a simple Origami.



Learn more:

- [Module 9 – Coding](#)

Tip: Show the children a finished folded Origami and a series of instructions that are completely mixed up. To do this, print out instructions to make an Origami and then cut the paper so that each instruction is in a small strip of paper. Then jumble the pieces of paper. Now the children try to put the instructions back in the right order and at the same time recreate / "programme" the Origami.

If you end up with a different result than the Origami shown, it is clear that a mistake was made in "coding". Go back together and correct it.

Through this craft activity, the principles of *sequencing*, *decomposition* and *debugging* can be made clear.



The actual procedure is as follows:

1. The two children sit back to back on their chairs. Both children have a small table in front of them so that the folding work can be done better.
2. Each child has a square sheet of coloured paper lying in front of him or her. The Programmer Child also has the folding instructions for the Origami Dog in front of him/her in the format of pictures that the teacher has provided. The Computer Child cannot see these images.
3. The Programmer Child now explains to the Computer Child how to make the dog face by giving step-by-step instructions. The Programmer Child will very quickly understand how demanding algorithms are for the computer. If the instructions are not given correctly, the result can be very different from what has been planned.
4. When the coding/handcrafting is finished, the children compare the results of their Origami dogs.
5. Perhaps there are a few mistakes in the realisation of the task by the Computer Child. This is not a problem at all. Errors are part of coding. Now the errors just have to be corrected. Find out together with the children where errors have been made and think about how the instructions could be formulated more clearly so that they are understood better next time. In doing so, you are also addressing the concept of *debugging* at this point - i.e. correcting errors during coding.

➤ Postprocessing

Talk to the children again about their Origami coding project at a later date. Let the children say how the handicraft work was done in pairs. The children can explain again what they had to pay attention to when "coding" the Origami dog face and how important it is to give specific instructions. Here it is especially exciting to hear how the team members felt in their role as "programmer" or "computer": *Did they find the task easy or difficult? What did they have to pay particular attention to How did they feel in their roles? Which of the roles do they prefer? Why?*



Photo credits: Eva-Maria



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