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HUMAN ROBOT

Brief description: Students give written directions for their pairs. The idea of the exercise is that students learn how to give simple and unambiguous instructions. Instructions have to be given in a certain order, or the human-robot won't do the task correctly.

Target group: 3rd-6th grade
Subject: Mathematics, Physical Education
Background: Computational Thinking, Haptic Learning, Real-Life Learning
Duration: ~ 2 x 45min.
Diagram type: Activity diagram
Language: English
Materials needed: There is a lot of movement in this exercise and some space is needed. If the classroom is small, the exercise can be held in the gym or even outdoors.

MODELING AT SCHOOL

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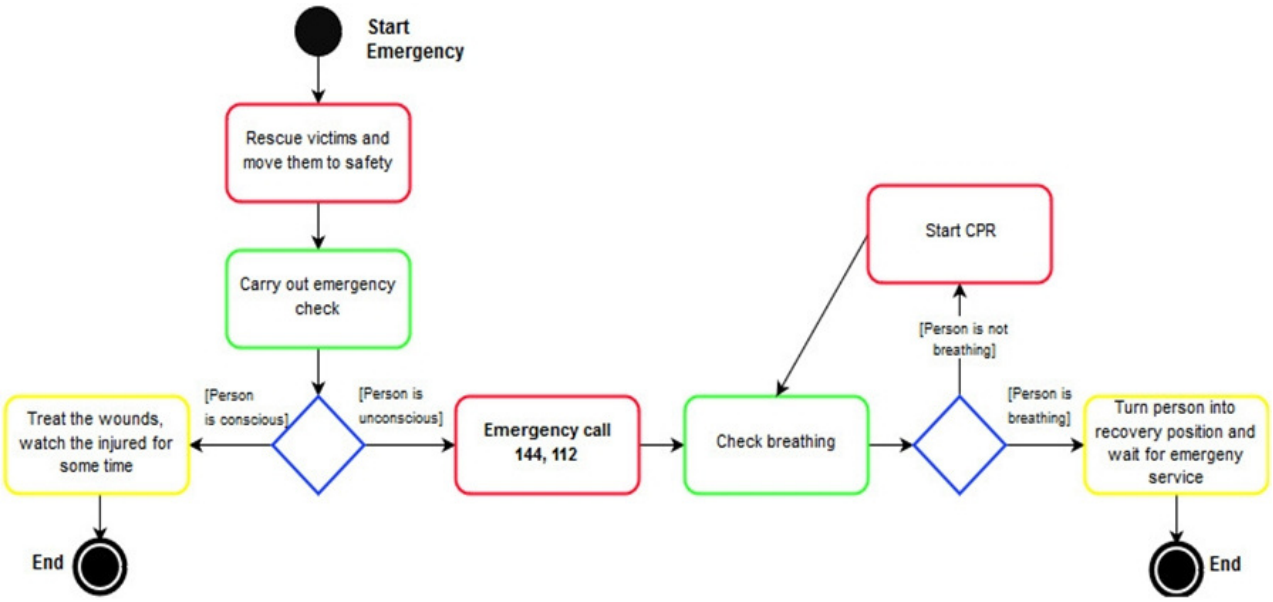
ACTIVITY DIAGRAM

ACTIVITIES, PROCESSES & RULES

"Promote the algorithmic thinking skills to your students! Have a recipe, a grammar rule, or a chemical experiment; students can easily represent individual steps of an activity, a process, or a rule with the activity diagram."

General processes are shown in an activity diagram. They indicate a series of activities that lead from an initial state to an end state. This example shows the action steps of the first aider in an emergency. The rectangles represent the individual activities, and the diamonds represent the so-called decision points. In this example, the first decision (marked with a diamond) depends on whether the person to be rescued is conscious or not. The second diamond shows a branch with a loop. The loop is included here if the first aider determines that the person does not breathe. When the situation changes positively, the first aider can finish chest compressions and leave the loop.



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- *Students learn why precise and unambiguous instructions are important.*
- *Students understand that instructions must come in a certain order, otherwise, the robot will not be able to complete the task.*
- *Students learn simple principles of programming languages.*
- *Students notice the importance of common language and unambiguous words.*
- *Students learn the idea of conditional sentences in programming.*
- *Students learn debugging.*

Students work in pairs. Students come up with some tasks that the robot will perform. One student writes the instructions to the robot and the robot follows the instructions as they are written. For example, the task may be to lift the book off the floor on the other side of the classroom.

Students are told about the principles of programming languages and how the language they use should be so unambiguous that the machine cannot misunderstand it in any way.

The lesson exercise is introduced to the students and together they discuss how the instructions could be communicated to the other student as accurately and unambiguously as possible.

Students should be reminded that the robot should follow the instructions completely and accurately.

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Exercise 1:

Students are paired, one being a programmer and the other a robot. The programmer decides what he wants the robot to do. For example, a robot may be tasked with getting up from a chair and walking into a corner of a classroom to wash its hands. The instruction assumes the student is sitting, so first, the robot is told to get up, turn left, take a step, turn right, take 8 steps, turn right, take five steps, bend over, open the faucet, put hands under water and rub hands. Of course, the instructions do not immediately produce a result, and the robot can end up rubbing its hands at the wrong end of the class. The goal is to correct the instructions and try again until most of the class is successful in the task.

Discussion

After the groups have tried the robot programming, the exercise is discussed under the guidance of a teacher.

Facilitating questions: Was the guidance successful? What was difficult about programming? Did the robot just obey the instructions or did he "help" the programmer by interpreting the instructions? Did the robot do as it was told by the programmer? What was difficult being a robot? Why was it difficult to get the message across? Could the programming of the robot be made easier by giving the conditional sentence instead of the exact number of steps: "If you are not in front of the sink, take a step and return to the beginning of this line"?

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Exercise 2:
The same pairs continue, but they change roles. Usually, the second time is immediately faster and it is easier for students to communicate movements because of more precise terms. The teacher can observe that each group tries to use the conditional sentence at least once. Once students understand how to do the easy tasks, they can do more difficult tasks or even make the robot jump with one leg as part of the journey.

Discussion

Once every student has been a programmer and a robot, the exercise can be completed. Usually, however, this takes a couple of hours to comfortably. After the exercises, students can discuss together how the exercise went. The teacher can still remind that computers need complete instructions that can only be understood in a certain way.

This activity was created in collaboration with:

Computational Thinking and Acting

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MODELING AT SCHOOL

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