PACT group (pact.cs.nuim.ie)
Department of Computer Science
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# Computational Thinking Obstacle Course Activity Plan
Version 2020.1

## What is it?

A 40 minute activity for a class of 30 pupils. The number of pupils can be reduced to 2, or increased to 40. The duration of the activity can be shortened by 10 mins or lengthened by 30 mins. The document describes what is required to increase/decrease the number of pupils or activity duration.

Posters, each containing a Bebras computational thinking task in the form of a multiple choice question, are presented to pupils. Pupils work in groups to solve the tasks. This activity promotes literacy, communication, and teamwork among students and enhances their logic, mathematics, and problem solving skills. Pupils can work at their own pace. An opportunity for reflection is incorporated at the end.

## Resources:

1. Approx. 15 A0-size or A1-size “Computational Thinking Obstacle Course” posters. At least one such set of approx. 20 posters is available at pact.cs.nuim.ie. These posters are numbered in order of increasing difficulty.

2. An answer sheet for each pupil (available from pact.cs.nuim.ie). It is assumed each pupil will have a pencil or pen.

4. A room or hall with enough empty wall space to accommodate the posters. Chairs and desks in the centre of the room are not a problem as long as there is room for participants to comfortably walk around the room. There should be at least half a metre gap between posters, ideally greater than 1 metre (consider, we may have groups of up to 4 pupils gathering around each poster; we don’t want them bumping into each other or one group’s conversation interfering with a neighbouring group’s). To aid in planning, for 20 posters printed on A1 portrait paper and with the minimum 0.5 metre gap between posters, one would need 22 m horizontally of wall space.

5. At least one, ideally two, adults/older pupils in the room to help with literacy issues.

## Preparation:

1. Choose the number of posters based on the following three factors.

a. class size: there should be at least half as many posters as pupils. For example, for a class size of 20 there should be at least 10 posters, for a class size of 30 there should be at least 15 posters, and so on.

b. pupil reading age: younger age groups (less than 10 years) might only be presented with posters 1 through 12, while 10-18 year-olds might be presented with all 20 posters. We refer to “pupil reading age” rather than “pupil age” because we have found that the most challenging aspect of these tasks is often one of literacy rather than computational thinking. The teacher can judge whether particular posters should be included, based on how much reading assistance can be provided by adults in the room.

For differentiation, one might inform the class that everyone should aim to answer the first two thirds of the posters, and that the remainder are only for groups that finish early.

c. required duration of the activity: our experience is that a class of 10 year-olds requires 40 minutes to tackle tasks 1 through 15, including a very brief explanation at the beginning, and including 10 minutes at the end for students to reflect on how they tackled the most difficult tasks and volunteer to explain to the rest of the class what strategies their group chose to solve them. A class of 18 year-olds requires 40 minutes to tackle 20 tasks, including time for self-reflection and explanation.

2. Place the posters around the walls of a room, with a vertical position appropriate for the heights of the pupils, ordering the tasks by number.

3. Print out an answer sheet for each pupil.

Running the session:

1. Partition the pupils into groups of three (if possible). A mix of younger and older participants in each group is not discouraged.

2. Give each pupil an answer sheet.

3. The instructions to relay to the groups are as follows.
a. The tasks are ordered by increasing difficulty.
b. Each group should visit each task, discuss the tasks together, and answer them on their answer sheet. Everyone in a particular group should write the same answer for each task. Group members should stay together.
c. In general, the tasks can be answered in any order, but one or two tasks may require the completion of other tasks first.
d. At the end, there is a final task that asks one to use the answers from selected posters.
e. There are some advanced tasks, which groups can tackle if they have finished early.

4. The one or two adults/older pupils should circulate in the room proactively helping with literacy issues and encouraging communication between groups,

e.g. reminding pupils to carefully read each sentence and to discuss with each other what the meaning of the task and how it might be solved.

5. At the end, bring the class together for a period of self-reflection to discuss different groups' approaches/strategies for selected tasks.

6. Correct answers. For post-primary school pupils, it may be important to have the solutions available. However, when we visit primary schools to showcase the CT Obstacle Course we have found that there are several positive benefits of not providing the solutions:

a. when no correct answer is presented by Teacher, we have found that pupils are more likely to explain why they think their answer is correct, which is a very sophisticated form of reasoning and of expression. If a child has managed to articulate their approach to answering a puzzle, they have achieved so much that it is irrelevant whether their answer was correct or not.

b. many pupils tend to leave in very high spirits under the assumption of having arrived at the correct answers. They will receive important intrinsic validation of having worked hard and cooperated well with their teammates, that would only be dampened by highlighting any incorrect answers.

c. as a consequence of the previous point the pupils, both boys and girls, leave with a positive early impression of computer science, as something they might be good at.

d. as part of our primary school visits we will offer quick tutorials in how to solve the most challenging posters, as identified by the pupils. We provide sufficient scaffolding for each child to solve the final parts of the task themselves. This is much more valuable than simply presenting them with the correct answer.

Nevertheless, we do make all solutions available for any verified teachers contacting the email address advertised on the website `pact.cs.nuim.ie` .

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