



ACTIVITY TITLE: The Intelligent Paper

This guide will prepare you to facilitate an activity with students, at any event, to introduce fun and exciting cloud and computing concepts to the next generation of technologists. Before presenting the activities in this guide, we recommend you read the presentation and complete the lab activity on your own to make sure you are comfortable with each step.

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Materials and Resources

- Whiteboard or Flipchart and markers
- Two volunteers
- A single sheet of paper, laminated for protection and reuse.

Activity Purpose The purpose of this activity is to introduce students to the basic concept of algorithms and the basis for writing a computer programme.

Activity Objectives

Create a fun experience through which the students ‘discover’ how an algorithm works; what is it and how it forms the basis of a computer programme through playing a challenge game.

Introduction to the Activity.

The idea here is to introduce basic concepts in computational thinking and AI by playing a ‘challenge’ game and encouraging the whole class or those at home, to participate. Students will discover elements of AI, Conditional Statements and Algorithms. It is important to make the game fun. Most likely, if the facilitator is enjoying the game, then the audience will too.

The Intelligent Paper game.

The intelligent paper is essentially paper that has a short computer programme written on it in English so that the ‘instructions’ or ‘algorithm’ can be followed by a human.

Facilitator Narrative.

(You do not have to memorise this, treat it as a guide or suggestion. The gaps or spacing in the paragraphs indicates where you can usefully take a breath. Slower is better!)

We have learned a lot about the Cloud and AI and how computers and machines learn to do things.

Now, I have a challenge for you. In my hand, I have a piece of paper. Not just any paper mind you! This paper is a very intelligent piece of paper. Actually, it is more intelligent than anyone in this room! Does anyone know how to make a piece of paper intelligent?

Hands up all those who believe that I have a piece of paper that is intelligent. Or, maybe you all think I’m talking rubbish?

To begin, if this paper is intelligent, what do you think might be special about this paper that makes it intelligent?

Introductory discussion on how a piece of paper might be intelligent.

Encourage discussion on how it could be that the paper you hold in your hand might be intelligent.. Some might suggest that it is the writing on the paper. Ask how this might make the paper intelligent?

You are just trying to facilitate discovery here. There are no wrong answers per-se. And, keep the tone light and humorous. Explain that knowledge and intelligence are two different things. It is by doing something with our knowledge that we show intelligence. In the Cloud and in computing that is really important.

Narration: Introducing the game of 'Noughts and Crosses.

So, the real question here is, "what can this piece of paper do? Well, it has never lost a game of Noughts and Crosses. Ever!

I'm going to prove it to you now. This paper is going to challenge all of you in this room to play a game of noughts and crosses and, I promise you, that it won't lose a game.

Okay, so first of all I need two volunteers. Who is prepared to take on this challenge and see if this piece of paper can be beaten at a game of knots and crosses?

Greeting the volunteers.

Welcome the volunteers, ask for their names and invite the class to give them a round of applause. The idea here is to get the energy in the room going.

Draw a noughts and crosses grid on the whiteboard or flipchart. Give each of the volunteers a marker pen. Hand the piece of paper to 1 of the volunteers. Then, so that the whole class can hear you give your volunteers instructions.

Narration: instructions to the volunteers

This is not a game of one volunteer versus the second volunteer. In this game one of our volunteers is going to represent the piece of paper. The paper needs this because it has no limbs, so it can't draw. And our second volunteer is going to represent the class. So, the job of the class is to tell that volunteer what to do or how to play the game.

The computer goes first. (Note to facilitator: This is important)

(Addressing the Paper Rep)

Will you please read out aloud the first line on the paper.

Paper:

I'm X and I want to go first.

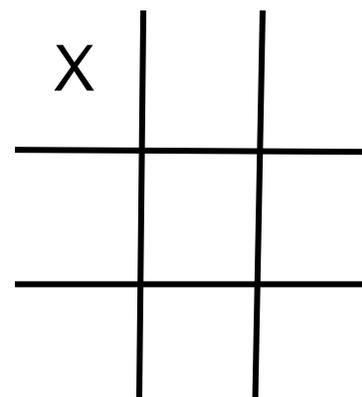
Facilitator:

That's quite clever that it wants to go first. Now, read out the first instruction.

1st move

Paper:

Mark X in a corner. (The volunteer representing the paper should do as instructed)



Facilitator: (speaking to the class representative)

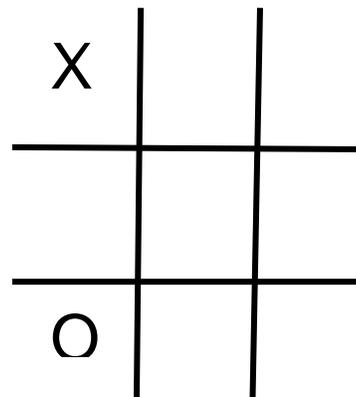
Now you get to decide where you want to place your nought. Ask the class what they think.

(Hopefully this will generate lots of noise in the room. Ultimately the person representing the class will probably have to make the choice herself.)

Facilitator:

Where are you going to go?

(The volunteer places the nought and now it is back to the piece of paper)



Second move

Facilitator:

So paper, where do you want to go now? Don't forget to read the instruction out loud so everyone can hear.

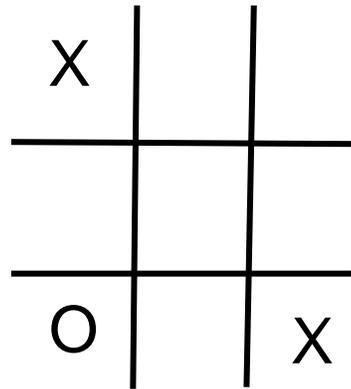
Paper:

Move 2

IF the other player did not go there

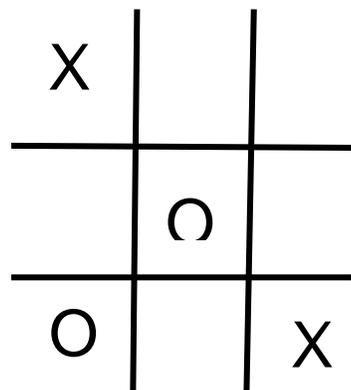
THEN go in the opposite corner to your move one

ELSE go in a free corner.



Facilitator:

Back to the class now, where would you like to go?



(Make sure that the class representative makes the decision if there is no clear consensus from the class).

3rd move

Facilitator:

So paper, what's your next move? Don't forget to read the instruction out loud so everyone can hear.

Paper:

Move 3:

Paper: IF there are 2 Xs and a space in a line THEN go in that space.

ELSE IF there are 2 Os and a space in a line THEN go in that space.

ELSE go in a free corner.

X		X
	O	
O		X

Facilitator.

Okay class, choose where you want to go. (The class rep picks a spot).

X	O	X
	O	
O		X

4th move

Facilitator:

So paper, what's your next move? Don't forget to read the instruction out loud so everyone can hear.

Paper:

Move 4

Paper: IF there are 2 X's and a space in a line THEN go in that space.

ELSE IF there are 2 Os and a space in a line THEN go in that space.

ELSE go in a free corner.

X	O	X
	O	X
O		X

The intelligent paper wins!

Facilitator.

Well, I guess the paper has won the game!

Well done everyone, and a special thanks to our two volunteers. Let's have a round of applause for them.

So, it seems like there's intelligence at work somewhere. How many of you agree that this is actually an intelligent piece of paper? Put your hands up if you do. (It's likely that there will only be a few if any hands

popping up. In any event, even if people do raise their hands they have recognised that there is intelligence, they just haven't recognised where.)

Allow a little discussion here to explore the kinds of theories that are emerging from the class.

Explanation

Well, I don't blame you for thinking that this piece of paper is intelligent. But if we look a little deeper we get a different picture. This is because the instructions written on this piece of paper which are volunteer faithfully followed are actually a computer program. You didn't know it at the time when you were playing the part of a computer. The computer was just blindly following instructions and had no real understanding of what was happening. All of the instructions were based on what we call three conditional commands; IF, THEN and ELSE. We've written this computer program in English so that a human could follow them. If we were writing the programme for a computer we would use a computer language so that a computer could follow the instructions. So perhaps, the real intelligence lies with the computer programmer who wrote the program in the first place.

When we talk about artificial intelligence and computer's – this is what we mean. We mean computers who follow instructions in a computer program which themselves have been written by a human computer scientist or programmer.

Has anyone any questions?

END

Overview in Brief. Tech-Week 2020. The Intelligent Paper.

This page can act as a handy reference sheet for facilitators as they progress through the workshop.

- Materials and Resources
 - Things you need to bring with you to the presentation.
- Activity Purpose.
 - Description of the instructional purpose of the activity
- Activity Objectives
 - Description of what can be learned from the activity
- Introduction to the Activity.
 - Information about what can be learned through the activity.
- The Intelligent Paper Activity.
 - Simple explanation of what the intelligent paper is
- Facilitator Narrative.
 - Guidance on possible introductory narrative for the activity.
- Introductory discussion on how a piece of paper might be intelligent
 - The most important point here is to encourage the audience to stretch their imaginations to consider how the paper might possess 'intelligence'.
- Narration: Introducing the game of 'Noughts and Crosses'.
 - Introducing the game of Noughts and Crosses.
- Greeting the volunteers.
 - Guidance on welcoming the volunteers
- Narration: instructions to the volunteers
 - Giving instructions to the volunteers so that the whole audience can hear.
- The paper goes first.
 - It is important that the paper takes the first turn in order to ensure that it does not lose the game.
- 1st move
 - Description of the first move
- Second move

- Description of the second move
- 3rd move
 - Description of the third move
- 4th move
 - Description of the fourth move
- The intelligent paper wins!
- Explanation
 - Guidance on explaining the relationship between human intelligence and AI/ML
- END