

Hopscotch: create with code

Hi. Do you have 5 minutes to go and take pictures for your students or with your child? Do you ask your students to share pictures of their personal explorations? With infrared, you can take pictures during the day or at night in complete darkness. I use the pictures to promote student thinking, personalize teaching, and stimulate motivation and questioning. This allows you to provide a wide-ranging context with personal connections, to learn to code with Hopscotch code and also to innovate with the Hopscotch code.

We learned with the pandemic that we have to teach students to work a lot more independently. Another pandemic could return. The Hopscotch app provides an ideal environment for students to work independently. The teacher just has to show him the basics and the students will be able to continue on their own, a large majority of the time.

My name is Diane Boulanger. I am a French immersion teacher in Ontario. I would like to show you how it is possible to innovate in the classroom with the Hopscotch code and infrared photography. There will be examples from grade 4, 5 and 6.

Create the space to ask effective questions

When the Canadian Forces Snowbirds passed through the Greater Toronto Area on May 10, 2020, the kids freaked out. You could see a lot of comments all over Twitter. The impact on the motivation of the children was quite visible. They were really excited to see such talented pilots come to inspire them. Can we invite students to question such an awesome event? They can invent a game where the Snowbirds move across the screen at the touch of a finger leaving the trail of smoke seen here in infrared. Yes, I did say a game. Under the influence of such intense motivation, followed by increased personal questioning by the event, coding

with Hopscotch is a game with a lot of mathematical concepts that the student will devote hours to it.

My condolences to those affected by the loss of a Snowbirds pilot the following week.

Find new ways to explore content

Out of all the programs I've written, here's one that caught the attention of the Hopscotch Team. My program was ranked among the best new projects in the Hopscotch community. I used a new way to explore content. I can virtually see, with the FlightRadar24 app, all the planes taking off and arriving at Toronto Pearson at any time of the day. There is information about the type of plane, where it came from and where it was going, the latitude and longitude of its current position, its altitude, speed, route. And all this instantly. One interesting aspect: we get alerts every day when something exciting happens at the airport. We became independent of the school library which lost all its funding during the pandemic. FlightRadar24 inspired me to plan the route of planes taking off from the runway. The code you see is for the Welcome to Pearson Airport text. Toronto Pearson won the 2020 environmental award for a 60% reduction in greenhouse gas emissions.

Finding positive adaptations

Even during a pandemic, all children in the GTA could see planes flying near the house. An Internet search will even tell us at what time the plane will take off or arrive at the airport. You could ask yourself questions about these planes, take pictures of them without leaving your home, and discuss them using code.

Each color in the FLIR infrared picture represents a different temperature. Blue is the coldest temperature in the sky just before the storm. We see the clouds a little warmer in pink. The plane, in yellow, is in contrast, much warmer. The air temperature behind the engines, in white, is really hot.

The code consists of presenting a line of text, waiting for the precise time it takes to read the text as measured by the student followed by another line of text. This is a very innovative project for the 4th year.

Questions that lead to reflection

The Ontario College of Teachers recently released statistics on coding. 92% of parents think technology is important, but only 38% of schools offer programming to students aged 12 and over. There were no statistics for the primary level.

Why not teach coding? Employment opportunities for students who know how to code are enormous. Giving all students the opportunity to solve impending problems that our society faces is probably the best reason to learn to code. What is your main reason for learning to code?

The Hopscotch app has been available in mode beta for several years. It is now complete, with all the support the busy teachers or parents need.

Computational thinking

Computational thinking is the thinking behind solving problems. It's a bit like cooking a good meal. You need to have the right ingredients, in the right amount. If something is missing or the steps in preparing the dish are not in the right order, we will not have the desired effect.

It is possible to learn to code as you learn to read, with the games placed under the LEARN HOPSCOTCH tab. With each game, you learn a concept of computational thinking, one block at a time.

On a stormy day, what happens to the plane that is struck by the lightning? Airplanes are constructed from aluminum, a lightweight material that conducts electricity. The lightning enters through the nose of the plane and exits through the tail. The aircraft's body design protects it from lightning strikes. In fact, it is the winds and not the lightning that we should be wary of.

Differentiated instruction

Another app, MétéoMedia, allows you to do differentiated instruction, to follow the interest of another student. We get alerts when we need to be wary of the weather. This allows us to question ourselves about what surrounds us, to make changes in our daily life if necessary. The infrared allows you to see these winds and the temperature. We can see two pictures at the top, just before a thunderstorm. At the bottom you see pictures of the atmosphere during the summer and in contrast during the winter. The summer temperature seems very cold. This is because we can see a point at altitude. The temperature drops in altitude at a rate of 6 degrees per kilometer.

Some students cannot follow the Ministry's curriculum exactly because they have specific learning needs. They then receive an Individualized Education Program (IEP). It is a legal document that explains the different needs of a student who must receive accommodations or modifications to the school program. It is adapted to the specific needs of the student. When evaluating the tool used, and the concepts learned by the student, it is done according to the standards established for the student. In this first example, the student had to follow the

weather for several seasons and take pictures at the appropriate times to see the difference. In the following example, the student searched the Internet and found that there is the NOAA satellite that uses infrared to predict temperature. Hurricane Laura is seen here, which hit Louisiana. These are two great projects. You must assess the project according to the subject you are teaching, and the specific needs of the student.

I am talking on the phone

Did you know, when you were younger, that smartphones would be developed? Smartphones are only 10 years old. This FLIR camera that you attach to the iPhone is only 5 years old.

The photo provides a context that motivates programming with Hopscotch. For example, pilots of airplanes should practice with a flight simulator before training on board an airplane.

Hopscotch provides an ideal environment to write a flight simulator with code. Hopscotch responds to movements of the iPhone or iPad. Hopscotch also responds to screen touch or sound.

We created a flight simulator here. When tilting the iPhone to the left or up, the plane changes direction !!! The student creates, at their own level, what professional engineers do! He can train as a pilot or train his friends with the flight simulator he built himself!

High quality games

Hopscotch features plenty of videos that teach you how to easily create games, to get you as excited as my students by this new culture. There are at least forty of them. Instead of playing video games, we write them ourselves. Writing Hopscotch games is a game too. Code is a means of mathematical expression. Almost all mathematics curricula can be expressed with

code, especially high level thinking. With the Hopscotch code game, we can develop our future leaders, even under very difficult conditions.

In this game, the planes fly in the opposite direction and you have to swipe your finger to change the position of one of the planes to avoid a collision.

Air traffic controller's perspective

The previous game is a lot of fun, but in real life the air traffic controller would like to have much more reliable systems for directing air traffic, given the number of planes that can occupy the airspace. In 2019, more than 75 airlines make approximately 1,250 daily departures from the airport to more than 180 destinations on the world's six inhabited continents. Seen here is part of the code for a plane landing on one of the runways at Pearson Airport.

Emotionally charged situations

We can take advantage of the inspiring shows produced by the media. The Découverte science show is such a show. There was a week when aviation was discussed. Why not use clips from the show to inspire our students? They are available online for anyone wondering and doing research. You can combine the Hopscotch code with the scientific concepts taught by the program Discovery. Coding ideas can also come from friends we are following online or from those who follow us. You learn a lot by looking at the portfolios of other people who use Hopscotch.

Several radars have been launched that communicate the position of an aircraft to air traffic controllers and other aircraft. Prior to these radars, the position of another aircraft could be

communicated at 45 minute intervals. With radars, the position of another aircraft is updated at 8 second intervals. This helps to avoid dangerous, emotionally charged situations.

Create new ideas

In science, we need to assess the impact on society and the environment of technological innovations. The infrared camera is very relevant during the pandemic. Patrice Roy of Radio-Canada even shared an interview with Yoshua Bengio on Twitter about this use of infrared. The infrared camera works like a visual thermometer. The colors in the image, representing a different temperature, are compared to the camera's temperature scale, in order to know the exact temperature. In this photo, we take the temperature of a passenger who wants to board a plane. The use of infrared is innovative: it saves lives. By comparing the temperature of the infrared photo with the temperature scale of the FLIR camera, it is possible to see that the child in the photo does not have a fever, one of the indicators of COVID-19.

Questions that provide information

The programs you create are interactive. It is possible to get user information in text form and modify the program flow depending on the response. Where would you like to go? Do we want to go to Mars? It is quite possible to include the interests of the students in our school program. Each student can do a different project according to their real interest and their own questioning, their own desire to learn.

Questions that shape understanding

On the multifunctional trail of the airport, you can also observe the helicopters. The helicopter operates differently from the airplane. It takes off and lands vertically. It can stand still. It can fly forward, backward and sideways. They are used for search and rescue, for surveillance or for aerial photography among other things. The motivated student will explore other Hopscotch games to learn more and more code while having fun, until he is ready to write his own programs.

Artificial Intelligence - and the ability to self-publish

With Mars, we open the door to artificial intelligence. Robots must make critical decisions with minimal intervention from planet Earth. In July 2020, a new NASA rover was launched to travel to Mars with a mini helicopter drone attached to it. The work to develop such a robot with artificial intelligence is enormous. However, we can get a little idea in the form of a Hopscotch game. The rover will be equipped with an infrared camera that improves the detection of different minerals on Mars. The mini-helicopter mission is to test the feasibility of flight on the planet Mars, which has an atmospheric density of only 1% of that of Earth. The student, girl and boy, walking on the multi-purpose runway at the airport sees a large orange rock that reminds him of the planet Mars. He takes a picture. After that, he develops an Artificial Intelligence which asks the controller where on planet Mars he should go. Once the data is compiled, the rover flies on the planet Mars at the 19 places indicated and that all alone.

The student created something that interested him, at the Redefinition level of the SAMR model. He used critical thinking in his scientific research. He got creative in the design of his game. The code uses a lot of math concepts, including high level thinking. He looked at a hot

topic. He has developed coding skills which are in great demand for a future profession.

Imagine his feeling of pride!

The program can be published inside the Hopscotch app and also shared with the world. If you want to use this program, go ahead. Here is the website where you will find it. You can write it down.

Effective questions

At the airport, we can see huge oil reservoirs where fuel for planes is kept. Where does this fuel for airplanes come from? It is transported by pipelines from Alberta. With infrared, we can see the oil level inside the reservoirs. My Hopscotch program showing oil extraction “in situ” with steam, without damaging animal habitat, has been my most viewed program. More than 7,600 students have viewed this program. This is a question that interested many students!

Response to climate change

Want clean fuel? No problem. Did you know that it is possible to produce renewable green petroleum using microalgae, while respecting the environment? The algae are fed with carbon dioxide from industrial wastes such as cement factories. The production of green oil has a net effect of cleaning up the atmosphere. From the biomass of the algae, a fatty acid can be extracted which is used to make a biofuel almost identical to fossil fuel. Air Canada already uses this type of fuel at Pearson. The green petroleum is transported by tanker-truck to the wheel of the plane.

Face to face connections

Using technology doesn't mean that you always work alone and ignore learning with other human beings. A poster created with Hopscotch can be used to stimulate a large-scale discussion. The poster features very advanced mathematical concepts like sine and cosine for letter movement. The photo was taken at the firefighter training site at Pearson Airport.

Is anyone on board? Is our design safe? What is the effect of our design on society? We can question the application of a project on society and for generations to come. For example, the tragedies of the two Boeing 737 MAX crashes that killed 346 people should never have happened. All Boeing 737 MAX were grounded as a result of these accidents. The planes crashed due to a problem with the code design. A report by the American Democrats concluded that Boeing favored profit over safety and that the Federal Aviation Administration, which approved the marketing of the aircraft, gave Boeing too much influence over its own surveillance. You can read a more detailed discussion in the media.

A community of inquiry

Learning does not happen as long as the student feels the need to learn. The teacher's role is to create an environment that encourages questioning. The most effective questions relate to the student's personal life.

Artificial intelligence will be present in all fields, including aviation. AI vision must recognize objects, including airplanes, in order to interpret them. To do this, AI must learn to see and interpret images. It's like showing a child a picture book. We show a picture and say it's a plane. We show another picture, is it an airplane or not? After a few images, the AI realizes what an airplane is. Here, we have a collection of images that artificial intelligence

must learn to recognize. You can identify a plane even if you only have a partial image of it.

The two circles are not glasses but a plane.

You can ask students to take more responsibility for their learning. You may want to ask students to ask questions that do not yet have the answers. You can ask students to code things that have not yet been done. This is the basis of science. Your colleagues, who are interested in how children learn, will be interested in this type of learning. Those who have another agenda will question your methods.

The student as questioner

Good questions, with good research, open the door to more good questions and interesting answers. This process is based on a sense of action, a sense of having a concrete goal and motivation for change. It's the dream of doing something worth doing.