Code a solution to the problem of the climate

2- Natural catastrophe

In the movie "Finest Hours", Ray Siebert who works in the tanker's engine room has a superb growth mindset. He observes the tanker's hull very closely and realizes by the sound of the metal that the boat can break in the waves of the storm. His captain had a fixed mindset. Siebert asks to slow down the tanker, but the captain does not listen. The tanker breaks in half, and half the boat sinks and pours its oil into the ocean.

3- Personal disaster

There was an explosion on my street in Mississauga last June. A house exploded following a gas leak caused by a suicidal couple: Diane and Robert. The explosion destroyed their homes and damaged 67 other addresses. Nearly a year later, 33 families have still not been able to return to their homes. The two suicidal persons showed a fixed mindset by thinking that they would never find a solution to their problems.

However, we teach our students to have a growth mindset. We can find solutions to everything. Each of us is able to learn, collaborate with others to build a better system, a better future. We see here a picture of the LEGO Mindstorms robot that my students built. We discuss that the robots allow to go into the rubble without endangering the life of the firefighters in order to find survivors.

4- Canadian Contribution

The Canadian movie 'Arrival' shows a superb growth mindset. In the movie, as extraterrestrials arrive on Earth and under the protection of the army, a linguist and a mathematician try, at the risk of their own lives, to communicate with the aliens in order to understand their intentions. The aliens communicate with symbols.

With such a growth mindset, one learns English, a foreign language or machine language like Hopscotch. We learn symbols, words, concepts, little by little, at our own pace.

5- The Difference

In his book Mathematical Mindsets, Jo Boaler, refutes our preconceived ideas, that mathematics is only for gifted people in mathematics.

If the students do not believe in themselves, they will not make the effort to solve the problems. They will believe either that we are gifted in mathematics and we understand right away or that we are not gifted and that we do not understand. According to her studies, 40% of students have a fixed mindset and 40% have a growth mindset towards mathematics. Students with a growth mindset have results that are at least one year ahead of other mathematics students, as assessed by the PISA mathematics tests. It is the kind of encouragement that is given to students that make a difference.

6- Computational thinking

Here is a first example in computational thinking. One sees the code of two programs: one draws a square, the other draws a circle. According to you, which one draws the square and which one draws the circle? PAUSE. To the left. It's the square. To the right, it's the circle.

7- ISTE standards 2016

ISTE's new technological norms include computational thinking, an example of a real-life system. For example, we want to create a security system to prevent the explosion of another house in my neighborhood. We use Hopscotch with the iPad to develop our prototype. We will also use the FLIR infrared camera which allows us to see in the dark. Infrared allows us to see if someone is present on the site. Infrared allows to see if gas leaks are present.

In our prototype, we will code the buttons that change the security system between the visible light camera and the infrared camera. The code tells the iPad what to do. The program is written gradually, and tested to see if it works properly. When errors occur, the code must be corrected and retested until the prototype is completed.

Hopscotch has videos that teaches you how to encode. Within a few days, you can learn the basics of programming.

8- Plan for the Northwest Territories

With global warming and melting ice in the Arctic, the region is becoming more conducive to navigation, exploration and oil drilling. Can we learn from the experience of the Americans?

The movie DeepWater Horizon gives a historical account of the explosion of the BP DeepWater Horizon oil rig and the worst ecological incident in the United States.

The program shows, in a simulation, the operation of DeepWater Horizon. One can also code the accident, the fire on the platform. Oil drilling is a job that requires a lot of precautions from engineers and technicians. If oil production or the market is a priority before the welfare of employees or the environment, major accidents can occur.

9- Observations of images to represent our thinking

We see in the movie the central role of technology. These instruments are crucial on board the oil rig. The instruments measure and regulate the pressure during drilling and extraction of oil. A human error, a poor reading and interpretation of the instruments, caused the fire. Even if a reading error has caused the fire and the oil spill, one can only feel a huge responsibility putting on all the instruments used.

10- Autonomy and co-operation

In his book Freedom to Change, Michael Fullan, gives us four major directions to all education leaders and anyone who would like to take a new initiative.

Each of us is more motivated if we have a sense of purpose, or common vision. The group you work with can be powerful, but also go with great power in a wrong direction, without considering other options.

For example, you can see in the Blacklist series on Netflix that my FLIR infrared camera is used to detect a hidden card in a painting. The hidden map directs us to bacteria, isolated for centuries, that for which we have no cure. The leader of the sect realizes that something must be done to solve the problem of global warming. Because humans are responsible, leader of the sect decides that the majority of humans must die to save the Earth. He therefore gives the deadly bacteria to all members of his community.

There are probably better ways of addressing global warming.

Most of the innovations in the digital world have been made in a collaborative way. Co-operation and autonomy must be balanced. With our autonomy, we can work with the group, develop ideas, but also generate ideas regardless of the group we work with.

11- What is the oil situation in Alberta?

Canada is the third-largest oil producer in the world after Saudi Arabia and Venezuela. There are two important ways to extract oil from Alberta's oil sands, either mined or in situ. Each way has a different effect on the earth. The best-known way is mining, removing oil from the oil sands near the surface of the Earth. Oil sands mines accumulate toxic waste in tailings ponds. Ponds must be under control because the effect on the environment is too great.

When a mining site is depleted and closes, the oil companies withdraw and redevelop the land.

12 - In situ technology

The in situ technology makes it possible to extract the bitumen which is deeply buried, where the shovel and the trucks cannot reach. Water vapour is injected to separate the bitumen from the sand. Liquid bitumen is pumped to the surface. The Hopscotch oil sands drilling program is a game where, like the engineers who build the site, you have to dig and insert the steam hoses and the bitumen pipes using the buttons, to extraction bitumen. The 'in situ' method does not have tailing ponds problems. With the 'in situ' method, energy is produced in an environmentally friendly way.

You can see a website that really works and gives information about the oil sands. For example, three new oil pipelines are under construction to link energy markets around the world: Kinder Morgan, TransCanada Keystone and Enbridge.

13- Does a pipeline affect water?

Many people are concerned about the effect of aging pipelines transporting oil from Alberta to Quebec on drinking water. I decided to do an experiment to see if the surrounding water is affected by the pipeline going to Mississauga.

The infrared camera can see up to one metre under the ground. It can detect gasoline and gas leaks, if any. The pipeline is underneath the electrical wires. Nothing is noticeable.

With the pen, it can be seen that the concentration of the particles in the tap water is 164 ppm. After the pipeline, in a small park south of Square One, the concentration of the particles in the water is 350 ppm. The concentration of the particles is lower than before the pipeline. Before the pipeline, there is a swamp on the Peel Council property in the centre of Mississauga. The concentration of the particles is 386 ppm. The marsh gives food that attracts animals. In the marsh, there are dead plants that decompose. The marsh also absorbs carbon instead of rejecting it into the atmosphere. Marshes help moderate the effects of climate change.

We do not have infrastructure problems.

14- Feedback

Feedback is critical in education. It is an important role of the teacher or the principal. When giving or receiving feedback, it is often painful or difficult to understand. Michael Fullan wants to change the method of feedback. He wants to reverse it. He believes that the responsibility for feedback is with the person who receives the feedback and not with the person who gives the feedback.

For example, my knowledge of the petroleum industry improved during my trip with Inside Education to Alberta's oil sands. The training I received was enhanced with all the articles I later read about social media and the videos I watched. The responsibility for learning is with the learner.

With Hopscotch, feedback is an important part of the application. For each program published by the student, the Hopscotch application provides feedback that the learner can use to improve his work. Hopscotch also offers an enormous amount of different programs at all levels that can be studied and used.

15- An image of global warming

The atmosphere is represented by a giant bath. The tap represents the emissions caused by human activity and the drainage system represents the planet's ability to absorb pollution. For our planet to survive, the inflow and flow of greenhouse gas emissions must be balanced. The question of the day underlying the Paris agreement is the extent to which the emissions, the influx, must be cut so that our system can stabilize concentrations, not to mention the enormous amount of emissions which are already in the bath and that the process is irreversible. Closing the faucet is very difficult to accomplish and as a matter of prudence, it should be closed as soon as possible.

People's mindsets can be portrayed on climate change using two survey questions from the Climate Shock book. Do you think that climate change is an urgent problem? Do you think removing fossil fuels will be difficult? According to Wagner (2015), if you answered yes to both questions, you are in the minority. There are climate skeptics like the new US President Donald Trump. There are also all those who believe that solving the environmental problem is important and urgent, but do not want to change their way of living or transporting themselves.

16- Responsibility

In this program, we see the effect of air pollution on the atmosphere. The left side is a photograph of a tree in a clean atmosphere. To the right, air pollution was added in contrast.

Accountability is with each one of us. What can each one of us do to do our part? We must establish the conditions for increased accountability, even when the hierarchy in which we find ourselves does not want to move. We have a vision! What are we going to do? What are our solutions?

17- Green petroleum

It is possible to create renewable oil using micro-algae while cleaning the atmosphere. Several companies are now testing it. Innovative companies build photo-bioreactors to grow algae. Algae are fed carbon dioxide from industrial waste such as cement plants. With a lot of sunlight, they develop, do photosynthesis and produce oxygen that returns to the atmosphere, with a net effect of cleaning the atmosphere. From the biomass of the algae, a fatty acid can be extracted which is used to make a biofuel almost identical to the oil that is used today.

18- Green petroleum

This biofuel is manufactured by removing two tons of carbon dioxide from the atmosphere for each barrel of renewable oil produced. It's a miracle technology. It removes carbon directly from the atmosphere. It does not mask the symptoms, it solves the problem of carbon in the atmosphere.

How does the green oil molecule differ from the petroleum fossil molecule? They are almost identical, and the fatty acid obtained from biomass algae could replace fossil oil or at least, be combined with fossil oil in our fuel.

19- Self-driving electric car

Here we see an example of an autonomous hybrid car. This has become possible with advances in Artificial Intelligence in the field of perception. The AI managed to understand its environment in order to choose the trajectory of the car. In AI, deep learning and reinforcement learning algorithms are used to do this. Deep learning allows you to analyze what happens around the car. The learning by reinforcement allows to analyze the sequences of actions of the autonomous car.
Google's current autonomous cars have less accident than human-driven cars. If we share these cars instead of buying them, we can order them with our smart phone which will solve the parking problems. The choice of the hybrid engine is more protective of the environment.

20- The Solar Aircraft

The solar-powered Solar Impulse 2 travelled around the world using only solar energy. The plane crossed the Pacific in 62 hours without using a single drop of oil. This demonstration inspires many people to know what can be done with solar energy and a little innovation. Is it possible to use solar energy in our current aircraft to make at least part of the journey by plane using solar energy?

21- Wind turbines

Wind turbines are already used on Earth and at sea. Can we improve their performance? Some Canadian and American companies are thinking of capturing the wind at high altitudes. According to their calculations, if only 1% of the high-altitude wind energy could be captured, there would be enough energy for the entire planet.

22- Solar Projects

Morocco gives the example of a very innovative solution to the problem of global warming. They started the first phase of the biggest solar power plant to power the population. Once completed, the Noor plant will have the power of a nuclear power plant.

Nanotechnology is also being used to develop graphene sheets. These sheets could be used to develop the next generation of very flexible and very thin solar panels.

23- Nuclear Energy

With the national plan to reduce carbon emissions, Ontario shut down all its coal power plants and uses nuclear power to generate electricity. Infrastructure should be inspected regularly, as here, using infrared. The reactors are very safe and we have not had any accidents.

This is not the case in Japan. During a nuclear accident in Japan, instead of sending a person to the radioactive region to know what happened, we send a robot to do the exploration. MIT develops these robots, but none yet managed to explore Fukushima appropriately. There are still technical problems to be solved. Perhaps my student will have the interest and the determination to perfect these robots.

24- Fusion

Nuclear reactors in Ontario use nuclear fission. This does not cause greenhouse gas emissions, but in a possible accident like Three Mile Island, Chernobyl or Fukushima, we are reconsidering decisions on nuclear power. Canada and France have had excellent results with nuclear power, but there is perhaps another solution: nuclear fusion. Nuclear fusion is the same nuclear reaction that is found in our sun. Would it be possible to develop our nuclear power plants to make them safer?

The advantage of fusion is that it produces very little waste. Several groups of engineers around the world are working to manufacture nuclear reactors based on fusion. A Quebec physicist, Daniel Laberge, innovates and embarks on a different technological direction. He uses the piston. His reactor will have 200 pistons arranged around a sphere. This technique has the advantage of being inexpensive compared to other fusion methods used by other engineers.

25- Geoengineering

With President Trump's recent decisions to eliminate the environmental measures put in place by President Obama, scientists are thinking of other ways to save the Earth: geo-engineering.

It is a risky procedure. Scientists have proven the concept in the laboratory but want an emergency solution, last minute. Geoengineering could also give us a little more time to put other solutions in place. It is, roughly speaking, to put sunglasses in our atmosphere. Geo-engineering does not solve the effect of climate change. She will begin to test the atmosphere to see if the process would work, in case we needed it in a desperate situation.

26- Diffusion

The new pedagogy focuses on real problems to be solved. The real problems are the curriculum. With diffusion, we spread good ideas. Diffusion is the process in which an innovation is communicated through certain channels over time between members of a social network. We show our students how to become excellent citizens of tomorrow by being excellent citizens today.

With the Montreal Protocol, we are on the right track to solve the ozone layer problem. I hope that our efforts will be sufficient, with the Paris agreement, to solve the problem of global warming.

27-

On March 12, Justin Trudeau received the CERAWeek World Energy and Environment Award. He is determined to develop our oil resources, but he says it must be done in a responsible, safe and sustainable way. While developing our traditional resources, he points out that we must assume two important responsibilities. We must ensure the viability of our planet so that we transmit it in better condition than we found it. We must also take the lead in the world of innovation.

It is not a competition between traditional or renewable energy, it is a wise preparation of our future.

28- International Awards

Hopscotch is an application that has proven itself. She has won several international awards including a gold medal in 2016 for her excellence in design. This is the fourth year that Hopscotch is used in Ontario to make innovation in the classroom. Hopscotch lets you learn computer science and also engineering with the inclusion of hardware with our device. Hopscotch's environment is so inviting that it allows students to learn by playing by themselves at home. Hopscotch supports the teacher. It allows differentiated instruction and, Hopscotch provides an assessment as learning, to the students. Hopscotch helps solve real-life problems such as climate change, not just learning math or science differently. Hopscotch works with the iPod touch, iPhones and iPads.

29- Fixed Mindset or Growth Mindset?

Do we have a fixed mindset or a growth mindset?

30- BOOK

If you are interested in programming with Hopscotch, you can always consult my free books on my blog attached to my Twitter account.

You do not have to reinvent the wheel. You have access to all programs that I wrote with the explanations.