

## 1. Project Description

The Micro:Bit Pilot Project went well, generally. The journal entries show a progressively confident group of teachers becoming more effective at teaching STEAM lessons with microchips and computers.

In the first two days of our PD and training, teachers were interested but nervous. They seemed to think that using this technology in class could be of value but could not see how they would be able to do it effectively. We agreed that LEARN and the consultants would launch the project for them and give a few lessons to model its effective use.

On the day of our first launch, we immediately encountered technological difficulties because the school's IT technician had locked down the computers and made downloading the necessary Micro:Bit files impossible (despite having received confirmation from the principal that the computers were properly prepared). Not all the computers were functioning and battery life was not ideal on the laptop models we used. To circumvent these issues, I planned lessons that had tasks that were completed in groups.

Furthermore, I would have liked to put Micro:Bits into the hands of students faster than we did but as I did not have the full inventory of the Micro:Bits, the project had a slower start.

Faith in the project seemed to waver at the beginning, but soon after we adjusted for these unforeseen complications, teachers noticed an undeniable surge in student engagement and motivation. This caused teachers to “go out of their comfort zone” and attempt Micro:Bit lessons on their own. They chose the pre-existing lessons available on the Micro:Bit website (<https://makecode.microbit.org/>). LEARN and I worked to raise teachers' confidence levels by co-teaching STEAM lessons with them frequently during the year. Teachers have reported that this had, indeed, helped them become more confident.

I was deeply focused on the following three elements:

1. The need to connect the Micro:Bits and STEAM lessons to the QEP
2. The proper use of formative assessment during these lessons
3. Continuous professional development for the teacher.

Hence, when I was invited to teach a STEAM lesson in their class, I made sure to not simply run pre-made lessons found online for the sake of doing a Micro:Bit lesson. Instead, my lessons modeled the 7 E's lesson planning framework (NSTA), made use of Assessment for Learning strategies from Page Keeley and Dylan Wiliam and were driven by QEP learning goals. I met with the teachers after the lessons to analyse its successes and failures and to plan our next PD/co-teaching episodes.

Ultimately, I met with teachers multiple times during the year to train, teach and create lessons (now available on the Micro:Bit pilot project website here: <https://sites.google.com/learnquebec.ca/microbit/home>)

## 2. Project Goals

The Micro:Bit Pilot Project had as goals the following:

- Teachers will make more engaging and memorable lessons
- Teachers will become more comfortable using computer technology to deliver more student-centered lessons
- Address the gender gap in sciences and computer science
- Foster computational thinking via programmable microchips

In many ways we have met our goals. Teachers have reported becoming more comfortable with computers and programmable microchips. Initially, the team of teachers believed that they didn't have enough computer science knowledge to be effective STEAM teachers. Furthermore, they described feeling anxious about not having answers to students' questions about the Micro:Bit. They received two days of PD and training at the beginning of the school year, but this still wasn't enough to make them less nervous about the project. Gradually, after many classroom visits by the consultant with the purpose of modeling STEAM lessons and the use of the Micro:Bits, did the team of teachers begin to realize the potential of the device and teaching style. Now, teachers happily use the Micro:Bit in their classes.

Lessons are more student-centered when using this STEAM - Micro:Bit approach as it typically asks of students to solve real-world science or engineering problems. Computational thinking is a successful strategy when solving these problems, requiring students to break larger problems down into smaller, more manageable, ones and recursively improving their solutions until the teachers' criterias are met.

We addressed the gender gap present in the sciences and computer science by motivating and encouraging both boys and girls. Moreover, we had an equal number of boys and girls expressing their pleasure in coding the microchip to solve relevant problems.

As for engaging and memorable lessons, teachers report students being much more engaged and motivated to participate in the Micro:Bit lessons. It is more difficult to measure how memorable the lessons are.

### 3. Project Outcomes

Gains were made in many areas including subject specific content knowledge and more effective implementation of the QEP, but the biggest gain was in teacher confidence and collaboration. The project started off being focused in one elementary school and now has guests from two other elementary schools. Interest has grown from the 6 initial teachers to at least 10 in three schools this year alone and principals are looking to this project and asking to have their school transformed also to a STEAM school for next year - inviting the aforementioned benefits in their schools.

(<https://sites.google.com/learnquebec.ca/microbit/photos-2018-2019>)

### 4. Reinvestment

SWLSB saw the following three main benefits:

- Engaging QEP lessons with well thought out learning goals, student-centered experiences, formative assessment and opportunities for students to be creative
- A growing community of empowered and collaborative teachers
- More effective and confident teachers

The resources created by the SWLSB team (and others) can be found on the following website:  
<https://sites.google.com/learnquebec.ca/microbit/home>.

I recommend that other teams try this project, but avoid disconnected lessons that use the microchips and computers for the sake of using them and not with a deeper purpose. Take time to plan lessons with your teachers and make sure they relate to the curriculum.

### 5. Final Report

In Sir Ken Robinson's TED talk on creativity and schools

(<https://www.youtube.com/watch?v=iG9CE55wbtY>), he describes creativity as the process of having original thoughts that have value. Our Micro:Bits Pilot Project brought valuable creative problem solving and other STEAM skills to four of our schools by the end of the year. Originally,

Souvenir and Twin Oaks Elementary schools agreed to participate which ment introducing teachers to the Micro:Bit and Block Coding. At the start of the school year, eight elementary teachers met and explored the new tool and were allowed to explore freely the device. The team noted how the Micro:Bit would certainly be engaging to the students and how it would add a lot of excitement to their classes. They also expressed a small about of anxiety over their lack of experience in coding.

Over the course of a few months, with the support of the pedagogical consultants and LEARN, the team grew very comfortable allowing students the freedom to explore ideas, coding and making with unstructured “explore time”. The team was challenged and encouraged to structure the Micro:Bit lessons in a way that had students using the device to learn our maths and science curriculum. Guided inquiry lessons were developed that had students explore natural phenomena and design solutions to authentic problems (e.g. <https://drive.google.com/open?id=1UBjiEUArPcRgitAdSIQQUZdTVfnlfgwmGzrx1WwAZs>).

By the end of the school year, the project had become well known in other schools. Teachers and principals have asked that they too pilot a similar project in their schools in the following years.

I strongly recommend the adoption of Micro:Bits in elementary schools. We found that students were more engaged when they were allowed to explore the curriculum by way of the Micro:Bit. Furthermore, boys and girls alike saw success using the device and have expressed the same levels of enjoyment.