**2014-2015 NOII Inquiry Case Study**

**School:** RC Garnett Demonstration Elementary **District:** #35 Langley

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Learning Principles that we incorporated in this project:

1. Learners at the centre – learners are both metacognitive and self-regulated
2. Learning is social – well organized cooperative learning matters as does personal research
3. Stretching all learners – every learner is asked to do hard work and accept challenges – but each learner is not overloaded
4. Assessment for learning is a way of life – formative assessment is regular and learners get meaningful feedback. This individual feedback helps the individual learner. The assessment culture shapes the overall learning environment
5. Building horizontal connections – thoughtful connections are made between areas of knowledge. As well regular and well-designed opportunities take place in and with the broader community. The authenticity of these experiences promotes deeper understanding.

**Scanning**: Our challenge involves a group of gifted students in a grade 4/5 split classroom. Our gifted students have attributes such as high verbal ability, intensity, an understanding of abstract and complex ideas, curiosity, and accelerated flexible thinking. Some of these students are isolated as a result of their emotional maturity and range of interests. In order to encourage a love of learning and expose these students to ideas not covered in the general school curriculum we would like to provide an enrichment class using Lego Mindstorms to instill engineering skills, computer programming, innovation, and creativity. Often it is the gifted and talented students who are looked upon as being the innovators and creators of the future. Therefore nurturing these students' creative thinking skills is of special importance to this group.

For those not familiar with LEGO Mindstorms, they are a kit that include servo-motors, an array of sensors and mechanical parts and allow students to build and program robots.

Using Mindstorms students will go through the problem solving process of assessing what they know, identifying what they need to know, gathering info, and collaborating on the evaluation of their hypothesizes. While the students are learning teachers will be coaching students to encourage their metacognitive growth.

**Focus**: Will using inquiry and project based learning improve student's motivation to problem solve?

**Hunch**: Allowing students to actively engage in their learning through constructing robots will develop not only their metacognitive skills but also their ability to collaborate with each other. Research is very clear on the positive effect that being in charge of their learning has on students' emotional and motivational growth. While the students are learning teachers will be coaching students to encourage their metacognitive growth.

**New professional learning**: When the kits first arrived, we took them home to build, play with and learn. We scheduled a robotics engineer to come in for a workshop with the students and the teachers on December 15 to deepen our understanding of robotics programming and robotics design. In the morning, the group of gifted students put together three robots and started to explore how to control them. In the afternoon, they taught a class of grade 4/5 students what they had learned, and began to explore how to create new programs to control the robots.

**Taking action**: We provided students with the opportunity to actively engage, collaborate and construct their own LEGO Mindstorms design and computer program one afternoon each week. Additionally, students were offered the opportunity to bring their lunch to the Resource room where the kits were stored, and spend their lunch playtime and eating time working on their robots: many took advantage of this for weeks at a time! The kits naturally allowed students to perform experiments and test or adapt their ideas to allow them to work on concepts which are personally meaningful.

**Checking:** All groups were successful in creating a robot that could perform certain tasks and challenges. The students had to work together and collaborate to solve problems that they encountered, and they were able to articulate this in interviews at the end of the school year. Some of the students said:

> "Sometimes one person will think of an idea and then we will all build on top of that idea. Most of the little tiny details are individual, but the main frame and design is the group's."

> "I changed it up a small bit. In the back had a piece that was making it hunch over. Then Nathan took off the cords and it took two whole lunches and I spent five more lunches trying to put them in. Then finally on the Friday, Ricky (a student from another group) gave a great suggestion to swap it out for another piece that worked. Then it stood up and all the cords fit."

> "We decided to do the ball shooter instead of the spinning blades. Kyan and Finn (students from two different groups) helped us get the ball shooter to work. They helped us with how to get it set up with the remote. Then I got it to work with the iPAD and now it can shoot and move at the same time."

> "Everything just kind of whirls around in your head. I have to remember this and this and this. It was also very, very fun. I tried new things to see if I could add it and would it work and give myself a challenge to see if I could make it work."

**Reflections/Advice:** While this project involved gifted and talented students, it would probably be motivating for many students. The initial investment in six kits is a big financial commitment, but it will be possible to continue to use them with future classes and groups of students. It may also be possible to offer students the opportunity to investigate robotics as part of an inquiry project (in the past, our school has platooned students for inquiry according to their choice from a menu of options that teachers offered.)