



2015-2016 NOII Case Study

School: Lucerne Elementary Secondary **District:** #10 Arrow Lakes

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Our focus for this year: This inquiry will observe the impacts of integrating Science and Math at the secondary level (7-12), through project based and problem based learning activities.

Scanning: During the scanning phase we noticed two common themes among our learners. Firstly, that students tend to lose their natural curiosity for learning as they proceed through the high school years. They begin to merely go through the motions without much excitement or passion. Secondly, as subjects like Math become more abstract and less applicable to their daily lives, students further disengage from their learning. We asked: How can we engage learners to stimulate their curiosity about Science and Mathematics? How can we bridge the links between Science and Math so that students do not view them solely as separate subjects unrelated to daily life?

Focus: Through our observations we noticed that students were more engaged in hands-on cross curricular activities such as our “Into Learning” programs. We decided to focus on the successes of these activities and duplicate them in the regular timetable. By integrating Science and Math for grades 7-12, we hope that it enables more opportunity for larger project-based learning and problem-based learning activities, through greater teacher collaboration and more flexibility within the timetable.

Hunch: Our hunch is that the compartmentalization of subjects in separate classrooms, taught by separate teachers, has contributed to the apathy and disengagement of learners. Students think they do “Math” during math time and “Science” during science time rather than viewing them as skills that help them understand the world around them. As well, as classes become more theoretical and less hands-on students lose their enthusiasm.

New professional learning: We researched a variety of engaging activities with a Science/Math focus including but not limited to: computer coding, robotics, projectile labs, trebuchet construction, egg drops, and labs in real life situations. We also joined a district math team. This required a fair degree of professional learning in a variety of areas.

Taking action: Much collaboration and communication between the science and math teacher was required. We tried to meet at least bi-weekly to discuss the overlap in curriculum and to design a connecting lab. Part of this discussion included which areas of learning we needed to focus on, and if there were prior teachings to be done in either class to ensure students’ success.

Checking: It is hard to know if the differences we made were enough. We know that doing labs and activities to connect curriculum in math and science deepens understanding and gives real world context to what could be a more esoteric subject. In the senior class, where we

integrated math with Physics 11, we were satisfied. It was easy to connect the two subjects and easy to engage students in the labs. We found that integrating junior science and math was much more difficult, and we often struggled to find connections between the curriculums. This was even more difficult by the fact that our classes encompass three grades. By the end of the year we had concluded that instead of struggling to find direct links, doing labs and projects that integrated the two subjects, but may not be directly linked to each teacher's current curricular content was still valuable and helped students connect their learning to real life situations. An example of this is the snow density lab we did, which connected math, science, and outdoor education.

At the beginning of the year, students were confused as to which class they were in, in spite of us calling the class Integrated Math and Science. For the first few labs we did, the first questions were always "Is this Math or Science?". It took some time for the students to make the connections themselves and to understand that Physics is basically applied math. As we continued through the year, many comments such as "This is what we are doing in math/physics!" were heard. Students told us that topics made more sense or were more easily understood after doing the labs. In terms of students output in math problem solving, in the senior 10-12 class there was significant progress in their ability to solve complex multi-step problems with formulas as there were common expectations between the math and physics courses.

- As we are small community schools, almost all students still felt that they had TWO adults who believed in their success.
- Students' confidence in math and science improved and there was much more excitement in regards to these subjects.
- Students found that they had much more success in math. There were comments such as "I get this now, it is easy" and "I'm doing the same type of formula in physics so I understand this math now"
- Some students reported a new interest in pursuing science and math related fields.

Reflections/Advice: What we learned from this inquiry is that yes, integrating math and science through projects and labs does indeed help students deepen their understanding of topics in both subject areas, that it helps connect students to their life and make meaning of what they are learning, and that it is fun! Here are a few integrated projects/labs that we did:

- Physics of climbing – science and math of rock climbing prior to an Outdoor Education Rock climbing trip in junior science. Pulleys, ropes, and forces.
- Highway speed lab – are vehicles speeding in the neighborhood? Kinematics and Measurement.
- Amusement Park Physics – field trip and measurement lab – Kinematics and forces
- Projectiles lab – potato cannons