2016 - 2017 AESN / NOII Case Study

School Name: EBUS Academy

School District: SD#91 Nechako Lakes

Inquiry Team Members: Stephanie Sedgwick, Megan Boniface, Brian Naka

Inquiry Team Contact Email: mboniface@sd91.bc.ca

Type of inquiry: NOII

Grade levels: Secondary (8 - 12)

Curricular area(s): Science

Focus area(s): Core competencies (for example, critical thinking, communication, problem solving), Flexible learning, Formative assessment, Self-regulation, STEM / STEAM, online learning

In one sentence, what was your focus for the year?

Engaging students in Chemistry 11 in a distance learning (DL) environment through virtual and hands-on science labs with a focus on supporting lab-skills, making deeper connections to the real world and scaffolding metacognition.

Scanning: Briefly summarize your scanning process. How did you use the four key questions as part of the scanning process? What did you notice about the experiences of your learners that were most important to your team?

We are a teacher-team who each teach a section of online Chemistry 11, a course that we have co-created and developed together. Initially, our course was fairly-content based without a proper lab component. Additionally, there were few opportunities for students to support deeper understanding of material and connect content to the real world, self, community and environment.

Our initial scanning revealed a number of issues. Some students had given feedback that they enjoyed the one lab that was part of our original course but we observed that this single lab was not effectively teaching lab skills or reinforcing big ideas in chemistry 11. The lab did not have strong connections to the course content; the rationale for including the

2016 - 2017 AESN / NOII Case Study

lab was based mostly on easy access to materials and the ability to conduct safely at home.

We recognized that one lab was not sufficient to teach lab skills or to scaffold the correct communication of lab results (writing a lab report). Students needed multiple opportunities to do labs and scaffold their skills, yet without being overwhelmed in terms of time and access to supplies.

We were "interviewing" students on an ongoing basis as they entered the course. We had an "About You Assignment" for all new students in order to get to know students right away and understand their needs and motivation for taking our online course. We also asked about their learning preferences. We were learning that we had students with a range of learning preferences but a number of whom identified "hands-on learning approaches" as a preferred method. We also found that we had many adults taking our courses as a requirement for a post-secondary program (mainly Nursing and BSc programs).

Initially, the four key questions of the spiral of inquiry were not being addressed. We were not asking students the right questions and we had no information to go on. Inclusion of the inquiry questions was a priority and we creatively worked to include them in our online course. Given the nature of distributed learning, we needed to modify the questions to fit our learning environment. The questions we began asking of students were:

How do I learn best? Which learning strategies do I use to support my learning and which are working well or me?
How am I doing?
What next? If I am stuck, what strategies will I use to get un-stuck? What new strategies will I try out in the future?
These questions were asked in form of quick online "check-ins" and were used as ongoing scanning throughout the course as well as a means of supporting student metacognition.

At the midpoint and end of the course, we ask students to reflect on whether these questions made a difference in their learning and in terms of understanding themselves as learners. The data is still being collected since student enroll continuously in our course; however, the results continue to show that students are engaging with the process and are self-reporting that it has been effective. We are pleased to see that they are engaging in a meaningful way with the "check-ins" which are optional in the course.

We used the OECD principles of learning throughout the scanning process and made a number of changes to the course (types and wording of questions in the check-ins, changes

2016 - 2017 AESN / NOII Case Study

to the labs, and other tweaks) in response to what we observed from our students, as well as areas of deficiencies in our information. For example, part-way through the year, we realized that one of our big questions was “are our virtual labs and scaffolding helping students with their final home lab and full lab report?”. We were making assumptions based on the quality of work but we were not asking student directly. So we changed our “check-ins” to specifically ask students to describe how the virtual labs were helping, or not.

Focus: In a few sentences, explain why you selected this area. What changes were you hoping to obtain for your learners?

Our curiosity was sparked by a few things including: the challenge of incorporating hands-on activities in a DL environment, a sense from our own experience that richer learning experiences happen when students engage more deeply with the material through labs, how we could reach more learning styles (beyond visual and auditory). We also wondered if some students who dropped the course part way through may be leaving because the course was too content-heavy or because they were not engaged.

We observed through student work that a large number of students were not able to apply science concepts to real life or describe connections between course material and the world around them. We had a hunch that the lab component, when carefully designed, would help students make those connections in a meaningful way. The labs needed to benefit learners that planned to continue their education in science beyond graduation and those that did not. Through the metacognitive process (check-ins), we also hoped that students would benefit from knowing how they learned best and how to move forward when they encountered difficulties. We know metacognition is a competency applicable to learners beyond our course alone.

Hunch: Describe your hunches about the ways in which practices at the school may have been contributing to the experiences of your learners that were of concern to you.

A DL environment poses additional challenges to teaching science courses and supporting competencies. The primary challenges were:
Continuous enrollment of students which means students work asynchronously
Lack of face to face interaction with students
Scaffolding lab skills and lab communication skills
Access to materials for labs that are readily available and lab procedures that are safe to conduct at home
Supporting metacognitive process in grades 10-12 is not a common practice at our school

2016 - 2017 AESN / NOII Case Study

New professional learning: What new areas of professional learning did you explore? What resources were most helpful? What specific designs did you use to support the learning of your colleagues?

We explored, reviewed and selected labs that students could do at home or that could be videoed by us. In the lab selection process, we looked deeper into the curriculum to identify the big ideas and problematic areas for student comprehension (where we needed to reinforce deeper learning).

Two of the most important technological resources included Camtasia (video-editing software) and Edpuzzle (free interactive video software and LMS). We discovered a way to create virtual labs by creating our own media: we videoed ourselves performing labs, created edited Youtube videos using Camtasia, then imported our videos into Edpuzzle to create interactive labs for students. The final virtual lab was imported into Moodle as an interactive activity, which walked students through a lab, stopping at various parts to ask them questions or prompt them to record measurements/ make observations. The ability to add prepared feedback allowed us to scaffold. For example, a student is asked to make a qualitative observation and then the lab gives a good example. Another example: a student learns how to take temperature reading with the correct accuracy and precision.

Our online course is based in Moodle which we were already proficient with but we utilized new features and some features in new ways.

We spent time looking at effective strategies for online learners. We used our support team, our principal Brian Naka, and our district inquiry expert, Michelle Miller-Gauthier, as resources for implementing metacognition and overall feedback on our project.

Taking action: Describe strategies you and your team decided on and how your actions worked out.

The most important strategies that we employed and highly recommend to other educators are:
Spending time early on developing a clear vision and knowing your focus area. The time spent early on thinking deeply about the curriculum, the needs of our learners and where the issues lied was critical and extremely worthwhile
The collaborative approach: working in a team, distributing the workload
Finding a way to track and document progress, observations and ideas
Recognizing that we were learners in this process as well -- ask for help

2016 - 2017 AESN / NOII Case Study

Using the spiral as a template; understanding that it not prescriptive but serves as an important framework to continuously come back to
Carving out time to work and reflect on the project: using collaboration time and professional development time when possible.

Checking: Summarize the differences you made. Were they enough? Were you satisfied?

We were very satisfied and in many ways, pleasantly surprised the impact of this project on our students, as well the extent to which they are engaging with the labs and with metacognition. The most important differences that we observe are:
Students' abilities to articulate the connections they are making in the labs and the deeper understanding of key concepts
Engagement factor: students would often avoid the original lab in our course or rush through it; we now observe that students maintain flow in the course and do the labs in the order in which they are presented; they immediately complete the check-ins and self-report high-levels of engagement
Quality of full lab reports has improved significantly as a result of scaffolding through virtual labs and mini-lab reports, the use of a common rubric and specific feedback on areas to improve
The feedback from students is inspiring and encouraging. Here are some example:

"Before this lab I didn't really have a good understanding of what the terms endothermic and exothermic meant. This lab helped me grasp this concept and apply it to my life."

"Labs are fun, it's nice to see these reactions happening in real life. It's nice to watch a reaction instead of just reading about it."

"This lab connected to my life because I recently bought a car, and so now I understand more about how motor oil works, and will be able to take better care of my car because of it."

"I really understand now the connection between the limiting reagent going into the reaction and the amount of final product coming out."

The virtual labs prepared me for the home lab …"because each time I made mistakes, that lead me to fixing them all for the final lab, getting me a really good mark."

"When I can think about science in way that applies to life it makes the course seem more

substantiated and less like I'm learning for the sake of learning."

In addition, students were able to identify how they were doing, what strategies were working for them and what they were doing to help themselves get "un-stuck" when required. We collected data and analytics through Moodle and are able to see that our students as a whole are engaging in metacognitive practices. We are still collecting data since our students work asynchronously throughout the school year; we are seeing variation in the richness of answers to our questions but overall, the results are overwhelmingly positive.

Reflections/Advice: Finish by sharing what you learned from this inquiry, where you plan to go next, and what advice you would offer other schools with a similar interest.

The project was extremely rewarding and allowed for much professional growth. The encouraging results reaffirmed the possibilities of teacher and student inquiry, as well as the value and potential of collaboration. We learned that any well-designed project or unit focused on competencies and making connections will engage students. The results of our project confirmed the need and the value of scaffolding, and sparked confidence and excitement that scaffolding can be done effectively online.
The spiral of inquiry is a key component to our success (we learned how to formulate Qs, how to learn from student's feedback and we learned the value of it). Our advice to other schools with a similar interest, specifically DL schools, is to give it a try! Your time will be well-spent and is an empowering experience (for teachers and for students).