

Inquiry-Based Learning

Getting Started in the Middle School Science Classroom

K. Nowlan 2021-2022

Why Inquiry-Based Learning?

We live in an ever-changing and evolving world. Developing skills to learn about the world around us and find solutions for questions and problems that arise is essential to adapting and thriving.

In Middle School Science, teachers are encouraged to facilitate learning through inquiry-based, hands-on / minds-on active approaches situated in real-world contexts. This allows students to make connections with their own lives and the community in which they live. Students will become excited and curious about the concepts and phenomena under study, and they then become motivated to learn.

How does Inquiry-Based Learning align with the new curriculum?

Our NB Provincial Curriculum has supported skills-based learning before the process of creating the renewed Science curricula. Our goal as Science educators is to teach for *scientific literacy* with the *nature of science* (understanding the world through careful, systematic inquiry) in mind.

GCO 1: Students will use **scientific inquiry** and technological design skills to solve practical problems, communicate scientific ideas and results, and make informed decisions while working collaboratively.

GCO 2: Students will demonstrate an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology (STSE).

Scientific Literacy

Students can be considered scientifically literate when they are familiar with, and able to engage in, the following processes within a science context: inquiry, problem-solving, and decision making. Each strand consists of learning outcomes that share a common focus.

Scientific Inquiry involves posing questions and developing explanations for phenomena. This includes acquiring such skills as:

- Questioning
- Observing
- Inferring
- Predicting
- Measuring
- Hypothesizing
- Classifying
- Designing experiments
- Collecting data
- Analysing data
- Interpreting data

These activities provide students with opportunities to practice the process of theory development in science and understand the nature of science.

Problem-Solving involves seeking solutions to human problems and consists of proposing, creating and testing prototypes, products, and techniques to determine the best solution to a given problem.

Decision Making involves determining what we, as citizens, should do in a particular context or in response to a given situation. Decision-making situations are inherently important and provide a relevant context for engaging in scientific inquiry and/or problem-solving.

Where do I begin?

Renewed NB Science Curricula

Begin familiarizing yourself with the renewed curriculum

- Read the document, including the front matter
- Follow the resource links attached
- Keep an eye out for and attend PL opportunities in 2021-2022 on [STEM North](#) and in the monthly ASD-N Science & Cross-Curricular newsletter
- EECD Science Skills Rubrics ([6](#), [7&8](#))

Smarter Science

The Smarter Science framework developed by Youth Science Canada and the Thames Valley District School Board in Ontario supports the renewed NB Science curricula. This is an open-source free resource accessible online and resources may be freely reproduced and distributed.

- ***NB Desire2Learn online course** offered by Anglophone School Districts (email krista.nowlan@nbed.nb.ca for access)
- [Framework](#)
- [Posters](#)
- [Predict Explain Observe Explain](#) documents

Trevor MacKenzie (Teacher and Author of 'Dive into Inquiry')

What do you truly love to do? With the belief that all students deserve a chance to dig into their wonders and curiosities, MacKenzie proposes a scaffolded approach to student-centred learning by identifying the Types of Student Inquiry: Structured, Controlled, Guided and Free Inquiry. This inquiry-based learning model equips students to become lifelong learners by nurturing wonder, curiosity and agency in the classroom.

Website with book links and resources: trevormackenzie.com

Suggested starter activities

OBSERVATION

*The most important of all scientific skills – perhaps the most important skill across all disciplines – is the ability to **observe**.*

Observation is a fundamental science process skill that is often overlooked. However, like all skills, it can be developed with practice and feedback. It is student observations that lead to questioning and the process of inquiry. Observing is the key to understanding objects and phenomena in the world and interactions between objects or phenomena. It can also be a “hook” for further inquiry—looking closely can generate new questions, which lead to further investigations.

Observing is:

- *Using all five senses, as appropriate, to thoroughly understand an object's natural state*
- *Detecting details in natural phenomena that go beyond that of the casual observer*
- *Building understanding by connecting to past experiences*

([Smarter Science](#) – Youth Science Canada)

Visit STEM North for a list of suggested Observation activities:

[OBSERVATION ACTIVITIES](#)

QUESTIONING

Questioning is a strategy to make meaning or wonder about uncertainties.

Questioning – asking who, what, when, where, why, and how – leads to student inquiry and investigation. It is the underlying basis for Smarter Science and is a fundamental part of the inquiry process. Questioning arouses curiosity, promotes idea development, stimulates discussion, clarifies concepts, emphasizes key ideas, motivates students, encourages higher-order thinking and activates prior knowledge. Teaching effective questioning skills leads to increased student engagement and ownership

Questioning is:

- *Students leading the discussion and subsequent inquiry*
- *An interactive activity during which students record their curiosity*
- *Activities where students develop higher-order thinking and engage in high level discussion*
- *Asking who, what, when, where, why, and how – questions that lead to true discussion and inquiry*
- *A dynamic process whereby questions lead to new questions and new ideas for investigations*

([Smarter Science](#) – Youth Science Canada)

Visit STEM North for a list of suggested Questioning activities:

[QUESTIONING ACTIVITIES](#)

SEARCHING

The skill of Searching, requires students to locate and use several sources, developing self-reliance in acquiring library and internet skills.

SEARCHING ACTIVITIES (to come)