Primary Teacher PD	Inquiry Based Learning

PD Session Framework

Introduction

The teacher PD sessions are a set of three videos being released by Science North, starting with this one which is geared towards primary level teachers from Kindergarten to Grade 3. The goal of these sessions is to provide teachers with an overview of Inquiry Based learning while also sharing ideas and resources to do two inquiry-based activities with students.

There are three parts to the session:

- **Part 1: What is Inquiry Based Learning?**
- **Part 2: Sample Inquiry Activity (Mystery Shapes)**
- **Part 3: At Home Inquiry Challenge (Animal Discovery)**

Part 1: What is Inquiry Based Learning?

What is Inquiry Based Learning?

Inquiry based learning is the primary learning style used here at Science North. When you visit our Science Centre, you'll find yourself learning by doing, through a variety of hands-on activities, demonstrations and interactions that encourage students to ask questions, be curious and discover what is around them. That's inquiry-based learning; self-directed learning where the responsibility is on the learner to discover new knowledge rather than relying on getting it from someone else. [1] Inquiry based learning emphasizes active participation by engaging students in challenges that pique their interest and encourage them to learn more. [1]

Why Use Inquiry Based Learning?

What we love about inquiry-based learning at Science North is that it encourages students to follow the same process used by scientists to construct knowledge. Science revolves around not knowing the answer to something and being able to problem solve to come up with clever and helpful solutions. It engages students in an authentic scientific discovery process which builds their ability to communicate and think like a scientist. [1]

Potentially more important to inquiry-based learning right now is that this method of learning lends itself incredibly well to learning from home during the quarantine. Technology allows students to follow the inquiry process with self-guided projects that enable them to learn at their own pace and in areas that interest them. Inquiry based learning builds long term skills in students such as being able to identify problems, ask questions, carry out experiments, understand data and presenting results. No doubt these skills are beneficial to the scientific process, but they are also real-world skills that create well rounded learners. [1]

What are the steps in Inquiry Based Learning?

It is widely accepted that when participating in inquiry-based learning, the scientific process gets broken into five different inquiry phases, which make up the inquiry cycle. It's considered a cycle because the scientific process isn't linear but rather requires students to come back to different phases. [1] The learning is constantly changing and growing, encouraging students to learn from trials, make changes and expand their knowledge in the process. The names of the five phases change but at Science North we like to think of them as follows: **Observe, Brainstorm, Create, Improve and Share.**

- **Observe:** During the observation stage, the learning topic is introduced to the students. The goal is to stimulate curiosity about the topic by asking a question, providing a challenge or asking students to think about something they love and want to learn more about. At the **primary** level, it's especially important to provide a learning topic that has an element of prior-learning for students to provide an easy access point.
- **Brainstorm:** During this phase, students are encouraged to start thinking about the challenge and possible solutions. At a higher level this may be in the form of a hypothesis, but at the **primary** level, it can be as simple as sharing what they already know. This stage also invites students to learn more about the topic. Research at the **primary** level could include reading a story together, watching a video or even exploring the world around them.
- **Create:** Depending on the challenge, this phase can take different forms. This can be as simple as creating a drawing of the solution, building a prototype or even completing a science experiment. The goal of this stage is to take curiosity and turn it into action.
- **Improve:** During this stage, students are encouraged to make changes and improve on their creation stage. By seeking feedback from others, they can get ideas on how to make their project even better. An important part of science is making mistakes and getting feedback, which can be used to develop a deeper solution to the challenge.
- **Share:** This one of our favourite stages, we like seeing what you've created! Being able to share solutions to challenges promotes literacy and communication skills while also providing an opportunity to reflect on the project. We want you to share your projects with us on social media: **@ScienceNorth** and **#ScienceAtHome**

What is the Teacher's Role in Inquiry Based Learning?

While this can sound like a daunting task for a **primary** learner, we're going to look at how this process can be scaled to different ranges of grades. For your younger learners, the details of how this is done is less important. Rather the focus should be on how questions and prompts are framed that encourage students to learn more about something that interests them. As a teacher, your role is to develop a culture of inquiry, support discussions and promote the nature of science. You can also assist your students by providing information and resources about the learning topic and helping to facilitate collaboration. [2]

Part 2: Sample Inquiry Activity

Activity Overview:

Mystery Shapes: In this activity, shapes cut from craft foam are glued to the underside of a piece of cardboard. Students are required to determine and recreate the shape without flipping over the cardboard and looking at the shape.

Observe

Without looking at the underside of the cardboard, try to predict what shape it could be.

- How can you learn more, what materials would you need?
- Can you figure out how many sides the shape has? What about how many corners?
- Are the sides the same length or different lengths?

Brainstorm

Based on your observations, create a drawing of what you think the shape is. This is also an opportunity to discuss what we know about shapes.

Create

Try to recreate the activity by cutting out a shape from craft foam and gluing it to a piece of cardboard.

Improve

Compare the recreation to the original. Does it feel the same, is it different? What changes do you think you have to make to make it the same?

Share

Discuss what solution you came up with. Why did you pick the shape that you did? Could it have been another shape? What other steps would you need to do to know for sure?

Materials

- Cardboard
- Craft foam

Key Concepts

This activity mimics the scientific procedure. When scientists do an experiment, they don't know the answer and often times they can't even see what they are working with. They have to do what we did, and make educated guesses then try to learn more to be able to prove their guess. Inquiry-based learning promoted this form of scientific thinking and being able to problem solve.

To truly mimic a scientific experiment, students shouldn't need to look at the shape under the cardboard, but sometimes it is nice to know for sure. At the end of the experiment you can flip over the cardboard to see the shape.

Part 3: At Home Inquiry Challenge

At Home Inquiry Challenge

Animal Discovery: Your inquiry challenge is to create your very own animal based on what you know about living things. In this section we'll look at the steps to complete this project.

Observe

Think about what you know about living things, there's a lot to consider:

- What does it need to live?
- How does it get energy? What food does it eat?
- How do the seasons affect its habits?
- How does it grow? What do it's young look like?
- How does it move? Does it walk, swim or fly?
- Where does it live? What does its home look like?

When you are creating your animal, you should look at other animals to help understand what your creature will need. Teachers can use this opportunity to facilitate learning about some of these topics. Science North's website has lots of resources you can use.

Brainstorm

This your time to start thinking about what your animal will look like and what some of its key features will be. Draw a picture of your animal, its young, its home or anything else that you think should be included.

Teachers can facilitate a brainstorm and discuss key features in animals.

Create

During the create stage of inquiry-based learning, you're bringing your idea to life. Maybe you want to make a model of your animal, or maybe you can create a strong and stable habitat for it to live in. Or why not both?! You can do whatever you want to bring your animal to life.

Improve

Share your animal with your friends and family. What ideas do they have? What do you think you can add to make your animal more realistic?

Share

We want to see what you created! Share your pictures or videos of your animal with us and we will feature some of our favourites on our social media platforms. You can share these with us on social media: **@ScienceNorth** and **#ScienceAtHome**

Conclusion

Inquiry-based learning is great because it can be used to learn and explore so many different topics. We only gave you two suggestions, but there are countless other projects that you can try with your students. Join us next week as we explore two new inquiry activities for the junior level or come up with your own. If you do, be sure to share those with us, we always appreciate seeing what you and your students are up to. Thank you!

Bibliography

[1] M. Pedaste, M. Maeots, L. A. Siiman, T. de Jong, S. A. van Riesen, E. T. Kamp, C. C. Manoli, Z. C. Zacharia and E. Tsourlidaki, "Phases of inquiry-based learning: Definitions and the inquiry cycle," *Educational Research Review,* pp. 47-61, 2015.

[2] M. Dobber, R. Zwart, M. Tanis and B. van Oers, "Literature review: The role of the teacher in inquiry-based education," *Educational Research Review,* vol. 22, pp. 194-214, 2017.