THOMPSON RIVERS UNIVERSITY | Education & Social Work

Inquiry Demonstration Plan

Lesson Title: Plastic Pollution **Lesson #** 4 **Date:** April 2, 2021

Name: Deepika Arora **Subject(s):** Environmental Science **Grade(s):** 12

Rationale & Overview

Why does this topic matter to students?

Students will be encouraged to incorporate STEM/STEAM approach by creating solutions at their level and bring in their reflections on the project design- the related topics can be research project on plastic alternatives, bioplastics, recycling of plastics etc. where they can design the products, presentations, TED talks, posters, etc. Through this activity, the learners develop scientific skills with an integrative approach and they will develop a connection with the task which will serve as a motivation to complete the same. Through this inquiry approach, the young learners will be building life-long problem solving competencies about the issues that matter to themselves as well as natural environment.

How does this lesson fit within the larger inquiry project?

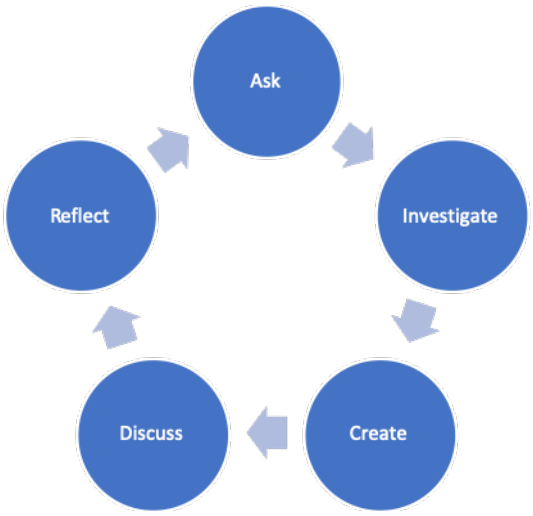
Understanding the fundamentals of science and technology are important in this 21st century learning paradigms where we face challenges and benefits of globalization of education. STEM/STEAM approach in the inquiry project helps students discover their creative and divergent thinking abilities and helps increase student engagement in this hands on learning experience where the knowledge comes into practice. Including this approach takes inquiry based learning to a next level where students combine familiar with unfamiliar and acquire new skills of discovery and innovations.

How does this project incorporate the inquiry cycle?

STEM/STEAM project caters to create and reflect part of the inquiry cycle, where they create innovative solutions and reflect upon how things work out when theory comes into practice. Since this inquiry based activity focusses on creative ways to solve problem of plastic pollution, the students after acquired skills of investigation and observation, will try to apply the gained knowledge to develop scientific habits while bringing out solutions with opportunities to think creatively and logically.

Key Questions for Inquiry

Core Question & Supporting Questions for Inquiry Project	Question(s) Addressed in This Lesson
What will be pros and cons of replacing this fast growing and economical product with any other material?	1. Can plastics be replaced with eco-friendly alternatives? 2. How can we reduce the use of plastics?



Inquiry Approach and Rationale

The inquiry approach used here in this lesson is mainly design thinking keeping in mind the human centered principles while keeping students in focus. The activities are planned in various stages- Empathize, Define, Ideate, Prototype, and Test. (Ramunas Balcaitis, 2019)

In this lesson, the last two stages of design thinking will suffice the true purpose of this inquiry project:

Prototype: This stage will be the experimental stage where the learners will investigate and find the best solution to this problem and will have clear picture of this ongoing problem by creating an alternative method or eco-friendly substitutes for this fast growing plastic pollution.

Test: At the end, the learners will assess their understanding of the topic and redefine solutions with the help of STEM project or questionnaires. This will bring change in their personal behavior towards the environment as well as creating awareness at community level.

Rationale

Inquiry based STEM/STEAM project, focusses on experiential learning and creative solutions to plastics problem. This activity employs diverse practices an individual or community can use to study the environmental issues. Inquiry based approach in this activity will bridge the gap between learning concepts and contents with active processes and students are provided with several opportunities to investigate a problem, search for possible solutions, make observations, analyze the possible challenges, test their ideas and lastly, coming out with creative solutions based on their conscience.

Core Principles of Effective Teaching (Sharon Friesen) Focus on one or more core principles in the lesson

Core Principle 1: Effective teaching practice begins with the thoughtful and intentional design of learning that engages students intellectually and academically. **What aspects of the inquiry are the most challenging and meaningful for students?*	We all are aware about the prevalence of plastic pollution in our environment and we must find ways to alleviate this problem. The challenge that students need to figure out is how to tackle this problem of plastics while continuing to produce and use plastics? This activity holds a meaningful connection with students where they need to investigate, ask questions, analyze the possible findings, ideate relevant solutions, and think critically to propose

	creative solutions to this problem. Thus, making them aware and focused towards a healthier life and safer societies while actively engaging them now in issues which they will face as the life progresses.
Core Principle 2: The work that students are asked to undertake is worthy of their time and attention, is personally relevant, and deeply connected to the world in which they live. **What makes this inquiry valuable, meaningful, and "alive" for the students and teachers?*	This STEAM project will help students discover their intellectual ability to showcase their talents and competencies in creative ways through the medium of science, technology, engineering and mathematics and showing these skills through a medium of art will also help in better engagement of students in their learning experience.
Core Principle 3: Assessment practices are clearly focused on improving student learning and guiding teaching decisions and actions. **How do I define learning and success in this inquiry? How learning is expressed and articulated in peer, self and teacher assessments?*	The most important guidelines for assessing a STEM project is to answer questions like what students are learning, what are they thinking and what skills are they gaining through this project? For assessing this project, students' self-assessment through entrance slips, peer assessment and teacher's formative assessment is used in the form of rubrics for presentation, where students will understand and reflect upon the integrated approach towards their project working collaboratively with the team members.

BC Curriculum Core Competencies

Communication	Thinking	Personal & Social
Collaborating Effectively recognize how combining others' perspectives, strategies, and efforts with their own enhances collective understanding, use, and impact. They value the contributions of group members, interact supportively and effectively using inclusive practices, and strive for shared commitment and mutual benefit.	**Creative Thinking** The generation of ideas and concepts that are novel and innovative in the context in which they are generated, reflection on their value to the individual or others, and the development of chosen ideas and concepts from thought to reality. **Critical and Reflective Thinking** They reflect on the information they receive through observation, experience, and other forms of communication to solve problems, design products, understand events, and address issues. And uses their ideas, experiences, and reflections to set goals, make judgments, and refine their thinking.	**Social Awareness and Responsibility** Focuses on interacting with others and the natural world in respectful and caring ways. It contributes positively to their family, community, and environment; empathizes with others and appreciates their perspectives; resolves problems peacefully; and develops and sustains healthy relationships.

BC Curriculum Big Ideas (STUDENTS UNDERSTAND)

- ✓ Living sustainably to support the well-being of self, family and local community.
  - i) How are your decisions to limit the use of plastics linked to global plastic pollution?
  - ii) What changes could you make in your life that will support a sustainable living and a clean habitat for marine life?

BC Curriculum Learning Standards

(STUDENTS DO)	(STUDENTS KNOW)
Learning Standards - Curricular Competencies	**Learning Standards - Content**
Applying and innovating Contribute to finding solutions to problems at a local and/or global level through inquiry. ***How could the design of packaging be improved to reduce the use of single plastics?*** ***How could you create awareness to minimalize the use of plastics in your family and local community?***	**Sustainable living:** Conservation of natural environment and resources, alternate eco-friendly methods.

BC Curriculum Indigenous Connections/ First Peoples Principles of Learning

How will I incorporate Indigenous knowledge and principles of learning?

The students will acquire knowledge about the problem of plastics through direct experience in natural environment understanding its importance in relation to whole as well as in context of sustainability.

Respectful Relations

How will I invite students of all backgrounds, interests and skills into the inquiry?

The students learn and store knowledge when they are able to make connections with their everyday life. The collaborative team effort on this project will develop cross-cultural connections helping every student felt welcomed and valued. When students work in a team, they will develop understanding of their peers' perspectives and opinions building cultural competence with one another.

Lesson Activities

Time Allotted		Teacher	Students
Invitation	15 minutes	The teacher will invite students to a TED talk video on 'The Surprising solution to Ocean Plastic'. Further the discussion will take place with a question and answer round with students.	The students will watch the video and engage themselves in group discussions.
Inquiry	4-5 days	**Activity**: Use of plastic bags is a common practice and the disposal of plastic bags is visible near the landfills as	Students will engage themselves in creating possible solutions and presentations over the time period.

		well as water resources which poses danger to the animals as well as create land pollution. Design an alternative packing product/ idea which is less wasteful, reusable, and justify the benefits of your packaging material over the use of plastics.	
Reflection & Discussion	40 minutes	The teacher will invite students to participate in the presentation of their product/solution created.	The students will work in teams for the project designed and present the relevant evidences to their proposed solutions.

Materials and Resources

Materials Required:

Youtube video:
https://www.youtube.com/watch?v=mT4Qbp89nIQ
(David Katz, 2018)

Resources

Assessment and Curriculum Support Center. (2021). *Creating and using rubrics*. https://manoa.hawaii.edu/assessment/resources/how-to/creating-and-using-rubrics/#j5

David Katz. (2018, February 16). *The Surprising Solution to Ocean Plastic*. TED. https://www.youtube.com/watch?v=mT4Qbp89nIQ

Organizational Strategies

- ✓ Giving students ample opportunities to learn at their own pace.
- ✓ Teaching as a facilitator not expert or lecture

Proactive, Positive Classroom Learning Environment Strategies

- ✓ Clear communication between teacher-student and student-student
- ✓ Building trust among the student by letting them choose the project as per their choice and creative ability.

Extensions

Run a plastic free drive in your school premises for a week and record observations about the changes from the first day and till the last day.

ASSESSMENT

Self (Entrance Slips)

Is the product flexible enough when considered for recycling? How does this proposed solution will affect its production on economy? Cost/sales How is this solution you proposed is better than the regular use of plastics?

Peer Feedback (Checklist)

Names of the team members:	**Yes**	**No**
1. Did all team members participated equally in the presentation?		
2. Were the team members able to demonstrate their ideas with relevant facts and evidences?	**One thing you got inspired with:**	**One thing which could be improved:**
3. Was the presentation interactive and team members answered all the questions?		

Teachers' Assessment

Scoring	**Interpretation**	**Analysis and Evaluation**	**Presentation**
4- Proficient	Analyzes insightful questions, critiques information and content, values information	Examines conclusion, synthesizes data critically, uses relevant evidences to pose solution	Argues concisely, assimilates information, clear communication, justifies discussion
3- Efficient	Asks insightful questions, categorizes content, recognizes context	Formulates conclusions, evaluates data, reorganizes argument	Argues clearly, identifies the issues and give logical argument, suggests solutions but lacks justification
2- Developing	Identifies some questions, selects sources correctly, recognizes basic context	Identifies some conclusions, paraphrases data, assumes valid information	Presents few points clearly, requires clear communication for logical argument, shows basic knowledge to proposed solutions
1- Emerging	Fails to question data, misses sources and unable to recognize basic context	Unable to draw conclusions, no relevant evidence to support argument, repeats information	Unclear proposal for solutions devised, omits arguments and relevant evidence to support discussion

(Creating and using rubrics, 2021)