

STEM-It-Up in Grade 7/8

Introduction

This resource contains 3 Inquiry Units which support the Ontario Science and Technology Curriculum (2023) designed around the Engineering Design Process, and honour Indigenous voices as integral to science learning. Cross curricular connections are natural in inquiry and are denoted throughout. Using authentic sources, examples of how to weave Indigenous Knowledge throughout inquiry to enrich the learning is demonstrated. We enter this work through a Catholic lens and each inquiry provides opportunities for students to pray, reflect, discuss and act.

This resource includes pedagogical underpinnings and one slide for each of the 3 Inquiries: an interactive visual that outlines the Engineering Design Process containing direct links to the lesson and teaching materials. Included supports: provocations, teacher background knowledge, student-facing materials, Faith connections, planning for assessment and coding extensions. Provided here is a starting point upon which educators can continue to build.



"As each has received a gift, use it to serve one another, as good stewards of God's varied grace".
1 Peter 4:10

Scientific and
Engineering Design
Processes

Curiosity and
Wonder in Science

2023 Resource Acknowledgements

Project Coordinator

Charlotte Rouleau - Executive Director, EOCCC

Project Lead

Maureen McGrath - Teacher, Algonquin & Lakeshore Catholic District School Board

Writers

Christina Poole - Teacher, Algonquin & Lakeshore Catholic District School Board

Kellie Hisko - Indigenous Education Coordinator, Renfrew County Catholic District School Board

Sarah Ireton - Teacher, Algonquin & Lakeshore Catholic District School Board

Reviewers

Kelsey Amelotte - Teacher, Algonquin & Lakeshore Catholic District School Board

Lori Bryden, Principal, Algonquin & Lakeshore Catholic District School Board (Retired)



What is Indigenous Knowledge and Why is it Important?

Rick Hill, Tuscarora, Six Nations, explains.

Mi'kmaq Elder, Albert Marshall explains Etuaptmumk Two-Eye Seeing



'Becoming a culturally responsive science teacher is a career-long process, not something obtained from a two-hour professional development session. It involves constantly learning from and about our students' interests, their lives outside of school, and the cultural practices in their homes. This knowledge informs our science teaching in rich and meaningful ways. Validating students' cultural identities in classroom practices—such as understanding and integrating the students' family makeup, immigration history and experiences, individual concerns, strengths, talents and interests into the curriculum—enriches our science classroom through the students' knowledge they bring into our science classes'.

-Ann Haley Mackenzie, *The Science Teacher*, Nov./Dec. 2021.



FUNDS OF KNOWLEDGE IN STEM

Indigenous Connections



Calls to Action
10, 62, 63, 92

**The UN Declaration
on the Rights of
Indigenous Peoples**

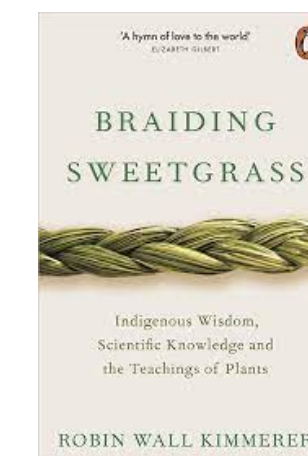
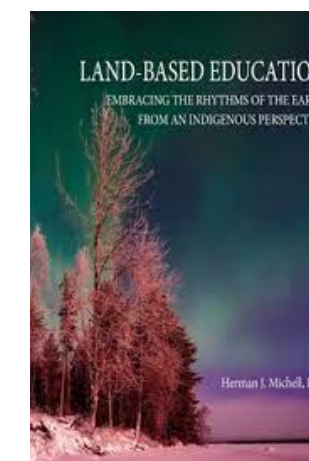
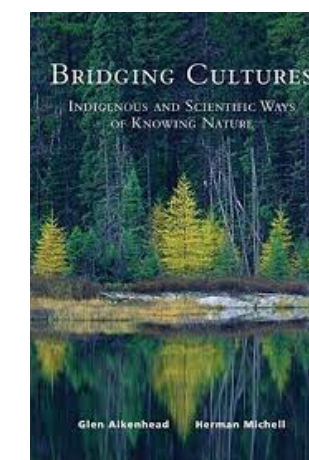


Articles 3, 13, 14, 15, 26, 29, 31, 32

Prayers and Reconciliation

- **CARFLEO:** <https://carfleo.com/2020/08/18/national-day-of-prayer-in-solidarity-with-indigenous-peoples/> and <https://carfleo.com/2021/12/12/national-day-of-prayer-in-solidarity-with-indigenous-peoples-2/>
- **CCCB:** <https://www.cccb.ca/indigenous-peoples/>
- **Indigenous Canada Research Fellowship:** <https://www.indigenouscatholic.org/unityprayer>
- **Catholic Register:** <https://www.catholicregister.org/item/33240-prayer-created-for-national-indigenous-peoples-day>

Your Next Reads Here:



Cultural Appropriation Vs Cultural Appreciation

Cultural Appreciation: Truly honours nations and cultures. You take the time to learn and interact, to gain an understanding of culture or cultures, different from your own. "If it's about us it should include us". Nothing about them without them. This could mean having a guest into your classroom for authentic learning or listening to/reading their words through authentic videos/publications.



CBC segment with host
Rosanna Deerchild

Cultural Appropriation: When someone takes elements from a culture not their own and remakes and reduces it to a meaningless pop-culture item or gains from the elements in any way. Cultural appropriation can also look like teaching culture when it is not yours to share. An example would be making dreamcatchers as an art activity.

Focusing on our Faith: Watch for these!



Challenge
yourself



Pray



Reflect



Discuss

Foundational Concepts

Delve into each to understand the pedagogical function in each Inquiry

UNSDG's



Transferable Skills

Ontario Curriculum 2022 Transferable Skills "Skills and attributes that students need in order to thrive in the modern world"		
Critical Thinking and Problem Solving Critical thinking and problem solving involve locating, processing, analyzing, and interpreting relevant and reliable information to address complex issues and problems, make informed judgments and decisions, and take effective action. With critical thinking skills comes an awareness that solving problems can have a positive impact in the world, and this contributes to achieving one's potential as a constructive and reflective citizen. Learning is deepened when it occurs in the context of authentic and meaningful real-world experiences.	Innovation, Creativity and Entrepreneurship Innovation, creativity, and entrepreneurship support the ability to turn ideas into action in order to meet the needs of a community. These skills include the capacity to develop concepts, ideas, or products for the purpose of contributing innovative solutions to economic, social, and environmental problems. Developing these skills involves a willingness to assume leadership roles, take risks, and engage in independent, unconventional thinking in the context of experimenting, conducting research, and exploring new strategies, techniques, and perspectives. An entrepreneurial mindset understands the importance of building and scaling ideas for sustainable growth.	Self-Directed Learning Self-directed learning involves becoming aware of and managing one's own process of learning. It includes developing dispositions that support motivation, self-regulation, perseverance, adaptability, and resilience. It also calls for a growth mindset – a belief in one's ability to learn – combined with the use of strategies for planning, reflecting on, and monitoring progress towards one's goals, and reviewing potential next steps, strategies, and results. Self-reflection and thinking about thinking (metacognition) support lifelong learning, adaptive capacity, well-being, and the ability to transfer learning in an ever-changing world.
Collaboration Collaboration involves the interplay of the cognitive (thinking and reasoning), interpersonal, and intrapersonal competencies needed to work with others effectively and ethically. These skills deepen as they are applied, with increasing versatility, to co-construct knowledge, meaning, and content with others in diverse situations, both physical and virtual, that involve a variety of roles, groups, and perspectives.	Communication Communication involves receiving and expressing meaning (i.e., through reading and writing, viewing and creating, listening and speaking) in different contexts and with different audiences and purposes. Effective communication increasingly involves understanding local and global perspectives, and social and cultural contexts, and using a variety of media appropriately, responsibly, safely, and with a view to creating a positive digital footprint.	Global Citizenship and Sustainability Global citizenship and sustainability involves understanding diverse world views and perspectives in order to effectively address the various political, environmental, social, and economic issues that are central to living sustainably in today's interconnected and interdependent world. It also involves acquiring the knowledge, motivation, dispositions, and skills required for engaged citizenship, along with an appreciation of the diversity of people and perspectives in the world. It calls for the ability to envision and work towards a better and more sustainable future for all.
Digital Literacy Digital literacy involves the ability to solve problems using technology in a safe, legal, and ethically responsible manner. With the ever-expanding role of digitalization and big data in the modern world, digital literacy also means having strong data literacy skills, and the ability to engage with emerging technologies. Digitally literate students recognize the rights and responsibilities, as well as the opportunities, that come with being, learning, and working in an interconnected digital world.		

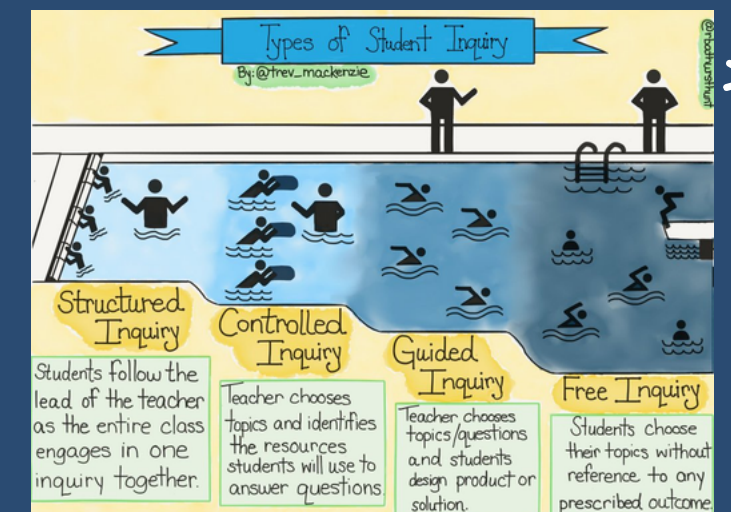


Long Range
Plans
Grade 7
Grade 8

Inquiry-based learning is a student-centered teaching method that encourages students to ask questions and investigate real-world problems.



Types of Inquiry



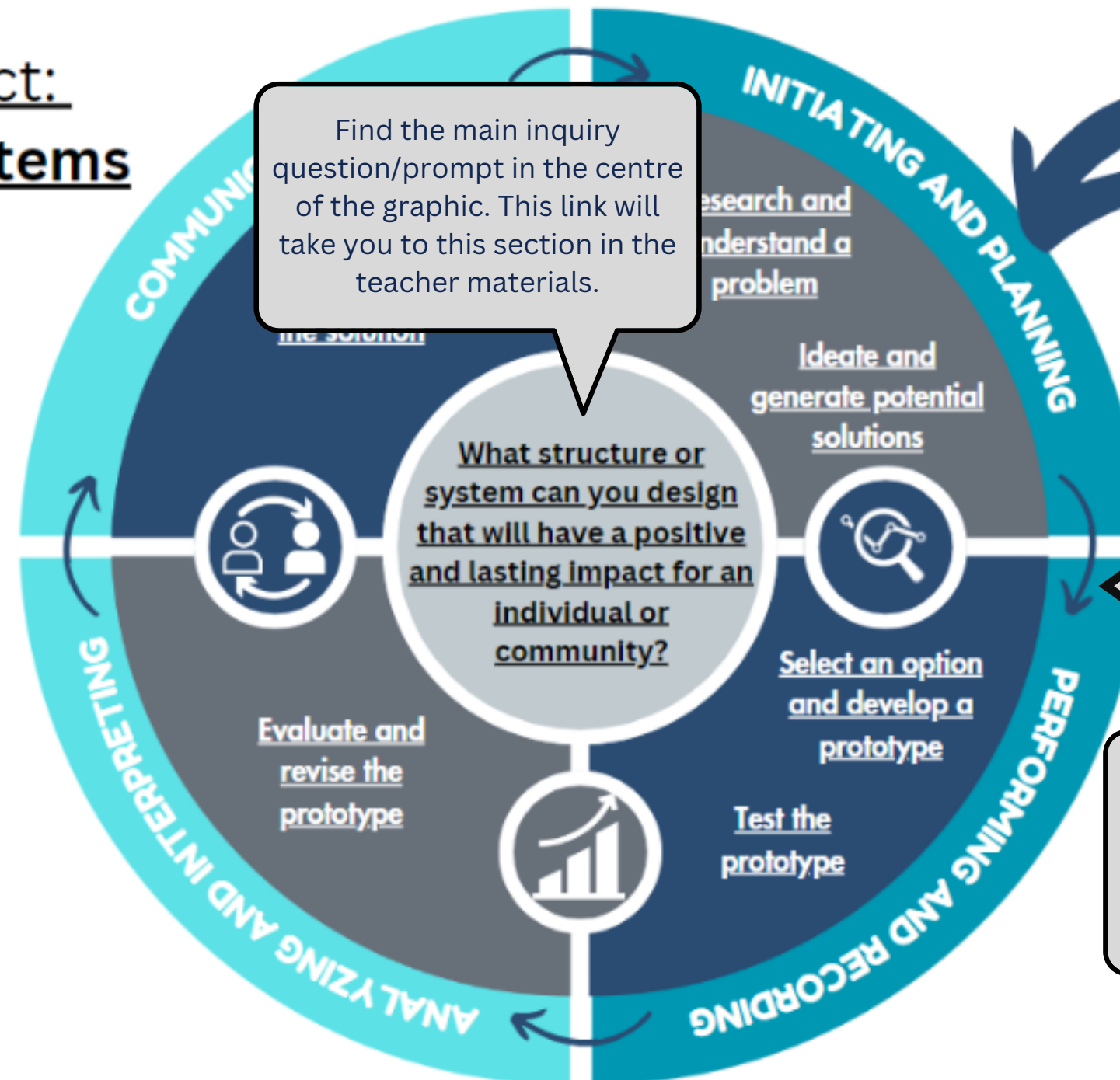
Implementing the Engineering Design Process through an Inquiry Lens...

The following slides provide links to Inquiry Units supporting the Grade 7/8 Science Curriculum Expectations. Each unit centers around an inquiry question. In each unit, students follow the Engineering Design to completion. Instructions on how to use the slides and linked materials are provided.

How to use these slides :

Find the focus of each inquiry project here. You can click this element to take you to the beginning of the inquiry teacher-facing materials.

Inquiry Project: Structures/Systems



Each project slide uses the engineering design process to frame the inquiry. Begin at the "Initiating and Planning" section, and click on "Research and Understand a Problem" to begin the process. Each stage of the design process has been linked to a bookmark in the project materials.

How to use linked materials:

Each of the major sections of the inquiries have bookmarks that link from the Inquiry Project slides (found in this Canva) to help you navigate to each element of the engineering design process.

Building a Structure or System That Matters EOCCC Gr. 7/8 STEM Challenge



Introduction

Inquiry Overview:

In this STEM Challenge students will work through the Engineering Design Process to build various designs and brainstorm where they feel a community or individual could use this (one). Connections with local experts will be made throughout the project and will provide location/purpose and design will be a solution to an identified problem. Their design will be evaluated by user feedback. The STEM challenge concludes with a celebration of learning and experts in the field.

This activity can be done with partners. Each individual student will be responsible for documenting their learning journey and communicating their solution in a format of their choice.

For a split grade 7/8 class, the whole class can begin the inquiry with the same provocation. Grade 7's will create a structure to solve a problem while grade 8's will create a system to solve a problem.

This lesson connects to the grade 7 Long Range Plan Question "How are structures built to withstand forces?" and the grade 8 Long Range Plan Question "What are efficient systems and how do they work in my life?"

Long-Range Plan Connection:

This inquiry connects to the grade 7 Long Range Plan Question: "How are structures built to withstand forces?" and the grade 8 Long Range Plan Question "What are efficient systems and how do they work in my life?"

Sample inquiry questions have been provided in each inquiry project. While these can be used with the entire class, students may take their inquiry in a different direction depending on their research and interest.

Inquiry Questions:

How might you redesign a current technology or human invention to reduce the negative impact(s) on ecosystems or human health?
Why is God good even if there is suffering in the world?

Each inquiry includes an introduction for the educator. This includes an overview of the inquiry, connections to long-range plans, teacher background knowledge, Culturally Responsive and Relevant Pedagogy and Land-based Learning, UN Sustainable Development Goals, and resources to guide the inquiry.

Catholic content and contexts have been naturally anchored within the inquiries to give students opportunities to explore learning through a Catholic lens.

The inquiry materials are divided into stages to help guide educators in the process. These sections provide relevant information about the upcoming activities to support students in the inquiry process with guidance to support curriculum connections and opportunities.



ENGAGE

My Lord and my God! You have a plan with all you desired, created and called to light.

Help us to know what you have bestowed on us, what you intended us for, and where you are calling us. Amen.

Curriculum Connections: Language grade 7 (2023)

Language Foundations for Reading and Writing

gr. 7 B2.3 read a variety of complex texts fluently, with accuracy and appropriate pacing, to support comprehension, and when reading aloud, adjust expression and intonation according to the purpose of reading

Oral and Non-verbal Communication: Effective Listening Skills

Curriculum Connections: Language grade 8 (2023)

Language Foundations for Reading and Writing

gr.8 B2.3 read a variety of complex texts fluently, with accuracy and appropriate pacing, to support comprehension, and when reading aloud, adjust expression and intonation according to the purpose of reading

Oral and Non-verbal Communication:

Throughout each part of the engineering design process, possible activities (including videos, links, research pieces, etc.) that align with each stage are provided. When relevant, discussion questions, possible student responses, and teacher/student research resources are included.

Throughout each stage of the inquiry, teacher supports have been shared. These teacher supports are intended to guide the educator around possible connections or ways to implement the associated activity.

Teacher Supports

Focusing on:

The research step of the Engineering Design Process will give students an opportunity to learn more about the problem they are about to solve. For this inquiry we want students to learn more about heat and climate change (gr.7) and Earth's water (gr. 8). We then want students to look into climate change or water related problems in their region. When students realize how their immediate environment might be negatively impacted they will want to take action!

Indigenous Knowledge

- Check with your Indigenous Education Lead to see what relationships already exist with local Elders and/or knowledge

Discussion:

- What problems currently exist in relation to water and climate change?
- How are Indigenous people working toward water protection?
<https://www.cbc.ca/radio/unreserved/water-is-sacred-protecting-1.6818685>

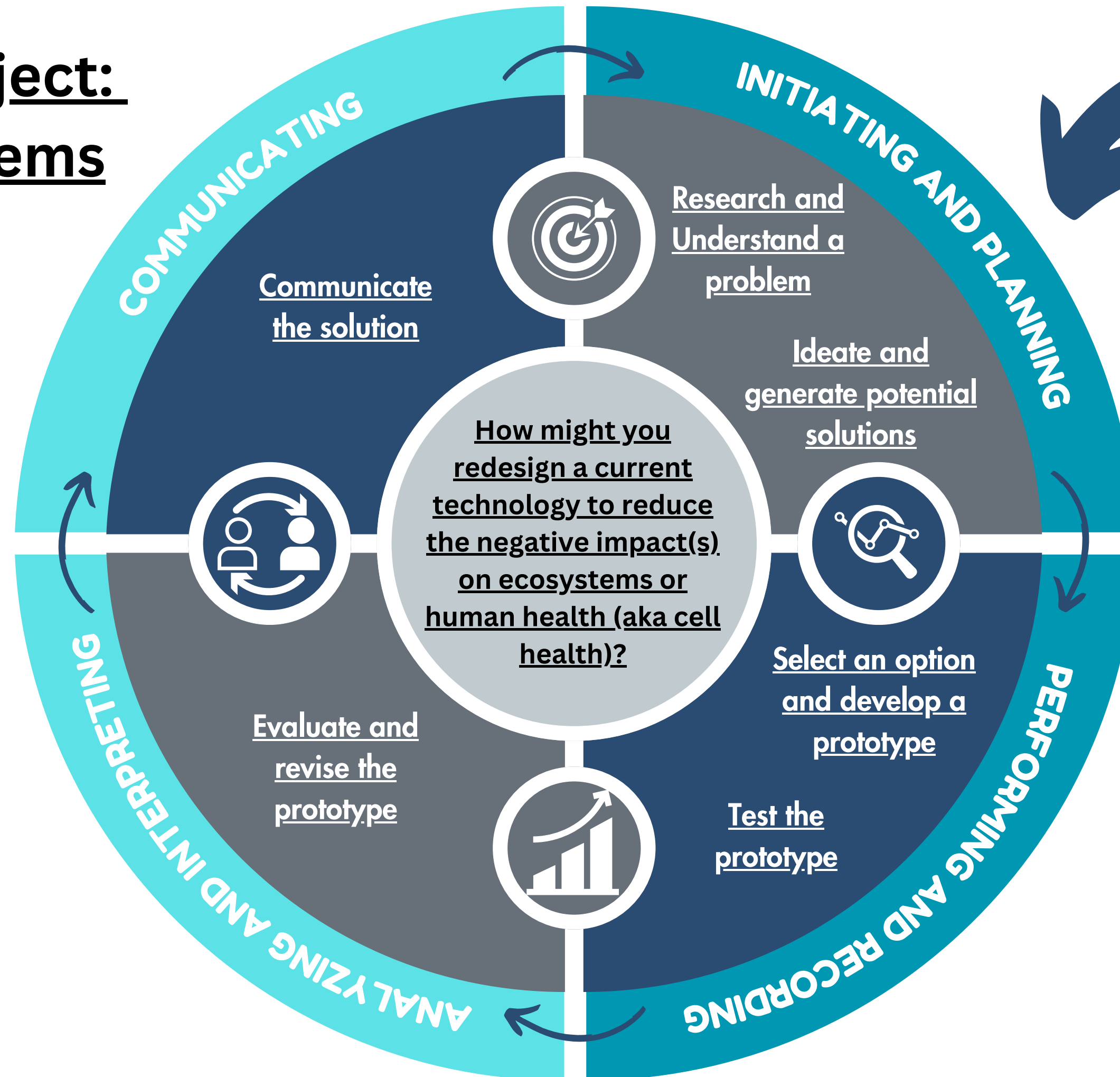
Consultation:

- Invite an "Expert in the Field" such as local conservation authorities, community environmental organizations, local stewardship councils (if applicable), Ministry of the Environment, Conservation, and Parks, Watersheds Canada, University/College student outreach in environmental studies, Indigenous consultant, etc). Either through in-person visits or virtual sessions, the expert should check in throughout various points of the STEM challenge to give authentic and timely feedback to students on their designs and design implications.

Research:

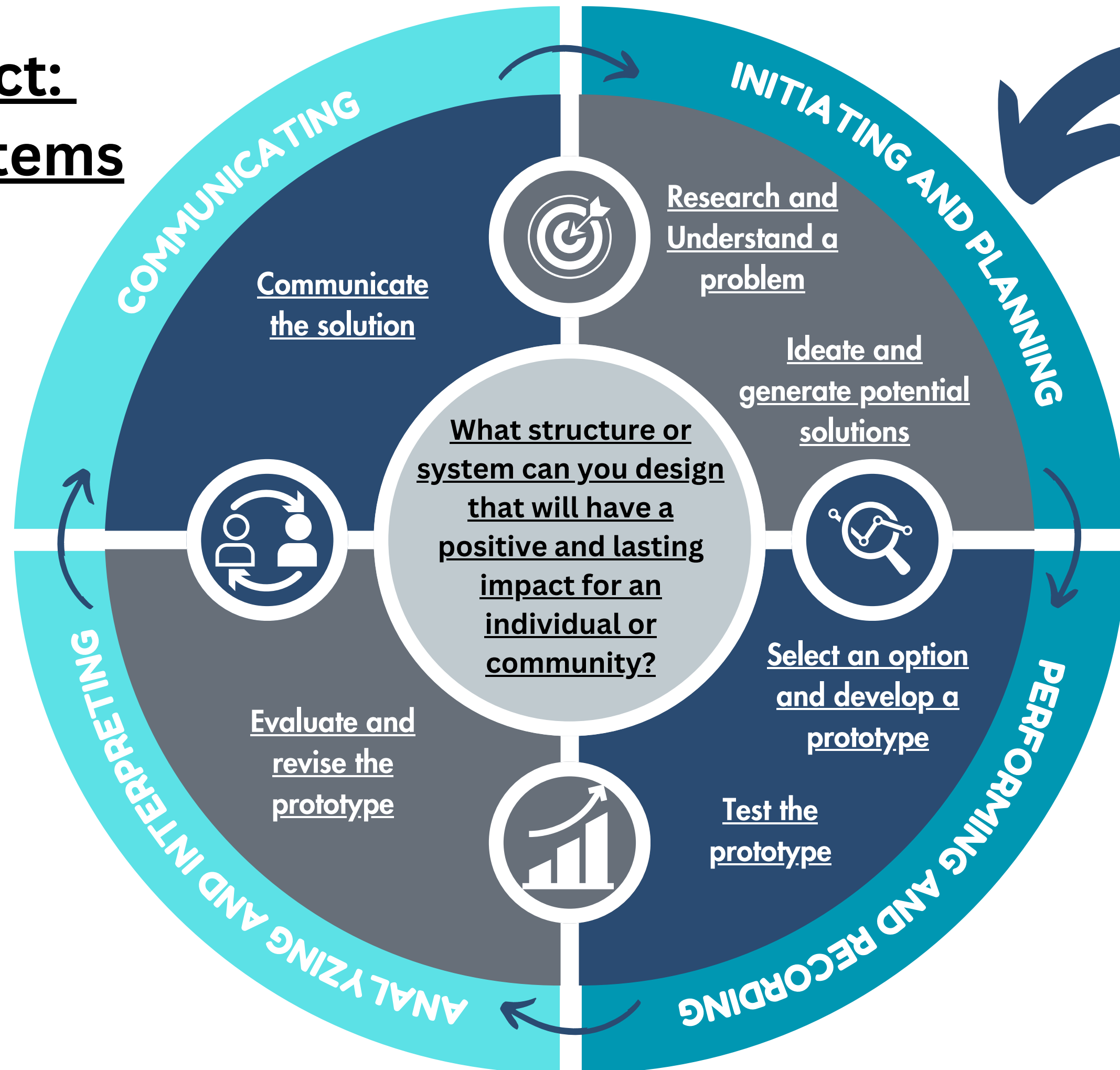
- Have students research how climate change has impacted their local region (Possible impacts might include: loss of biodiversity, loss of wetlands, invasive species, frequency of extreme weather events, flooding, poor air quality, drought, forest fires, algal bloom growth accelerated due to increased water temperatures, poor growing seasons for crops).

Inquiry Project: Living Systems



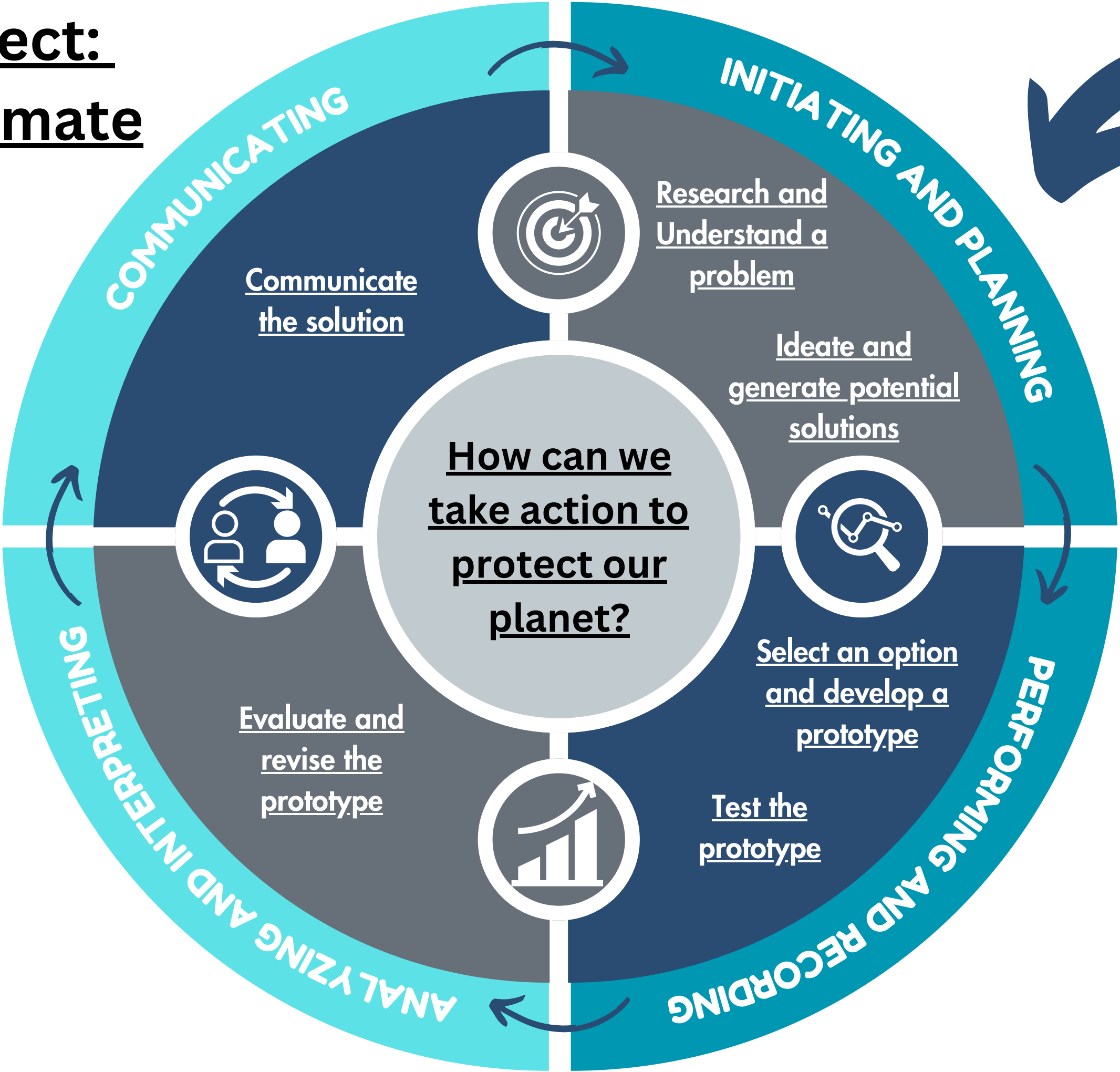
Click on any of the underlined elements of the engineering design process to take you to materials from that section of the inquiry project.

Inquiry Project: Structures/Systems



Click on any of the underlined elements of the engineering design process to take you to materials from that section of the inquiry project.

Inquiry Project:
Water and Climate
Change



Start Here

Click on any of the underlined elements of the engineering design process to take you to materials from that section of the inquiry project.