

Technology Education 7

Curriculum At a Glance

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Prepared by the Department of Education and Early Childhood Development

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Outcome

Learners will implement the design process in relation to the concept of Netukulimk

Rationale

In Technology Education, learners will solve increasingly complex problems and develop a more in depth understanding of the consequences of their possible solutions. Mastering the Design Process in relation to Netukulimk allows learners to break down large problems into smaller pieces through a logical and flexible process while striving to maintain harmony in nature.

As the design process is overarching to problem solving in any Technology Education context, this outcome is to be incorporated when addressing any of the other outcomes listed below.

Competencies

- Citizenship (CZ)
- Communication (COM)
- Critical Thinking (CT)
- Creativity and Innovation (CI)

Indicators

- **Analyse** the environmental footprint of materials (CZ/COM/CT)
- **Investigate** how life cycle analysis aligns with the teachings of Netukulimk (CZ/COM/CI/CT)
- **Evaluate** sustainable practices in relation to the concept of Netukulimk (CZ/COM)
- **Apply** the design process to a project (CZ/CT)
- **Investigate** how the design process is used to draft and improve a solution to a problem (CI/CT)

Concepts (and Guiding Questions)

Life cycle analysis

- What is the life cycle for a given product?
- How can I balance environmental and economic impact?
- How long will the product last?

Environmental Footprint

- What is meant by environmental footprint?
- What methods can be used to determine environmental footprint?

- Why is knowing the environmental footprint important?

Design Process

- What is the design process?
- Why are sketches and technical drawings necessary for the design process?
- How do I modify the design?
- What do I move from idea generation to application?
- How can the audience impact the design solution?
- How can we respond to the needs of an audience?

Repurposing/Upcycling

- How can I make use of leftover materials?
- What tools and materials can I use to minimize the environmental impact of a given product?

Netukulimk

- How does Netukulimk inform the design process?
- What is my responsibility regarding disposal of product?
- What is the final impact of the product?

Skills

Implement

Select - Locate several relevant and dependable details to support an answer

Plan – Formulate: Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices. Devise a process to solve the problem. Execute the steps, modifying as necessary.

Evaluate - Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

Apply - Carry out, use or complete a procedure/ technique.

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings.

Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives, and communicate findings.

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions; Identify potential new problems and/or issues; Justify decisions and/or findings.

Apply

Carry out, use or complete a procedure/ technique.

Outcome

Learners will evaluate the elements and principles of design for various media.

Rationale

Examples of good design can be found all around us in art, a building appearance and functionality, how a product looks or works, or even a commercial for a product. The elements and principles of design are fundamental building blocks that learners can use to help plan and construct successful projects. Good design is most often a result of design with intention and an understanding of these elements and principles will support learners in their ability to design effectively.

Competencies

- Communication (COM)
- Critical Thinking (CT)
- Creativity and Innovation (CI)

Indicators

- **Investigate** how the principles of design are used in media (COM/CI/CT)
- **Compare** the purposes of the principles and elements of design (COM/CI/CT)
- **Analyse** how audience and purpose inform the design of various media (COM/CI/CT)

Concepts (and Guiding Questions)

Demands of audience

- How can I identify my audience?
- How can my project meet the needs of the given audience?
- How can the audience influence my design?
- How do I evaluate the effectiveness of my design on a given audience?

Elements and principles of design

- What are the elements and principles of design?
- What principles are most effective for given medium and demands?
- What are the pros and cons of a given principle?
- How do the principles of design impact your proposed solution?

- What is the relationship between the principles of design and the target audience?

Skills

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions; Identify potential new problems and/or issues; Justify decisions and/or findings

Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives, and communicate findings.

Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings.

Outcome

Learners will implement a possible solution for communications technology need

Rationale

Being able to communicate effectively is one of the most important life skills to learn. Communication can be done verbally, written media, visually and non-verbally. We communicate for many reasons some of which include to educate, inform, entertain, persuade or control. Developing strong communication skills in various mediums will aid learners in all aspects of life.

Competencies

- Citizenship (CZ)
- Communication (COM)
- Critical Thinking (CT)
- Creativity and Innovation (CI)
- Technological Fluency (TF)

Indicators

- **Compare** the impact of various communication media in relation to audience (CT/CZ/TF)
- **Select** a communication medium in relation to audience and purpose (CT)
- **Formulate** possible designs for a communication technology need. (CT/CI)
- **Evaluate** ways that solutions can be modified for the needs of an audience (CI/CT)
- **Apply** the elements and principles of design in relation to a communications technology demand (COM/CI/CT/TF)
- **Plan** ways to share responses with an audience. (COM/TF)

Concepts (and Guiding Questions)

Communications technology

- What do I need to know about the equipment I am using?
- What are some types of communication?
- Why is avoidance of bias important?
- What careers might be involved in the implementation of the media solution?

Design problem

- Which available medium is the most effective?

- How do I verify that my given audience was reached?

Elements and principles of design

- How can the elements and principles of design influence my media solution?
- How do I use the elements and principles of design?

Responses

- How does modern media include or exclude certain audiences?
- How can I collect evidence from an intended audience?

Modifications

- What data can be used to evaluate the effectiveness of my solution?
- How can modifications be used to improve my results?

Skills

Implement

Select - Locate several relevant and dependable details to support an answer

Plan – Formulate: Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices. Devise a process to solve the problem. Execute the steps, modifying as necessary.

Evaluate - Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

Apply - Carry out, use or complete a procedure/ technique.

Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.

Select

Locate several relevant and dependable details to support an answer

Formulate

Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions; Identify potential new problems and/or issues; Justify decisions and/or findings.

Apply

Carry out, use or complete a procedure/ technique.

Plan

Formulate-Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

Devise a process to solve the problem. Execute the steps, modifying as necessary

Outcome

Learners will analyse how mechanical and electrical devices work

Rationale

With societies ever increasing reliability on mechanical and electrical devices it is important to have a basic understanding of functionality and efficiencies to help choose which products or services best meet our needs. Energy is required to move all objects from a standing position to a moving one and changing the direction of an object already in motion or the velocity of that object also requires an input of energy. Making these changes efficiently is important not only from an energy consumption perspective but also a durability perspective. Often the difference in the efficiency of devices is determined by the method used to put something into motion and how the direction of that motion is controlled and changed. Taking apart and examining a machine is a fun and practical way to gain meaningful understanding of the physical mechanics of a device.

Practicing safe work habits while examining these devices as well as exploring related careers in the manufacturing, distribution, use, repair and disposal of these devices will help learners better appreciate the value of the research and development that goes into every product design.

Competencies

- Communication (COM)
- Critical Thinking (CT)
- Creativity and Innovation (CI)
- Technological Fluency (TF)

Indicators

- **Question** how mechanical and electrical devices can be used to solve problems (COM/CT)
- **Investigate** how mechanical advantage is used in simple machines (COM/CT/TF)
- **Compare** devices that create or change motion (COM/CT/TF)
- **Investigate** the generation, storage, and uses of energy (COM/CI/CT/TF)
- **Analyse** the efficiency of control systems in a device (COM/CI/CT/TF)

Concepts (and Guiding Questions)

Mechanical advantage

- What is mechanical advantage?
- How is mechanical advantage used?

Simple machine

- What are simple machines?
- What forces are exerted by a device?
- How can a device be improved reverse engineering?

Motion

- How do devices change motion?
- What forces act upon a device?

Energy

- How is energy generated and transformed?
- How is energy used in a particular device?

Control systems

- What is a control system?
- How can a device be improved reverse engineering?
- What alternative control systems are available?

Skills

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings.

Question

Generate questions in response to increasingly complex problems and/or issues. Choose and develop a specific inquiry question to investigate.

Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives, and communicate findings.

Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.

Outcome

Learners will construct a solution to a design challenge

Rationale

Challenging learners with meaningful problems that need solving helps transform them from passive recipients of information to active learners through the creation of a solution. Learners need to develop the ability to apply problem solving skills and the use of design challenges is a great way for learners to explore, develop and improve these skills. Technology education labs can be quite different from school to school, but the building of projects is consistent throughout all. Learners learn by doing and meaningful project-based learning is at the heart of technology education. Authentic learning can happen through the construction of a solution to a challenge regardless of the success of the final product.

Competencies

- Communication (COM)
- Critical Thinking (CT)
- Creativity and Innovation (CI)
- Personal and Career Development (PCD)
- Technological Fluency (TF)

Indicators

- **Evaluate** available materials to address a design challenge (COM/CI/CT)
- **Plan** a solution to a design challenge (CI/CT/PCD/TF)
- **Analyse** a prototype in relation to a design challenge (COM/CI/CT)
- **Investigate** how prototypes can be modified to address a design challenge (CI/CT)

Concepts (and Guiding Questions)

Design challenge

- How can the parameters of a design challenge help me to construct a solution?
- How can the needs of my community help me to identify a possible challenge and/or solution?

Types of materials

- What materials are available?
- Can we process the material?
- What is the financial cost of the materials?
- How can the waste material be recycled?

- What is the durability of the material?

Prototype

- What is a prototype?
- Why is a prototype important?

Design process

- How does the design process guide the solution?
- How can setbacks be managed?
- How can the needs of your audience be met?
- What defines success?
- What modifications are necessary to your solution

Skills

Construct

Identify a purpose; brainstorm ideas; gather and select information to support a plan; identify and choose options within the plan; offer reasons to support choices; build a model; test and revise, modify as necessary; evaluate the results at each stage of the process; consider alternative options.

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions or findings; Identify potential new problems and/or issues; Justify decisions and/or findings.

Plan

Formulate-Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

Devise a process to solve the problem. Execute the steps, modifying as necessary

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings.

Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives, and communicate findings.

Outcome

Learners will formulate possible improvements for an existing product

Rationale

The ability to critically assess a product is a valuable skill for everyone to develop to help make wise decisions that help protect and advance society. In a consumer based society we need products to evolve and improve for economic, environmental and safety reasons and an informed consumer will drive the demand for these improvements. Product research and development provides career pathways in all economic sectors and formulating improvements to anything requires a high level of thinking and the application of logic. Having learners go through the formal process of formulating possible improvements to an existing product will help further develop and reinforce the required skills these learners will use throughout their lives.

Competencies

- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)

Indicators

- **Select** a product that requires improvement (CT)
- **Analyse** the limitations of a product (CI/CT)
- **Investigate** ways to improve a product (CI/CT/COM)
- **Evaluate** potential improvements for a product (COM/CI/PCD)

Concepts (and Guiding Questions)

Limitations of a product

- What does "limitation" mean?
- What are the pros and cons of an existing product?
- What data can be used to determine the limitations of a product?

Improvements for a product

- What alternatives can be suggested for improvement?
- What data can be used to evaluate modifications?

Skills

Formulate

Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

Select

Locate several relevant and dependable details to support an answer

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings.

Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives, and communicate findings.

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions; Identify potential new problems and/or issues; Justify decisions and/or findings.

Outcome

Learners will construct a product in response to audience need

Rationale

One of the fundamental elements of technology education is the combination of head and hands on learning through design and problem solving. Throughout many homes in Nova Scotia, many technology education projects are proudly displayed and hold fond memories of learning and school. Construction of school projects happens in many curriculum areas and is certainly not limited technology education. To construct is not simply assembling but rather requires designing, planning, evaluating, selecting, justifying, testing, etc. There are often many different solutions that can satisfy the prescribed requirements of a project and knowing one's audience increases the chances of developing the most successful solution.

Competencies

- Citizenship (CZ)
- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

Indicators

- **Analyse** the needs of an audience (CZ/COM/CT)
- **Formulate** a design in relation to audience need (CZ/COM/CT)
- **Evaluate** possible modifications to the design throughout the process (CI/CT)
- **Analyse** steps to eliminate unsafe practices in construction (PCD/COM/CT)
- **Apply** safe practices for all applicable tools, machines and locations (CT/TF/PCD)

Concepts (and Guiding Questions)

Audience need

- How does my project meet the needs of the audience?
- How does my project meet the needs of the audience?

Project plan

- What resources are available?

- What are the constraints for constructing my project?
- How can the available resources be best used?
- How does the design process guide product development?

Safe practices/Safety-Net

- Why is safety important?
- How can I plan for safety?
- What is Safety-Net?
- How do I implement Safety-Net protocols?

Design process

- How does my project meet the needs of the audience?
- What resources are available?
- What are the constraints for constructing my project?
- How can the available resources be best used?
- How does the design process guide product development?

Skills

Construct

Identify a purpose; brainstorm ideas; gather and select information to support a plan; identify and choose options within the plan; offer reasons to support choices; build a model; test and revise, modify as necessary; evaluate the results at each stage of the process; consider alternative options.

Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives; communicate findings

Formulate

Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

Evaluate

Review processes and results from an inquiry; Consider and communicate varying perspectives and alternative solutions; Identify potential new problems and/or issues; Justify decisions and/or findings.

Apply

Carry out, use or complete a procedure/ technique.