



Powertrain and Chassis 110

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1. Introduction

1.1 Mission and Vision of Educational System

The New Brunswick Department of Education and Early Childhood Development is dedicated to providing the best public education system possible, wherein all students have a chance to achieve their academic best. The mission statement for New Brunswick schools is:

Each student will develop the attributes needed to be a lifelong learner, to achieve personal fulfillment and to contribute to a productive, just and democratic society.

1.2 New Brunswick Global Competencies

New Brunswick Global Competencies provide a consistent vision for the development of a coherent and relevant curriculum. The statements offer students clear goals and a powerful rationale for school work. They help ensure that provincial education systems' missions are met by design and intention. The New Brunswick Global Competencies statements are supported by curriculum outcomes.

New Brunswick Global Competencies are statements describing the knowledge, skills and attitudes expected of all students who graduate high school. Achievement of the New Brunswick Global Competencies prepares students to continue to learn throughout their lives. These Competencies describe expectations not in terms of individual school subjects but in terms of knowledge, skills and attitudes developed throughout the curriculum. They confirm that students need to make connections and develop abilities across subject boundaries if they are to be ready to meet the shifting and ongoing demands of life, work and study today and in the future.

See Appendix 6.1.

2. Pedagogical Components

2.1 Pedagogical Guidelines

Diverse Cultural Perspectives

It is important for teachers to recognize and honour the variety of cultures and experiences from which students are approaching their education and the world. It is also important for teachers to recognize their own biases and be careful not to assume levels of physical, social or academic competencies based on gender, culture, or socio-economic status.

Each student's culture will be unique, influenced by their community and family values, beliefs, and ways of viewing the world. Traditional aboriginal culture views the world in a much more holistic way than the dominant culture. Disciplines are taught as connected to one another in a practical context, and learning takes place through active participation, oral communication and experiences. Immigrant students may also be a source of alternate world views and cultural understandings. Cultural variation may arise from the differences between urban, rural and isolated communities. It may also arise from the different value that families may place on academics or athletics, books or media, theoretical or practical skills, or on community and church. Providing a variety of teaching and assessment strategies to build on this diversity will provide an opportunity to enrich learning experiences for all students.

Universal Design for Learning

The curriculum has been created to support the design of learning environments and lesson plans that meet the needs of all learners. Specific examples to support Universal Design for Learning for this curriculum can be found in the appendices. The **Planning for All Learners Framework** will guide and inspire daily planning.

See Appendix 6.2

English as an Additional Language Curriculum

Being the only official bilingual province, New Brunswick offers the opportunity for students to be educated in English and/or French through our public education system. The EECD provides leadership from K-12 to assist educators and many stakeholders in supporting newcomers to New Brunswick. English language learners have opportunities to receive a range of instructional support to improve their English language proficiency through an inclusive learning environment. EECD, in partnership with the educational and wider communities offer a solid, quality education to families with school-aged children.

2.2 Pedagogical Guidelines

Assessment Practices

Assessment is the systematic gathering of information about what students know and are able to do. Student performance is assessed using the information collected during the evaluation process. Teachers use their professional skills, insight, knowledge, and specific criteria that they establish to make judgments about student performance in relation to learning outcomes. Students are also encouraged to monitor their own progress through self-assessment strategies, such as goal setting and rubrics.

Research indicates that students benefit most when assessment is regular and ongoing and is used in the promotion of learning (Stiggins, 2008). This is often referred to as formative assessment. Evaluation is less effective if it is simply used at the end of a period of learning to determine a mark (summative evaluation).

Summative evaluation is usually required in the form of an overall mark for a course of study, and rubrics are recommended for this task. Sample rubrics templates are referenced in this document, acknowledging teachers may have alternative measures they will apply to evaluate student progress.

Some examples of current assessment practices include:

• Questioning	• Projects and Investigations
• Observation	• Checklists/Rubrics
• Conferences	• Responses to texts/activities
• Demonstrations	• Reflective Journals
• Presentations	• Self and peer assessment
• Role plays	• Career Portfolios
• Technology Applications	• Projects and Investigations

Formative Assessment

Research indicates that students benefit most when assessment is ongoing and is used in the promotion of learning (Stiggins, 2008). Formative assessment is a teaching and learning process that is frequent and interactive. A key component of formative assessment is providing ongoing feedback to learners on their understanding and progress. Throughout the process adjustments are made to teaching and learning.

Students should be encouraged to monitor their own progress through goal setting, co-constructing criteria and other self-and peer-assessment strategies. As students become more involved in the assessment process, they are more engaged and motivated in their learning.

Additional details can be found in the Formative Assessment document.

Summative Assessment

Summative evaluation is used to inform the overall achievement for a reporting period for a course of study. Rubrics are recommended to assist in this process. Sample rubrics templates are referenced in this document, acknowledging teachers may have alternative measures they will apply to evaluate student progress.

For further reading in assessment and evaluation, visit the Department of Education and Early Childhood Development's Assessment and Evaluation site [here](#).

Cross Curricular Literacy

Literacy occurs across learning contexts and within all subject areas. Opportunities to speak and listen, read and view, and write and represent are present every day -in and out of school.

3. Subject Specific Guidelines

3.1 Rationale

Powertrain and Chassis 110 is designed to develop proficiency in the repair, overhaul, service, and testing of the automobile chassis and power train. Emphasis is placed on the function, repair and replacement of components and includes spring and shock assemblies, brakes, steering, wheel bearings, tires, transmissions, differentials, and drive lines.

This course develops the interdisciplinary skills of observation, reflection, documentation, purposeful/intentional planning, goal setting, decision-making, and problem-solving. This course will also incorporate using a hands-on approach of both project-based and experiential learning.

3.2 Course Description

The overall aim of this course is to cultivate the need and desire of students to follow safe work practices and to develop the language and work skills of the trade by being able to:

- demonstrate the skills and knowledge required for taking the necessary precautions in the prevention of accidents in the workplace (General Occupational Health and Safety);
- identify the various materials, tools, techniques, and rules governing the automotive repair industry;
- exploration of employment skills and career awareness in automotive repair and the associated trades (heavy equipment, farm machinery, diesel engine repair and truck and transport industries);
- explore potential employment options looking at provincial statistics and industry projections; and,
- identify the certification and continued education available at colleges and universities as well as an awareness of the Canadian Red Seal Certification Program and its professional designation (RSE).

3.3 Curriculum Organizers and Outcomes

Outcomes

The New Brunswick Curriculum is stated in terms of general curriculum outcomes, specific curriculum outcomes and achievement indicators.

General Curriculum Outcomes (GCO) are overarching statements about what students are expected to learn in each strand/sub-strand. The general curriculum outcome for each strand/sub-strand is the same throughout the grades.

Specific Curriculum Outcomes (SCO) are statements that identify specific concepts and related skills underpinned by the understanding and knowledge attained by students as required for a given grade.

Learning Outcomes Summary Chart

GCO 1	Students will examine employment practices and Occupational Health and Safety legislation.
SCO 1.1	Students will examine safe and legal workplace procedures.
SCO 1.2	Students will describe ethical and legal workplace behavior.
SCO 1.3	Students examine employment opportunities, trades designations, and the Canadian Red Seal Certification program.

GCO 2	Students will identify and select interdisciplinary hand tools, power tools, and fasteners.
SCO 2.1	Students will identify, select and care for basic hand tools.
SCO 2.2	Students will identify, select and care for basic power tools.
SCO 2.3	Students will identify and select proper fasteners for the specific application.

GCO 3	Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.
SCO 3.1	Students will identify, select, and interpret service information.

SCO 3.2	Students will identify and interpret standard and metric measurement systems
SCO 3.3	Students will identify, select, and appropriately use specialty equipment related to working in a vehicle repair facility.
SCO 3.4	Students will identify, select, use, and maintain tools and equipment used in the repair of power train and chassis.

GCO 4	Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.
SCO 4.1	Students will classify body and chassis types.
SCO 4.2	Students will interpret and investigate suspension systems.
SCO 4.3	Students will compare and examine steering systems and components.
SCO 4.4	Students will identify, inspect, and repair tires and wheels.

GCO 5	Students will demonstrate an understanding of brake systems and components of services brakes.
SCO 5.1	Students will identify, inspect and repair basic brake hydraulic principles.
SCO 5.2	Students will identify and interpret antilock brake systems (ABS), traction control, and proximity controls.

GCO 6	Students will identify and explain the operation of clutch, manual transmission/transaxle, and driveline assemblies.
SCO 6.1	Students will compare, adjust and examine clutch assemblies.
SCO 6.2	Students will interpret and investigate manual transmissions/ transaxles and transfer cases.
SCO 6.3	Students will identify, interpret and service differentials and drive axles.

4. Curriculum Outcomes

GCO 1 Students will examine employment practices and Occupational Health and Safety legislation.	
SCO 1.1	Students will examine safe and legal workplace procedures.
Concepts and Content	I Can – exemplars:
<p>New Brunswick Construction Safety Association (NBCSA) online training courses in Workplace Hazardous Materials Information Systems (WHMIS) and Safety Orientation to learn safe work practices regarding WHMIS and the Employment Standards Act.</p> <p>Safe body mechanics (i.e. back safety, lifting, etc.).</p> <p>Basic First Aid.</p>	<p>I can identify potential consequences for unsafe procedures.</p> <p>I can interpret WHMIS symbols as identification for hazardous products.</p> <p>I can locate and properly use safety equipment.</p> <p>I can use Personal Protective Equipment (PPE).</p> <p>I can lockout and tag-out equipment with proper procedures.</p> <p>I can give examples of potential hazards with inappropriate clothing, footwear, and jewellery.</p> <p>I can understand back safety.</p> <p>I can use proper lifting techniques.</p> <p>I can demonstrate safe working loads.</p> <p>I can understand the importance of ergonomics and body mechanics.</p> <p>I can use proper body position when using tools.</p> <p>I can respond to potential hazard or injury.</p>

GCO 1: Students will examine employment practices and Occupational Health and Safety legislation.

Resources		
Video	Website	Document
	New Brunswick Construction Safety Association https://www.worksafenb.ca/	

GCO 1: Students will examine employment practices and Occupational Health and Safety legislation.

SCO 1.2 Students will describe ethical and legal workplace behavior.		
Concepts and Content		I Can – exemplars:
<p>Interacting with customers’ property regarding appropriate responsible resource management.</p> <p>Obligations to an owner (e.g. bonding, liability, privacy).</p> <p>Examine codes of ethics of organizations and companies.</p>		<p>I can co-construct a description of appropriate workplace behavior based on my own and my peers’ experiences.</p>
Resources		
Video	Website	Document
	<p>https://www.eca.nb.ca/about/code-of-ethics/</p> <p>http://www.cba.org/Publications-Resources/Practice-Tools/Ethics-and-Professional-Responsibility-(1)/Codes-of-Professional-Conduct</p> <p>http://www.cips.ca/ethics</p>	

GCO 1: Students will examine employment practices and Occupational Health and Safety legislation.

SCO 1.3 Students will examine employment opportunities, trades designations, and the Canadian Red Seal Certification program.		
Concepts and Content		I Can – exemplars:
<p>Job descriptions and employment opportunities in the skilled trades.</p> <p>Post secondary training options have grown in New Brunswick.</p> <p>There are some trades that are designated.</p> <p>The red seal certification program has a professional designation.</p>		<p>I can discuss employment opportunities and statistics for tradespeople.</p> <p>I can explore post secondary options or apprenticeship programs for trade training.</p> <p>I can identify a designated trade.</p> <p>I can explain the Red Seal Certification Program and its professional designation RSE.</p>
Resources		
Video	Website	Document
	<p>http://nbcc.ca/</p> <p>www.eastcoasttrades.com</p> <p>https://www2.gnb.ca/content/gnb/en/departments/post-secondary_education_training_and_labour/Skills/content/ApprenticeshipAndTrades.html</p> <p>http://www.red-seal.ca/w.2lc.4m.2-eng.html</p>	

GCO 2: Students will identify and select interdisciplinary hand tools, power tools, and fasteners.

GCO 2 Students will identify and select interdisciplinary hand tools, power tools, and fasteners.

SCO 2.1 Students will identify, select and care for basic hand tools.		
Concepts and Content		I Can – exemplars:
Hand tool selection, use, and care.		I can identify, care for and safely use the appropriate: clamping devices, pliers, wrenches, screwdrivers, striking tools, chisels, saws, and files.
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 2: Students will identify and select interdisciplinary hand tools, power tools, and fasteners.

SCO 2.2 Students will identify, select and care for basic power tools.		
Concepts and Content		I Can – exemplars:
Power tool selection, use, and care.		<p>I can identify, care for, and safely use the appropriate pneumatic, electric, or battery-operated power tools</p> <p>I can choose the appropriate pneumatic, electric, or battery-operated tool for the task at hand.</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 2: Students will identify and select interdisciplinary hand tools, power tools, and fasteners.

SCO 2.3 Students will identify and select proper fasters for the specific application.		
Concepts and Content		I Can – exemplars:
Fastener selection, use, and care.		I can identify and safely use the appropriate temporary, removable, or permanent fasteners for the application (screws, bolts and nuts, washers, clips, rivets, glues, and epoxies).
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 3: Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.

GCO 3 Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.		
SCO 3.1 Students will identify, select, and interpret service information.		
Concepts and Content		I Can – exemplars:
Students will learn about vehicle components and locations, service information, vehicle identification, parts ordering, vehicle service vocabulary and communication techniques.		<p>I can locate and interpret vehicle and component identification numbers.</p> <p>I can locate and interpret vehicle specifications.</p> <p>I can use shop manuals.</p> <p>I can order parts.</p> <p>I can interpret work orders.</p> <p>I can interpret and communicate test results.</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 3: Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.

SCO 3.2 Students will identify and interpret standard and metric measurement systems	
Concepts and Content	I Can – exemplars:
Students will become familiar with fractional inch and metric measuring systems; they will also understand the need for both fractional inch and decimal inch systems in the trade area and be able to relate them with the metric system.	<p>I can use proper place values.</p> <p>I can work with equivalent fractions.</p> <p>I can convert from fractions to decimals and vice versa.</p> <p>I can use conversion charts.</p> <p>I can choose how to work with measurements that are dimensioned in fractional inches, decimal inches, and metric units.</p>
Resources	
Video	<p>Website</p> <p>CDX Global</p> <p>ProDemand.com</p>
	Document

GCO 3: Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.

SCO 3.3	Students will identify, select, and appropriately use specialty equipment related to working in a vehicle repair facility.	
Concepts and Content	I Can – exemplars:	
Vehicle repair facility capital equipment and general repair tools. Vehicle environmental concerns relating to repair and service: storing and recycling of consumable materials and vehicle routine maintenance substances (Oil, Anti-Freeze, filters, tires).	<p>I can choose and use:</p> <ul style="list-style-type: none"> • electric or hydraulic tools (floor jacks, engine lifts, presses, hoists, electric drills, valve grinding equipment, grinders, extension cords, lights, parts, washers) • air tools (impact wrenches, ratchets, blow nozzles); • clamping or holding tools (engine holding fixtures, bench vice, safety stands) • hazardous waste storage and recycling containers 	
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 3: Students will identify, select, and interpret service information, measurement, shop equipment, and specialty tools.

SCO 3.4	Students will identify, select, use, and maintain tools and equipment used in the repair of power train and chassis.	
Concepts and Content	I Can – exemplars:	
Powertrain and Chassis specialty tools for diagnostics, service and repair.	<p>I can identify and use specialty tools:</p> <ul style="list-style-type: none"> • pullers • torque wrench • flaring tools • tie rod end spreaders • ball joint and bushing tools • universal joint remover • coil spring compressor • brake tools • clutch alignment tools 	
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 4: Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.

GCO 4 Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.		
SCO 4.1 Students will classify body and chassis types.		
Concepts and Content		I Can – exemplars:
Vehicle construction and chassis types.		I can identify and explain frame designs: <ul style="list-style-type: none"> • full frame (ladder and perimeter frame) • unibody • sub frames
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 4: Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.

SCO 4.2 Students will interpret and investigate suspension systems.		
Concepts and Content		I Can – exemplars:
Steering and suspension component maintenance, service and repair.		I can identify and explain functions of suspension systems: <ul style="list-style-type: none"> • check ball joints for wear • check tie-rod ends for wear • springs: coil, leaf, torsion bars, air bags • service control arms • wheel bearings • shocks and strut types) gas filled, air, oil filled, magnetorheological dampers)
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 4: Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.

SCO 4.3 Students will compare and examine steering systems and components.		
Concepts and Content		I Can – exemplars:
Steering system types, operation, alignment principles and steering geometry.		I can identify and explain the function and operation of steering systems: <ul style="list-style-type: none"> • steering geometry (caster, chamber, and toe-in) • steering types (steering box and components, rack and pinion) • manual and both electrically and hydraulically assisted
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 4: Students will demonstrate an understanding of the operating principles and describe the components of steering, suspension systems, and tire and wheel assemblies.

SCO 4.4 Students will identify, inspect and repair tires and wheels.		
Concepts and Content		I Can – exemplars:
Tire and wheel construction and servicing.		<p>I can identify types and construction of tires.</p> <p>I can identify wheel design and construction.</p> <p>I can identify tire monitoring systems and service according to manufacturers recommendations.</p> <p>I can rotate tires properly for the vehicle drive type and tire construction.</p> <p>I can change and repair tires.</p> <p>I can demonstrate an understanding of wheel balance (static, dynamic).</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 5: Students will demonstrate an understanding of brake systems and components of brakes systems.

GCO 5 Students will demonstrate an understanding of brake systems and components of brakes systems.		
SCO 5.1 Students will identify, inspect and repair basic brake hydraulic principles.		
Concepts and Content		I Can – exemplars:
Hydraulic brake operation service and repair.		<p>I can explain operation of master cylinders, wheel cylinders, calipers, and valve assembly.</p> <p>I can identify and service drum brakes assemblies.</p> <p>I can diagnose and service disc brake assemblies.</p> <p>I can bleed brake system as per manufacturer’s specifications.</p> <p>I can explain application of brake fluid.</p> <p>I can identify types of tubing and flaring procedures.</p> <p>I can describe and service flex lines.</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 5: Students will demonstrate an understanding of brake systems and components of brakes systems.

SCO 5.2	Students will identify and interpret antilock brake systems (ABS), traction control, and proximity controls.	
Concepts and Content	I Can – exemplars:	
Antilock brake and traction control system components, operation and advances.	I can identify and explain the operating principles of antilock brake systems (ABS) and Traction control systems: <ul style="list-style-type: none"> • wheel speed sensors (integral and external) • sensor rotors • ABS control module • electro-hydraulic modulator • warning lights 	
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 6: Students will identify and explain the operation of clutch, manual transmission/transaxle, and driveline assemblies.

GCO 6 Students will identify and explain the operation of clutch, manual transmission/transaxle, and driveline assemblies.		
SCO 6.1 Students will compare, adjust and examine clutch assemblies.		
Concepts and Content		I Can – exemplars:
Clutch system component identification, service and repair.		<p>I can identify and explain the operation of:</p> <ul style="list-style-type: none"> • clutch assemblies • friction disks • release bearings (mechanical and hydraulic) • types of pressure plate (coil spring, diaphragm pressure type) <p>I can adjust clutch linkage, pedal free play.</p> <p>I can service, replace, and bleed hydraulic slave and master cylinder components.</p> <p>I can identify, remove, and service pilot bearing.</p> <p>I can diagnose, troubleshoot, and service clutch systems.</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

GCO 6: Students will identify and explain the operation of clutch, manual transmission/transaxle, and driveline assemblies.

SCO 6.2 Students will interpret and investigate manual transmissions/ transaxles and transfer cases.	
Concepts and Content	I Can – exemplars:
<p>Manual transmission and transfer case operation and component identification.</p> <p>Gear ratios</p>	<p>I can explain manual transmission operating procedures (power flow and drive, driven and idler gears).</p> <p>I can identify and explain operation of manual transaxle assemblies.</p> <p>I can explain and identify transfer case types and components, service as available.</p> <p>I can identify and explain basic manual transmission components (transmission input shaft, transmission gears, synchronizers, shift forks, shift linkage, gear shift lever, output shaft).</p> <p>I can use formulas to calculate and determine gear ratios and output speed of output shaft.</p>
Resources	
Video	<p>Website</p> <p>CDX Global</p> <p>ProDemand.com</p> <p>Document</p>

GCO 6: Students will identify and explain the operation of clutch, manual transmission/transaxle, and driveline assemblies.

SCO 6.3 Students will identify, interpret and service differentials and drive axles.		
Concepts and Content		I Can – exemplars:
<p>Driveshaft component, diagnosis and repair. Universal joints and Constant velocity joints Differentials and final drive ratios.</p>		<p>I can identify, type, and service drive line components.</p> <p>I can remove and replace drive shafts and drive axles.</p> <p>I can identify types of universal joints and retention methods and service as available:</p> <ul style="list-style-type: none"> • cross and roller • ball and trunnion • constant velocity • replace support bearing <p>I can identify the major parts of a rear drive axle assembly.</p> <p>I can compare different types of axles.</p> <p>I can identify and explain operation of various differential designs.</p>
Resources		
Video	Website CDX Global ProDemand.com	Document

5. Bibliography

Common Content

Universal Design for Learning, Center for Applied Special Technology (CAST) <http://www.cast.org/>

Nelson, Louis Lord (2014). Design and Deliver: Planning and Teaching Using Universal Design for Learning. 1st Edition, Paul H. Brooks Publishing Co.

Subject Specific

POWER TRAIN AND CHASSIS 110 (Graduation Credit Value - One Credit) Course code: EIPTBO 1981 and 2005 documents.

CDX Learning: [CDX Global](#)

[ProDemand.com](#)

<https://www.eca.nb.ca/about/code-of-ethics/>

[http://www.cba.org/Publications-Resources/Practice-Tools/Ethics-and-Professional-Responsibility-\(1\)/Codes-of-Professional-Conduct](http://www.cba.org/Publications-Resources/Practice-Tools/Ethics-and-Professional-Responsibility-(1)/Codes-of-Professional-Conduct)

<http://www.cips.ca/ethics>

<http://nbcc.ca/>

www.eastcoasttrades.com

https://www2.gnb.ca/content/gnb/en/departments/post-secondary_education_training_and_labour/Skills/content/ApprenticeshipAndTrades.html

<http://www.red-seal.ca/w.2lc.4m.2-eng.html>

6. Appendices

6.1 New Brunswick Global Competencies

Critical Thinking and Problem-Solving	Innovation, Creativity, and Entrepreneurship	Self-Awareness and Self-Management
<ul style="list-style-type: none"> • Engages in an inquiry process to solve problems • Acquires, processes, interprets, synthesizes, and critically analyzes information to make informed decisions (i.e., critical and digital literacy) • Selects strategies, resources, and tools to support their learning, thinking, and problem-solving • Evaluates the effectiveness of their choices • Sees patterns, makes connections, and transfers their learning from one situation to another, including real-world applications • Analyzes the functions and interconnections of social, ecological, and economic systems • Constructs, relates and applies knowledge to all domains of life, such as school, home, work, friends, and community • Solves meaningful, real-life, and complex problems by taking concrete steps to address issues and design and manage projects • Formulates and expresses questions to further their understanding, thinking, and problem-solving 	<ul style="list-style-type: none"> • Displays curiosity, identifies opportunities for improvement and learning, and believes in their ability to improve • Views errors as part of the improvement process • Formulates and expresses insightful questions and opinions to generate novel ideas • Turns ideas into value for others by enhancing ideas or products to provide new-to-the-world or improved solutions to complex social, ecological, and economic problems or to meet a need in a community • Takes risks in their thinking and creating • Discovers through inquiry research, hypothesizing, and experimenting with new strategies or techniques • Seeks and makes use of feedback to clarify understanding, ideas, and products • Enhances concepts, ideas, or products through a creative process 	<ul style="list-style-type: none"> • Has self-efficacy, sees themselves as learners, and believes that they can make life better for themselves and others • Develops a positive identity, sense of self, and purpose from their personal and cultural qualities • Develops and identifies personal, educational, and career goals, opportunities, and pathways • Monitors their progress • Perseveres to overcome challenges • Adapts to change and is resilient in adverse situations • Aware of, manages, and expresses their emotions, thoughts, and actions in order to understand themselves and others • Manages their holistic well-being (e.g., mental, physical, and spiritual) • Accurately self-assesses their current level of understanding or proficiency • Advocates for support based on their strengths, needs, and how they learn best • Manages their time, environment, and attention, including their focus, concentration, and engagement

Collaboration	Communication	Sustainability and Global Citizenship
<ul style="list-style-type: none"> • Participates in teams by establishing positive and respectful relationships, developing trust, and acting interdependently and with integrity • Learns from and contributes to the learning of others by co-constructing knowledge, meaning, and content • Assumes various roles on the team and respects a diversity of perspectives • Addresses disagreements and manages conflict in a sensitive and constructive manner • Networks with a variety of communities/groups • Appropriately uses an array of technology to work with others • Fosters social well-being, inclusivity, and belonging for themselves and others by creating and maintaining positive relationships with diverse groups of people • Demonstrates empathy for others in a variety of contexts 	<ul style="list-style-type: none"> • Expresses themselves using the appropriate communication tools for the intended audience • Creates a positive digital identity • Communicates effectively in French and/or English and/or Mi'kmaq or Wolastoqey through a variety of media and in a variety of contexts • Gains knowledge about a variety of languages beyond their first and additional languages • Recognizes the strong connection between language and ways of knowing the world • Asks effective questions to create a shared communication culture, attend to understand all points of view, express their own opinions, and advocate for ideas 	<ul style="list-style-type: none"> • Understands the interconnectedness of social, ecological, and economic forces, and how they affect individuals, societies, and countries • Recognizes discrimination and promotes principles of equity, human rights, and democratic participation • Understands Indigenous worldviews, traditions, values, customs, and knowledge • Learns from and with diverse people, develop cross-cultural understanding • Understands the forces that affect individuals and societies • Takes action and makes responsible decisions that support social settings, natural environments, and quality of life for all, now and in the future • Contributes to society and to the culture of local, national, global, and virtual communities in a responsible, inclusive, accountable, sustainable, and ethical manner • Participates in networks in a safe and socially responsible manner.
Foundation of Literacy and Numeracy		

6.2 Universal Design for Learning (UDL)

UDL helps meet the challenge of diversity by suggesting flexible instructional materials, techniques, and strategies that empower educators to meet these varied needs. UDL research demonstrates that the challenge of diversity can and must be met by making curriculum flexible and responsive to learner differences. UDL provides guidelines to minimize barriers and maximize learning for all.

Is there a form of assistive technology that could be used to enhance/facilitate this lesson?	General Examples	Example in your subject area
Are there materials which can appropriately challenge readers to enhance this learning?	Audiobooks, EBSCO, Worldbook Online	
Are there students in this group who cannot access this learning (PLP background) and whose needs I must revisit before teaching?	PLP information/considerations	
Are there other choices that can be provided in this learning opportunity?	Differentiation models (RAFTs...)	
Is there another/a variety of media available? Only paper-based? Can it be listening? Can I add a visual component?		
Can movement be involved?	Quantum techniques	

Grouping and regrouping?	Cooperative learning; team games and tournaments	
Teacher versus non- teacher centered? Instructional design strategies –...	web based lesson... project-based, student research based	
Contracts?		
Opportunities for students to propose variations to the assignments/projects?	Tic Tac Toe	
Use of art /music / technology?	Songs, Videos, URL, YouTube	
Can I use drama? Art....	Use of improvisation; Skits; reader's theater; Can we make something? Demonstrate understanding visually? Paint a painting?	
Is there a plan to support the student/s who might already know this subject matter? Enrichment	Triad Model	
Does the language level need to be adjusted for the student to access this learning?	Link to adjust language level of text; CEFR information... SIOP techniques for EL learners; use of alternate texts...	

<p>Is there an independent or collaborative activity-project that would be better meet the needs of one or more students?</p>		
<p>Are there any experts that I could bring into the classroom electronically or as a guest speaker?</p>	<p>Speakers list, Skype contacts, media links, television documentary, archived historical documents</p>	
<p>Have I linked the goal to as current event or a cultural event in the student's lives? Can I make the learning more relevant?</p>	<p>Can this be applied in real life? TED talk, news item; societal trend, popular song? Can we start the unit and adjust or create it based on the students, interests or direction?</p>	
<p>Is there a hands-on experience that we could do to launch this lesson or this learning?</p>		