Manufacturing Trades 11

Guide

NOVA SCOTIA
NOUVELLE-ÉCOSSE

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Manufacturing Trades 11

Prepared by the Department of Education and Early Childhood Development

This is the most recent version of the current curriculum materials as used by teachers in Nova Scotia.

Manufacturing Trades 11

Background

Skilled trades education has been designed specifically to mirror the realities of working as a tradesperson in Nova Scotia's labour force. In an experiential learning environment, under the guidance of a certified journeyperson teacher, learners learn about safety, measurement and calculations, tools and materials, and trades realities including the role of apprenticeship training in the development of skilled tradespeople. Skilled trades courses give learners a realistic idea of what it is like to work in the trades.

Manufacturing Trades 11 is for learners to investigate careers available in the manufacturing trades while working with the tools and processes of the manufacturing trades to learn skills required to work in the manufacturing industry. Following the apprenticeship model, learners in Manufacturing Trades 11 will spend approximately 20% of their time learning the theoretical, regulatory, and conceptual aspects of the manufacturing trades. The remaining 80% of the course is task-oriented work in the trades. Specifically, learners complete manufacturing-related trades skill-building projects. Learners are expected to develop physical skills, manipulate tools, and interpret project drawings.

Outcomes and Indicators

Learners will analyse current and evolving careers, including pathways for diverse groups of people.

Indicators

- Investigate the roles and responsibilities of various manufacturing trades careers, including entrepreneurial opportunities (COM/PCD/CT/TF)
- Compare labour market information including current and future opportunities for employment, trade's needs, and salary scales (COM/PCD/CT/TF)
- Analyse the essential skills necessary for a range of manufacturing trades careers (CZ/COM/PCD/CT)
- Analyse personal suitability for careers in the manufacturing trades (CZ/COM/PCD/CT)
- Compare different types of manufacturing (welding/fabricating, pipe fitting, sheet metal) (COM/PCD/CT/TF)

Learners will evaluate employability skills necessary for manufacturing trades related careers.

Indicators

- Investigate how technology changes in manufacturing trades (CZ/COM/PCD/CT/TF)
- Analyse personal development of employability skills (CZ/COM/PCD/CT)
- Investigate businesses of personal interest, including opportunities for entrepreneurship (COM/PCD/CT/TF)
- Apply personal management and teamwork skills (CZ/COM/PCD/CT)

Learners will implement applicable workplace health and safety practices and procedures.

Indicators

- Evaluate safe operating procedures associated with required tools and other equipment (COM/PCD/CT/TF)
- Implement safety training that could be expected in a workplace setting (COM/PCD/CT/TF)
- Implement the safe use of personal protective equipment, materials, tools and equipment (COM/PCD/CT/TF)
- Implement safety testing for individual manufacturing tools and equipment (COM/PCD/CT/TF)

Learners will plan a construction project including the use of manufacturing trades' related documents and drawings.

Indicators

- Interpret manufacturing drawings (COM/PCD/CT/TF)
- Scale manufacturing-related drawings (COM/PCD/CT/TF)
- Apply spatial perception through orthographic and isometric projection (COM/PCD/CT/TF)
- Estimate length, area, and volume (COM/PCD/CT/TF)
- Implement template development (COM/PCD/CT/TF)

Learners will apply various manufacturing trades related systems of measurements in calculations.

Indicators

- Use applicable layout tools for manufacturing trades (COM/PCD/CT/TF)
- Use applicable measurement tools for manufacturing trades (PCD/CT/TF)
- Apply imperial measurement system (PCD/CT/TF)
- Apply metric measurement system (PCD/CT/TF)

Learners will implement the safe use of tools and equipment during the construction process.

Indicators

- Compare different types of welding materials, processes, and properties (COM/PCD/CT/TF)
- Select the best materials for a job (PCD/CT/TF)
- Use applicable tools for the job (PCD/CT/TF)
- Implement safe handling of materials and by-products (PCD/CT/TF)

Learners will implement proper procedures to store and maintain tools, equipment, and products.

Indicators

- Implement inspections, repairs and maintenance on equipment and tools where applicable (PCD/CT/TF)
- Implement applicable recording, storing and safety procedures (PCD/CT/TF)
- Apply lockout, tagout procedures (PCD/CT/TF)
- Apply safe, effective, and sustainable procedures when moving, storing, assembling and disassembling materials and by-products (PCD/CT/TF)
- Implement sustainable processes to re-enter components into the manufacturing system (CZ/PCD/CT/TF)

Learners will construct a manufacturing trades project.

Indicators

- Construct a product to specifications and acceptable standards (PCD/CI/CT/TF)
- Implement applicable and safe manufacturing trades processes (PCD/CT/TF)
- Use a procedural guide (COM/PCD/CI/CT/TF)
- Plan appropriate order of assembly (PCD/CT/TF)
- Apply finishing techniques and quality control checks (PCD/CT/TF)
- Evaluate the process and final product in relation to the planned design (COM/PCD/CT/TF)

Outcomes and Indicators

Learners will analyse current and evolving careers, including pathways for diverse groups of people.

Rationale

Learners will engage in experiences that highlight the day to day practices of skilled tradespersons. They will be introduced to the apprenticeship system in Nova Scotia, along with alternative pathways for pursuing a career in the manufacturing trades.

Indicators

- Investigate the roles and responsibilities of various manufacturing trades careers, including entrepreneurial opportunities (COM/PCD/CT/TF)
- Compare labour market information including current and future opportunities for employment, trade's needs, and salary scales (COM/PCD/CT/TF)
- Analyse the essential skills necessary for a range of manufacturing trades careers (CZ/COM/PCD/CT)
- Analyse personal suitability for careers in the manufacturing trades (CZ/COM/PCD/CT)
- Compare different types of manufacturing (welding/fabricating, pipe fitting, sheet metal) (COM/PCD/CT/TF)

Concepts

- Careers
- Employment opportunities
- Employability skills
- Education and career pathways

Guiding Questions

- Why would someone choose to enter the manufacturing trades field?
- What potential pathways are available for someone interested in working in the manufacturing trades field?
- How do I know what pathway is right to enter the manufacturing trades field?
- What is the employment outlook in the manufacturing trades sectors?
- What aspects of working in the manufacturing trades field would you find challenging?
- What interests and skills do you have to work in the manufacturing trades?
- What interests/skills do you want to develop further ?
- How is your daily life impacted by the manufacturing trades?
- Where do you see the manufacturing trades in your community?
- What does it mean to be certified in the manufacturing trades in Nova Scotia?

- What are the pathways to certification in Nova Scotia?
- What potential barriers exist to a career in manufacturing trades?
- What resources can I leverage to support a career in manufacturing trades?

Learners will evaluate employability skills necessary for manufacturing trades related careers.

Rationale

Learners will explore personal attributes, professional skills, and character building to be successful in the manufacturing trades, both current and with the progress of standards within the industry.

Indicators

- Investigate how technology changes in manufacturing trades (CZ/COM/PCD/CT/TF)
- Analyse personal development of employability skills (CZ/COM/PCD/CT)
- Investigate businesses of personal interest, including opportunities for entrepreneurship (COM/PCD/CT/TF)
- Apply personal management and teamwork skills (CZ/COM/PCD/CT)

Concepts

- Employability skills
- Work records
- Technology

Guiding Questions

- What essential skills are necessary for someone to be successful in the manufacturing trades?
- What employability skills are crucial for tradespersons?
- What types of businesses in Nova Scotia employ manufacturing trades persons?
- What types of technology are currently being used by manufacturing businesses in Nova Scotia?
- What is the opportunity for entrepreneurship in manufacturing trades?
- What businesses in Nova Scotia employ manufacturing tradespersons?

Learners will implement applicable workplace health and safety practices and procedures.

Rationale

Safety is at the heart of every action in the skilled trades. By its nature, work in the manufacturing trades can be extremely dangerous. This outcome fosters the development of safety practices required by law to work on the jobsite in Nova Scotia.

Indicators

- Evaluate safe operating procedures associated with required tools and other equipment (COM/PCD/CT/TF)
- Implement safety training that could be expected in a workplace setting (COM/PCD/CT/TF)
- Implement the safe use of personal protective equipment, materials, tools and equipment (COM/PCD/CT/TF)
- Implement safety testing for individual manufacturing tools and equipment (COM/PCD/CT/TF)

Concepts

- Safety certifications
- Jobsite safety
- Environmental safety

Guiding Questions

- What PPE is required in a manufacturing trades environment?
- Why is it necessary to establish safe operating procedures (SOP) in the workplace?
- What precautions are in place to ensure that businesses are following safe operating procedures (SOP)?
- What types of safety training exist for manufacturing trades careers?
- What are my rights and responsibilities in the workplace?
- What do i do if I am aware or see unsafe practices in the workplace?
- How do I report unsafe practices?
- What are potential consequences of not following safety procedures?

Learners will plan a construction project including the use of manufacturing trades' related documents and drawings.

Rationale

Blueprint reading is the most common form of communication in the trades. There are standard symbols, graphics, and language that are essential to working effectively in the manufacturing trades. Learners will develop skills in interpreting scale drawings, layout and pattern development, and spatial perception.

Indicators

- Interpret manufacturing drawings (COM/PCD/CT/TF)
- Scale manufacturing-related drawings (COM/PCD/CT/TF)
- Apply spatial perception through orthographic and isometric projection (COM/PCD/CT/TF)
- Estimate length, area, and volume (COM/PCD/CT/TF)
- Implement template development (COM/PCD/CT/TF)

Concepts

- Blueprint drawings and symbols
- Scale drawings
- Layout and pattern development
- Spatial perception

Guiding Questions

- How does design influence the choice of tools and materials in the manufacturing process?
- Why are drawings needed to effectively communicate a construction idea?
- What different types of drawings may be required to to construct a project?
- What symbols are reflective of welding processes?
- Why are symbols used in drawings?
- What skills for reading a drawing are transferable from manufacturing trades to other trades?

Learners will apply various manufacturing trades related systems of measurements in calculations..

Rationale

For the manufacturing trades, using and converting various systems of measurement are essential. Learners will be introduced to a variety of tools and their applicable systems of measurement; applying tolerances, allowances, quality assurance, estimation, weight, basic arithmetic, ratios, scaling, and fractions.

Indicators

- Use applicable layout tools for manufacturing trades (COM/PCD/CT/TF)
- Use applicable measurement tools for manufacturing trades (PCD/CT/TF)
- Apply imperial measurement system (PCD/CT/TF)
- Apply metric measurement system (PCD/CT/TF)

Concepts

- Spatial awareness
- Estimation
- Measuring systems

Guiding Questions

- Why are multiple systems of measurement used in manufacturing trades?
- What layout and measurement tools are frequently used in the manufacturing trades sector?
- What factors need to be considered when choosing a measuring tool?

Learners will implement the safe use of tools and equipment during the construction process.

Rationale

Learners will gain an understanding of the tools of the trade, in relation to the work tasks associated with manufacturing trades. Learners will operate various manufacturing related tools and equipment safely, purposefully, and with precision.

Indicators

- Compare different types of welding materials, processes, and properties (COM/PCD/CT/TF)
- Select the best materials for a job (PCD/CT/TF)
- Use applicable tools for the job (PCD/CT/TF)
- Implement safe handling of materials and by-products (PCD/CT/TF)

Concepts

- Hazard assessments
- Safe operating procedures
- Compound gas Procedures
- Cold metal forming

Guiding Questions

- What factors need to be considered when determining safe handling procedures for tools/ materials? By-products?
- Why might different materials require different steps for handling?
- Why might different tools require different steps for handling?
- How do you know which processes or procedures to follow?

Learners will implement proper procedures to store and maintain tools, equipment, and products.

Rationale

Maintaining tools, equipment, and products is key to establishing a safe workplace. Learners will engage in sustainable practices applicable to their work environment and the tools and materials being used.

Indicators

- Implement inspections, repairs and maintenance on equipment and tools where applicable (PCD/CT/TF)
- Implement applicable recording, storing and safety procedures (PCD/CT/TF)
- Apply lockout, tagout procedures (PCD/CT/TF)
- Apply safe, effective, and sustainable procedures when moving, storing, assembling and disassembling materials and by-products (PCD/CT/TF)
- Implement sustainable processes to re-enter components into the manufacturing system (CZ/PCD/CT/TF)

Concepts

- Tool and equipment storage
- Tool and equipment maintenance
- Sustainability

Guiding Questions

- Why is it important that regular maintenance procedures are in place?
- Why is it important to maintain an orderly workplace?
- How do lock out/tag out procedures contribute to a safe workplace?
- How does proper planning contribute to less material waste?
- What factors need to be considered when moving tools? Materials? By-products?
- What factors need to be considered in maintaining and repairing tools and equipment?

Learners will construct a manufacturing trades project.

Rationale

This outcome is the application of the skills acquired throughout the Manufacturing Trades 11 program. Learners design, construct, and evaluate a project that reflects a variety of manufacturing trade processes.

Indicators

- Construct a product to specifications and acceptable standards (PCD/CI/CT/TF)
- Implement applicable and safe manufacturing trades processes (PCD/CT/TF)
- Use a procedural guide (COM/PCD/CI/CT/TF)
- Plan appropriate order of assembly (PCD/CT/TF)
- Apply finishing techniques and quality control checks (PCD/CT/TF)
- Evaluate the process and final product in relation to the planned design (COM/PCD/CT/TF)

Concepts

- Quality Control
- Finishing techniques
- Efficient material use

Guiding Questions

- How do the materials used impact the order of assembly?
- Why is material choice an important part of the planning process?
- How might the tools and equipment available impact the planning process?
- What considerations need to be taken before applying finishes?
- What safety practices and procedures are applicable to your construction project?
- What criteria will be considered in evaluating your project?

Appendices

Grade 11 Skills

Analyse

Gather and select appropriate information; reflect on accuracy, validity, and, importance, of the information; reflect on the implications of the information from multiple perspectives. Communicate findings.

Apply

Carry out or complete a procedure/ technique.

Classify

Identify attributes and select criteria for groupings and subgroupings; Sort based on selected criteria and reflect on the grouping(s); Incorporate a new item in a group, offering a rationale for the choice based on relationships.

Compare

Make observations; Identify similarities and differences; Identify relationships and offer an interpretation; Reflect on the findings

Construct

Identify a purpose; brainstorm ideas; Identify a detailed plan; Gather and select information to support plan; Identify and choose options within the plan; Offer reasons to support choices; Build a model; Test and revise, modify as necessary; Reflect on the results; Evaluate each stage of the process; Evaluate alternative options

Create

Develop an idea; Express a visualization of a process and/or a product produce a product; Modify as necessary; Evaluate results and alternatives..

Evaluate

Review steps and results from an investigation or problem solving; Critically examine and communicate varying perspectives and alternative solutions or findings; Identify potential new problems and/or issues; Justify decisions and/or findings.

Formulate

Identify a topic of interest; brainstorm ideas; Refine, prioritize, and choose ideas to guide next steps; Evaluate choices and alternatives.

Implement

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

Plan - Identify steps to solve the problem. Execute the steps, modifying as necessary.

Evaluate - Review steps and results from an investigation or problem solving; Critically examine varying perspectives and alternative solutions or findings; Identify potential new problems and/or issues; Justify decisions and/or findings.

Apply - Carry out or complete a procedure/ technique

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.

Plan

Identify steps to solve the problem. Execute the steps, modifying as necessary.

Problem Solve

Question - Independently and collaboratively generate questions that arise from increasingly complex problems and issues; Formulate a specific question to investigate.

Analyse - Gather and select appropriate information; Reflect on accuracy, validity, and, importance of the information; Reflect on the implications of the information from multiple perspectives

Plan - Identify steps to solve the problem; Execute the steps, modifying as necessary.

Evaluate - Review steps and results from an investigation or problem solving; Critically examine and communicate varying perspectives and alternative solutions or findings; Identify potential new problems and/or issues; Justify decisions and/or findings.

Question

Independently and collaboratively generate questions that arise from complex problems and issues. Formulate a specific question to investigate.

Reflect

Ask questions of content or experiences; Examine and consider ideas, perceptions, and perspectives about content and/or experiences; Formulate ideas, perceptions, and perspectives on content and/or experiences

Select

Locate several relevant and dependable details to support an answer

Test

Formulate a testable question; Hypothesize a reasonable result, based on research; Identify dependent and independent variables and intentionally control variables; Design and conduct an experiment; Collect, record, and analyze evidence; Analyse the validity and reliability of the data; Draw conclusions based on evidence; Communicate findings; Predict the results of a similar experiment and justify the prediction; Evaluate limitations and improvements

Grade 11 Competencies

Citizenship

- consider possible consequences of decisions, judgments, and solutions to problems
- participate in civic activities that support social and cultural diversity and cohesion
- demonstrate understanding of environmental sustainability
- consider issues surrounding human rights and equity
- demonstrate the disposition and skills necessary for effective citizenship
- recognize the principles and actions of citizens in a just, pluralistic, and democratic society
- appreciate the complexity and interconnectedness of factors in analyzing issues

Personal Career Development

- demonstrate behaviors that contribute to the well-being of self and others
- establish skills and habits to pursue physical, mental, and emotional well-being
- connect learning to personal and career development
- demonstrate preparedness to learn and work in diverse, evolving environments
- build healthy personal and work relationships
- develop strategies to manage career balance and wellness
- create a personal, education, career, and financial plan to support transitions and achievement of education and career goals

Communication

- listen and interact purposefully and respectfully in formal and informal contexts
- express ideas, information, learnings, perceptions, and feelings through multiple media forms, considering purpose and audience
- engage in constructive and critical dialogue
- understand, interpret, and respond to thoughts, ideas and emotions presented through multimedia forms
- assess the effectiveness of communication and critically reflect on intended purpose, audience, and choice of media
- analyse the impact of information communication technology on social equity
- demonstrate the provincially-defined level of proficiency in a second official language

Creativity and Innovation

- gather information through all senses to imagine, create, and innovate
- develop and apply creative abilities to communicate ideas, perceptions, and feelings
- collaborate to create and innovate
- take responsible risk, accept critical feedback, reflect and learn from trial and error
- critically reflect on creative and innovative works and processes
- think divergently, and embrace complexity and ambiguity
- recognize creative processes are vital to innovation
- use creation techniques to generate innovations
- value the contribution of creativity and innovation to social and economic well-being

Critical Thinking

- use critical thinking skills to inquire, make decisions, and solve problems
- recognize that critical thinking is purposeful
- demonstrate curiosity, inquisitiveness, and creativity, flexibility, and persistence, open and fair mindedness, tolerance for ambiguity, and suspension of judgement
- ask powerful questions which support inquiry, decision-making, and problem solving
- value the ideas and contributions of others who hold diverse points of view
- work individually, cooperatively, and collaboratively to use various types of reasoning and strategies, draw conclusions, make decisions, and solve problems based on evidence
- effectively communicate ideas, conclusions, decisions, and solutions
- acquire, interpret, and synthesize relevant and reliable information from a variety of sources
- analyze and evaluate evidence, arguments and ideas
- value the ideas of others who hold diverse points of view
- reflect critically on thinking processes used and acknowledge assumptions

Technological Fluency

- use and interact with technology to the create new knowledge
- apply digital technology to gather, filter, organize, evaluate, use, adapt, create, and share information
- select and use technology to create and innovate
- recognize technology encompasses a range of learning tools and contexts
- adopt, adapt, and apply technology efficiently, effectively, and productively
- analyse how technology and society impact and advance one another

What is the Learning Logbook?

At the beginning of a skilled trades course, learners are given a Learning Logbook. This logbook is designed to be comparable to an apprentice's logbook. As in the skilled trades, the learning logbook is treated as an important, permanent record of a learner's progress in the course. The logbook is also a valuable learning tool for both learning and assessment. The logbook provides learners with the opportunity to plan, record, and reflect upon the tasks they complete in the Skilled Trades Centre. The logbook also provides opportunities for assessment for learning and regular feedback between the learner, the teacher, parents/guardians, and peers. Reflection and immediate feedback on their skill development is an essential component of the course. This is possible through regular use of the logbook.

Learners use the logbook:

- to log skills as they are acquired
- to log time spent on various tasks
- To track safety training and certifications
- to reflect on personal engagement
- to direct feedback about their skill development
- to establish and maintain a focused dialogue with the teacher
- to share in-class experiences and learning
- as an artifact in their portfolio

How do I know it's working?

Learners:

- understand how the logbook is used in the progress from apprentice to journeyperson
- complete their logbooks
- extend their thinking beyond the information in the logbook
- discuss personal experiences in the trades
- use feedback to determine their goals, areas for development, and what they have mastered.

Apprenticeship Training as a Post-Secondary Option

Apprenticeship training is a cooperative learning model designed to help registered apprentices to learn the skills, attitudes, and knowledge necessary to work in a certified trade. Apprentices earn wages while attaining practical skills under the supervision of a certified journeyperson. This workplace portion accounts for about 80% of the apprenticeship program. The remaining time is devoted to technical training through a training provider such as Nova Scotia Community College or other accredited college. The average apprenticeship ranges from 6000 to 8000 hours (three to four years).

The overall responsibility for the apprenticeship system in Nova Scotia rests with the Nova Scotia Apprenticeship Agency, which administers the Apprenticeship and Trades Qualifications Act and General Regulations. For more information about careers in apprenticeship, please search Nova Scotia Apprenticeship Agency.