Program Overview and Rationale

Background

Power and Energy 3211 is based conceptually, philosophically and practically on the Atlantic Canada Foundation document for Technology Education (2001). The teacher is directed to the document for specific information that forms the basis for this and other technology education curricula in the province of Newfoundland and Labrador.

This two-term course replaces the one-term technology education course, Power Mechanics 2103. While content from this course that addresses the General Curriculum Outcomes (GCOs) is retained, Power and Energy 3201 features additional topics dealing with alternative energy production and a delivery model that reflects the learning philosophy of the modular approach and experiential learning.

Rationale

In the power generation sector, alternative energy is the newest answer to environmental concerns. Working with renewable and inexhaustible sources, alternative energy solutions are present in many energy plans around the world, and specifically mentioned in the Energy Plan for Newfoundland and Labrador. Electricians in the near future will need to be familiar with a variety of alternative energy solutions, how best to implement them and how to install them. In this manner, the energy section of this course encompasses the future of skilled trades in electricity. Students will be exposed to actual working models of wind turbines, solar cells, power distribution systems, fuel cells and a variety of electrical technologies that are on the cutting edge of the alternative energy sector. They will also be introduced to topics dealing with apprenticeship and Occupational Health and Safety to ensure they are exposed to post-secondary options and the world of work.

The second part of the Power and Energy course will involve examining power usage through experiential work with engines. Within the automotive and mechanical sectors a variety of engine types and methods are used. Within this course these will be explored through the study of small engines, troubleshooting and tear downs. Working in groups; students will work with the small engine, becoming familiar with it and the series of systems from which it is made up. Students will learn about working with these engines experientially and develop skills that are specific to the small engine sector. They will explore the engine-base skilled trades and have a sense of what a career in this area will entail.

Rationale cont.

The Futures in Skilled Trades and Technology Program is not intended to offer trades-based training in the high school environment, but rather give students an opportunity to explore careers in the skilled trades and learn new skills through real-world experiential learning.

In this manner the Power and Energy 3201 course will give students a chance to meaningfully experience the automotive/small engine and electrical trades and completes the full suite of courses in the program. Students completing this course and the complementary Career Development 2201 course should be well prepared for making good career choices after high school.

Purpose of Curriculum Guide

The purpose of this curriculum guide is to provide the teacher with a clear picture of expectations for learning in the course. The guide includes the specific curriculum outcomes, suggested learning and teaching strategies, suggested assessment and evaluation strategies and support resources.

Context for Teaching and Learning

As stated in the Atlantic Canada Foundation document for Technology Education (2001), the technology education curriculum in Atlantic Canada adheres to principles that guide decisions shaping the continuous improvement of learning and teaching including the design and implementation of the curriculum. These include:

Authenticity

Technology education values and embraces the strategic links between applied learning and integrated learning.

Unity

Technology education values and embraces meaningful connections among diverse areas of study.

Constructivism

Technology education incorporates each individual's prior knowledge, skills, and attitudes in the design of authentic learning experiences.

Context for Learning cont.

Collaboration

Technology education curriculum in Atlantic Canada adheres to strategies that emphasize the unifying concepts of related disciplines, particularly science.

Autonomy

Technology education values an environment with the learner as its pivotal force.

Continuous Inquiry

Continuous inquiry is essential to technology education.

Continuous Improvement

The success of technology education initiatives is a function of informed implementation and improvement practices.

Continuous Learning

Technology education implies strategic and distinct pre-service and in-service demands on teacher education.

Power and Energy 3201 encourages student collaboration in solving technical problems and reflects true industry practice through the use of a problem-based learning approach. Continuous inquiry, improvement and learning are fundamental to this approach and the design project provides an authentic learning experience where students direct the learning.

Literacy through Technology Education

As noted in the Atlantic Canada Foundation document on Technology Education, in order to acquire technological "literacy", students must be given the opportunity to actively participate in the solution of technical problems. In support of this, it is recommended that delivery of Power and Energy 3201 be focused on the shop/lab setting with intermittent classroom instruction as required. Accordingly, the course is designed for 80% lab and 20% class delivery. This emphasis on practical experiential learning opportunities for students is consistent with instructional delivery models used in post-secondary skilled trades programs.
Trades apprentices seeking journeyperson certification, for example, are required to complete a training program that consists of 20% classroom-based instruction and 80% field experience. This mode of instructional delivery provides students with opportunities to:

- Identify, assess, and make decisions about their use of technological resources
- Assess their technological literacy/capability in the context of specific situations
- Develop personal action plans to acquire specific technical skills and capabilities

Literacy through Technology Education cont.

- Safely use a wide variety of technological systems, tools, and other resources
- Identify and address technological issues and situations important to them
- Design, develop, and articulate technological solutions to a wide range of problems
- Articulate ideas and take intellectual risks
- Reflect on and evaluate learning
- Reflect on, evaluate, and express ideas and opinions on the relationship between technology and education and the role of technology education
- Assess technology as a force for change in a variety of workplaces, jobs, occupations, and careers

The modular approach is particularly important to providing students with each of these learning opportunities. It allows students to individually experience all of the learning opportunities while the teacher's role becomes that of facilitator. In a modular, setting learning stations are set within the fabrication lab which will meet the learning objectives while producing a variety of learning experiences occurring at the same time.

Meeting the Needs of All Learners

In the Atlantic Canada Foundation document on Technology Education (2001), it is suggested that in a learning community characterized by mutual trust, acceptance, and respect, student diversity is both recognized and valued. Educators should ensure that classroom practices and resources positively and accurately reflect diverse perspectives and reject prejudicial attitudes and discriminatory behaviours. It is also suggested in the document that if curriculum is to contribute to the achievement of equity and quality in education, it must:

- Reflect students' abilities, needs, interests, and learning styles
- Expect that all students will be successful regardless of gender, racial and ethno-cultural background, socioeconomic status, lifestyle, or ability
- Enable students to value individual variation among members of their classroom community

Power and Energy 3201 considers a wide range of learners and learning styles through a problem-based learning approach that encourages experiential learning. This student-centered learning model emphasizes a group approach to problem-solving that requires students to take ownership of their own learning. As suggested in the Atlantic Canada Foundation document on Technology Education (2001), taking ownership and responsibility for their own learning is a significant element in the growth of a student's technological capability.

Effective Assessment and Evaluation Practices

The Atlantic Canada Foundation document on Technology Education (2001), recommends that in planning assessments, teachers should use a broad range of strategies in an appropriate balance to give students multiple opportunities to demonstrate their knowledge, skills, and attitudes. The document identifies many types of assessment strategies as suitable for technology education including:

- Formal and informal observations
- Work samples
- Anecdotal records
- Conferences
- Teacher-made and other tests
- Portfolios
- Learning journals
- Questioning
- Performance assessment
- Peer and self-assessment
- Available information
- Using a high level of professional judgment in making decisions based upon information

Similarly, the document suggests that evaluation involves teachers and others in analyzing and reflecting upon information about student learning gathered in a variety of ways. The process requires:

- Developing clear criteria and guidelines for assigning marks or grades to student work
- Synthesizing information from multiple sources
- Weighing and balancing all available information
- Using a high level of professional judgment in making decisions based upon information

Assessment and evaluation in Power and Energy 3201 must consider both the problem-based learning approach used and the required General Curriculum Outcomes (GCOs) outlined in the Atlantic Canada Foundation document on Technology Education. The assessment strategies recommended in section III of this guide, reflect these requirements.