2019 Saskatchewan Curriculum

Drafting and Computer-Aided Design 10, 20, 30

Saskatchewan

August 2019 – Due to the nature of curriculum development this document is regularly under revision. For the most up-to-date content, please go to www.curriculum.gov.sk.ca.

Acknowledgements

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Introduction

Practical and Applied Arts in an area of study in Saskatchewan's Core Curriculum which is intended to provide all Saskatchewan students with an education that will serve them well regardless of their choices after leaving school. Through its various components and initiatives, Core Curriculum supports the achievement of the Goals of Education for Saskatchewan. For current information regarding Core Curriculum, please refer to the *Registrar's Handbook for School Administrators* found on the Government of Saskatchewan website. For additional information related to the various components and initiatives of Core Curriculum, please refer to the Government of Saskatchewan website for policy and foundation documents.

This curriculum provides the intended learning outcomes organized in modules from which teachers/schools select a minimum of 100 hours for each course. The curriculum reflects current Practical and Applied Arts education research and updated technology and is responsive to changing demographics within the province.

All students will work toward the achievement of the provincial outcomes. Some students, however, will require additional supports. Effective instruction, including the use of the Adaptive Dimension, will support most students in achieving success. The Adaptive Dimension refers to the concept of making adjustments to any or all of the following variables: learning environment, instruction, assessment and resources. Adjustments to these variables are intended to make learning meaningful and appropriate and to support achievement. **Within the context of the Adaptive Dimension, curricular outcomes are not changed; adaptive variables are adjusted so that they curricular outcomes can be achieved. Please refer to the Saskatchewan Curriculum website for more information on the Adaptive Dimension.**

Course Synopsis

Drafting and Computer-Aided Design 10, 20, 30 provide students with opportunities to acquire knowledge and skills in drafting and computer- aided design. The courses help develop an appreciation for drafting and the numerous trades where it can be used.

Drafting and Computer-Aided Design 10 provides students with opportunities to develop a basic knowledge of the fundamental principles of drafting and computer-aided design.

Drafting and Computer-Aided Design 20 provides students with opportunities to build knowledge and skills in drafting and computer-aided design with a focus on architectural design and drafting.

Drafting and Computer-Aided Design 30 provides students with opportunities to advance their knowledge and skills in drafting and computer-aided design with a focus on mechanical design and drafting.

Unique Features of Practical and Applied Arts

Curricula in the Practical and Applied Arts (PAA) have several features unique to this area of study. The reasons for inclusion of these features in PAA curricula are to encourage flexibility in school programming, to support community partnerships that facilitate learning beyond the classroom and to ensure the practical emphasis of the program.

PAA curricula contain all courses in a **single document** whether it is one course or a series of several. This feature allows schools and teachers the flexibility to choose modules supportive of their students' needs as well as utilize available facilities and equipment. The order and number of outcomes in a course can vary between schools as long as the integrity of the discipline and the required 100 hours per course are maintained.

All PAA curricula are designed using **modules**, each with a single outcome for students to achieve. To aid teachers and schools in course planning, each module is designated as Introductory, Intermediate, or Advanced. Modules may also have prerequisite modules. Core modules are compulsory modules that must be covered in pure courses of study for developmental or safety reasons. Some modules may serve as prerequisites for more advanced study. Each module provides a suggested time to aid teachers in planning their courses. Each module may take more or less than the suggested time depending on factors such as background knowledge of the students.

A third unique feature of PAA curricula is the inclusion of an optional **Extended Study** module in each course. The Extended Study module allows teachers to create their own outcome and indicators relevant to the purpose and areas of focus for the subject to meet their students' needs. Using Extended Study modules to accommodate advances in technology and changing practices is one way that teachers can ensure their programs stay current with industry standards.

Work Study modules encourage personalized learning and development of community relationships. Work Study is designed as a work-based learning portion of a course to provide off-campus educational opportunities for individuals or small groups in a work setting. Planning and assessment are managed by the teacher while the learning opportunity is provided by an expert in the community. Practical skills developed in school are directly transferred to a work environment.

Transferable work skills are a desirable aspect of lifelong learning. The practical nature of these skills enriches students' lives as they transition into life beyond Grade 12. In Canada, two taxonomies of transferable work skills have been produced. The Conference Board of Canada developed a list of Employability Skills and Human Resources and Service Development Canada identified a series of Essential Skills. Students will be familiar with both of these taxonomies from their learning in Grade 8 Career Education.

More details on the above curriculum features are provided in the *Practical and Applied Arts Handbook* available on the Ministry of Education website.

Purpose and Areas of Focus for *Drafting and Computer-Aided Design 10, 20, 30*

Drafting and Computer-Aided Design 10, 20, 30 provide students the opportunity to develop the knowledge, skills and understanding in drafting and computer- aided design. The courses help students to develop an appreciation for drafting and computer-aided design, communicate effectively in a non-traditional environment; develop independent work practices; and make informed career decisions.

The Areas of Focus for *Drafting and Computer-Aided Design (CAD) 10, 20, 30* are:

- basic functions of CAD software;
- terminology related to drafting;
- reading technical drawings;
- architectural drawings;
- mechanical drawings;
- diversity of perspectives and preferences in architectural and mechanical drafting;
- cost estimation of materials;
- energy efficiency and environmental sustainability; and,
- career exploration.

Teaching *Drafting and Computer-Aided Design 10, 20, 30*

The purpose of *Drafting and Computer-Aided Design 10, 20, 30* is to encourage innovation and exploration through the hands on process of designing and creating. Through project based learning, design thinking, and inquiry learning, students will explore the processes and skills needed to design and fabricate.

This curriculum communicates visually the language of technical industry. Drafting is essential to all design and manufacturing and is key top the growth of industry and businesses. It transforms an idea to a physical object in a form that can be shared with and understood by others. It is not bound by language; it is a language in itself. It is a communication tool that transcends barriers of language or location.

Drafting and Computer-Aided Design 10, 20, 30 are designed to support different approaches to address student interests.

One suggested course configuration is provided for each course.

Drafting and Computer-Aided Design 10 configuration is an introduction to the principles and application of architectural and mechanical drafting.

Drafting and Computer-Aided Design 20 configuration has an architectural focus. The intent is to represent the construction methods and code requirements of a single family dwelling.

Drafting and Computer-Aided Design 30 configuration has a mechanical focus. The intent is to prepare designs for production or fabrication aligned with industry standards. The application of a 3D printer will support/enable students in meeting outcomes.

Grades 7-12 Practical and Applied Arts

Opportunities available to students within Practical and Applied Arts are numerous. The choices assist students in developing personal skills, gaining entry level employment skills or pursuing apprenticeship opportunities in the trades. Students have the opportunity to explore and develop career pathways.

Each Practical and Applied Arts curriculum is composed of modules configured into courses, along with suggestions for modules that are suitable for middle or secondary level survey courses. PAA curricula are grouped in clusters according to common themes. Because various combinations of modules can be chosen, the courses will have variable occupational or career pathways to post-secondary education and training or workplace opportunities.

The modular design provides for flexibility and for community involvement. The design allows teachers and schools to develop unique PAA offerings that reflect student interest and school/community resources. Partnerships with community businesses and service providers enhance learning opportunities in a community context.

Practical and Applied Arts courses can be offered in two ways within a school—as pure or survey course offerings. A pure course at the secondary level is a course where core (compulsory) modules are taught, and optional modules are selected from the same PAA curriculum to total 100 hours. A survey course is a configuration of modules recommended from a minimum of three pure PAA curricula to create a middle level course of a minimum of 50 hours or a secondary level course to total 100 instructional hours (1 credit). The *Practical and Applied Arts Handbook* offers recommendations for configuring survey courses at the middle and secondary levels.

Broad Areas of Learning

There are three Broad Areas of Learning that reflect Saskatchewan's Goals of Education. All areas of study contribute to student achievement of the Goals of Education through helping students achieve knowledge, skills and attitudes related to these Broad Areas of Learning. The K-12 goals and grade level outcomes for each area of study are designed for students to reach their full potential in each of the following Broad Areas of Learning.

Sense of Self, Community and Place*

(Related to the following Goals of Education: Understanding and Relating to Others, Self Concept Development and Spiritual Development)

Students possess a positive sense of identity and understand how it is shaped through interactions within natural and constructed environments. They are able to nurture meaningful relationships and appreciate diverse beliefs, languages and practices from the diversity of cultures in our province, including First Nations and Métis. Through these relationships, students demonstrate empathy and a deep understanding of self, others and the influence of place on identity. In striving to balance their intellectual, emotional, physical and spiritual dimensions, students' sense of self, community and place is strengthened.

To engage in the Practical and Applied Arts, students need to use knowledge and skills and to interact with each other. Through the Practical and Applied Arts, students learn about themselves, others, and the world around them. They use their new understanding and skills to explore who they are and who they might become. Practical and Applied Arts programming should vary by school to reflect the community at large. Community projects can play a key role in Practical and Applied Arts programming and connect the school more closely to the community.

Lifelong Learners

(Related to the following Goals of Education: Basic Skills, Lifelong Learning, Positive Lifestyle)

Students are curious, observant and reflective as they imagine, explore and construct knowledge. They demonstrate the understandings, abilities and dispositions necessary to learn from subject discipline studies, cultural experiences and other ways of knowing the world. Such ways of knowing support students' appreciation of Indigenous worldviews and learning about, with and from others. Students are able to engage in inquiry and collaborate in learning experiences that address the needs and interests of self and others. Through this engagement, students demonstrate a passion for lifelong learning.

Students in Practical and Applied Arts courses will gain a positive sense of identity and efficacy through development of practical skills and knowledge. Many Practical and Applied Arts curricula are closely related to careers found in Saskatchewan and, therefore, are directly connected to lifelong learning whether in a professional career or through hobbies and personal interests.

Engaged Citizens

(Related to the following Goals of Education: Career and Consumer Decisions, Membership in Society and Growing with Change)

Students demonstrate confidence, courage and commitment in shaping positive change for the benefit of all. They contribute to the environmental, social and economic sustainability of local and global communities. Their informed life, career and consumer decisions support positive actions that recognize a broader relationship with, and responsibility for, natural and constructed environments. Along with this responsibility, students recognize and respect the mutual benefits of Charter, Treaty and other constitutional rights and relationships. Through this recognition, students advocate for self and others, and act for the common good as engaged citizens.

Engaged citizens have empathy for those around them and contribute to the well-being of the community as a whole. Practical and Applied Arts students learn how new skills and abilities enable them to make a difference in their personal lives as well as in their family and community. Skills and abilities gained in Practical and Applied Arts courses build a sense of confidence which encourages students to participate effectively in their world.

*A sense of place is a geographical concept that attempts to define our human relationships with the environment and knowledge derived from this relationship.

Cross-curricular Competencies

The Cross-curricular Competencies are four interrelated areas containing understanding, values, skills and processes which are considered important for learning in all areas of study. These competencies reflect the Common Essential Learnings and are intended to be addressed in each area of study at each grade.

Developing Thinking

(Related to CEL of Critical and Creative Thinking)

Constructing knowledge (i.e., factual, conceptual, procedural, and metacognitive) is how people come to know and understand the world around them. Deep understanding develops through thinking and learning contextually, creatively, and critically in a variety of situations, both independently and with others.

Think and learn contextually

- Apply prior knowledge, experiences, and the ideas of self and others in new contexts.
- Analyze connections or relationships within and/or among ideas, experiences, or natural and constructed objects.
- Recognize that a context is a complex whole made of parts.
- Analyze a particular context for ways that parts influence each other and create the whole.
- Explore norms*, concepts, situations, and experiences from several perspectives, theoretical frameworks, and worldviews.

Think and learn creatively

- Show curiosity and interest in the world, new experiences, materials, and puzzling or surprising events.
- Experiment with ideas, hypotheses, educated guesses, and intuitive thoughts.
- Explore complex systems and issues using a variety of approaches such as models, simulations, movement, self-reflection, and inquiry.
- Create or re-design objects, designs, models, patterns, relationships, or ideas by adding, changing, removing, combining, and separating elements.
- Imagine and create central images or metaphors for subject area content or cross-disciplinary ideas.

Think and learn critically

- Analyze and critique objects, events, experiences, ideas, theories, expressions, situations, and other phenomena.
- Distinguish among facts, opinions, beliefs, and preferences.
- Apply various criteria to assess ideas, evidence, arguments, motives, and actions.
- Apply, evaluate, and respond to differing strategies for solving problems and making decisions.
- Analyze factors that influence self and others' assumptions and abilities to think deeply, clearly, and fairly.

*Norms can include unexamined privilege (i.e., unearned rights/entitlements/immunity/exemptions associated with being "normal") which creates a power imbalance gained by birth, social position, or concession and provides a particular context.

Developing Identity and Interdependence

(Related to CELs of Personal and Social Development and Technological Literacy)

Identity develops as an individual interacts with others and the environment, and learns from various life experiences. The development of a positive self-concept, the ability to live in harmony with others, and the capacity and aptitude to make responsible decisions about the natural and constructed world supports the concept of interdependence. The focus within this competency is to foster personal reflection and growth, care for others, and the ability to contribute to a sustainable future.

Understand, value, and care for oneself (intellectually, emotionally, physically, spiritually)

- Recognize that cultural and linguistic backgrounds, norms, and experiences influence identity, beliefs, values, and behaviours.
- Develop skills, understandings, and confidence to make conscious choices that contribute to the development of a healthy, positive self-identity.
- Analyze family, community, and societal influences (such as recognized and unrecognized privileges) on the development of identity.
- Demonstrate self-reliance, self-regulation, and the ability to act with integrity.
- Develop personal commitment and the capacity to advocate for self.

Understand, value, and care for others

- Demonstrate openmindedness* toward, and respect for all.
- Learn about various peoples and cultures.
- Recognize and respect that people have values and worldviews that may or may not align with one's own values and beliefs.
- Value the varied abilities and interests of individuals to make positive contributions to society.
- Advocate for the well-being of others.

Understand and value social, economic, and environmental interdependence and sustainability**

- Examine the influence of worldviews on one's understanding of interdependence in the natural and constructed world.
- Evaluate how sustainable development depends on the effective and complex interaction of social, environmental, and economic factors.
- Analyze how one's thinking, choices, and behaviours affect living and non-living things, now and in the future.
- Investigate the potential of individual and group actions and contributions to sustainable development.
- Demonstrate a commitment to behaviours that contribute to the well-being of the society, environment, and economy – locally, nationally, and globally.

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*Openmindedness refers to a mind that is open to new ideas, and free from prejudice or bias in order to develop an "ethical space" between an existing idea and a new idea (Ermine).

**Sustainability refers to making informed decisions for the benefit of ourselves and others, now and for the future, and to act upon those decisions for social, economic, and environmental well-being.

Developing Literacies

(Related to CELs of Communication, Numeracy, Technological Literacy, and Independent Learning)

Literacies provide many ways to interpret the world and express understanding of it. Being literate involves applying interrelated knowledge, skills, and strategies to learn and communicate with others. Communication in a globalized world is increasingly multimodal. Communication and meaning making, therefore, require the use and understanding of multiple modes of representation. Each area of study develops disciplinary literacies (e.g., scientific, economic, physical, health, linguistic, numeric, aesthetic, technological, cultural) and requires the understanding and application of multiple literacies (i.e., the ability to understand, critically evaluate, and communicate in multiple meaning making systems) in order for students to participate fully in a constantly changing world.

Construct knowledge related to various literacies

- Acknowledge the importance of multiple literacies in everyday life.
- Understand that literacies can involve words, images, numbers, sounds, movements, and other representations and that these can have different interpretations and meanings.
- Examine the interrelationships between literacies and knowledge, culture, and values.
- Evaluate the ideas and information found in a variety of sources (e.g., people, databases, natural and constructed environments).
- Access and use appropriate technologies to investigate ideas and deepen understanding in all areas of study.

Explore and interpret the world using various literacies

- Inquire and make sense of ideas and experiences using a variety of strategies, perspectives, resources, and technologies.
- Select and critically evaluate information sources and tools (including digital) based on the appropriateness to specific tasks.
- Use various literacies to challenge and question understandings and interpretations.
- Interpret qualitative and quantitative data (including personally collected data) found in textual, aural, and visual information gathered from various media sources.
- Use ideas and technologies in ways that contribute to creating new insight.

Express understanding and communicate meaning using various literacies

- Create, compute, and communicate using a variety of materials, strategies, and technologies to express understanding of ideas and experiences.
- Respond responsibly and ethically to others using various literacies.
- Determine and use the languages, concepts, and processes that are particular to a discipline when developing ideas and presentations.
- Communicate ideas, experiences, and information in ways that are inclusive, understandable, and useful to others.
- Select and use appropriate technologies in order to communicate effectively and ethically.

Developing Social Responsibility

(Related to CELs of Communication, Critical and Creative Thinking, Personal and Social Development, and Independent Learning)

Social responsibility is the ability of people to contribute positively to their physical, social, and cultural environments. It requires an awareness of unique gifts and challenges among individuals and communities and the resulting opportunities that can arise. It also requires participation with others in creating an ethical space* to engage in dialogue, address mutual concerns, and accomplish shared goals.

Use moral reasoning processes

- Evaluate the possible consequences of a course of action on self, others, and the environment in a particular situation.
- Consider the implications of a course of action when applied to other situations.
- Consistently apply fundamental moral values** such as "respect for all".
- Demonstrate a principle-based approach to moral reasoning.
- Examine how values and principles have been and continue to be used by persons and cultures to guide conduct and behaviour.

Engage in communitarian thinking and dialogue

- Model a balance in speaking, listening, and reflecting.
- Ensure that each person has an opportunity to contribute.
- Demonstrate courage to express differing perspectives in a constructive manner.
- Use consensus-building strategies to work towards shared understanding.
- Be sensitive to, and respectful of, diversity and different ways of participating.

Take social action

- Demonstrate respect for and commitment to human rights, treaty rights, and environmental sustainability.
- Contribute to harmony and conflict resolution in own classroom, school, family, and community.
- Provide support in a manner that is respectful of the needs, identity, culture, dignity, and capabilities of all persons.
- Support individuals in making contributions toward achieving a goal.
- Take responsible action to change perceived inequities or injustice for self and others.

*An ethical space exists between separate worldviews. In this space, "we can understand one another's knowledge systems" (Ermine, 2006). For further information, see Willie Ermine's work related to ethical space.

**The most basic moral value underlying development of the CEL of Personal and Social Development is that of respect for persons. For further discussion related to fundamental moral values, refer to *Understanding the Common Essential Learnings: A Handbook for Teachers* (1988, pages 42-49). See also the *Renewed Objectives for the CELs of Critical and Creative Thinking and Personal and Social Development* (2008).

Aim and Goals

The aim of 7-12 Practical and Applied Arts is to provide life skills to prepare students to participate as family members, community members, citizens, consumers and producers in Canadian society.

Goals are broad statements identifying what students are expected to know and be able to do upon completion of the learning in a particular area of study by the end of Grade 12. The goals of 7-12 Practical and Applied Arts are:
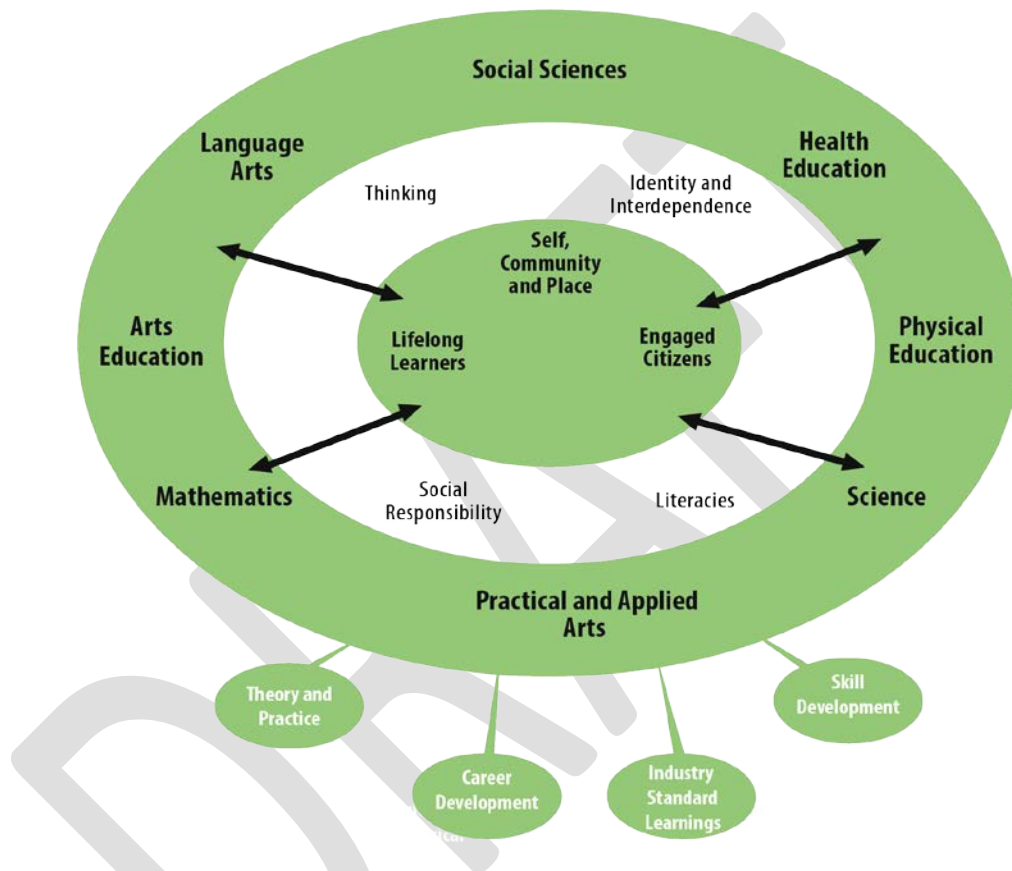
- **Theory and Practice** – Students will be engaged in a balance of theory and practice for lifelong learning.
- **Career Development** – Students will experience opportunities for career awareness, exploration and experience.
- **Industry Standard Learnings** – Students will gain industry standard learnings to assist them in accessing post-secondary education, training and employment.
- **Skill Development** – Students will develop the skills needed to enter, stay in and progress in the world of work.

Inquiry

Inquiry learning provides students with opportunities to build knowledge, abilities and inquiring habits of mind that lead to deeper understanding of their world and human experience. Inquiry builds on students' inherent sense of curiosity and wonder, drawing on their diverse backgrounds, interests and experiences. The process provides opportunities for students to become active participants in a collaborative search for meaning and understanding.

"My teacher (Elder) liked it when I asked questions, this way it reassured him that I understood his teachings. He explained every detail, the meaning and purpose. Not only talked about it, but, showed me! Communication, critical and creative thinking were important" (Traditional Knowledge Keeper Albert Scott)

Students who are engaged in inquiry:

- construct deep knowledge and deep understanding, rather than passively receiving information;
- are directly involved and engaged in the discovery of new knowledge;
- encounter alternative perspectives and differing ideas that transform knowledge and experience into deep understandings;
- transfer new knowledge and skills to new circumstances; and,
- take ownership and responsibility for their ongoing learning and mastery of curriculum content and skills.

(Adapted from Kuhlthau, Maniotes, & Caspari, 2007)

Constructing Understanding Through Inquiry
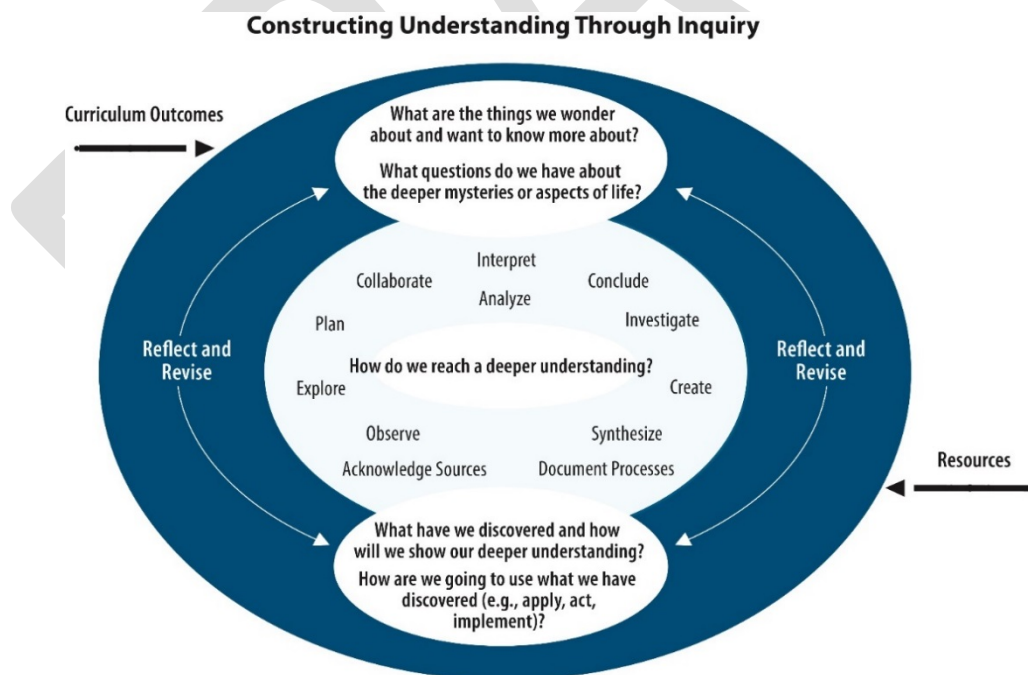
In the Practical and Applied Arts, inquiry encompasses creating solutions to challenges through the practical application of understandings and skills. This includes processes to get from what is known to discover what is unknown. When teachers show students how to solve a challenge and then assign additional/similar challenges, the students are not constructing new knowledge through application but merely practising. Both are necessary elements of skill building in the Practical and Applied Arts, but one should not be confused with the other. If the path for getting to the end situation already has been determined, it is no longer problem solving. Students must understand this difference as well.

Inquiry learning is not a step-by-step process, but rather a cyclical process, with various phases of the process being revisited and rethought as a result of students' discoveries, insights and construction of new knowledge. Experienced inquirers will move back and forth among various phases as new questions arise and as students become more comfortable with the process. The following graphic shows various phases of the cyclical inquiry process.

An important part of any inquiry process is student reflection on their learning and the documentation needed to assess the learning and make it visible. Student documentation of the inquiry process may take the form of works-in-progress, reflective writing, journals, reports, notes, models, arts expressions, photographs, video footage, action plans and many more.

Creating Questions for Inquiry

It is important that teachers and students learn within meaningful contexts that relate to their lives, communities and world. Teachers and students need to identify big ideas and questions for deeper understanding central to the area of study.

Big ideas invoke inquiry questions. These questions are important in developing a deep understanding of the discipline or an area of study within the discipline. They do not have obvious answers and they foster high-order thinking. They invite genuine inquiry.

It is important to develop questions that are evoked by student interests and sense of wonder and have potential for rich and deep learning. These questions are used to initiate and guide inquiries that lead to deep understandings about topics, problems, ideas, challenges, issues, concepts and areas of study related to curriculum content and outcomes.

Well-formulated inquiry questions are broad in scope and rich in possibilities. Such questions encourage students to explore, observe, gather information, plan, analyze, interpret, synthesize, problem solve, take risks, create, conclude, document, reflect on learning and develop new questions for further inquiry.

The process of constructing questions for deep understanding can help student grasp the important disciplinary or interdisciplinary ideas that are situated at the core of a particular curricular focus or context. These broad questions lead to more specific questions that can provide a framework, purpose and direction for the learning activities in a lesson, or series of lessons, and help student connect what they are learning to their experiences and life beyond school.

Effective questions in Practical and Applied Arts are the key to initiating and guiding students' investigations, critical thinking, problem solving, and reflection on their own learning. Such questions include:

- How might diverse cultural perspectives and individual preferences guide drafting in architectural projects?
- How can indigenous knowledge and building practices contribute towards environmental sustainability and protection of natural resources?
- What are the implications of urbanization on architectural styles?
- How do industry standards, government regulations and bylaws inform drafting projects?

The above are only a few examples of questions to move students' inquiry towards deeper understanding. Effective questioning is essential for teaching and student learning, and should be an integral part of planning. Questioning should also be used to encourage students to reflect on the inquiry process and on the documentation and assessment of their own learning.

An Effective Practical and Applied Arts Program

An effective Practical and Applied Arts program provides a variety of relevant, engaging and authentic learning opportunities that are driven by student interest and facilitated through school- and work-based learning with linkages that connect the two. The course offerings emphasize:

- relevance to real life;
- hands-on learning;
- career development opportunities;
- industry standard learnings;
- connections to community; and,
- alignment with labour market needs.

Relevance to real life – Whether students enroll in PAA courses to develop skills for personal use, gain entry level employment skills or pursue post-secondary education or training such as apprenticeship, learning must be contextualized to help them see the application and relevance to the real world.

Hands-on learning – Hands-on learning gives students the opportunity to practice what they have learned using equipment and materials commonly found in the home, community or workplace. A balance between theory and practice enhances students' learning experiences.

Career development opportunities – All three levels of the career development continuum-awareness, exploration and experiential-should be supported. Students grow in their awareness of personal traits, skills and preferences that influence career decisions and in their awareness of occupational and career pathways. They explore many opportunities and may begin to experience careers firsthand through specialized work placements or classroom learning that support the refinement of skills related to a particular job or occupation. Opportunities for students to acquire industry certifications will help to enhance their employment opportunities.

Industry standard learnings – Integral to PAA curricula are industry standard learnings that ensure student learning is up-to-date and relevant to current industry standards and practices. These learnings can assist students in accessing post-secondary education as well as training and employment opportunities.

Connections to community - Students recognize the importance of their efforts when they apply their knowledge, skills and abilities to support creative and innovative community projects; they become engaged citizens making a positive contribution. Likewise, work placements within the community help to connect school- with work-based learning. Community professionals serving as mentors can encourage students to expand their career interests and to work towards achieving their career goals.

Alignment with labour market needs – Students can quickly see the importance and relevance of their learning when learning in PAA courses aligns with community labour market trends and opportunities.

Using this Curriculum

Outcomes define what students are expected to know, understand and be able to do by the end of a grade or secondary level course in a particular area of study. Outcomes provide direction for assessment and evaluation, and for program, unit and lesson planning. In PAA, outcomes that are required are those within core modules for pure courses, and those within optional modules selected at the local level.

Outcomes:

- focus on what students will learn rather than what teachers will teach;
- specify the skills, abilities, knowledge and/or attitudes students are expected to demonstrate;
- are observable, assessable and attainable; and,
- are supported by indicators which provide the breadth and depth of expectations.

Indicators are representative of what students need to know and/or be able to do in order to achieve an outcome. When planning for instruction, teachers must comprehend the set of indicators to understand fully the breadth and the depth of learning related to a particular outcome. Based on this understanding of the outcome, teachers may develop indicators that are responsive to students' needs, interests and prior learning. Teacher-developed indicators must maintain the intent of the outcome.

The set of indicators for an outcome:

- provides the intent (breadth and depth) of the outcome;
- tells the story, or creates a picture, of the outcome;
- defines the level and types of knowledge required; and,
- is not a checklist or prioritized list of instructional activities or assessment items.

Other Terms

Within curricula, the terms "including", "such as", "e.g." and "i.e." serve specific purposes:

- **Including** prescribes content, contexts or strategies that students must experience in their learning, without excluding other possibilities.
- **Such as** provides examples of possible broad categories of content, contexts or strategies that teachers or students may choose, without excluding other possibilities.
- **E.g.** offers specific examples of what a term, concept or strategy might look like.
- **I.e.** means 'that is' and clarifies the term, concept or strategy it follows.

Modules/Outcomes at a Glance

Module Number	Modules (Core or Optional)	Level	Suggested Time (hrs)
1	**Safety (Core)** Integrate safety practices into personal work habits.	Introductory	2-3
2	**Basic 3D CAD (Core)** Create 3D objects using CAD software.	Introductory	5-15
3	**Manual Sketching (Core)** Manually sketch geometric figures, forms and shapes with consideration to scale and proportion.	Introductory	3-5
4	**Manual Drafting (Optional)** Investigate basic manual drafting tools and procedures.	Introductory	10-15
5	**CAD Basics (Core)** Investigate the basic functions of 2 dimensional (2D) CAD software.	Introductory	5-15
6	**Basic Section Views (Core)** Create full section views of various objects.	Introductory	5-10
7	**Basic Conceptual Design (Optional)** Explore general conceptual designs.	Introductory	5-10
8	**Design Fabrication (Optional)** Model and fabricate a product.	Intermediate	5-20
9	**Reading Technical Drawings (Core)** Explore basic principles of communication associated with reading technical drawings (e.g., construction drawings and industrial drawings).	Introductory	2-5
10	**Multi-view (Orthographic) Drawings (Core)** Produce 2D representation of multiple views of 3D objects.	Introductory	5-15
11	**Pictorial Drawings (Core)** Produce pictorial drawings to scale and proportion.	Intermediate	5-10
12	**Basic Dimensioning (Core)** Dimension drawings using principles (e.g., accuracy, appropriate positioning, completeness and readability) for purpose of production.	Introductory	3-10
13	**Energy Efficiency and Environmental Sustainability (Core)** Investigate building practices that promote energy efficiency and environmental sustainability.	Introductory	5-7

14	**Career Opportunities Exploration (Core)** Explore drafting and computer aided design related occupations in Saskatchewan, Canada and the world.	Introductory	2-5
15	**Basic Drafting Project (Optional)** Demonstrate basic drafting skills to complete a project.	Intermediate	10-30
16	**Intermediate 3D CAD (Optional)** Create 3D CAD models.	Intermediate	5-15
17	**Wall Sections (Core)** Create wall section drawings.	Advanced	5-20
18	**Intermediate Conceptual Design (Optional)** Develop a general conceptual design for a building based on client needs and preferences.	Intermediate	5-7
19	**Architectural Technical Drawings (Core)** Develop industry standard architectural drawings.	Intermediate	5-15
20	**Surveying and Mapping (Optional)** Investigate purposes and applications of mapping and surveying.	Advanced	5-15
21	**Foundation Plans (Core)** Create a foundation plan for a residential building.	Advanced	5-15
22	**Floor Plans (Core)** Create floor plans for residential buildings.	Advanced	10-30
23	**Elevations (Core)** Create elevation plans for residential buildings.	Advanced	10-20
24	**Site Plans (Core)** Produce site plans for residential buildings.	Advanced	3-5
25	**Residential Design (Core)** Create a residential design for a family dwelling.	Advanced	5-15
26	**Presentation Floor Plan (Core)** Produce a presentation floor plan for a residential building.	Advanced	5-10
27	**Presentation Elevations (Core)** Produce a presentation elevation for a residential building.	Advanced	5-15
28	**Architectural Styles (Optional)** Investigate architectural styles from various periods and geographical regions.	Intermediate	3-5
29	**Architectural Drafting Careers Investigation (Core)** Analyze architecture related occupations in Saskatchewan, Canada and the world.	Intermediate	3-5
30	**Architectural Drafting Project (Optional)** Demonstrate increasing proficiency of architectural drafting skills to complete a project.	Advanced	20-50

31	**Building Information Modelling (BIM) Group Project (Optional)** Collaborate with peers to design and implement a detailed exploration of a BIM project.	Advanced	20-40
32	**Advanced 3D CAD (Core)** Create an advanced 3D drawing.	Advanced	15-25
33	**Advanced Dimensioning (Core)** Create drawings using principles of advanced dimensioning suitable for production purposes.	Advanced	5-15
34	**Fasteners and Joints (Core)** Represent appropriate fasteners and/or fastening methods for given context.	Advanced	5-10
35	**Pattern Development (Optional)** Draw and construct pattern developments.	Intermediate	5-15
36	**Engineering and Design Fabrication (Optional)** Design, model and fabricate a product.	Advanced	10-40
37	**Piping (Optional)** Create piping drawings to scale.	Advanced	10-15
38	**Schematics (Optional)** Create hydraulic, pneumatic and electrical schematic drawings.	Advanced	5-15
39	**Section Views (Core)** Create appropriate section views of various objects.	Intermediate	5-10
40	**Auxiliary Views (Optional)** Create auxiliary view drawings.	Advanced	5-10
41	**Mechanical Drawings (Core)** Develop industry standard mechanical drawings.	Advanced	5-15
42	**Mechanical Drafting Careers Investigation (Core)** Analyze mechanical drafting related occupations in Saskatchewan, Canada and the world.	Advanced	3-5
43	**Mechanical Drafting Project (Optional)** Demonstrate increasing proficiency of mechanical drafting skills to complete a project.	Advanced	10-40
44A	**Work Study Preparation (Optional)** Prepare for the work placement.	Intermediate	3-5
44B	**Work Study Placement (Optional)** Participate in a work placement experience.	Advanced	3-5
45A	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Intermediate	25-50

45B	**Work Study Placement (Optional)** Participate in a work placement experience.	Advanced	25-50
46A	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Intermediate	2-4
46B	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Advanced	2-4
99A	**Extended Study (Optional)**	Introductory	10-25
99B	**Extended Study (Optional)**	Intermediate	10-25
99C	**Extended Study (Optional)**	Advanced	10-25

Course Configurations – Core and Suggested Optional Modules

Module Number	Drafting and Computer-Aided Design 10 Modules (Core or Optional)	Level	Suggested Time (hrs)
1	**Safety (Core)** Integrate safety practices into personal work habits.	Introductory	2-3
2	**Basic 3D CAD (Core)** Create 3D objects using CAD software.	Introductory	5-15
3	**Manual Sketching (Core)** Manually sketch geometric figures, forms and shapes with consideration to scale and proportion.	Introductory	3-5
4	**Manual Drafting (Optional)** Investigate basic manual drafting tools and procedures.	Introductory	10-15
5	**CAD Basics (Core)** Investigate the basic functions of 2 dimensional (2D) CAD software.	Introductory	5-15
6	**Basic Section Views (Core)** Create full section views of various objects.	Introductory	5-10
7	**Basic Conceptual Design (Optional)** Explore general conceptual designs.	Introductory	5-10
8	**Design Fabrication (Optional)** Model and fabricate a product.	Intermediate	5-20
9	**Reading Technical Drawings (Core)** Explore basic principles of communication associated with reading technical drawings (e.g., construction drawings and industrial drawings).	Introductory	2-5
10	**Multi-view (Orthographic) Drawings (Core)** Produce 2D representation of multiple views of 3D objects.	Introductory	5-15
11	**Pictorial Drawings (Core)** Produce pictorial drawings to scale and proportion.	Intermediate	5-10
12	**Basic Dimensioning (Core)** Dimension drawings using principles (e.g., accuracy, appropriate positioning, completeness and readability) for purpose of production.	Introductory	3-10
13	**Energy Efficiency and Environmental Sustainability (Core)** Investigate building practices that promote energy efficiency and environmental sustainability.	Introductory	5-7
14	**Career Opportunities Exploration (Core)** Explore drafting and computer aided design related occupations in Saskatchewan, Canada and the world.	Introductory	2-5

15	**Basic Drafting Project (Optional)** Demonstrate basic drafting skills to complete a project.	Intermediate	10-30
99A	**Extended Study (Optional)**	Introductory	10-25
	MINIMUM		**100**

Module Number	Drafting and Computer-Aided Design 20 Modules (Core or Optional)	Level	Suggested Time (hrs)
16	**Intermediate 3D CAD (Optional)** Create 3D CAD models.	Intermediate	5-15
17	**Wall Sections (Core)** Create wall section drawings.	Advanced	5-20
18	**Intermediate Conceptual Design (Optional)** Develop a general conceptual design for a building based on client needs and preferences.	Intermediate	5-7
19	**Architectural Technical Drawings (Core)** Develop industry standard architectural drawings.	Intermediate	5-15
20	**Surveying and Mapping (Optional)** Investigate purposes and applications of mapping and surveying.	Advanced	5-15
21	**Foundation Plans (Core)** Create a foundation plan for a residential building.	Advanced	5-15
22	**Floor Plans (Core)** Create floor plans for residential buildings.	Advanced	10-30
23	**Elevations (Core)** Create elevation plans for residential buildings.	Advanced	10-20
24	**Site Plans (Core)** Produce site plans for residential buildings.	Advanced	3-5
25	**Residential Design (Core)** Create a residential design for a family dwelling.	Advanced	5-15
26	**Presentation Floor Plan (Core)** Produce a presentation floor plan for a residential building.	Advanced	5-10
27	**Presentation Elevations (Core)** Produce a presentation elevation for a residential building.	Advanced	5-15
28	**Architectural Styles (Optional)** Investigate architectural styles from various periods and geographical regions.	Intermediate	3-5
29	**Architectural Drafting Careers Investigation (Core)** Analyze architecture related occupations in Saskatchewan, Canada and the world.	Intermediate	3-5
30	**Architectural Drafting Project (Optional)** Demonstrate increasing proficiency of architectural drafting skills to complete a project.	Advanced	20-50

31	**Building Information Modelling (BIM) Group Project (Optional)** Collaborate with peers to design and implement a detailed exploration of a BIM project.	Advanced	20-40
44A	**Work Study Preparation (Optional)** Prepare for the work placement.	Intermediate	3-5
45A	**Work Study Placement (Optional)** Participate in a work placement experience.	Intermediate	25-50
46A	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Intermediate	2-4
99B	**Extended Study (Optional)**	Intermediate	10-25
	MINIMUM		**100**

Module Number	Drafting and Computer-Aided Design 30 Modules (Core or Optional)	Level	Suggested Time (hrs)
32	**Advanced 3D CAD (Core)** Create an advanced 3D drawing.	Advanced	15-25
33	**Advanced Dimensioning (Core)** Create drawings using principles of advanced dimensioning suitable for production purposes.	Advanced	5-15
34	**Fasteners and Joints (Core)** Represent appropriate fasteners and/or fastening methods for given context.	Advanced	5-10
35	**Pattern Development (Optional)** Draw and construct pattern developments.	Intermediate	5-15
36	**Engineering and Design Fabrication (Optional)** Design, model and fabricate a product.	Advanced	10-40
37	**Piping (Optional)** Create piping drawings to scale.	Advanced	10-15
38	**Schematics (Optional)** Create hydraulic, pneumatic and electrical schematic drawings.	Advanced	5-15
39	**Section Views (Core)** Create appropriate section views of various objects.	Intermediate	5-10
40	**Auxiliary Views (Optional)** Create auxiliary view drawings.	Advanced	5-10
41	**Mechanical Drawings (Core)** Develop industry standard mechanical drawings.	Advanced	5-15
42	**Mechanical Drafting Careers Investigation (Core)** Analyze mechanical drafting related occupations in Saskatchewan, Canada and the world.	Advanced	3-5
43	**Mechanical Drafting Project (Optional)** Demonstrate increasing proficiency of mechanical drafting skills to complete a project.	Advanced	10-40
44B	**Work Study Preparation (Optional)** Prepare for the work placement.	Advanced	3-5
45B	**Work Study Placement (Optional)** Participate in a work placement experience.	Advanced	25-50
46B	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Advanced	2-4
99C	**Extended Study (Optional)**	Introductory Intermediate Advanced	10-25
	MINIMUM		**100**

Suggested Modules for Middle Level PAA Survey Courses

Module Number	Modules	Level	Suggested Time (hrs)	Prerequisites
1	**Safety** Integrate safety practices into personal work habits.	Introductory	2-3	None
2	**Basic 3D CAD** Create 3D objects using CAD software.	Introductory	5-15	Module 5
3	**Manual Sketching** Manually sketch geometric figures, forms and shapes with consideration to scale and proportion.	Introductory	3-5	None
4	**Manual Drafting** Investigate basic manual drafting tools and procedures.	Introductory	10-15	Module 3
5	**CAD Basics** Investigate the basic functions of 2 dimensional (2D) CAD software.	Introductory	5-15	Module 3
7	**Basic Conceptual Design** Explore general conceptual designs.	Introductory	5-10	Module 12
8	**Design Fabrication** Model and fabricate a product.	Intermediate	5-20	Module 1,2
10	**Multi-view (Orthographic) Drawings** Produce 2D representation of multiple views of 3D objects.	Introductory	5-15	Module 3
11	**Pictorial Drawings** Produce pictorial drawings to scale and proportion.	Intermediate	5-10	Module 12
12	**Basic Dimensioning** Dimension drawings using principles (e.g., accuracy, appropriate positioning, completeness and readability) for purpose of production.	Introductory	3-10	None
13	**Energy Efficiency and Environmental Sustainability** Investigate building practices that promote energy efficiency and environmental sustainability.	Introductory	5-7	None
16	**Intermediate 3D CAD** Create 3D CAD models.	Intermediate	5-15	Module 2
28	**Architectural Styles** Investigate architectural styles from various periods and geographical regions.	Intermediate	3-5	None

Suggested Modules for Secondary PAA Survey Courses

Module Number	Modules	Level	Suggested Time (hrs)	Prerequisites
1	**Safety** Integrate safety practices into personal work habits.	Introductory	2-3	None
2	**Basic 3D CAD** Create 3D objects using CAD software.	Introductory	5-15	Module 5
3	**Manual Sketching** Manually sketch geometric figures, forms and shapes with consideration to scale and proportion.	Introductory	3-5	None
5	**CAD Basics** Investigate the basic functions of 2 dimensional (2D) CAD software.	Introductory	5-15	Module 3
10	**Multi-view (Orthographic) Drawings** Produce 2D representation of multiple views of 3D objects.	Introductory	5-15	Module 3
11	**Pictorial Drawings** Produce pictorial drawings to scale and proportion.	Intermediate	5-10	Module 12
12	**Basic Dimensioning** Dimension drawings using principles (e.g., accuracy, appropriate positioning, completeness and readability) for purpose of production.	Introductory	3-10	None
13	**Energy Efficiency and Environmental Sustainability** Investigate building practices that promote energy efficiency and environmental sustainability.	Introductory	5-7	None
18	**Intermediate Conceptual Design (Optional)** Develop a general conceptual design for a building based on client needs and preferences.	Intermediate	5-7	Module 7
19	**Architectural Technical Drawings (Core)** Develop industry standard architectural drawings.	Intermediate	5-15	Module 17, 21, 22, 24, 26, 27
21	**Foundation Plans (Core)** Create a foundation plan for a residential building.	Advanced	5-15	Module 22
22	**Floor Plans (Core)** Create floor plans for residential buildings.	Advanced	10-30	Module 25

23	**Elevations (Core)** Create elevation plans for residential buildings.	Advanced	10-20	Module 22
26	**Presentation Floor Plan (Core)** Produce a presentation floor plan for a residential building.	Advanced	5-10	Module 18, 25
28	**Architectural Styles** Investigate architectural styles from various periods and geographical regions.	Intermediate	3-5	None
32	**Advanced 3D CAD (Core)** Create an advanced 3D drawing.	Advanced	15-25	Module 16
33	**Advanced Dimensioning (Core)** Create drawings using principles of advanced dimensioning suitable for production purposes.	Advanced	5-15	Module 9, 12
39	**Section Views (Core)** Create appropriate section views of various objects.	Intermediate	5-10	Module 6, 9
41	**Mechanical Drawings (Core)** Develop industry standard mechanical drawings.	Advanced	5-15	Module 9
44A	**Work Study Preparation (Optional)** Prepare for the work placement.	Intermediate	3-5	
44B	**Work Study Preparation (Optional)** Prepare for the work placement	Advanced	3-5	
45A	**Work Study Placement (Optional)** Participate in a work placement experience.	Intermediate	25-50	
45B	**Work Study Placement (Optional)** Participate in a work placement experience.	Advanced	25-50	
46A	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Intermediate	2-4	
46B	**Work Study Follow-up (Optional)** Relate one's work placement experience to personal and career goals.	Advanced	2-4	
99A	**Extended Study (Optional)**	Introductory	10-25	
99B	**Extended Study (Optional)**	Intermediate	10-25	
99C	**Extended Study (Optional)**	Advanced	10-25	

Modules

Module 1: Safety (Core)		
Suggested Time: 2-3 hours	**Level: Introductory**	**Prerequisite: None**
Outcome	**Indicators**	
Integrate safety practices into personal work habits.	a. Discuss the importance of focusing on personal tasks while maintaining an awareness of others working in proximity. b. Investigate ways to prevent computer screen eye strain and fatigue. c. Discuss benefits of movement, proper posture, exercises, breaks and healthy eating habits for sedentary workers. d. Investigate best practices in work station design and ergonomics. e. Analyze effects of emotional pressure and working in isolation on mental well-being. f. Discuss need for safety practices and equipment (e.g., safety glasses, hard hats, steel toed boots) when visiting work sites. g. Identify hazards and safety practices outlined in manufacturer's operator's manual for fabrication processes. h. Research government regulations for safety (e.g., WHMIS, GHS, Occupational Health and Safety).	

Module 2: Basic Three Dimensional (3D) Computer-Aided Drafting (CAD) (Core)		
Suggested Time: 5-15 hours	**Level: Introductory**	**Prerequisite: Module 5**
Outcome	**Indicators**	

Create 3D objects using CAD software.	a. Investigate use of standard drawing protocols for producing 3D drawings such as:
	   • identify x, y and z axis;
	   • apply concepts of scale to produce drawings;
	   • use CAD tools to extrude two dimensional (2D) basic shapes into 3D basic form; and,
	   • remove and add components to 3D basic forms.
	b. Create and save 3D files in correct format.
	c. Create holes in slab or block.
	d. Create protrusions and cuts in basic 3D form.
	e. Determine if a 3D object is solid.
	f. Apply different surface materials and/or textures to 3D objects.
	g. Change views (e.g., solid, wire frame, realistic) in drawings.	

Module 3: Manual Sketching (Core)		
Suggested Time: 3-5 hours	**Level: Introductory**	**Prerequisite: None**
Outcome	**Indicators**	
Manually sketch geometric figures, forms and shapes with consideration to scale and proportion.	a. Identify drawings of geometric forms such as 2D geometric figures, orthographic, or pictorial. b. Sketch simple 2D geometric figures and shapes. c. Sketch orthographic drawings of geometric forms. d. Sketch isometric drawings (30° and 60°) of geometric forms. e. Sketch pictorial drawings of simple 3D geometric shapes. f. Manually sketch drawings of manufactured items that have painted or polished surfaces that reflect light and create highlights. g. Produce sketches that are complete, neat, accurate and demonstrate proper layout and proportion.	

Module 4: Manual Drafting (Optional)		
Suggested Time: 10-15 hours	**Level: Introductory**	**Prerequisite: Module 3**
Outcome	**Indicators**	
Investigate basic manual drafting tools and procedures.	a. Produce drawings using traditional manual tools (e.g., ruler, T square, pencil, triangle set squares). b. Draw and manipulate elements (e.g., lines, circles, arcs, curves and polygons) using manual drafting tools. c. Draw objects to an exact size using appropriate metric and/or imperial scale. d. Construct title blocks with required information. e. Create lines of various types and weights, (e.g., hidden lines, centre lines, guidelines, construction lines). f. Use terms such as parallel, radius, diameter, tangent, and perpendicular in proper context. g. Produce technical drawings that are complete, neat, accurate, have clear and legible printing and demonstrate proper layout and proportion.	

Module 5: CAD Basics (Core)		
Suggested Time: 5-15 hours	Level: Introductory	Prerequisite: Module 3
Outcome	Indicators	
Investigate the basic functions of 2 dimensional (2D) CAD software.	a. Collaborate with peers to discuss inquiry questions such as: What is the value computer technology in the field of drafting? How has the use of technology with respect to drafting evolved over time? b. Open and save a CAD file. c. Differentiate between presentation scale and full model (1:1) scale in CAD software. d. Draw and manipulate elements (e.g., lines, circles, arcs, curves and polygons) within CAD software. e. Manipulate elements to specific sizes. f. Locate and use tools within CAD software to develop drawings. g. Use various view controls such as zoom in, zoom out and pan. h. Draw elements on different layers and turn layers off and on as required. i. Create layers and loads in each line type (e.g., hidden lines, centre lines, guidelines, construction lines). j. Discuss the value of using layers in CAD software. k. Draw and complete title blocks with required information. l. Plot files with consideration given to scale. m. Use terms such as parallel, radius, diameter, tangent, intersection, midpoint, endpoint and perpendicular in proper context. n. Create an ordered and logical layer structure by assigning a specific name and function to each drawing layer. o. Develop an organized file structure so that drawings may be stored in a logical manner and easily referenced. p. Reflect on and analyze processes used to create 2D CAD drawings.	

Module 6: Basic Section Views (Core)		
Suggested Time: 5-10 hours	**Level: Introductory**	**Prerequisite: Module 10, 12**
Outcome	**Indicators**	
Create full section views of various objects.	a. Discuss the purpose, characteristics and types of section views. b. Produce appropriately scaled full section views of objects: • Select appropriate face(s) for hatch. • Determine which face(s) should not be hatched. c. Identify corresponding orthographic view with cutting plane on drawings.	

Module 7: Basic Conceptual Design (Optional)		
Suggested Time: 5-10 hours	**Level: Introductory**	**Prerequisite: Module 12**
Outcome	**Indicators**	
Explore general conceptual designs.	a. Explore various stages of conceptual design process: • Examine and prioritize client needs and preferences. • Explore a variety of floor plan room sizes for a simple residential building. • Explore various room types, size requirements and any special requirements (e.g., personal, cultural, religious, accessibility). • Explore relationship between function and space in the design. • Identify standard room components (e.g., windows, doors, fixtures, appliances) and their sizes. b. Demonstrate understanding of conceptual floor plan through representation (e.g., sketches, models, virtual walk-throughs).	

Module 8: Design Fabrication (Optional)		
Suggested Time: 5-20 hours	Level: Intermediate	Prerequisite: Module 1, 2
Outcome	**Indicators**	
Model and fabricate a product.	a. Manipulate an existing model in a 3D environment. b. Model objects in a 3D environment. c. Generate drawings of models from a 3D environment. d. Fabricate 3D objects using equipment such as a 3D printer, CNC mill, lathe. e. Explore costs associated with producing a designed and fabricated product (e.g., quantity, material, labour, equipment costs). f. Discuss inquiry questions such as, what are the future possibilities and implications of fabrication technology?	

Module 9: Reading Technical Drawings (Core)		
Suggested Time: 2-5 hours	Level: Introductory	Prerequisite: Module 12
Outcomes	**Indicators**	
Explore basic principles of communication associated with reading technical drawings (e.g., construction drawings and industrial drawings).	a. Investigate different types of drawings as they relate to each building trade (e.g., welding, construction, electrical, plumbing). b. Recognize that imperial or metric measurements may be used in technical drawings. c. Understand concepts of scale and proportion. d. Identify various types of views (e.g., orthographic, pictorial, detail, section, assembly). e. Identify basic lines types (e.g., object, hidden, construction, profile) and relevant abbreviations and symbols. f. Discuss uses and significance of notes, specifications and tolerances on technical drawings. g. Identify information found on the drawing and in a title block. h. Read dimensions from a drawing. i. Interpret a technical drawing to determine the types and quantity of materials required for construction.	

Module 10: Multi-view (Orthographic) Drawings (Core)		
Suggested Time: 5-15 hours	**Level: Introductory**	**Prerequisite: Module 3**
Outcome	**Indicators**	
Produce 2D representation of multiple views of 3D objects.	a. Explore various ways to represent 3D objects in 2D planes. b. Create properly spaced and aligned multi-view drawings using orthographic projection. c. Represent a variety of holes (e.g., THRU, blind countersunk, and counterbore) using hidden lines, center marks and center lines. d. Generate pictorial details in orthographic projections. e. Differentiate between third-angle and first-angle views in a multi-view projection. f. Lay out a drawing with two or three views using appropriate scale and placement of views. g. Communicate verbally or in writing, purpose and proper use of orthographic drawings including specific language and terms.	

Module 11: Pictorial Drawings (Core)		
Suggested Time: 5-10 hours	**Level: Intermediate**	**Prerequisite: Module 12**
Outcome	**Indicators**	
Produce pictorial drawings to scale and proportion.	a. Investigate characteristics of different types (e.g., isometric, oblique cavalier, oblique cabinet) of pictorial drawings. b. Construct isometric drawings. c. Produce isometric drawings incorporating circles, arcs and non-isometric lines. d. Create oblique cavalier and oblique cabinet drawings.	

Module 12: Basic Dimensioning (Core)		
Suggested Time: 3-10 hours	**Level: Introductory**	**Prerequisite: None**
Outcome	**Indicators**	
Dimension drawings using principles (e.g., accuracy, appropriate positioning, completeness and readability) for purpose of production.	a. Discuss importance of dimensioning as a communication tool. b. Investigate use of appropriate guidelines regarding dimension selection and placement, including: • creating strings of dimensions; • grouping dimensions (multiple strings); • placing dimensions between views; • avoiding dimensioning hidden lines, creating long extension lines and crossing extension lines, repeated dimensions; • dimensioning to the center of arcs and circles; • dimensioning circles with diameter symbols; • dimensioning arcs with radius symbols; • dimensioning angles numerically; and, • placing leaders correctly. c. Create dimension text in appropriate sizes. d. Describe orally or in writing the size of objects represented in dimensioned orthographic drawings. e. Dimension simple objects that require overall dimensions. f. Dimension objects with simple holes, arc and cylinders using leaders and correct symbols. g. Demonstrate understanding of terminology related to drafting.	

Module 13: Energy Efficiency and Environmental Sustainability (Core)		
Suggested Time: 5-7 hours	**Level: Introductory**	**Prerequisite: None**
Outcome	**Indicators**	
Investigate building practices that promote energy efficiency and environmental sustainability.	a. Explore building practices (e.g., passive house design, house orientation, geographical location of the house, seasonal factors) to energy efficiency and environmental sustainability. b. Discuss the importance of building codes and by-laws related to public safety and pollution reduction. c. Investigate ways that Indigenous knowledge and practices contribute to environmental sustainability and protection of natural resources. d. Compare the cost of different types of building materials used for windows, doors, insulation and framing in energy efficient buildings. e. Analyze potential environmental impacts of various building materials. f. Discuss methods of disposing building materials to minimize their environmental impact.	

	g. Research current job site practices (e.g., recycling, repurposing used materials) that reduce waste of materials.
	h. Compare effectiveness of environmentally sustainable building materials versus traditional building materials.

Module 14: Career Opportunities Exploration (Core)		
Suggested Time: 2-5 hours	Level: Introductory	Prerequisite: None
Outcome	**Indicators**	
Explore drafting and computer-aided design related occupations in Saskatchewan, Canada and the world.	a. Generate a list of occupations that require a background in drafting and computer-aided design. b. Explore gender diversity of careers related to drafting and computer-aided design in Saskatchewan, Canada and the world. c. Research educational institutions that offer required educational qualifications in drafting and CAD. d. Participate in events such as career fairs or job shadows. e. Explore connections between topics in drafting and computer-aided design and occupations of personal interest. f. Examine roles, responsibilities, educational qualifications and personal and professional qualities common to people involved in architectural and mechanical drafting related jobs. g. Create a representation (e.g., display, brochure, video, presentation software, oral presentation) to communicate research findings related to drafting occupations.	

Module 15: Basic Drafting Project (Optional)		
Suggested Time: 10-30 hours	Level: Intermediate	Prerequisite: Module 1, 2, 3, 5, 6, 9, 10, 11, 12, 13, 14
Outcome	Indicators	
Demonstrate basic drafting skills to complete a project.	a. Identify the required tools, skills and timelines associated with a selected project. b. Identify safety considerations. c. Select the software program required for the project. d. Represent shape and views required to produce a working drawing. e. Explore industry standards in CAD. f. Create professional drawings in consideration of industry standards. g. Construct a tool (e.g., rubric, checklist, self or peer evaluation form) to assess the process and product. h. Present and share the results of the project. i. Reflect on and share with peers the successes and challenges experienced during the project development.	

Module 16: Intermediate 3D CAD (Optional)		
Suggested Time: 5-15 hours	Level: Intermediate	Prerequisite: Module 2
Outcome	Indicators	
Create 3D CAD models.	a. Design 3D CAD models using a variety of CAD tools: • Explore premade 3D drawings from a variety of views and perspectives. • Compare surface characteristics of a variety of 3D objects. • Differentiate between opaque and transparent solids. • Determine support or raft structures for the model. • Add lighting and materials to objects in 3D CAD environment. b. Produce prints of rendered images of 3D CAD models by: • exporting model to slicing software; • manipulating model to correct scale for print; and, • determining material for model print. c. Develop and maintain a portfolio of completed drawings.	

Module 17: Wall Sections (Core)		
Suggested Time: 5-20 hours	**Level: Advanced**	**Prerequisite: Module 12**
Outcome	**Indicators**	
Create wall section drawings.	a. Investigate various types of wall materials with respect to their use, sustainability, cost, individual preferences and energy efficiency. b. Identify interior wall components (e.g., top plate, bottom plate, studs). c. Label load bearing and non-load bearing interior walls. d. Identify exterior wall components (e.g., top plate, bottom plate, studs, insulation, exterior finish, sheet polyethylene, header, blocking). e. Size and locate floor joists according to the National Building Code. f. Determine the boundary of the wall section to be displayed. g. Draw a completed wall section to scale. h. Insert correct symbols for materials used in construction. i. Differentiate between nominal and actual lumber sizes.	

Module 18: Intermediate Conceptual Design (Optional)		
Suggested Time: 5-7 hours	**Level: Intermediate**	**Prerequisite: Module 7**
Outcome	**Indicators**	

Develop a general conceptual design for a building based on client needs and preferences.	a. Investigate a variety of floor plan room sizes for a selected building (e.g., residential building, commercial, recreational, business) to develop an understanding of conceptual design.
	b. Create a conceptual design:
	  • Determine rooms.
	  • For each room, define use of room, size requirements and any special requirements.
	  • Produce bubble diagrams and adjacency matrices to determine circulation patterns and proximity based on functional relationships.
	  • Create preliminary box assemblies of volumes.
	  • Develop conceptual floor plans and elevations.
	c. Develop presentation package of conceptual design.	

Module 19: Architectural Technical Drawings (Core)		
Suggested Time: 5-15 hours	**Level: Intermediate**	**Prerequisites: Module 17, 21, 22, 24, 26, 27**
Outcome	**Indicators**	
Develop industry standard architectural drawings.	a. Investigate the purpose and use of architectural drawings. b. Research terminology related to architectural drawings. c. Determine and produce drawings for a sheet set, including: • presentation elevation; • presentation floor plan; • floor plan; • foundation plan; • elevation plan; • wall section; and, • site plan. d. Create professional layout (e.g., title block, schedules, symbols, balance, scale, sheet sequence). • Include annotations and general notes. • Provide all dimensions required for construction. • Dimension to centre of all openings in metric and/or imperial units. • Develop material takeoff and construction estimation.	

Module 20: Surveying and Mapping (Optional)		
Suggested Time: 5-15 hours	**Level: Advanced**	**Prerequisites: Module 5, 10, 11**
Outcome	**Indicators**	
Investigate purposes and applications of mapping and surveying.	a. Discuss technical terms associated with mapping and surveying. b. Demonstrate an understanding of latitude and longitude. c. Research and develop a basic understanding of the Dominion Land Survey System. d. Explore the set up and use of surveying equipment, including procedures such as: • finding angles between bearings; • plotting deflection angles on both open and closed traverses; • sight levels using engineer's level and/or transit and rod; • determining unknown elevations and entering readings into field notes; and, • plotting out a lot. e. Apply coordinates to find locations. f. Explore how data is stored in mapping software, such as AutoCAD	

	MAP 3D, and properly structured for efficient retrieval.
	g. Find map locations based on given legal descriptions.
	h. Produce simple topographical maps incorporating relevant mapping symbols.
	i. Interpret a land use zoning map.

Module 21: Foundation Plans (Core):

Suggested Time: 5-15 hours	Level: Advanced	Prerequisite: Module 22
Outcome	**Indicators**	

Outcome	Indicators
Create a foundation plan for a residential building.	a. Design a foundation plan using appropriate scale ratios that include: • placing foundation walls in relation to the floor plan; • placing footings correctly aligned with foundation walls or piles; • drawing window openings according to the National Building Code; • locating stairs to suit floor plan design; • calculating number of columns and spacing required according to the National Building Code; • sizing and locating beam(s) according to National Building Code; • dimensioning and labelling elements of the foundation plan; and, • creating levels in reference to grade. b. Create legend notes that include foundation specifications and other important details. c. Estimate the cost to construct the completed foundation plan using new resources or reclaimed items.

Module 22: Floor Plans (Core)		
Suggested Time: 10-30 hours	**Level: Advanced**	**Prerequisite: Module 25**
Outcome	**Indicators**	
Create floor plans for residential buildings.	a. Discuss and apply terminology (e.g., exterior walls, interior partitions) associated with floor plans. b. Design multiple floor plans to demonstrate understanding of drawing tools and drawing symbols. • Draw exterior walls and interior partitions/walls. • Insert doors and windows. • Insert plumbing fixtures, millwork and typ on construction drawings. • Locate and place stairwell openings and stairs. c. Provide detail to floor plan by: • representing miscellaneous objects (e.g., closets, closet rods, hangers, shelves, balcony handrails, appliances, cabinets); and, • dimensioning using correct architectural symbols (e.g., arrows, slashes). d. Label and dimension rooms using correct architectural symbols and following correct standards. e. Capture room information (e.g., room area, room function) in a central database for reference and to identify building trends and preferences for future projects. f. Differentiate between a presentation and construction floor plan. g. Explore floor plans which take into account universal design and cultural needs.	

Module 23: Elevations (Core)		
Suggested Time:10-20 hours	**Level: Advanced**	**Prerequisite: Module 22**
Outcome	**Indicators**	

Create elevation plans for residential buildings.	a. Investigate and develop elevation plans that demonstrate understanding of required technical vocabulary, drawing tools and symbols.
	   • Identify grade level on plans.
	   • Produce front and side elevations for a set of house plans.
	   • Label materials used to finish house exterior and significant elevations (e.g., top of top plate, top of subfloor).
	b. Determine required levels for wall and window heights.
	c. Explore differences among roof types (e.g., flat, gable, shed, mansard, hip).
	d. Design roof pitch in accordance with floor plan.	

Module 24 : Site Plans (Core)		
Suggested Time: 3-5 hours	**Level: Advanced**	**Prerequisite: Module 21, 22**
Outcomes	**Indicators**	
Produce site plans for residential buildings.	a. Research existing site plans in your community. b. Explore the role of community in regulating site plans. c. Create a scale representation of the site in standard scales (e.g., 1:100/1:200/1:500). d. Prepare a complete title block for a site plan. e. Identify legal site descriptions (e.g., lot, block, plan number) of the plan. f. Identify location for the building footprint and overall building dimensions with consideration to easements. g. Identify property lot lines, lengths, azimuths, orientation and easements on the site plan. h. Identify exterior items (e.g., stairs, ramps, platforms, services for water and power) on the site plan. i. Identify and dimension all roads, driveways, and sidewalks.	

Module 25: Residential Design (Core)		
Suggested Time: 5-15 hours	**Level: Advanced**	**Prerequisites: Module 12, 17, 21, 22, 23**
Outcome	**Indicators**	
Create a residential design for a family dwelling.	a. Demonstrate understanding and application of elements and principles of residential design for a family dwelling. b. Investigate specific residential needs (e.g., traffic patterns, number of family members, family needs, individual preferences, diverse cultural/indigenous perspectives, accessibility). c. Create a residential design for personal use and apply qualities of good functional design, such as: • investigating relevant building codes and by- laws; • analyzing options for house size and orientation on lot; • dividing home into zones (e.g., living; sleeping, cooking and dining spaces); • investigating and applying coordination of exterior design with the surrounding landscape; and, • exploring use and location of various residential construction materials used in the construction of a typical house.	

Module 26: Presentation Floor Plan (Core)		
Suggested Time: 5-10 hours	**Level: Advanced**	**Prerequisite: Module 18, 25**
Outcome	**Indicators**	
Produce a presentation floor plan for a residential building.	a. Discuss ways multiple floor plans can be generated from a single conceptual design. b. Create design sketches based on bubble diagrams and adjacency matrices as developed during conceptual design process that include: • coloured bubble diagram and preliminary floor plan according to zones (e.g., public, private, service); and, • legend with colours and zone titles. c. Produce finished presentation plan including room dimensions, room labels, door sizes, fixture tags (e.g., shower, shelves) and furniture placement. d. Present the finished product to a client. e. Refine presentation floor plan based on client needs and preferences.	

Module 27: Presentation Elevations (Optional)		
Suggested Time: 5-15 hours	**Level: Advanced**	**Prerequisite: Module 26**
Outcome	**Indicators**	
Produce a presentation elevation for a residential building.	a. Distinguish between presentation elevations and working drawings. b. Investigate concepts of scale and proportion. c. Produce elevation drawings consisting of all four views including the following processes: • creating annotations to identify all exterior building materials; • drawing walls and roof, windows and doors, and other visible exterior materials; and, • adding landscaping details (e.g., side walk, bushes, trees) and shade and shadow to enhance presentation elevation. d. Collaborate with peers to share work progress. e. Present finished product to an audience. f. Refine the elevation drawings based on feedback.	

Module 28: Architectural Styles (Optional)		
Suggested Time: 3 – 5 hours	**Level: Intermediate**	**Prerequisite: None**
Outcome	**Indicators**	
Investigate architectural styles from various periods and geographical regions.	a. Research how individual needs, cultures, religions and social perspectives have influenced architectural styles. b. Analyze qualities that distinguish various historical architectural styles (e.g., Indigenous, European, American) and discuss how they have influenced contemporary housing. c. Create a representation (e.g., pictorial timeline, video) of significant architectural designs from various periods and geographical regions. d. Compare historically and architecturally significant roofing types. e. Investigate contributions of renowned architects (e.g., Frank Lloyd Wright, Julia Morgan, Michelangelo). f. Explore implications of urbanization (e.g., low density vs. high density communities) on architectural styles. g. Explore implications of geography (mountain versus valley dwellings, warm versus cold climate regions) on architectural styles. h. Explore local or regional heritage buildings for their unique architectural and historical significance. i. Research relevant by-laws related to heritage building conservation. j. Discuss the benefits and challenges of heritage building restoration.	

Module 29: Architectural Drafting Careers Investigation (Core)		
Suggested Time: 3-5 hours	**Level: Intermediate**	**Prerequisite: None**
Outcome	**Indicators**	

Analyze architecture related occupations in Saskatchewan, Canada and the world.	a. Discuss the roles, responsibilities, educational qualifications and personal and professional qualities common to people involved in architectural related careers.
	b. Investigate gender diversity in careers related to architectural drafting in Saskatchewan, Canada and the world.
	c. Identify which drafting and computer-aided design related occupations are facing shortages and which are oversubscribed locally, regionally and/or nationally.
	d. Interview or connect with others to discuss drafting related occupations.
	e. Analyze personal suitability or non-suitability for a specific drafting related occupation considering criteria such as:
	   • initial and continuing educational requirements;
	   • duties and skills required for this occupation;
	   • the work environment, including typical hours and shifts worked and typical locations;
	   • current wages received in Saskatchewan and how these compare to the rest of Canada;
	   • physical, mental and emotional stresses related to this occupation;
	   • workplace hazards and safety considerations;
	   • other occupations with which they interact;
	   • professional and/or licensing requirements in Canada and Saskatchewan; and
	   • future trends impacting the occupation.
	f. Develop a plan to attain a job of personal interest in the drafting field.	

Module 30: Architectural Drafting Project (Optional)		
Suggested Time: 20-50 hours	**Level: Advanced**	**Prerequisite: Module 17, 19, 21, 22, 23, 24, 25, 26, 27, 29**

Outcome	Indicators

Demonstrate increasing proficiency of architectural drafting skills to complete a project.	a. Conduct an inquiry of required tools, skills and timelines associated with a selected project.
	b. Identify safety considerations.
	c. Select the software program required for the project.
	d. Produce drawings with all required detail views for a sheet set, including:
	   • presentation elevation;
	   • presentation floor plan;
	   • floor plan;
	   • foundation plan;
	   • elevation plan;
	   • wall section; and,
	   • site plan.
	e. Create professional drawings in consideration of industry standards.
	f. Construct a tool (e.g., rubric, checklist, self or peer evaluation form) to assess the process and product.
	g. Develop an assessment of personal skills, attitudes, work habits, and the final product.
	h. Present and share the results of project.
	i. Identify options (e.g., using LISP, Python programming to automate repetitive tasks) for streamlining workflow for the next project.
	j. Reflect on and share with peers the successes and challenges experienced during the project development. Consider the inquiry questions:
	   • How might the knowledge gained through this project be used to inform future projects?
	   • How might the learnings transfer to a future workplace project?

Module 31: Building Information Modelling (BIM) Group Project (Optional)		
Suggested Time: 20 - 40 hours	**Level: Advanced**	**Prerequisite: Module 25, 26**
Outcome	**Indicators**	
Collaborate with peers to design and implement a detailed exploration of a BIM project.	a. Research to develop knowledge and understanding of required components of BIM projects. b. Select a BIM inquiry project as a team. c. Collaborate as a team to plan and carry out a BIM inquiry project, including: • discussing personal and team members' skills and interests; • assigning roles and responsibilities; • developing timelines to manage project; and, • reflecting on personal contribution to the team and collaborative team performance. d. Reflect how BIM can create project efficiencies (e.g., improve facility management and operational maintenance; deliver projects on time and under budget; help develop more innovative and sustainable designs; improve communication with clients). e. Present findings to class.	

Module 32: Advanced 3D CAD (Core)		
Suggested Time: 15-25 hours	**Level: Advanced**	**Prerequisite: Module 16**
Outcomes	**Indicators**	
Create an advanced 3D drawing.	a. Produce project models in a 3D CAD environment. b. Create drawings of objects in 3D environment (e.g., multiple component objects). c. Produce multiple presentation files accurately displaying multiple components. d. Identify tolerances and accurately displaying in presentation files. e. Apply materials (e.g., faces, edges, colours) to the project in the 3D CAD environment. f. Incorporate lighting to create desired shade and shadow effects in the 3D CAD environment. g. Produce a video presentation (e.g., virtual reality, animated, animated exploded assembly) of the components and/or finished project. h. Recognize technical terms associated with 3D models. i. Maintain an electronic portfolio of completed drawings.	

Module 33: Advanced Dimensioning (Core)		
Suggested Time: 5-15 hours	Level: Advanced	Prerequisite: Module 9, 12
Outcome	Indicators	
Create drawings using principles of advanced dimensioning suitable for production purposes.	a. Create drawings that incorporate conventions of advanced dimensioning, including: • counterbore and countersunk holes; • angles and chamfers; • specifying allowable manufacturer tolerances; • non-circular curves; • assembly drawings; • using appropriate abbreviating terms; and, • placing notes with and without leaders. b. Design drawings that incorporate drawing symbols used in advanced dimensioning. c. Place and select dimensions with consideration to production purposes. d. Demonstrate understanding of the following: • all relevant measurements and information in technical drawings; • shapes in multi-view drawings; and, • abbreviations and their use. e. Create legends, notes and finish symbols required for production purposes. f. Represent efficient use of dimension lines (e.g., symmetrical, array, repeated features).	

Module 34: Fasteners and Joints (Core)		
Suggested Time: 5-10 hours	**Level: Advanced**	**Prerequisite: Module 9, 33**
Outcome	**Indicators**	
Represent appropriate fasteners and/or fastening methods for given context.	a. Investigate the purpose and use of fasteners and joints. b. Categorize fasteners by type: • head shape and drive type; • grade; • diameter and length; • pitch; and, • series. c. Investigate different thread forms (e.g., unified, metric, square, acme) and their applications. d. Determine thread designations and state the components of the designation. e. Identify and place basic welding symbols and associated joints on a drawing. f. Distinguish among wood joints (e.g., butt, mitre, dado, mortise and tenon, dowel, biscuit) and their applications. g. Identify common fasteners (e.g., counterbore, countersunk, hex head).	

Module 35: Pattern Development (Optional)		
Suggested Time: 5-15 hours	**Level: Intermediate**	**Prerequisite: Module 10, 40**
Outcome	**Indicators**	
Draw and construct pattern developments.	a. Identify various pattern developments. b. Draw or plot patterns on cardboard in order to construct pattern developments. c. Produce pattern developments for: • basic rectangular prisms; • truncated rectangular prisms; • truncated cylinders; • cones; • pyramids; • rectangular to round transition pieces; and, • oblique pyramids. d. Discuss different industries that use pattern developments.	

Module 36: Engineering and Design Fabrication (Optional)		
Suggested Time: 10-40 hours	**Level: Advanced**	**Prerequisite: Module 1, 8**
Outcome	**Indicators**	
Design, model and fabricate a product.	a. Manipulate an existing model in a three dimensional (3D) environment. b. Investigate commercial and industrial applications of CAD. c. Explore significance of CAD in the operation of manufacturing equipment (e.g., 3D printer, CNC mill, lathe). d. Create models of objects in a 3D environment. e. Develop prototypes to address specific needs based on selected criteria (e.g., use, quantity, cost) following a standard design process, including: • identifying the problem; • identifying known variables; • identify the solution by producing sketch, 2D drawing, model and prototype; • testing and validating the prototype; and, • reflecting and making necessary changes. f. Generate sketches of concepts. g. Generate working drawings of models. h. Create 3D objects using available equipment (e.g., 3D printer, CNC mill, lathe). i. Investigate alternatives to materials used in fabricated products. j. Calculate costs associated with producing a designed and fabricated product. • Breakdown material list. • Efficiency of material (e.g., tensile strength, hardness, pliability, ductility). k. Discuss the advantages and disadvantages of the computer fabrication of products in the context of ethical implications, cost production (single vs mass), and environmental issues. l. Discuss copyright and patent implications of designs. m. Predict future possibilities and implications of fabrication technology.	

Module 37: Piping (Optional)		
Suggested Time: 10-15 hours	**Level: Advanced**	**Prerequisite: Module 5, 41**
Outcome	**Indicators**	
Create piping drawings to scale.	a. Represent 3D objects presented on a two-dimensional plane in relation to sizes and shapes on multi-view drawings. b. Investigate different examples of pipe and their uses. c. Research the purpose and functions of different materials (e.g., joint valves, fittings) used in piping. d. Produce piping drawings to scale: • Draw single line multi-view piping drawings and create blocks. • Draw single line isometric piping drawings. • Dimension piping drawings. • Use appropriate technical terms in drawings. e. Research Saskatchewan based industries that incorporate piping drawings.	

Module 38: Schematics (Optional)		
Suggested Time: 5-15 hours	**Level: Advanced**	**Prerequisite: Module 5, 41**
Outcome	**Indicators**	
Create hydraulic, pneumatic and electrical schematic drawings.	a. Discuss the purpose of technical terms associated with hydraulic, pneumatic and electrical schematics (e.g., valves, pumps, motors, air supply, resistors, switches, solenoid). b. Identify the standard symbols used in hydraulic, pneumatic and electrical schematics. c. Interpret hydraulic, pneumatic and electrical schematics. d. Produce simple hydraulic, pneumatic and electrical schematics.	

Module 39: Section Views (Core)		
Suggested Time: 5-10 hours	**Level: Intermediate**	**Prerequisite: Module 6, 9**
Outcome	**Indicators**	
Create appropriate section views of various objects.	a. Analyze the suitability of various section views (e.g., full section, half section, offset section). b. Design and describe shapes in a multi-view (orthographic) drawing. c. Identify and produce appropriate section views to best represent the shape of the object, including: • full section; • half section; • offset section; and, • detailed design sections. d. Identify corresponding orthographic view with cutting plane. e. Produce detail of sectioned face(s), including: • identifying material by selecting appropriate hatch pattern or material symbol; • selecting appropriate face(s) for hatch; • selecting appropriate angle and scale; • creating legend for visual information, if necessary; and, • determining which face(s) should not be hatched. f. Demonstrate and apply knowledge of terminology used in mechanical drafting industry.	

Module 40: Auxiliary Views (Optional)		
Suggested Time: 5-10 hours	**Level: Advanced**	**Prerequisite: Module 41**
Outcome	**Indicators**	
Create auxiliary view drawings.	a. Discuss shape description in multi-view drawings. b. Produce drawings with primary and secondary auxiliary views, that include. • identifying auxiliary and non-auxiliary surfaces; • rotating an object to view auxiliary surfaces; • locating inclined edges of surfaces; and, • accurately drawing inclined surfaces. c. Correctly dimension auxiliary view drawings. d. Draw object surfaces located off (auxiliary view) planes.	

Module 41: Mechanical Drawings (Core)		
Suggested Time: 5-15 hours	**Level: Advanced**	**Prerequisite: Module 9**
Outcome	**Indicators**	
Develop industry standard mechanical drawings.	a. Research and describe characteristics of various types of drawings (e.g., manufacturing drawings, assembly drawings, general arrangement drawings, working drawings, part drawings, weldment drawings, forming drawings, profile drawings, burning drawings). b. Determine the optimal number of views required to represent each part of a specific mechanical object. c. Determine the types of views (e.g., section view, detail view, auxiliary view) and the number of views required to describe each part of a specific mechanical object accurately, paying attention to the assembly order and function of parts. d. Produce simple working drawings for mechanical projects that include: • drawing and dimensioning each part; • laying out the parts effectively in a title block; • drawing an assembly drawing that shows all the parts; • labelling parts and include general notes, when necessary; and, • creating a parts list or a bill of material.	

Module 42: Mechanical Drafting Careers Investigation (Core)		
Suggested Time: 3-5 hours	**Level: Advanced**	**Prerequisite: None**
Outcome	**Indicators**	
Analyze mechanical drafting related occupations in Saskatchewan, Canada and the world.	a. Discuss the roles, responsibilities, educational qualifications and personal and professional qualities common to people involved in mechanical drafting related careers. b. Explore gender diversity of careers related to mechanical drafting in Saskatchewan, Canada and the world. c. Identify which drafting and computer-aided design related occupations are facing shortages and which are oversubscribed locally, regionally and/or nationally. d. Interview or connect with others to discuss drafting related occupations. e. Analyze personal suitability or non-suitability for a specific drafting related occupation considering criteria such as: • initial and continuing educational requirements; • duties and skills required for this occupation; • the work environment, including typical hours and shifts worked and typical locations;	

	• current wages received in Saskatchewan and how these compare to the rest of Canada; • physical, mental and emotional stresses related to this occupation; • workplace hazards and safety considerations; • other occupations with which they interact; • professional and/or licensing requirements in Canada and Saskatchewan; and, • future trends impacting the occupation. f. Develop a plan to attain a job of personal interest in the drafting field.

Module 43: Mechanical Drafting Project (Optional)		
Suggested Time: 10-40 hours	Level: Advanced	Prerequisite: Module 32, 33, 34, 39, 41, 42
Outcome	**Indicators**	
Demonstrate increasing proficiency of mechanical drafting skills to complete a project.	a. Conduct an inquiry of required tools, skills and timelines associated with a selected project. b. Identify safety considerations. c. Select the software program required for the project. d. Produce initial sketches of design. e. Produce a set of working drawings with all required views, dimensions, details, notes and schedules. f. Create professional drawings in consideration of all industry standards. g. Construct a tool (e.g., rubric, checklist, self or peer evaluation form) to assess the process and product. h. Develop an assessment of personal skills, attitudes, work habits, and the final product. i. Present and share the results of project. j. Identify options (e.g., using LISP, Python programming to automate repetitive tasks) for streamlining workflow for the next project. k. Reflect on and share with peers the successes and challenges experienced during the project development.	

Module 44A: Work Study Preparation (Optional)		
Suggested Time: 3-5 hours	**Level: Intermediate**	**Prerequisite: None**

Note: Work Study is used to prepare students for employment through specific skill development within a workplace. The number of work study opportunities is equal to the number of courses available in the curriculum area at the 20 and 30 level.

Outcomes	Indicators
Prepare for the work placement.	a. Explain the roles and responsibilities of each partner (e.g., student, parent, teacher or other school staff, employer) involved in the work placement. b. Research the business/organization to become familiar with its operations. c. In collaboration with all partners, develop personal and learning goals for the work placement. d. Develop a procedural guide for the work placement that includes items such as: • transportation to and from the work placement; • hours of work; • guidelines for absence and tardiness; • dress code; • job description; and, • conflict resolution. e. Compile an employer information package that includes documents needed for the work placement (e.g., personal career documentation such as a resume or portfolio, permission forms, logs, self- and employer evaluation forms). f. Brainstorm a list of questions to ask the employer before beginning the work placement; these may include: • What is my schedule of work hours? • Who is my supervisor? • What should I wear? • When will I be provided with safety training? • What potential hazards might I encounter in the work placement? • Where do I find fire extinguishers, first aid kits and emergency assistance? • What type of safety gear am I expected to wear? Is it provided? • What should I do if I get injured or have an accident in the workplace? • How can I contact my health and safety committee or representative? • Are there any health and safety procedures I should follow?

	• Who is the first aid person? • Where are safety notices posted? • What should I do in case of a fire or emergency? g. Develop a list of questions that could potentially be asked by the employer/work placement in an interview situation as well as answers to the questions. h. Participate in an interview with the employer prior to beginning the work placement. i. Reflect upon one's performance during the interview.
Note: For more information about implementing work study in schools, see the Work Study Guidelines for the Practical and Applied Arts included in the *Practical and Applied Arts Handbook*.	

Module 44B : Work Study Placement (Optional)		
Suggested Time: 25-50 hours	**Level: Advanced**	**Prerequisite: None**

Outcomes	Indicators
Participate in a work placement experience.	a. Apply relevant skills and abilities during the work placement experience. b. Document one's experience using electronic and other tools (e.g., vlogs, blogs, log sheets, reflective journals) to summarize and reflect upon items such as: • hours of work including breaks; • responsibilities and tasks performed; • interactions with the employer, staff, customers and others; • company or organization's 'raison d'être;' and, • skills developed and demonstrated during the work placement that enhance one's employability. c. Document knowledge and awareness of labour standards, safety, workplace ethics, rights and responsibilities, occupational health and safety, and networking observed during the work placement.
Note: For more information about implementing work study in schools, see the Work Study Guidelines for the Practical and Applied Arts included in the *Practical and Applied Arts Handbook*.	

Module 45A: Work Study Follow-up (Optional)		
Suggested Time: 2-4 hours	Level: Intermediate	Prerequisite: None

Outcomes	Indicators
Relate one's work placement experience to personal and career goals.	a. Showcase one's skills and abilities demonstrated during the work placement using artifacts, evidence of skill development and personal reflections on aspects of the work experience such as: • hours worked; • responsibilities and tasks performed; • the importance of attitude towards work and taking responsibility for what needs to be done; • details about the entry level wage, salary scales and earning potential; • worker rights and responsibilities and the role of the union, if applicable; • ownership structure (e.g., corporation, franchise, sole proprietorship, partnership); and, • opportunities for advancement at the workplace and elsewhere in the industry. a. Reflect on the attainment of personal and learning goals. b. Update personal career documentation (e.g., resume, portfolio) following the work placement. d. In appreciation prepare a letter, note, card or other communication for the work placement employer. e. Develop and/or revise personal and career goals based on the work placement experience.

Module 45 B: Work Study Placement (Optional)		
Suggested Time: 25-50 hours	Level: Advanced	Prerequisite: None

Outcomes	Indicators
Participate in a work placement experience.	a. Apply relevant skills and abilities during the work placement experience. b. Document one's experience using electronic and other tools (e.g., vlogs, blogs, log sheets, reflective journals) to summarize and reflect upon items such as: • hours of work including breaks; • responsibilities and tasks performed; • interactions with the employer, staff, customers and others; • company or organization's 'raison d'être;' and, • skills developed and demonstrated during the work placement that enhance one's employability. c. Document knowledge and awareness of labour standards, safety, workplace ethics, rights and responsibilities, occupational health and safety, and networking observed during the work placement.
Note: For more information about implementing work study in schools, see the Work Study Guidelines for the Practical and Applied Arts included in the *Practical and Applied Arts Handbook*.	

Module 46A, B: Work Study Follow-up (Optional)		
Suggested Time: 2-4 hours	Level: Intermediate, Advanced	Prerequisite: None

Outcomes	Indicators
Relate one's work placement experience to personal and career goals.	a. Showcase one's skills and abilities demonstrated during the work placement using artifacts, evidence of skill development and personal reflections on aspects of the work experience such as: • hours worked; • responsibilities and tasks performed; • the importance of attitude towards work and taking responsibility for what needs to be done; • details about the entry level wage, salary scales and earning potential; • worker rights and responsibilities and the role of the union, if applicable; • ownership structure (e.g., corporation, franchise, sole proprietorship, partnership); and, • opportunities for advancement at the workplace and elsewhere in the industry. b. Reflect on the attainment of personal and learning goals. c. Update personal career documentation (e.g., resume, portfolio) following

	the work placement.
	d. In appreciation prepare a letter, note, card or other communication for the work placement employer.
	e. Develop and/or revise personal and career goals based on the work placement experience.

Module 99A, B, C, : Extended Study (Optional)		
Suggested Time: 10-25 hours	**Level:** **Introductory, Intermediate, Advanced**	**Prerequisite: None**
Note: The extended study module may be used only once in each 100-hour course. **Module Overview**: Evolving societal and personal needs, advances in technology, and demands to solve current problems require a flexible curriculum that can accommodate new ways and means to support learning in the future. The extended study module is designed to provide schools and teachers with an opportunity to meet current and future demands not provided for in current modules of every PAA curriculum. This flexibility allows a school or teacher to design one new module per credit to complement or extend the study of the core and optional modules to meet the specific needs of students or the community. The extended study module is designed to extend the content of the pure courses and to offer survey course modules beyond the scope of the available selection of PAA modules, either in depth or breadth. The list of possibilities for topics of study or projects for the extended study module approach is as varied as the imagination of those involved in using the module. The extended study module guidelines should be used to strengthen the knowledge, skills, and processes advocated in the PAA curriculum. For more information on the guidelines for the Extended Study module, see the *Practical and Applied Arts Handbook.*		

Assessment and Evaluation of Student Learning

Assessment and evaluation are continuous activities that are planned for and derived from curriculum outcomes and consistent with the instructional learning strategies. The depth and breadth of each outcome, as defined by the indicators, informs teachers of the skills, processes and understandings that should be assessed.

Assessment is the act of gathering information on an ongoing basis in order to understand individual students' learning and needs.

Evaluation is the culminating act of interpreting the information gathered through relevant and appropriate assessments for the purpose of making decisions or judgements, often at reporting times.

Effective and authentic assessment and evaluation involves:

- designing performance tasks that align with curricular outcomes;
- involving students in determining how their learning will be demonstrated; and,
- planning for the three phases of assessment and evaluation indicated below.

Formative Assessment		Summative Assessment and Evaluation
Assessment *for* Learning involves the use of information about student progress to support and improve student learning, inform instructional practices, and: - is teacher-driven for student, teacher and parent use; - occurs throughout the teaching and learning process, using a variety of tools; and, - engages teachers in providing differentiated instruction, feedback to students to enhance their learning and information to parents in support of learning.	**Assessment *as* Learning** involves student reflection on learning, monitoring of own progress, and: - supports students in critically analyzing learning related to curricular outcomes; - is student-driven with teacher guidance; and, - occurs throughout the learning process.	**Assessment *of* Learning** involves teachers' use of evidence of student learning to make judgements about student achievement and: - provides opportunity to report evidence of achievement related to curricular outcomes; - occurs at the end of a learning cycle, using a variety of tools; and, - provides the foundation for discussions on placement or promotion.

There is a close relationship among outcomes, instructional approaches, learning activities, assessment and evaluation. Assessments need to be reflective of the cognitive processes and level(s) of knowledge indicated by the outcome. An authentic assessment will only collect data at the level for which it is designed.

Glossary

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