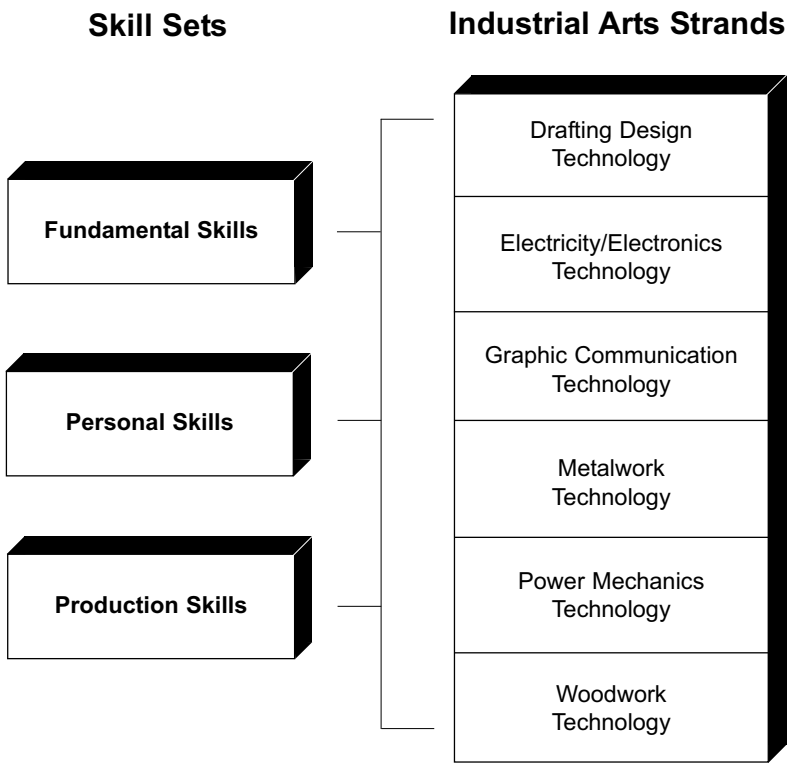
Framework Rationale

This framework has been designed to provide students with the opportunity to develop transferable learning skills. These learning skills are grouped into three sets:

- **Fundamental Skills**—the basic skills for study in Industrial Arts
- **Personal Skills**—the basic skills for personal effectiveness and growth
- **Production Skills**—the basic skills for production and fabrication

These skill sets are reflected in work done by The Conference Board of Canada (*Employability Skills 2000+*), Human Resources Development Canada (*Essential Skills Research Project*), and The National Life/Work Centre (*The Blueprint for Life/Work Designs*).

The framework is designed to support and broaden the focus of Industrial Arts. It is intended to be used by teachers to strengthen and revitalize programming. The General Learning Outcomes are interrelated and interdependent. Each outcome is to be achieved through a variety of learning strategies and experiences.



Three skill sets apply to each Industrial Arts strand.

Industrial Arts Strands

Industrial Arts is available in a variety of strands based on facility configurations. The following chart outlines Industrial Arts strands for Middle Years and Senior Years students.

Middle Years	Senior Years
Titles	Titles
Manufacturing ■ Metalwork ■ Plastics ■ Woodworking	**Drafting Design** ■ Drafting Design Technology
Graphic Communications ■ Drafting ■ Graphic Arts ■ Graphic Communications	**Electricity/Electronics** ■ Electricity/Electronics Technology
Power and Energy ■ Electricity/Electronics ■ Power Mechanics ■ Power/Energy	**Graphic Communication** ■ Graphic Communication Technology
Construction	**Metalwork** ■ Metalwork Technology
	Power Mechanics ■ Power Mechanics Technology
	Woodwork ■ Woodwork Technology ■ Construction Technology ■ Furniture Design Technology ■ Manufacturing Technology
	Applied Technology 40S

Instructional Philosophy

Industrial Arts teachers use various approaches to guide student learning. It is essential to recognize and utilize student learning styles, thinking styles, and capabilities. The following text summarizes three models that describe student differences in these areas.

Learning Styles

The model developed by Ken Dunn and Rita Dunn of St. John's University, New York, classifies students according to their learning styles:

- **Auditory learners** absorb spoken material easily and are likely to ask for information rather than read printed instructions.
- **Visual learners** learn best from information that they read or see.
- **Tactile learners** learn best by handling materials, writing, drawing, and being involved in concrete experiences.
- **Kinesthetic learners** learn best by moving and doing, by taking part in activities that have direct relevance to their lives.

Dunn and Dunn believe that most people have two highly developed learning styles, and that within a class of 30 students, 22 will be fairly balanced in their ability to take in information in a variety of ways.

Thinking Styles

Anthony Gregorc (1982) of the University of Connecticut has developed a theory of thinking styles based on two variables: the way we view the world (concretely or abstractly) and the way we order the world (in sequential order or random order). In Gregorc's framework, these two variables combine to describe four thinking styles:

- **Concrete sequential thinkers** are based in the physical world that they can detect through their senses. They notice and recall details easily, and remember facts, formulas, and rules with ease. They learn well through "hands-on" experiences.
- **Concrete random thinkers** are experimenters/ divergent thinkers, willing to take the intuitive leaps necessary for creative thought. They have a strong need to find alternatives and to do things in their own way.
- **Abstract sequential thinkers** love the world of theory and abstract thought. Their thinking processes are logical, rational, and intellectual. They prefer to work alone rather than in groups.
- **Abstract random thinkers** organize information through reflection, and thrive in unstructured, people-oriented environments. They live in the world of feelings and emotions, and learn best when information is personalized.

Multiple Intelligences

The theory of multiple intelligences is a cognitive model developed by Harvard psychologist Howard Gardner. Gardner's theory is that each of the following seven intelligences has an evolutionary history, its own symbolic system, and a separate locus in the human brain:

- **Verbal/linguistic intelligence** is responsible for the production of language and all of the complex possibilities that follow: storytelling, abstract reasoning, symbolic thinking, conceptual patterning, and, of course, the written word.
- **Logical/mathematical intelligence** is most often associated with "scientific thinking," deductive reasoning, and problem solving. This intelligence involves the capacity to recognize patterns, to work with abstract symbols such as numbers and geometric shapes, and to see connections between separate pieces of information.
- **Visual/spatial intelligence** deals with the visual arts, navigation and map-making, architecture, and games such as chess. The key sensory base of this intelligence is sight, but also the ability to form mental images.
- **Body/kinesthetic intelligence** is the ability to use the body to express emotion (as in dance and body language), to play a game, or to devise an invention. Individuals with high body/kinesthetic intelligence thrive on hands-on experience; they "learn to do by doing."

- **Musical/rhythmic intelligence** includes such capacities as the recognition and use of rhythmic and tonal patterns, and sensitivity to sounds from the environment, the human voice, and musical instruments. Many children learn the alphabet through this intelligence.
- **Interpersonal intelligence** involves the ability to communicate verbally and non-verbally, to work co-operatively in a group, and to observe the moods, temperament, and intentions of others. Individuals with high interpersonal intelligence are able to imagine and empathize with the experience of others.
- **Intrapersonal intelligence** involves knowledge of the self—of feelings, thinking processes, and spiritual realities. This intelligence involves our capacities for self-reflection, to experience wholeness and unity, to perceive higher states of consciousness, and to dream of and actualize the possible.

Gardner's multiple intelligences theory proposes that each person has capabilities of varying degree in all seven intelligences, and that we perform most functions through a complex interaction of several intelligences.

Implementation Techniques

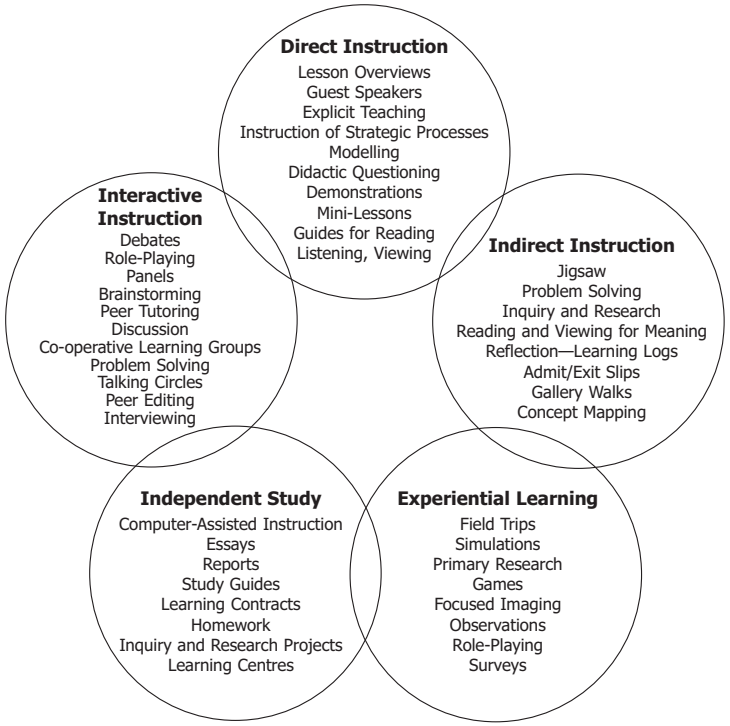
The learning styles previously described can be accommodated through a number of instructional focuses in an Industrial Arts facility. Some common techniques are

- **tools and materials focus**—focusing on the equipment and supplies used
- **process focus**—emphasizing the systematic use of materials
- **design/problem-solving focus**—developing the creative problem-solving and decision-making processes in a generic sense
- **project or product focus**—focusing on the net result of the skills developed

Instructional Approaches and Assessment

The General Learning Outcomes for Industrial Arts courses promote skill development and reflective learning. As there is no single way to teach or learn, teachers will organize their courses using one or a combination of the previously mentioned implementation techniques and then, while taking into account their students' learning and thinking styles, will use their professional judgment to decide which instructional approach will be most effective in promoting the learning of knowledge and skills. The "Instructional Approaches" diagram displays instructional approaches and methods of application.

Instructional Approaches



Students learn most effectively when their studies are rooted in concrete learning experiences, related to a particular context or situation, and applied to their world where appropriate. Ideas and understandings that students develop should be progressively extended and reconstructed as students grow in their experiences and their ability to conceptualize. Learning involves the process of linking newly constructed understandings with prior knowledge, and adding new contexts and experiences to current understandings.

To achieve the vision of Industrial Arts education, students must increasingly become engaged in the planning, development, and assessment of their own learning experiences. They should have the opportunity to work co-operatively with other students, to initiate investigations, to communicate their findings, and to complete projects that demonstrate their learning.

To assist teachers in their planning for instruction, assessment, evaluation, and reporting, Manitoba Education, Citizenship and Youth recommends that at the beginning of a block of instruction, teachers and students identify expected student learning outcomes and establish performance criteria. It is important that these criteria correspond with the student learning outcomes. This communication between students and teachers helps to identify clearly what needs to be accomplished, thereby assisting the learning process.

When students are aware of expected learning outcomes, they will be more focused on the learning and more likely to assess their own progress. Furthermore, they can participate in creating appropriate assessment and evaluation criteria. Teachers are encouraged to use a variety of learning experiences and assessment and evaluation methods and tools that are valid, reliable, and fair to students. Consideration needs to be given to the many ways students learn, their diverse backgrounds and needs, as well as maximizing active learning time, and making learning meaningful.

Glossary of Instructional Approaches

Direct Instruction

Lesson Overviews—Teachers construct the frame that best suits their subject matter, grade, and classroom and lesson organization. Overviews are often put on a transparency or erasable poster so they can be reused with each class. The purpose is to help students focus on the goals of the lesson and to place the lesson in the context of a unit.

Guest Speakers—Inviting professionals or those with information on topics being studied offers students the opportunity to examine topics from a personal point of view and to obtain current, reality-based responses to questions.

Explicit Teaching—Teacher-directed lectures can provide students with information that may be required before high-order thinking can occur. Teachers are encouraged to provide information which meets at least two learning modalities (visual, auditory, tactile, and kinesthetic) by using visuals, writing on the board, and supplying handouts and reading notes.

Instruction of Strategic Processes—Strategic processes outline the steps required to complete a task and move on to the next level.

Modelling (role-playing, think alouds, and demonstrations)—Teachers model their use of strategies so that students can emulate them. Teachers verbalize all thoughts for students as they demonstrate skills or processes. After several modeling experiences, students should practise using the strategy in pairs. Ultimately, students should work independently with the strategy.

Didactic Questioning—By asking leading questions, teachers can draw information and answers from students.

Demonstrations—A teacher, student, or guest demonstrates a technique to students. This technique works best if students are allowed to practise the technique on their own or in pairs following the demonstration. The teacher or fellow students offer feedback. Students should be given the opportunity to reflect on their proficiency and areas for improvement.

Mini-Lessons—Mini-lessons are lessons that are 20 minutes in length. Recent brain research indicates that learning/retention occurs in the first 20 minutes of each class.

Guides for Reading, Listening, Viewing—Providing students with guides (e.g., guided notes for a video) helps them to identify important information and encourages attentiveness.

Indirect Instruction

Jigsaw—Individuals or small groups each explore a different topic or a different area of the same topic. Individuals or groups are then responsible for teaching their newly acquired knowledge to the rest of the class.

Problem Solving—Teachers can stimulate student thinking by presenting a situation in which the student works through a process which leads to a solution.

Inquiry and Research—Individually, in pairs, or in small groups, students explore topics and present their findings to the class via an oral presentation or Gallery Walk.

Reading and Viewing for Meaning—These are techniques of reading print material and viewing visual media to become more conscious, discerning, critical, and appreciative of the texts.

Reflection—Learning Logs: Students regularly write short, spontaneous, exploratory, personal pieces of writing about the content they are studying. It is writing for thinking and not for creating a polished product.

Admit/Exit Slips—Students fill in these small slips at the beginning and end of the class. They help students to focus on what they expect to learn, and to reflect on what they have learned. This provides the teacher with information on student learning.

Gallery Walks—Teachers or students display information and samples on various topics throughout the room. Individually, in groups, or as a class, students circulate and are presented different information at each station.

Concept Mapping—Teachers assign students a word or idea and have them generate related words and/or topics. Students then examine the relationships between the words and ideas they have generated.

Experiential Learning

Field Trips—Students visit sites that relate to topics being studied. The most successful excursions outside the classroom are those that are organized because students have asked to visit a particular site to further some aspect of research they have undertaken.

Simulations—Students practise a skill or technique under controlled or ideal conditions with teacher or peer guidance before they are given the opportunity to perform on their own.

Primary Research—Primary research explores original (first-hand) sources. It may include interviews or reading first-hand accounts of a person's experience or findings.

Games—Teachers conduct activities based on popular board or television games. Questions can be based on course content and can be written by the teacher or the students. Games can be used to review information or to activate learning prior to starting a unit.

Focused Imaging—Teachers talk students through an event. Students may choose to close their eyes, listen, and visualize as the teacher describes a process, event, or location. Focused imaging can be enhanced with sound effects.

Observations—Students and the teacher identify phenomena they are looking for and observe the frequency of occurrence. Observations can be used to determine how a process takes place. It is important that teachers remind students to remain objective (record what they see) and to not make assumptions regarding causes of phenomena.

Role-Playing—The teacher provides, or the students write skits which students act out in an effort to explain or demonstrate an idea or the sequence of a process.

Surveys—Students or the teacher develop questions and determine an audience in an effort to study a phenomenon, belief, or the perceptions of others.

Independent Study

Computer-Assisted Instruction (CAI)—Software (computer programs) can provide exercises for drill and practise, rapid evaluation of student response, student feedback, concrete representations of abstract concepts, and more one-on-one instructional time.

Essays and Reports—Students research and write on a topic assigned by the teacher, or one that they have chosen themselves.

Study Guides—Students review content through the use of a document that provides the framework of knowledge covered in a unit or course.

Learning Contracts—The teacher and students create a contract or proposal specifying the topic, learning outcomes, experiences, products, resources, timelines, and assessment.

Homework, Inquiry, and Research Projects—Students are given the opportunity to independently research and examine information.

Learning Centres—Teachers organize the classroom into various activity or learning stations. These offer opportunities for independent inquiry and exposure to a wide variety of materials and sources of information.

Interactive Instruction

Debates—The class is divided into two groups (teams). Each team is assigned one side of an issue to defend or promote. Teams are responsible for generating support for their side of the issue. Following the time assigned for developing arguments, students individually argue points on behalf of their team by introducing new points or offering a rebuttal to points made by the other team.

Role-Playing—The teacher provides or the students write skits which students act out in an effort to explain or demonstrate an idea or sequence of a process.

Panels—Panels are groups of people with first-hand knowledge or experience on a topic.

Brainstorming—Students generate ideas and information as a result of contributing what they already know, and building on the ideas of others.

Peer Tutoring—Students teach and learn from one another as they share their work.

Discussion—Discussion is the most useful way of transmitting information, learning what students think and know, and building a sense of classroom identity, when all class members have a chance to speak before anyone responds twice.

Co-operative Learning Groups—Students are placed into small groups or teams, based on the teacher's criteria, and work together at various times to achieve common learning goals.

Problem Solving—Problem solving is a meaningful task that centres on overcoming constraints or limiting conditions.

Talking Circles—Based on First Nations teachings, talking circles create a safe environment for discussion of conflicts, difficult situations, or decisions that students may face. This allows every student to be heard and teaches students to respect each other and build consensus.

Peer Editing—Peer editing can involve ongoing groups in which students give feedback on drafts of each other's writings for the purpose of improvement.

Interviewing—Students generate questions to ask and arrange an interview with a person who has first-hand knowledge and/or experience with a topic.

Learning Outcomes Structure

The following definitions were used in structuring the framework of learning outcomes.

What Are Learning Outcomes?

Learning outcomes are statements that indicate what learners will know or be able to do as a result of a learning activity. Learning outcomes are usually expressed as knowledge, skills, or attitudes.

Learning outcomes provide direction in the planning of a learning activity. They help to

- focus on the learner's behaviour/action
- serve as guidelines for content, instruction, and assessment
- identify specifically what should be learned
- convey to learners exactly what is to be accomplished

Why Learning Outcomes?

Learning outcomes

- enable students to learn more effectively
- act as a template to enable teachers to design their student materials more effectively
- enable teachers to select the teaching strategy for the intended learning outcome based on student needs
- enable teachers to select the assessment strategy based on the materials delivered

What Are General Learning Outcomes (GLOs)?

GLOs identify the broad categories of knowledge, skills, and attitudes that students are expected to learn and be able to demonstrate in a subject area or course.

In this document many of the GLOs are accompanied by examples. These are meant to be a guide to the breadth and depth of a topic in those sections where teachers are asked to develop their own Specific Learning Outcomes.

What Are Specific Learning Outcomes (SLOs)?

SLOs identify the knowledge, skills, and attitudes that contribute to a GLO. They are to help teachers focus on particular aspects of knowledge and skills as they plan learning activities for their students.

What Are the Characteristics of Good Learning Outcomes?

Learning outcomes have three distinguishing characteristics. The specific action by the learner must be

1. observable
2. measurable
3. obtainable