**Area of Learning: Applied Design, Skills, and Technologies — Metalwork Grade 12**

**BIG IDEAS**

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| Design for the life cycle includes consideration of social and **environmental** **impacts**. |  | Personal design interests require the evaluation and refinement of skills. |  | Tools and technologies can be adapted for specific purposes. |

**Learning Standards**

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| **Curricular Competencies** | **Content** |
| *Students are expected to be able to do the following:*Applied DesignUnderstanding context* Engage in a period of **user-centred research** and **empathetic observation** to understand design opportunities

Defining* Establish a point of view for a chosen design opportunity
* Identify potential users, intended impact, and possible unintended negative consequences
* Make decisions about premises and **constraints** that define the design space, and develop criteria for success
* Determine whether activity is collaborative or self-directed

Ideating* Critically analyze how competing social, ethical, and sustainability considerations impact design
* Generate ideas and add to others’ ideas to create possibilities, and prioritize them for prototyping
* Evaluate suitability of possibilities according to success criteria and constraints
* Work with users throughout the design process

Prototyping* Identify, critique, and use a variety of **sources of inspiration**
* Choose an appropriate form, scale, and level of detail for prototyping, and plan procedures
* Analyze the design for the life cycle and evaluate its **impacts**
 | *Students are expected to know the following:** complex metalworking and design
* operation and safety of **welding equipment**
* casting **methods**
* incorporation of **non-metal material** in metalwork products
* **finishing** purposes and processes
* metal selection for specific applications
* sequence of steps when working with powered and non-powered equipment
* dimensional tolerance
* operation, **maintenance, and adjustment** of stationary powered and non-powered equipment
* areas of **metal specialization**
* sheet metal layout, forming, and fabrication
* heat treatment purposes and processes
* **design for the life cycle**
* ethics of **cultural appropriation** in design process
* future career options and opportunities in metalworking contexts
* **interpersonal and consultation skills** to interact with clients
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**Learning Standards (continued)**

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| **Curricular Competencies** | **Content** |
| * Visualize and construct prototypes, making changes to tools, materials, and procedures as needed
* Develop an appropriate test of the prototype, conduct the test, and collect and compile data
* Record **iterations** of prototyping

Testing* Identify and communicate with **sources of feedback**
* Evaluate design according to critiques, testing results, and success criteria to make changes

Making* Identify appropriate tools, **technologies**, materials, processes, cost implications, and time needed
* Create design, incorporating feedback from self, others, and testing prototypes
* Use materials in ways that minimize waste

Sharing* Decide on how and with whom to **share** or promote design, creativity, and processes
* Share the product with users and critically evaluate its success
* Critically reflect on their design thinking and processes, and identify new design goals
* Identify and analyze new design possibilities, including how they or others might build on their concept

Applied Skills* Apply safety procedures for themselves, co-workers, and users in both physical and digital environments
* Identify and assess skills needed for design interests, and develop specific plans to learn or refine them over time
* Demonstrate competency and proficiency in skills at various levels involving manual dexterity and complex metalworking techniques

Applied Technologies* Explore existing, new, and emerging tools, technologies, and systems to evaluate suitability for their design interests
* Evaluate impacts, including unintended negative consequences, of choices made about technology use
* Examine and analyze the role that changing technologies play in metalworking contexts
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