BIG IDEAS

Products can be **designed for life cycle**.	Personal design interests require the evaluation and refinement of skills.	Tools and technologies can be adapted for specific purposes.

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following: **Applied Design** *Understanding context* • Conduct **user-centred research** to understand design opportunities and barriers ***Defining*** • Choose a design opportunity and point of view • Identify potential users, intended impact, and possible unintended negative consequences • Make inferences about premises and **boundaries** that define the design space ***Ideating*** • Take creative risks to identify gaps to explore as design space • Generate ideas to create a range of possibilities and add to others' ideas in ways that create additional possibilities • Critically analyze how competing social, ethical, and sustainability considerations impact designed solutions to meet global needs for preferred futures • Prioritize ideas for prototyping and **designing with users** *Prototyping* • Identify and use a variety of **sources of inspiration** and **information** • Choose an appropriate form, scale, and level of detail for prototyping, and plan procedures for prototyping multiple ideas • Analyze the **design for life cycle** • Construct prototypes, making changes to tools, materials, and procedures as needed • Record **iterations** of prototyping	*Students are expected to know the following:* • **mechanical systems** • alternating current (AC) and direct current (DC) **electronic systems** • **electromechanics** • **computer control systems** • drafting, drawing, and design using computer-aided design (CAD) and computer-aided manufacturing (CAM) • programmable logic controllers, processors, and microcontrollers • displays, interfaces, and instrumentation • **hydraulic and pneumatic systems** • repeatability and load capacity • **industrial applications** of mechatronics

Learning Standards (continued)

Curricular Competencies	Content
Testing • Identify feedback most needed and possible **sources of that feedback** • Develop an **appropriate test** of the prototype • Gather feedback from users over time to critically evaluate their design and make changes to product design or processes • Iterate the prototype or abandon the design idea *Making* • Identify appropriate tools, technologies, materials, processes, **potential funding sources**, and time needed for production, and where/how these could be available • Use project management processes when working individually or collaboratively to coordinate production *Sharing* • **Share** their progress while making to increase feedback, collaboration, and, if applicable, marketing • Decide on how and with whom to share or promote their **product**, creativity, and, if applicable, intellectual property • Critically evaluate their design thinking and processes, and their ability to work effectively both as individuals and collaboratively in a group, including the ability to implement project management processes • Identify new design issues, including how they or others might build on their concept **Applied Skills** • Demonstrate an awareness of safety issues for themselves, co-workers, and users in both physical and digital environments • Identify and evaluate their skills and skill levels, in relation to their project or design interests, and develop specific plans to learn or refine their skills over time **Applied Technologies** • Explore existing, new, and emerging tools, **technologies**, and systems and evaluate their suitability for their design interests • Analyze the role and impact of technologies in societal change, and the personal, social, and environmental impacts, including unintended negative consequences, of their choices of technology use • Analyze how cultural beliefs, values, and ethical positions affect the development and use of technologies	