BRITISH COLUMBIA
Ministry of Education

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:	*Students are expected to know the following:*

Curricular Competencies

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

Content

Students are expected to know the following:

- **2D**, **3D**, **audio**, and **video** digital media editing tools, including paid, freeware, open source, and cloud-based solutions
- **principles of 2D graphic design**
- tools and techniques for **image manipulation**
- methods and **principles of 3D graphic design**
- **methods for digital animation**
- **methods for 3D modelling**
- **digital sound** and **audio data compression**
- digital animation techniques
- computer-assisted versus computer-generated
- **desktop video production**
- principles of user-centred design

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	

- **designed for life cycle:** taking into account in the design process, economic costs, and social and environmental impacts of the product, from the extraction of raw materials to eventual reuse or recycling of component materials

- **user-centred research:** research done directly with potential users to understand how they do things and why, their physical and emotional needs, how they think about the world, and what is meaningful to them
- **Defining:** setting parameters
- **boundaries:** limiting factors, such as available technology, expense, environmental impact, issues of appropriation, and knowledge that is considered sacred
- **Ideating:** forming ideas or concepts
- **designing with users:** working with users at all stages of the design process
- **sources of inspiration:** may include experiences; traditional cultural knowledge and approaches, including those of First Peoples; places, including the land and its natural resources and analogous settings; and people, including users, experts, and thought leaders
- **information:** for example, other people as experts (e.g., First Peoples Elders), secondary sources, collective pools of knowledge in communities, collaborative atmospheres
- **design for life cycle:** including the social and environmental impacts of extraction and transportation of raw materials, manufacturing, packaging, transportation to markets, servicing or providing replacement parts, expected usable lifetime, and reuse or recycling of component materials
- **iterations:** repetitions of a process with the aim of approaching a desired result
- **sources of that feedback:** may include peers; users; keepers of traditional cultural knowledge and approaches, including those of First Peoples; and other experts
- **appropriate test:** includes evaluating the degree of authenticity required for the setting of the test, deciding on an appropriate type and number of trials, and collecting and compiling data
- **potential funding sources:** It is not the intent, and not appropriate, for students to have to raise funds in order to complete their school project. Students may, however, wish to investigate sources of funding for the commercial development of their products.
- **share:** may include showing to others, use by others, giving away, or marketing and selling
- **product:** for example, a physical product, a process, a system, a service, or a designed environment
- **technologies:** things that extend human capabilities

- **2D:** for example, Photoshop, InDesign, Gimp, Paint, Sketch, Adobe Experience
- **3D:** for example, 3D Studio, Blender, Maya, Sketchup
- **audio:** for example, Garage Band, Audacity
- **video:** for example, iMovie, Windows Movie Maker, Adobe Premiere
- **principles of 2D graphic design:** proximity, alignment, rhythm/repetition, balance, contrast, white space, vector/raster images, guides and rulers (grid systems), cyan magenta yellow black (CMYB) and red green blue (RGB) colour systems, fonts and typography
- **image manipulation:** for example, adjustment and resizing, resolution, cropping, masking, soft light adjustment, layers, cloning, retouching, filters, painting, managing text
- **principles of 3D graphic design:** harmony, contrast/variety, rhythm/repetition, emphasis, continuity, balance (asymmetrical/symmetrical), proportion
- **methods for digital animation:** squash and stretch (exaggerating body formations for a comedic effect), anticipation (e.g., guiding the audience's eyes toward upcoming action), staging (e.g., using the characters' poses to set the mood of a scene), straight-ahead action or pose-to-pose action (two techniques for moving the action forward), follow-through and overlapping action (e.g., showing detail by giving characters' reactions), slow-in and slow-out (acceleration and retardation of a scene for effect), arcs (moving characters in curved paths for a more realistic look), secondary action (e.g., using smaller motions to complement the main action, using layers), timing (the precise amount of time spent on an action), exaggeration (e.g., squash and stretch), solid modeling and rigging (originally called solid drawing, this emphasizes a clear representation of the shapes), character personality (creating a personality that will connect with the audience)
- **methods for 3D modelling:** polygonal modeling (points in 3D space, called vertices, are connected by line segments to form a Polygon mesh), curve modeling (surfaces are defined by curves, which are influenced by weighted control points), digital sculpting (displacement, volumetric and dynamic tessellation)
- **digital sound:** sampling, sampling rates, aliasing, bit depth, bit rate, microphones
- **audio data compression:** MP3, Windows WAVE format (WAV), advanced audio codec (AAC), Ogg Vorbis, free lossless audio codec (FLAC), loss versus lossless, binary format, analog-to-digital conversion
- **desktop video production:** pre-production (e.g., storyboarding, layout, model sheet and animatics, script writing), production (e.g., layout, modelling, texturing, lighting, rigging and animation, green screen techniques, videography), post-production (e.g., compositing, sound editing and video editing, titling, special effects, over-dubbing)