LOCALLY DEVELOPED COURSE OUTLINE

DesignThinking for Innovation (2021
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Submitted By:

The Calgary School Division

Submitted On:

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Course Basic Information

Outline Number	Hours	Start Date	End Date	Development Type	Proposal Type	Grades
15-3	62.50	09/01/2021	08/31/2025	Developed	Authorization	G10
15-5	125.00	09/01/2021	08/31/2025	Developed	Authorization	G10
25-3	62.50	09/01/2021	08/31/2025	Developed	Authorization	G10
25-5	125.00	09/01/2021	08/31/2025	Developed	Authorization	G10
35-3	62.50	09/01/2021	08/31/2025	Developed	Authorization	G10
35-5	125.00	09/01/2021	08/31/2025	Developed	Authorization	G10

Course Description

The Design Thinking for Innovation 15-25-35 course provides an opportunity for students to engage in longer term, increasingly complex, personally relevant, design, innovation and invention projects that require a significant investment in time to design, prototype, iterate, and refine. Projects are interdisciplinary in nature and therefore must also incorporate the skills, knowledge, tools and technology from a minimum of two distinct discipline areas. The nature of the course is to apply design thinking methodologies, mindsets, and processes to explorations into innovation and invention. As such, the use of current and emerging technologies for rapid design and prototyping is an important element of the course. Many of the needed technical skills will be directly connected to a variety of interdisciplinary areas. Students would be required to work with one or more educators/mentors/experts and/or community members to develop the scope of the project. Expectations for the project, the final deliverables and the project assessment structure would be co-developed with the student.

Design Thinking for Innovation 15-25-35 requires students to take up complex challenges requiring solutions that are iterative and time consuming. The process-driven and interdisciplinary nature of this course will encourage students to connect and integrate learning from other subject areas. It is essential that sufficient time be given to develop the disposition of innovation and the necessary technical knowledge required for project development. The minimum amount of time required for this type of deep and iterative innovation process would be 62.5 hours, equalling 3 credits. This time commitment would be an additional expectation where the project is connected to content or outcomes with other courses.

Design Thinking for Innovation 15-25-35 is a flexible course that would allow for students in all three course levels to be integrated in the same block. This flexible grouping would provide increased constructivist learning opportunities as more mature creative producers could serve as mentors, collaborators, and “experts” for less experienced students. This integrated structure would also provide a great deal of inspiration for students as they see others working on high level innovation projects.

Course Prerequisites

15 | None

25 | Design Thinking 15 OR demonstrate disciplinary knowledge and creative capacity

35 | Design Thinking 25 OR demonstrate disciplinary knowledge and creative capacity

Sequence Introduction (formerly: Philosophy)

The world is changing at an incredible rate. This change provides new and constant opportunities and challenges for education. The world today demands people who are creative and innovative design thinkers, and design doers who have a high level of creative capacity in order to take on real world problems for real world audiences. (Kelly, 2016) More than ever people are creating their own career pathways through innovative start-ups and the use of crowd source funding to finance their entrepreneurial endeavours.

There is a growing understanding that a great amount of thinking, learning, problem solving, and creativity are developed when people are deeply engaged in the process of making things. Thinking with your hands (designing, building, and making) greatly enhances many skills and competencies needed in today's world and improves deep understanding and mastery learning. Design thinking has a close connection to the maker movement and there would be many maker elements in the Design Thinking for Innovation 15-25-35 course. The maker movement and maker education help connect learning from the head, to the heart, hands and feet, through design thinking, invention and innovation. Sheninger (2016) states that the maker movement,

represents a global community of inventors, designers, engineers, artists, programmers, hackers, tinkerers, crafts people, and do-it-yourselfers. These types of people see innovation and learning as a single element driven by curiosity. As they create and make things, they constantly think about how it can be done differently the next time. The design cycle is about trying something again and again until it works, and then, once it works, making it better. (p. 77)

Design thinking can help students develop new ways of viewing the world around them and help foster a disposition for innovation. Design thinkers use empathy and perceive adversity as an opportunity for better design. Combining design thinking mindsets with tools and technology for making can provide rich opportunities for exploration. More traditional methods of making can be used in combination with more modern technologies to provide students opportunities to approach and solve problems in ways never conceived of before. Pair these tools with access to the internet, and students have limitless potential to explore and learn things that could greatly enhance their school experience

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Student Need (formerly: Rationale)

The interdisciplinary learning offered by Design Thinking for Innovation 15-25-35 is a unique opportunity for students to bring together their interests and learning from across subject areas to solve problems in authentic and practical ways. Today's students must become tomorrow's innovators, able to solve problems and find solutions to unique circumstances. Design Thinking for Innovation builds upon the learning of students across subject areas to prepare them for this future.

To solve complex problems students need to learn more than foundational discipline skills and the ways which they can be applied to generate original solutions. Most high school courses focus on the unique knowledge and skills of a discipline, where Design Thinking for Innovation 15-25-35 is structured to bring together that knowledge in constructive ways. This teaches, in a manner unique for each student, how the knowledge they have gained in a variety of subjects is interconnected and relevant to solving the challenges of our world. The Design Thinking for Innovation 15-25-35 course not only brings together the content from across subjects but prepares students with the necessary creative problem-solving skills to identify and design solutions to authentic and complex problems.

A special aspect of the Design Thinking for Innovation 15-25-35 course is the time allotted to students for the engagement and exploration of innovative solutions to increasingly complex challenges. This supports students in becoming self-investigative, collaborative, comfortable with ambiguity and solution focused.

Scope and Sequence (formerly: Learner Outcomes)

Learner outcomes focus on design thinking, creative development and increasing a student's creative capacity over time. Sawyer (2012) articulates two definitions of creativity, that encompass the creative development of the individual, and the creation of ideas and products that impact a group in society. Simultaneously learning the process of design thinking and the stages of creative development help the student to develop and recognize his or her own creative potential and the tools and processes that maximize that potential.

Kelly (2016) has identified eight strands that are woven together in creative development. These eight strands include: collaborative development, research/investigative development, self-instigative development, generative development, experimentation development, discipline complexity development, critical/analytical thinking development, and sustained creative development.

Students will develop and demonstrate increasing levels of complexity in each area over time. Instructional strategies will be student-centered and focused on individual student growth and development. The outcomes in this course focus on developing competencies and learner dispositions (habits of mind), in combination with specific technical skills and content knowledge. Authentic technical skills will be developed within the context of the larger scale design challenges and project work that students engage in over the length of the course. This course structure aligns closely with the Ministerial Order on Student Learning and will directly support the three pillars of fostering engaged learners, ethical citizens and entrepreneurial spirit.

At the 10 level, concepts are introduced, and some foundational technical skills will be developed. Students will have opportunities to apply those skills into teacher generated or co-generated projects. At the 20 level, students will show a practical understanding and knowledge of the concepts through longer term co-generated or student-generated projects. At the 30 level, students are expected to show a complex understanding and highly autonomous application of the concepts through longer term, student-generated or co-generated projects that demonstrate a higher level of interdisciplinary complexity. All projects involve a level of collaboration with an educator/mentor to ensure that the

appropriate level of relevance and complexity is achieved for each level.

Guiding Questions (formerly: General Outcomes

1 How might the understanding and application of design thinking processes and methodologies be used to develop potential solutions to design challenges?

2 How might communication and collaboration skills foster improved design challenge solutions?

3 How might students use divergent idea generation skills to broaden potential design challenge solutions?

4 In what ways might research and investigation skills support improved potential design challenge solutions?

5 How might students use experimentation and prototyping skills to test and refine potential design challenge solutions?

6 How might students use creative, critical and analytical thinking skills to develop potential solutions to design challenges?

7 In what ways might students develop discipline specific knowledge and skills required to pursue potential design challenge solutions?

Learning Outcomes (formerly: Specific Outcomes)

1 How might the understanding and application of design thinking processes and methodologies be used to develop potential solutions to design challenges?	**15-3**	**15-5**	**25-3**	**25-5**	**35-3**	**35-5**
1.1 Identify the steps and demonstrate empathy in the design thinking process	X	X				
1.2 Engage in supported use and application of design thinking steps throughout introductory level design project development		X				
1.3 Engage and apply design thinking methodologies and mindsets throughout development of a co-generated, intermediate level design project, of personal relevance			X	X		
1.4 Demonstrate and apply highly autonomous and effective uses of design thinking methodologies and mindsets to foster highly innovative project development for advanced level design projects that have potential for applicable socio-cultural relevance					X	X
1.5 Maintain a consistent level of creative focus throughout introductory-level design project development	X	X				
1.6 Engage meaningfully in the work to seek successful resolution of introductory level design project challenges		X				
1.7 Demonstrate a growing level of sustained creative focus in the context of longer-term intermediate level design project development			X	X		
1.8 Maintain optimism and focus when facing intermediate level challenges requiring multiple iterations and refinement				X		
1.9 Independently and consistently demonstrate a high level of personal engagement and creative focus throughout long term advance level design project development					X	X
1.10 Maintain optimism and focus when dealing with complex challenges, multiple iteration production, and detailed design refinements						X

2 How might communication and collaboration skills foster improved design challenge solutions?	**15-3**	**15-5**	**25-3**	**25-5**	**35-3**	**35-5**
2.1 Describe cooperation and collaboration, identify similarities and differences between the two	X	X				
2.2 Demonstrate and apply supported collaboration skills in teacher-initiated groups and introductory level design projects		X				
2.3 Demonstrate and apply intermediate collaboration skills that foster increased project potential through idea sharing and brainstorming in co-initiated groups and intermediate level design projects			X	X		
2.4 Demonstrate and apply highly complex collaboration skills in student-initiated groups and advanced level design projects					X	X
2.5 Independently seek opportunities for idea amplification and further project development through collaboration with other high-level thinkers, experts and/or mentors						X

3 How might students use divergent idea generation skills to broaden potential design challenge solutions?	**15-3**	**15-5**	**25-3**	**25-5**	**35-3**	**35-5**
3.1 Identify and demonstrate various methods used for idea generation	X	X				
3.2 Demonstrate supported use of one or more idea generation techniques to develop potential solutions to introductory level design projects		X				
3.3 Select and implement one or more idea generation techniques to develop multiple potential solutions to co-generated, intermediate level design projects			X	X		
3.4 Independently identify, select, and utilize effective idea generation techniques to produce multiple potentially viable solutions to advanced level design projects					X	X

4 In what ways might research and investigation skills support improved potential design challenge solutions?	**15-3**	**15-5**	**25-3**	**25-5**	**35-3**	**35-5**
4.1 Identify a variety of potential research methods, tools, sources, and mindsets that could be applied to support introductory design project development		X				

4.2 Implement the use of one or more teacher approved research methods and resources to deepen knowledge, relative to current project work	X X
4.3 Use a variety of research methods to deepen knowledge and supply new stimuli needed for intermediate design project development and refinement	X
4.4 Utilize teacher support in resource evaluation	X X
4.5 Independently explore, evaluate, and use a variety of effective research methods, techniques, and resources to supply stimuli and information required to tackle complex problems, produce original ideas and innovative potential solutions to advanced level design projects	X X

5 How might students use experimentation and prototyping skills to test and refine potential design challenge solutions?	**15-3 15-5 25-3 25-5 35-3 35-5**
5.1 Apply the steps in the design process and/or design thinking methods to create one or more prototypes to address introductory level design projects	X X
5.2 Identify the strengths and weaknesses of prototype design and suggest potential improvements	X
5.3 Utilize the steps in the design process and/or design thinking methods to develop multiple and increasingly complex prototypes for intermediate design projects	X X
5.4 Co-analyze prototypes to inform next steps in project development and refinement	X
5.5 Autonomously and effectively utilize design thinking methodologies and mindsets to develop a range of simple through to complex prototypes for advanced level design projects	X
5.6 Use and carefully analyze prototypes to inform product development, refinement and evaluate project success relative to initial design challenge requirements and constraints	X X

6 How might students use creative, critical and analytical thinking skills to develop potential solutions to design challenges?	**15-3 15-5 25-3 25-5 35-3 35-5**

6.1 Identify the interconnectedness of creative, critical and analytical thinking skills	X X
6.2 Use critical, creative, and collaborative thinking in isolation or under teacher direction to analyze resources and justify thinking	X
6.3 Use one or more types of thinking skills to evaluate ideas and information sources to determine relevance for problem resolution and project development	X
6.4 Justifies thinking and reasoning when asked to defend choices	X X
6.5 Independently and skillfully select and apply needed types of thinking skills to conceptualize, evaluate and synthesize ideas	X X
6.6 Demonstrate highly developed reasoning skills for complex comparative analysis to further potential for problem resolution	X

7 In what ways might students develop discipline specific knowledge and skills required to pursue potential design challenge solutions?	**15-3 15-5 25-3 25-5 35-3 35-5**
7.1 Develop introductory and foundational technical skills, understanding and safe practices of needed tools and equipment	X
7.2 Further develop teacher/co-initiated foundational skills and safety practices to increase personal technical capacity in need areas	X X
7.3 Express interest and begin to develop basic skills in other technical areas of interest	X X
7.4 Apply and further develop introduced technical skills required to successfully engage in increasingly complex project work	X X
7.5 Identify areas requiring growth and development and seek training in areas of identified needs	X
7.6 Demonstrate consistently safe practices regarding tools and equipment use	X X

7.7 Independently assess and evaluate personal technical skill level relative to required skills needed for advanced level design challenges	X	X
7.8 Independently seek, evaluate, and access a variety of sources for further training in needed areas to further develop and refine advanced level design challenges		X
7.9 Independently apply safe practices to the use and skill development of all tools and equipment	X	X

Facilities or Equipment

Facility

No required facilities

Facilities:

Equipment

No required equipment

Learning and Teaching Resources

No required resources

Sensitive or Controversial Content

No sensitive or controversial content

Issue Management Strategy

Health and Safety

No directly related health and safety risks

Risk Management Strategy

Statement of Overlap with Existing Programs

Provincial Courses with Overlap and/or Similarity

-none

Identified Overlap/Similarity

-none

Reasoning as to Why LDC Is Necessary

-

Locally Developed Courses with Overlap and/or Similarity

-none

Identified Overlap/Similarity

-

Reasoning as to Why LDC Is Necessary

Student Assessment

No identified student assessment

Course Approval Implementation and Evaluation

No specific process