TDJ4M

Technological Design

Hardscape Design Project

Abstract

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Project Overview

Throughout the course students apply the design process to develop solutions, products, processes and process controls to solve a variety of manufacturing challenges. In this project, students are introduced to design concepts required to research, develop, plan and prepare a hardscape design idea for production. A strong emphasis will be placed on project management and product development. The skills and knowledge acquired in this project can then be applied to other product design projects in the following units.

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Project Challenge	Connections

Now that you have completed a 1500-1600 ft^2 residential design, your potential buyer would like to begin some landscape designs starting with outdoor furniture to place on the back patio/porch/deck or other outdoor areas around the house. The client would prefer that it be made out of wood (negotiable) and follow a style/theme that suits the home and flows as an extension of living area. You must create a design portfolio package complete with all of your research, planning, idea development and detailed working drawings that can be used to build the furniture.	**Science, Technology, Engineering and Mathematics (STEM)** This project supports the fundamental principles around STEM. It encompasses all aspects of STEM; material properties, engineering concepts, computer aided design, and mathematics **Innovative, Creativity, Entrepreneurship (ICE)** This project can be part of an ICE initiative through collaboration with the art, business, and other technology program areas (e.g., Manufacturing or Construction Technology). As part of an overall project team, students can plan, design, build and apply cost estimates to community projects such as park bench designs or playground designs. **SEF Component 2 Classroom Leadership Connections** **Indicator 2.1-** Collaborate with construction/manufacturing/special education teachers in establishing team-teaching opportunities or joint lesson planning in the context of a design/build approach. **Differentiated Instructions (DI)** Provide an open-end approach when having students select a product. Have students choose their own product. A choice board with examples may help. The recommended material is noted as wood. Provide some enrichment by challenging some students to research alternate material based on environmental considerations. **Ontario's Equity and Inclusive Education Strategy** As a strategy in applying equity and inclusion, engage community partners that reflect the diversity of the local community and work towards representation of diverse groups within this potential ICE initiative. As an example, design culturally based hardscape design that can be built and installed at a local cultural centre. **SEF Component 6: Home, School and Community Partnerships** **Indicator 6.3-**The school and community build partnerships to enhance learning opportunities and well-being for students.
Project Criteria	Examples

- must have more than four components
- made of wood (negotiable)
- must include a complete set of working drawings and an assembly drawing with a parts and materials list
- presented as a design portfolio package
- keep it simple!!

Examples:

- BBQ accessories storage bin
- lounge chair
- pot holder
- swing
- birdhouse
- bird feeder (squirrel proof as an additional challenge)
- bench
- potting bench
- wind mill

Project Synopsis and Timelines

Act #	Activity Title/Name	Time (hrs.)	Curriculum Expectations	Assessment & Evaluation	Connections?
1	Project Research and Planning	3.0	A1, A2, A5 A1.1, A1.2, A1.3, A1.4 A2.1 A5.3	• K/U • T • C	• Ontario Curriculum • Growing Success • DI • SEF • Think Literacy • Equity Inclusive… • FNMI • OSP

2	Design Development (Idea Development. Presentation/Working Drawings)	15.0	A3, A5 A3.1, A3.2, A3.3 A5.1	• K/U • T • A • C	• Ontario Curriculum • Growing Success • DI • SEF • Math Literacy • Think Literacy • FNMI • OCTE Resources
3	Project Portfolio	5.0	A5 A5.1, A5.2, A5.3	• K/U • T • C • A	• Ontario Curriculum • Growing Success • SEF • Think Literacy

CONNECTIONS RESOURCE LIST		
1	The Ontario Curriculum, Grade 11-12, Revised 2009	http://www.edu.gov.on.ca/eng/curriculum/secondary/2009teched1112curr.pdf
2	Growing Success	http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf
3	Student Success: Differentiated Instructions Educator's Package, 2010(DI)	http://www.edugains.ca/resourcesDI/EducatorsPackages/DIEducatorsPackage2010/2010EducatorsGuide.pdf
4	School Effectiveness Framework, 2013 (SEF)	http://www.edu.gov.on.ca/eng/literacynumeracy/SEF2013.pdf
5	Think Literacy	http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/
6	Leading Math Success	http://www.edu.gov.on.ca/eng/document/reports/numeracy/numeracyreport.pdf
7	Ontario First Nations, Metis, and Inuit Education Policy Framework (FNMI)	http://www.edu.gov.on.ca/eng/aboriginal/fnmiFramework.pdf
8	Ontario's Equity and Inclusive Education Strategy	http://www.edu.gov.on.ca/eng/policyfunding/equity.pdf
9	Ontario Skills Passport (OSP)	http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xhtml
10	OCTE Resources: SafeDocs, SafetyNet	http://www.octelab.com/

Activity 1 Project Research and Information Gathering

Activity Description:
Most homeowners have some idea of the features they would like to have in their yards and how they want to use them, yet they are often unsure of their choices and how to put it all together in an appealing and functional design. A design **theme** can offer inspiration and guidance for making decisions about which features to include, appropriate materials, and spatial organization. Understanding how to use a theme for design guidance can be helpful for finding a theme that works for your yard. Examples of themes; quiet and relaxing, active, entertaining, eco-friendly, etc.

Landscape **styles** can be identified because they are based on a collection of distinctive features and materials with a recognizable organization and/or form. Examples of landscape or garden styles include; culturally inspired gardens, such as Italian, English, Japanese, or Spanish colonial gardens. Other styles may be historic gardens, such as cottage gardens, colonial kitchen gardens. Styles also include urban, contemporary, classic, or iconic designs that can be attributed to a particular designer, a certain design movement, or a design period.

In this activity, you are asked to research a variety of themes and styles.

Activity 1 Criteria and Instructions

Themes/Styles

- research and describe a variety of hardscape themes, styles, and hardscape items. Include a variety of ways to present your research….e.g., notes, images, photos, illustrations
- note any connection to your residential design from last year
- key word searches: home styles, cottage gardens, colonial gardens, California modern, Tuscan, Asian, contemporary, classic country, ranch, traditional, coastal, farm, outdoor décor

Hardscape Designs

- research, note and collect digital photos and images of different hardscape designs in your local community or beyond
- note some local designs……..take as many digital pictures as possible

- when searching using the Internet, be sure you find designs that have detailed plans included. This will help in creating your design portfolio

Research Sources

- use a variety of resources in collecting your information…. magazine, newspaper, design books, Internet, and any other sources available. You must show proof that a variety of sources were used for full marks
- be sure to cite all sources of information

Report Presentation

- report must be presented in a structured format with cover sheet, page numbers, headers and footers
- note that you'll be asked to include portions of this report in your final portfolio so be sure you keep a working portfolio as you complete this activity and future activities

Minds On (Engaging Prior Knowledge)

Activity 1 Prior Knowledge	Connections
The student will have: ● group work skills; ● research skills….ability to use a variety of resources (Internet, magazines, interviews, etc.); ● skills in co-operative learning techniques (effective interpersonal skills) and an understanding of personal responsibilities and commitment required for group activities; ● basic skills in word processing used for journals/log entries;	**Teacher Tips** It may be a good idea to review report format and specific word processing features. E.g., inserting tables, headers, footers, cover page, etc.

• respect for the rights, responsibilities, and contributions of self and others; • knowledge of research report formats based on grade 11 TDJ3M course.	
Activity 1 Planning Notes	Connections
• Check all recommended resources prior to beginning lesson and activity. • Be sure that all computers are in working order and that Internet access is available. • Check school WiFi for accessibility. • Review all activities and prepare all resources (handouts and materials) necessary for the delivery of content. • If using collaboration software, be sure that all posts are updated and ready for student interaction. • Review learning goals and success criteria so that they can be identified, shared and clarified with students and parents. • It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility. • This activity is ideal for allowing students to use their own personal devices in their research. • Select and photograph local public and private creative hardscape items that may be of interest to students. This will give them a clear understanding of expectations through visual references. You may use some Internet samples as well but local designs will make it more relatable. Encourage students to visit the specific locations where they can find the hardscapes.	**SEF Component 3 Student Engagement** **Indicator 3.4:** Community partnerships fostered through ICE programs can provide positive peer, teacher, school and community relationships **SEF Component 1 Assessment for, as and of Learning** **Indicator 1.7:** Describe what students are expected to learn. Provide students a clear vision. All communication about assessment must be personalized, clear, precise and meaningful. A system (e.g., classroom website, learning management system, blog) is in place to allow educators, students and parents to continuously monitor student progress.

Action (Introduce or Extend Learning)

Activity 1 Instructional Strategies	Connections
TEACHER The Challenge	**The Ontario Curriculum, Grade 11-12, Revised 2009** Overall Expectations: A2 Specific Expectations: A2.1

- Introduce the design challenge **(Appendix A).** Be sure to clearly describe expectations. Use previous design portfolios to give students visual exemplars that provide a clear vision of the final product.

The Design Team

- Have students establish design teams of 2-3. Teacher may choose or modify the teams depending on individual strengths and weaknesses.
- Discuss best practices regarding group work.

Project Management

- Introduce lesson on project management **(Appendix B).**
- Describe the project planning part as one of the initial stages of the project.
- Place emphasis on the importance of project management in the "real" world and how project management skill set differs from day-to-day manufacturing management.
- Graphic organizers and **GANTT** chart lessons to follow.
- As a design team, a schedule of activities must be created to manage their time and document the shared responsibilities within their group
- In order to stay organized and consistent as well as aligning the management piece of this project to design standards, have students use design notebooks **(Appendix C).** Explain the importance of the notebook in terms of proprietary information and patent documentation.
- The design notebook template **(Appendix D)** should be used throughout the process, from research to design development. It will become part of their final design portfolio.

The Research

- Introduce activity and criteria **(Appendix E)**. Discuss the link with the grade 11 course.
- Describe what students are expected to learn and how their learning will help with the overall project. Provide students a clear vision of where this activity will lead.
- Tell students, at the outset of instruction, what the learning goals are. Refer frequently to the learning goals and design process during instruction
- Introduce graphic organizing strategies and describe how it can be used in note-taking when researching **(Appendix F)**. Demonstrate as a class by using the 'design theme' as the central topic.
- Explain that the mind map must be part of their final portfolio
- Show students exemplars to better help them understand activity expectations.

FNMI

To address the FNMI document, schools will strive to "employ instructional methods designed to enhance the learning of all First Nation, Métis, and Inuit students", it is recommended that students research some First Nation, Métis, and Inuit natural hardscape designs.

Ontario Skills Passport

Literacy skills in planning and organizing.

Ontario's Equity and Inclusive Education Strategy

The equity and inclusive education is addressed in this research project where students become aware of the cultural influences on landscape designs which are especially evident in a multi-cultural nation like Canada. There are numerous examples of hardscape designs that represent cultural diversity.

SEF Component 1 Assessment for, as and of Learning

Indicator 1.1 and 1.3: Describe what students are expected to learn. Provide students a clear vision of where they are going by describing the design process as setting direction and guidelines to the final product.

The design challenge provides meaningful tasks, activities and experiences that will foster thinking and metacognition – build on students' diverse perspectives, knowledge and experiences.

SEF Component 4 Curriculum Teaching and Learning

Indicator 4.4-Students are engaged in exploring real-world situations/issues and solving authentic problems. Critical thinking skills are taught, modelled, practised and developed.

Indicator 4.5-Students are grouped and regrouped, frequently and flexibly. Learning groups are based on prior assessment of student learning, strengths and needs, interests and/or learning preferences. Choices are

- As part of the research, have students analyze different cultural hardscape designs. Discuss how culture and religion play roles in the design.

Student:

- Establish design team of 2-3.
- Use project management tools and techniques to plan and organize their work.
- They will create a GANTT chart identifying timelines and responsibilities.
- Participate in collaborative/cooperative learning through group research.
- List, describe and document a number of themes and styles based on research.
- Analyze their research and select a theme and style for their product.
- Research a variety of hardscape items based on theme and style.
- Select a product that best suits their needs.
- Produce a report of their research and final design choice.
- Use exemplars to help understand what quality work looks like and to develop or refine their understanding of success criteria.

provided based on prior assessment of student learning, interests and/or learning preferences.

Differentiated Instructions (DI)

Flexible Learning Groups In a differentiated classroom, students are grouped and regrouped, frequently and flexibly based on their; readiness to learn a concept; interest in a concept learning preferences in working with or thinking about a concept; or environmental or social sensitivities

SEF Component 3 Student Engagement

Indicator 3.1: Learning experiences are engaging, promote collaboration, innovation and creativity (i.e. are clear, meaningful, challenging, productive and include problem solving and critical thinking on a variety of issues). Ongoing feedback between students and teachers enables students to refine both thinking and products.

Think Literacy

Reading (research) Strategy: Engaging in Reading

- § Sorting ideas using a concept map can be used in documenting their research on themes and styles.
- § 'Making Notes' strategy is applicable for this activity.

SEF Component 4 Curriculum Teaching and Learning

Indicator 4.2-Instruction in all content areas supports clear connections among reading, writing, oral and digital communication and media literacy. Sort and analyze information from a variety of sources. ❖ Summarize and synthesize in order to understand what they read, hear and see. ❖ Understand, acquire, build on and apply oral communication, reading, writing and media literacy knowledge and skills.

Ontario Skills Passport

Literacy skills in reading, writing, oral communications, document and computer use.
Thinking skills in decision making, finding information, and critical thinking

	SEF Component 1 Assessment for, as and of Learning Connections **Indicator 1.1** Students will actively plan for and set team goals that relate to project and curriculum expectations. Through the design process, students will engage in authentic and relevant performance tasks that are connected to expectations.
Activity 1 Assessment and Evaluation	Connections
Assessment strategies and tools in this activity will include opportunities in monitoring students' achievement levels as well as learning skills. **Knowledge and Understanding** ● To assess students on their knowledge and understanding, teachers will evaluate students' research report content relating to themes and styles. **Thinking** ● To assess students on their thinking skills, teachers will evaluate students' research report based on: level of research in terms of design themes and styles, the use a variety of resources, clear notes, and report format. **Communications** ● The research report will be assessed in terms of format, content and overall appearance. **Learning Skills** ● Through observation and conferencing, students will be assessed formally or informally. ● The teacher will document the following: - the student's skills pertaining to conflict management skills; - student's ability to work effectively as a team member; - student's initiative, leadership and participation in a group. ● Conferencing assessment can take place on a daily basis. Be sure to provide encouragement and praising effort as tasks are complete building on self-confidence. **Assessment Tools:** ● Rubric **(Appendix G)**	**Growing Success** Teachers assess and evaluate student work with reference to established criteria for four levels of achievement that are standard across the province. The development of learning skills and work habits is an integral part of student learning. **SEF Component 1 Assessment for, as and of Learning Connections** **Indicator 1.6-** The final rubric for this activity addresses the 'assessment of learning' which is based on the performance standards set out in the Achievement Chart. The assessment criteria of this activity align with the overall expectations and form the basis of assessment of learning. Students use the rubric the assessment of learning results to set new goals and strategies for the next phase of their design. Learning skills and work habits are evaluated regularly through monitoring and progress and regular conferencing with individual students. **Indicator 2.2**- Provide explicit feedback about their engagement and learning as educators and advocate for what they need as learners Assessments will include communications, observation, performance assessment, and conferencing.

Activity 1 Accommodations	Connections
● Teachers are to be familiar with exceptional students' Individual Education Plans (IEPs) for legislated accommodations, and consult with the appropriate staff. By doing this, teachers will be aware of and can implement prescribed modifications accommodations and/or alternative program goals. ● Teaching Strategies for students with special needs may include: — grouping design teams with varied abilities to allow for peer support. The teacher may choose or modify the teams depending on individual strengths and weaknesses; — providing a list of web sites that will assist with finding specific research materials; — pairing experienced students with those who are not yet familiar with the techniques; — the use of a support staff to assist students in reaching their IEP goals.	**SEF Component 1 Assessment for, as and of Learning Connections** **Indicator 1.2 & 1.4:** Reviewing student profiles, learning portfolios, IEPs and assessment data will inform decisions regarding assessment tools and strategies. In this activity, a variety of assessment strategies and tools are used to improve learning and inform instructional decisions (e.g., observations, presentations, work samples, regular conferencing, and reports of student work).

Consolidation & Connections (Provide Opportunities for Reflection)

Activity 1 Exit Card	Connections
Have students fill out exit cards at the end of this activity. Be sure questions are broad in nature but specific enough to measure student learner. Prepare half-slips of paper with typed questions or write questions on the whiteboard for students to answer.	**Differentiated Instructions** The student completes an exit card to demonstrate their learning. This will provide an informal measure of how well students understood design concepts in terms of research and information gathering. Teaching

Have students complete exit cards during the final 5 minutes of the class period. Since exit cards must be turned in before students leave class, it is best if the prompts are specific and brief. Often they refer directly to the content that was studied, but they can also be general in nature such as: ● List three things you learned in completing this activity. ● What questions, ideas and feelings have been raised by this lesson? ● What was your favourite part of this activity? Why? What was your least favourite part of this activity? Why? ● Evaluate your participation in class today. What did you do well? What would you like to do differently next time.	strategies may need to be changed based on student feedback.

Materials, Tools and Resources

Activity 1 Websites

- **Outdoor furniture design images**
  - https://www.google.ca/search?q=outdoor+furniture+design+plans&tbm=isch&tbo=u&source=univ&sa=X&ei=xbOMUqv0Jsf6qwGTnIC4DQ&ved=0CFUQsAQ&biw=1280&bih=855
- **Woodworking Plans**
  - http://www.todaysplans.net/woodwork-howto-build-barbecue-furniture.html
- **Simple Outdoor Lounge Chair**
  - http://ana-white.com/2010/05/plans/simple-outdoor-lounge-chair
- **Birds and Bloom Garden Projects**
  - http://www.birdsandblooms.com/Backyard-Projects/Small-Garden-Projects/Grill-Table
- **Birds and Bloom Birdhouses**
  - http://www.birdsandblooms.com/Backyard-Projects/Birdhouses/Bluebird-house
- **Images of Squirrel Proof Bird Feeders**
  - https://www.google.ca/search?q=Squirrel+Proof+Bird+feeder+plans&espv=2&biw=1024&bih=653&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwi0gtfWxfrNAhUnzIMKHSJ-A0YQsAQIOg

Activity 1 Publications

- design magazines
- Outdoor Landscaping/Hardscaping Design Books

Activity 1 Computer Software

- Word Processing
- Internet Accessibility

Activity 1 Human Resources

- Guest Speakers: First Nations, Metis, Inuit guest speakers
- Local Cultural Centre staff
- Special Education/Resource staff
- English Department Staff
- Computer Technician
- Local community: anyone willing to showcase their hardscapes

Activity 1 Other

- Board computer policies

Activity 1 Appendices

- Appendix A: Design Challenge
- Appendix B: Project Management
- Appendix C: Design Notebook
- Appendix D: Design Notebook Template
- Appendix E: Research Activity
- Appendix F: Graphic Organizer
- Appendix G: Research Rubric

Activity 2 Design Development
Activity Description: In this activity students will develop a design drawing package of their product. The package will include planning, design sketches, presentation drawings and working drawings. As part of a design team, the student will develop thinking, problem-solving and technical communications skills. This activity is designed to introduce students to a variety of sketching and drawing techniques used in the design industry. Students are shown how to sketch objects or ideas using oblique, isometric, perspective and orthographic representation. Emphasis is placed on understanding the differences among these techniques and when they should be used. Through proper dimensioning of the drawings, students will also identify production control monitoring strategies. The completed design portfolio can then be used in the production/modeling phase of the process.

Minds On (Engaging Prior Knowledge)

Activity 2 Prior Knowledge	Connections
Prior Knowledge Required The student will have: ● group work skills; ● skills in co-operative learning techniques (effective interpersonal skills) and an understanding of personal responsibilities and commitment required for group activities; ● basic skills in word processing used for journals/log entries; ● respect for the rights, responsibilities and contributions of self and others; ● experience from the Grade 11 Technological Design activities. This experience will provide students with knowledge of basic sketching and drawing standards as well as an understanding of	**Teacher Tips** It may be a good idea to create diagnostic assessment tools to determine specific prior knowledge. This could include a simple questionnaire, defining technical terms, sketching exercises, etc. **SEF Component 4 Curriculum Teaching and Learning** **Indicator 4.2-**Numeracy specific concepts are explicitly used to deepen

Computer Aided Design and Drafting; ● having taken art courses can also be an asset; ● mathematical skills relevant to drawing accuracy, measurement units, geometric shapes as well as Cartesian Plane used in learning CAD.	student learning and understanding in all subjects. **Ontario Skills Passport** Numeracy skills in measurement and calculations.
Activity 2 Planning Notes	Connections
● Prior to beginning this activity, ask students to define some key terms for homework. Terms may include design brief, portfolio, brainstorming, thumbnail sketches, design engineering, presentation drawings, working drawings, etc. ● Create sketching exercises that will establish student sketching abilities. ● Be sure that all computers are in working order and that the CAD software is functional. ● Review all activities and prepare all resources (handouts, tools, and materials) necessary for the delivery of content. ● If using collaboration software, be sure that all posts are updated and ready for student interaction. ● This activity should be split into several phases aligned with the design process: planning, idea development, presentation drawings, and working drawings. ● Teachers should consult the Art Department in the school for resources on sketching techniques. Ask Art instructors to describe their perspectives on the use of principles and elements of design. ● Consultation with the Computer Science teachers can also be helpful in understanding computer station safety precautions (ie. repetitive stress injuries, ergonomics, electromagnetic fields, posture, etc.) ● Create and/or gather teaching aids to act as visual aids when introducing orthographic views. A box with hinged sides will help in discussions of orthographic view development. ● A variety of simple objects such as wooden blocks cut in geometric shapes can also help. Solicit help from the Construction Technology teachers and students to create these visual aids. ● Demonstration of drawing techniques can be very helpful. Use whiteboard or projection system. ● Prepare handout activities for each stage of the package development. ● Create posters of examples illustrating these techniques and put them up around the room so students always have something to refer to.	**Teacher Tips** It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility **SEF Component 2 Classroom Leadership Connections** **Indicator 2.1** Collaboration with other teachers will inform instructional practices to meet the needs of students. A collaborative learning culture (e.g., a commitment to continuous improvement, a collective focus on student learning for all, deprivatization of practice and reflective dialogue) is evident. Evidence-based teaching practices, modelled in professional learning, are used in classrooms. ❖ Collaborative learning, inquiry, co-planning and/or co-teaching inform instructional practices to meet the needs of students. **Professional Learning Communities** Learning teams provide teachers with opportunities to work together to identify challenges and discuss classroom strategies. Actively participating in these communities can help contextualize content. As an example, discuss principles and elements of design teaching strategies with the Art Dept. **Teacher Tips** It is recommended that all resources be posted to your board collaboration

• When reviewing sketching techniques, teachers should demonstrate the techniques in progression starting with simple two-dimensional shapes progressing to three-dimensional representation and the final addition of value and texture. Students should have several practice exercises through each progression. These exercises can be used as diagnostic assessments in determining individual levels of proficiencies. • Graphic communication requires a lot of practice exercises to develop drawing skills, some of which may be completed for homework. • When working on practice exercises, be sure to select components that allow a progression of activities for the same drawings. The student will sketch the part, dimension it, and add size tolerances where necessary. • Have students complete practice exercises individually. The final package may be completed as design teams considering the number of drawings necessary. As a supplemental activity, the teacher may arrange for guest speaker(s) and a field trip to a local manufacturer or engineering firm.	system to avoid too many handouts and to ensure full accessibility. Collaborate with Tech Design teachers within your school, Board or province to establish best practices and curriculum improvements. Become a member of the Ontario Council for Technology (OCTE) where tech teachers can network and collaborate on common challenges and resource development. **Growing Success** Diagnostic assessment: Develop a set of sketching/drawing exercises that will determine level of drawing proficiencies. This would be considered a strategy in addressing an assessment for learning.

Action (Introduce or Extend Learning)

Activity 2 Instructional Strategies	Connections
TEACHER <u>Design Team</u> • Introduce 'Discussion Etiquette" in preparation for brainstorming design ideas. Students must learn to work cooperatively. Discuss how this team work approach is a vitally important in careers related to design. <u>Design Concepts</u> • Review 'Design Concepts' based on TDJ3M course **(Appendix I)**. Be sure to discuss how the design process will be applied to this project. • Introduce 'Reverse Engineering' **(Appendix J)** and discuss how it will specifically apply to this project in terms of design alterations/improvements/enhancements. <u>Design Brief</u>	**The Ontario Curriculum, Grade 11-12, Revised 2009** Front Matter of this document describes problem solving methods and approaches that include the design process and reverse engineering Overall Expectations: A3, A5 Specific Expectations: A3.1, A3.2, A3.3, A5.1 **Think Literacy** Oral Communications-Whole Class Discussion-Discussion Etiquette Small group discussion strategies can also apply here.

- Based on the Act 1, design teams should now have a design brief established. Conference with teams to ensure the design brief has been created.
- As a next step, they will need to create layouts and idea developments of their design. An emphasis should be placed and design improvements or modifications as per design concepts.

Design Layouts and Idea Development

- Review principles and elements of design and discuss how they are useful in presenting design layouts and ideas. Describe how the expectations for this year's idea development sketches will include an emphasis on value, texture and colour.
- Review the different drawing types **(Appendix K).** Be sure to identify the difference between presentation drawings and working drawings and discuss where in the design package they belong.
- Emphasize the fact that sketches can be developed using any type of drawing techniques from two-dimensional orthographic representation to three-dimensional pictorial representation.
- Discuss simple sketching techniques for drawing shapes (squares, rectangles and circles) and assign practice exercises for homework as an option and based on any diagnostic assessments.
- Demonstrate how these shapes can then be converted to three dimensional geometry using oblique, isometric and perspective representation standards **(Appendix L)**.
- Review sectional **(Appendix M)** and special views **(Appendix N)**. Emphasis should be placed on the sectional and special views to distinguish this project from the grade 11 project.
- Students should provide a number of sectional, enlarged and exploded view of the hardscape.
- Through design team format, have students use all the learned techniques to develop design layouts and ideas for their hardscape.
- Sketch layouts will require informal dimensions that need to be calculated as well as annotations. Review metric vs imperial units. Discuss measurement requirements and annotations as part of the criteria. Review any measurement calculations based on diagnostic assessments.

Material Selection

- Discuss different types of materials that are available for the challenge **(Appendix O).**
- Describe how to select materials based on design criteria, costs, and environmental consideration.

Joining Methods

- Discuss joining thermal, chemical, and mechanical joining methods **(Appendix P).**
- Describe different types of threaded and non-threaded fasteners **(Appendix Q).**

SEF Component 2 Classroom Leadership Connections

Indicator 2.5: By introducing students to 'Discussion Etiquette', classroom practice reflects safe, accepting, inclusive, caring, respectful and healthy learning environments. The learning environment supports the diversity of learners.

Teacher Tips

It is important that students have a sound understanding of how reverse engineering is applied to this design challenge. It is recommended that there are constant reminders of reverse engineering and design concepts, especially the design process.

Ontario Skills Passport

Literacy skills in reading, writing, oral communications, document and computer use.

Think Literacy

Developing and organizing ideas: have students use mind-mapping techniques when brainstorming ideas

The Ontario Curriculum, Grade 11-12, Revised 2009

Front Matter of this document describes the Fundamental Technological Concepts

Teacher Tips

It is recommended that all resources be posted to your board collaboration system (LMS) to avoid too many handouts and to ensure full accessibility.

Teacher Tips

Note that joining methods and material selection lessons can be delivered while students are working on their design layouts. This will allow

- Explain how to select your project fasteners based on your design criteria and exposure to the environment **(Appendix R).**
- Based on lessons and examples, have students select materials and joining methods for their hardscape.

Presentation Drawings

- Have design team create one final presentation drawing of their final design
- Be sure students add texture, value, colour and other design elements to their proposals by emphasizing the importance of presentation in demonstrating their creative thinking skills.

Working Drawings

- Introduce students to working drawings **(Appendix S)** orthographic representation and assign practice exercises for homework based on diagnostic assessments.
- Discuss proper dimensioning standards for the working drawings **(Appendix T)**.

Drawing Package

- Give students an overview (with criteria and instructions) **(Appendix U)** of the drawing requirements for the drawing package.
- Review basic CAD commands and discuss computer station safety and ergonomics.

STUDENT

Design Team

- Students will listen actively and critically to learn, understand and apply discussion etiquette when working as a team.

Design Concepts

- Students will be able to list and apply design concepts.
- They will use reverse engineering after selecting an existing product. Design teams will analyze the aesthetic and functional of the product in order to make informed decisions on design changes based on design concepts

Design Brief

- Design teams will create a design brief outlining design modifications, criteria and constraints in preparation for the next phase of the design process

Design Layouts and Idea Development

- At this stage of the design process, teams will create a number of design layouts of their project. These sketched layouts will include the use of elements and principles of design with a focus on value, texture and colour.
- The layouts will also include a variety of drawing types with emphasis on exploded assemblies and sub-assemblies, sectional views and special views.
- Use imperial or metric units and be sure to add informal dimensions and annotations to sketch layouts.

opportunities for just-in-time delivery of content.

Math Literacy

Establishing A Positive Classroom Climate Valuing mathematics implies being productively disposed towards the subject. It involves seeing mathematics as sensible, useful, and worthwhile, and seeing oneself as able to learn and use it. Teachers must create a climate whereby all students can make sense of the mathematics they are learning and gain confidence in their mathematical ability. Introduce most skills and concepts through problem solving. Building math literacy capacity is a strong component of this project.

FNMI

When describing material selection, describe some aboriginal concerns for our environment in terms of natural resources. To address the FNMI document, schools will strive to “employ instructional methods designed to enhance the learning of all First Nation, Métis, and Inuit students”, it is recommended that students research some First Nation, Métis, and Inuit natural hardscape designs.

OCTE SafeDocs/SafeNet/Safety Videos

Computer station and ergonomic safety awareness.

SEF Component 1 Assessment for, as and of Learning Connections

Indicator 1.5: Students are encouraged to participate in the collection and development of personal documentation of learning (e.g., portfolios, journals, design notebooks) that assist in informing the next steps in their learning. This is especially important as they look forward to post-secondary opportunities where they can showcase these personal documents that demonstrate learning.

● All layouts will be created on design notebook templates and will include annotations as well as sketch developments. ● Students should provide a number of sectional, enlarged and exploded view of the hardscape. ● Independently and as a group, students will be able to identify, describe, and apply; design concepts, elements and principles of design, drawing types, sectional and special view types. <u>Material Selection and Joining Methods</u> ● Through research, design teams will select materials and joining methods for their designs. <u>Presentation Drawings</u> ● Design teams will analyze their ideas and select the best design. ● They will apply their reasoning in solving the design challenge by writing a one paragraph rationale of how they came about choosing their best design. ● Using pictorial representation and principles of design, the team will present final design proposal. <u>Working Drawings</u> ● Students will become familiar with drafting standards allowing them to develop engineering drawings of their design proposal. ● Design teams will develop a portfolio package containing presentation drawings and detail working drawings of their proposal. ● They will independently work on team specified individual drawings which will then be assembled as a drawing package. ● All hand drawings and sketches will be duplicated as formal drawings using CAD software. <u>Drawing Package</u> ● Design teams will assemble the design brief, criteria/constraints, idea development sketches, hand drawings and CAD drawings in a package to be submitted as per instructions.	**Think Literacy** Sketch development and formal CAD drawings Graphic Communications **Math Literacy** <u>Establishing A Positive Classroom Climate</u> Valuing Mathematics: Valuing mathematics implies being productively disposed towards the subject. It involves seeing mathematics as sensible, useful, and worthwhile, and seeing oneself as able to learn and use it. Teachers must create a climate whereby all students can make sense of the mathematics they are learning and gain confidence in their mathematical ability. Introduce most skills and concepts through problem solving. In this project, students will see mathematics as useful in understanding metric and imperial units as they apply to dimensioning and tolerances. They will also apply Cartesian concept in using CAD software.
Activity 2 Assessment and Evaluation	Connections
Assessment strategies and tools in this activity will include opportunities in monitoring students' achievement levels as well as learning skills. **Diagnostic Assessment** ● Diagnostic assessment tools can be helpful to determine specific prior knowledge. This could include a simple questionnaire, defining technical terms, **Application** ● Students are assessed on their ability to create a set of formal drawings using CAD software. The assessment will be based on the following drawing and dimensioning standards.	**Growing Success** Teachers assess and evaluate student work with reference to established criteria for four levels of achievement that are standard across the province. The diagnostic assessment can determine where the learners are in their learning, where they need to go, and how best to get there (assessment for learning) Using checklists allow for assessment as learning, also have conversations

- The completed CAD drawings will be evaluated as a package using a rubric assessment tool. The purpose of this assessment is to gauge the student's ability in applying their communication skills graphically using engineering standards.

Thinking

- To assess students on their thinking and inquiry skills, teachers will evaluate students' design brief, student developed criteria and constraints, idea development sketches and the written rationale in selecting their best design.

Knowledge and Understanding

- Upon completion of all drawings, students will be assessed on their knowledge and understanding through a written test containing true/false, multiple choice and fill in the blank type questions. Knowledge and understanding assessment will also take place through a practical CAD test where students are asked to convert a hand drawing to a CAD drawing;

Communications

- Reflections: Students will self-assess their experiences through a reflective journal entry. The journal entries are evaluated through a rubric evaluation format. (Appendix B of the Grade 10 Manufacturing Technology Profile).

Learning Skills

- Through observation and conferencing, students can be assessed formally or informally. Checklists, anecdotal comments or the Learning Skills rubric will serve to help assess students. The teacher will document the following:
    - the student's skills pertaining to conflict management skills;
    - student's ability to work effectively as an interdependent team member;
    - student's initiative, leadership and participation in a group
- Conferencing assessment can take place on a daily basis. Be sure to provide encouragement and praising effort, as tasks are complete building on a positive self-image.

Assessment Tools:

- Rubric **(Appendix U)**
- Written Test
- Reflection Paper **(Appendix H)**

with the student about their progress to keep the process transparent. Final evaluations should not occur until the student has had verbal feedback along the way – assessment as learning.

The development of learning skills and work habits is an integral part of student learning.

Differentiated Instructions (DI)

Tiering: Consider weighting summative activities according to destination (i.e., weigh the application higher for trade/college bound students…T/I & C higher for university bound students)

SEF Component 1 Assessment for, as and of Learning Connections

Indicator 2.2- Provide explicit feedback about their engagement and learning as educators and advocate for what they need as learners

Assessments will include communications, observation, performance assessment, reflection, conferencing and tests/quizzes.

Assessment tools will include marking schemes for the activities, rubric assessments, tests, checklists and anecdotal comments.

input, through the reflection papers will help refine instruction to improve student learning

SEF TIP

It is recommended that there is regular collaboration in the development of assessment tasks, tools (e.g. rubrics) and practices supports consistency of practice in and between grades, departments and courses. This is especially important with when working with identified students.

Activity 2 Accommodations	Connections

• Teachers are to be familiar with exceptional students' Individual Education Plans (IEPs) for legislated accommodations, and consult with the appropriate staff. By doing this, teachers will be aware of and can implement prescribed modifications accommodations and/or alternative program goals.
• Teaching Strategies for students with special needs may include:
  ○ grouping design teams with varied abilities to allow for peer support. The teacher may choose or modify the teams depending on individual strengths and weaknesses;
  ○ pairing experienced students with those who are not yet familiar with the techniques. Some students have obtained knowledge of drawing techniques in previous art and/or technology courses;
  ○ having students enhance their design package by adding more difficult pictorial type drawings (isometric, oblique or perspective);
  ○ the use of a support staff to assist students in reaching their IEP goals.
	SEF Connections
	Accommodations are to be made so students do not lose dignity because of disability, poverty, lack of success, linguistic diversity or race. Teachers foster a positive atmosphere accepting of individual's uniqueness, values, and needs.
	
	Differentiated Instructions (DI)
	Challenge students by having them prepare for and write the CAD Certification Exam. The preparation will need to be completed independently.
	
	Encourage students to participate in skills competition.

Consolidation & Connections (Providing Opportunities for Reflection)

Activity 2 Reflection Paper	Connections
Students will be asked to write a Reflection Paper at the end of this project **(Appendix H)**. The paper will include a summary of the activities. The purpose of this paper is to allow students to practice the use of proper written language skills. It will also help students reflect on their experiences throughout this unit in preparation for the unit test. This paper should include all the key terms discussed throughout the activity.	**SEF Component 2 Classroom Leadership Connections** Indicator 2.2- input, through the reflection papers will help refine instruction to improve student learning **Ontario Skills Passport** Literacy skills in reading, writing, oral communications, document and computer use.

Materials, Tools and Resources

Activity 2 Websites

Ontario Association of Certified Technicians and Technologists
https://www.oacett.org/

Association of Professional Engineers
http://www.peo.on.ca/

Activity 2 Publications

French E., Svensen C., Helsel J., Urbanick B., Mechanical Drawing, CAD-Communications, (Twelfth Edition), Peoria, Illinois: Glencoe, McGraw-Hill, 1997.

- ISBN 0-02-667958-2 (Student Text)
- ISBN 0-02-677959-0 (Teacher's Resource Binder)
- ISBN 0-02-667961-2 (Student Workbook)

Spencer H., Dygdon J., Novak J., Basic Technical Drawing, Glencoe/McGraw Hill, 2000

- ISBN 0-02-682553-8 (Student Text)
- ISBN 0-02-682554-6 (Student Workbook)
- ISBN 0-02-682555-4 (Teacher's Resource Binder)

Activity 2 Computer Software

Search for YouTube or other video resources for subject specific supports

Activity 2 Human Resources

- Guest speakers: local professionals (survey class for parents, friends and family employed in manufacturing sector)
- Special Education/Resource staff
- Art/Math/Science teachers
- Computer Technician

Activity 2 Other

- Board computer policies
- Local manufacturing industry for tours and guest speakers
- Canadian Professional Engineering Association for guest speakers
- Ontario Certified Engineering Technician and Technologist association for guest speakers
- Skills Ontario-select students to participate in Mechanical CADD category

Activity 2 Appendices

- Appendix I: Design Concepts
- Appendix J: Reverse Engineering
- Appendix H: Reflection Paper
- Appendix K: Drawing Standards
- Appendix L: Pictorial Representation
- Appendix M: Sectional Views
- Appendix N: Special Views
- Appendix O: Product Material
- Appendix P: Joining Methods
- Appendix Q: Mechanical Fasteners
- Appendix R: Fastener Selection
- Appendix S: Working Drawings
- Appendix T: Dimensioning
- Appendix U: Drawing Package

Activity 3 Project Portfolio

Activity Description:

Your final project portfolio sums up the work that your team has completed. It needs to showcase the breadth of your project, your skills in resolving the challenge, and how you generate and execute ideas. It describes your whole creative process.
When done well, the portfolio should impress the viewer, demonstrating how your team collaborated on a design that meets or surpasses all expectations.

There are varying opinions on exactly what a design portfolio should contain (especially what format it should take). In this activity, students will be introduced to a variety of portfolio options. Using all of their work produced throughout the design process, teams will present their design using a portfolio format.

Activity 3 Criteria and Instructions

The Design Portfolio Will include:

- Challenge Statement
- Design Brief
- Research and Information Gathering
- Idea Development
- Presentation Drawings
- Reflection/Concluding Remarks

Minds On (Engaging Prior Knowledge)

Activity 3 Prior Knowledge	Connections
Prior Knowledge Required; The student will have: ● group work skills; ● skills in co-operative learning techniques (effective interpersonal skills) and an understanding of personal responsibilities and commitment required for group activities; ● intermediate skills in word processing used for journals/log entries; ● respect for the rights, responsibilities and contributions of self and others; ● knowledge of report formats based on grade 11 TDJ3M course prerequisite	**Teacher Tips** It may be a good idea to review report format and specific word processing features. E.g., inserting tables, headers, footers, cover page, etc.
Activity 3 Planning Notes	**Connections**
● Check all recommended resources prior to beginning lessons and activity. ● Be sure that all computers are in working order and that Internet access is available. ● Check school WiFi for accessibility. ● Review all activities and prepare all resources (handouts, and materials) necessary for the delivery of content. ● If using collaboration software, be sure that all posts are updated and ready for student interaction.	**Teacher Tips** It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility. This activity is ideal for allowing students to use their own personal devices in their research.

Action (Introduce or Extend Learning)

Activity 3 Instructional Strategies	Connections
Teacher: ● Review portfolio types **(Appendix V)** ● Introduce activity and criteria **(Appendix X)**. Discuss the link with the grade 11 course. ● Describe what students are expected to learn and how their learning will help with the overall project. Provide students a clear vision of where this activity will lead. ● Review portfolio types (Appendix G) and describe differences. **Student:** ● Organize portfolio and prepare to present their design.	**The Ontario Curriculum, Grade 11-12, Revised 2009** Overall Expectations: A5 Specific Expectations: A5.1, A5.2, A5.3 **SEF Component 1 Assessment for, as and of Learning Connections** Describe what students are expected to learn. Provide students a clear vision of where they are going **Ontario Skills Passport** Literacy skills in reading, writing, oral communications, document and computer use. **Think Literacy** Reading (research) Strategy: Engaging in Reading ● Sorting Ideas Using a Concept Map can be used in documenting their research on themes and styles ● 'Making Notes' strategy is applicable for this activity
Activity 3 Assessment and Evaluation	**Connections**
Assessment strategies and tools in this activity will include opportunities in monitoring students' achievement levels as well as learning skills. **Thinking** ● To assess students on their thinking skills, teachers will evaluate students' creativity in how they lay out their portfolios. **Communications** ● The portfolio will be assessed in terms of format, content and overall appearance.	**Growing Success** Teachers assess and evaluate student work with reference to established criteria for four levels of achievement that are standard across the province. The development of learning skills and work habits is an integral part of student learning.

Learning Skills ● Through observation and conferencing, students will be assessed formally or informally. ● The teacher will document the following: - the student' s skills pertaining to conflict management skills; - student's ability to work effectively as a team member; - student's initiative, leadership and participation in a group. ● Conferencing assessment can take place on a daily basis. Be sure to provide encouragement and praising effort, as tasks are complete building on a positive self-image. **Assessment Tools:** ● Checklist **(Appendix X)** ● Rubric **(Appendix Y)**	**SEF Component 1 Assessment for, as and of Learning Connections** **Indicator 2.2-** Provide explicit feedback about their engagement and learning as educators and advocate for what they need as learners Assessments will include communications, observation, performance assessment, and conferencing .
Activity 3 Accommodations	Connections
● Teachers are to be familiar with exceptional students' Individual Education Plans (IEPs) for legislated accommodations, and consult with the appropriate staff. By doing this, teachers will be aware of and can implement prescribed modifications accommodations and/or alternative program goals.. ● Teaching Strategies for students with special needs may include: ○ providing choices in portfolio formats; ○ grouping design teams with varied abilities to allow for peer support. The teacher may choose or modify the teams depending on individual strengths and weaknesses; ○ pairing experienced students with those who are not yet familiar with the techniques; ○ the use of a support staff to assist students in reaching their IEP goals.	**SEF Connections** Accommodations are to be made so students do not lose dignity because of disability, poverty, lack of success, linguistic diversity or race. Teachers foster a positive atmosphere accepting of individual's uniqueness, values, and needs.

Consolidation & Connections (Provide Opportunities for Reflection)

Activity 3 Reflection Paper/Self-Assessment	Connections
Students will be asked to write a reflection paper as part of their project portfolio. The paper will include a summary of the activities.	**SEF Component 2 Classroom Leadership Connections** Indicator 2.2- input, through the reflection papers will help refine instruction to improve student learning **Ontario Skills Passport** Literacy skills in reading, writing, oral communications, document and computer use.
Learning Skills Self-Assessment Have students complete a self-assessment form **(Appendix Z).** This will increase responsibility for students' own learning as a result of more opportunities for self-reflection.	**SEF Component 1 Assessment for, as and of Learning Connections** **Indicator 1.5-** Students are explicitly taught and regularly use self-assessment skills to monitor, improve, and communicate their learning.

Materials, Tools and Resources

Activity 3 Websites
• Internet • search for YouTube or other video resources for subject specific supports
Activity 3 Computer Software
• Word Processor • Desktop Publishing Software • Scanning Software • Computer Aided Dsign Software
Activity 3 Appendices
• Appendix V: Portfolios • Appendix X: Portfolio Checklist • Appendix Y: Portfolio Rubric • Appendix Z: Learning Skills Self-Assessment