TWJ 4E

Custom Woodworking

Whiteboard Frame

Abstract

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Project Overview

Whether you took the Custom Woodworking course to pursue a career or just to learn some handy skills, learning which types of wood joints are required for various projects, is crucial to your success. Not every type of wood joint is equal in terms of strength or application, which means that learning a variety of joinery methods can give you the most options to proceed with. There are many different ways that you can join two pieces of wood. Every place that two separate pieces of wood meet each other, is considered to be a joint. Some joints are better suited than others, depending on the application.

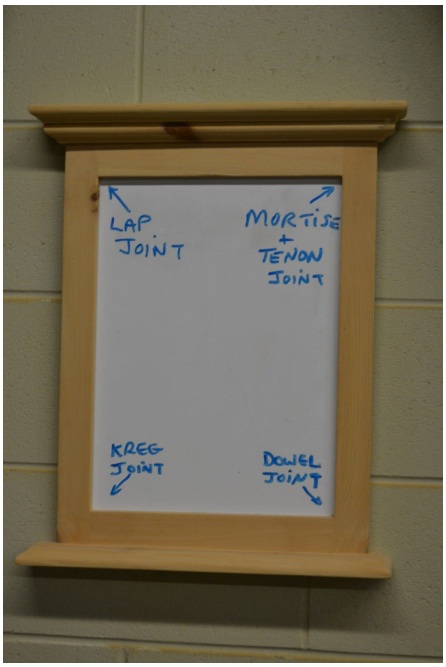
The Whiteboard Frame project is one that will involve several different wood joints, chosen by students. This project can be used as an introductory project where teachers can take students through the breaking out/squaring stock and safety passport process. It could also be scaled down to be used as a final performance task. Either way, it is a great project to evaluate student performance and a nice little project for them to take home.

Project Challenge

Students will be building a small whiteboard frame that will hang on the wall, to keep track of life's little details. The overall dimensions will stay the same (as outlined in the basic project plans provided). Designs will be communicated through sketches and/or CAD drawings. A key area of focus for this project is enhancing student knowledge and understanding of construction processes in the application of designing and producing products, specifically wood jointery. Students will also gain valuable hands-on skill development as they create the project using various woodworking equipment and machines.

Connections

SEF - Component 1 - Assessment for/as/of Learning - Indicators 1.1 - 1.7
SEF - Component 3 - Indicators 3.1 - 3.4
L: Literacy
ML: Mathematical Literacy

Project Criteria	Examples
Criteria can be adjusted to reflect the actual equipment available at the given school • Project will be the same size as the frame that is outlined in the basic project plans (16” wide X 2.5” deep X 21” high). Students will choose four different types of joints for each corner of the frame, with one of them having to be a mortise and tenon joint (measurements provided on the drawing) and constructed from a softwood (e.g., pine, basswood, etc) • Sketches and orthographic drawings required • Bill of Materials will be prepared • Blended learning will be utilized when possible: research, activating prior knowledge safety considerations, manufacturing processes and project management techniques	See appendices provided 

Project Synopsis and Timelines

Act #	Activity Title/Name	Time (hrs.)	Curriculum Expectations	Assessment & Evaluation	Connections?
1	Research	2	B1 B1.1 B1.2 B1.3 B2.1	T K/U A	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy ▪ Equity Inclusive…
2	Project Planning - Orthographic Drawing and Bill of Materials	3	B1 B1.1 B1.2 B2 B2.1 B2.2 B3 B3.2 B4 B4.1 B1.2 B1.3 B1.4 B4.5	T A C	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy ▪ Equity Inclusive…
3	Machining and Assembly	10-15	A1 A2 A3 A1.7 A3.1 B4 B4.4 C1 C1.1 C1.2	A	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy ▪ Equity Inclusive…

CONNECTIONS RESOURCE LIST		
1	The Ontario Curriculum, Grade 11-12, Revised 2009	http://www.edu.gov.on.ca/eng/curriculum/secondary/2009teched1112curr.pdf
2	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	2013 (SEF) School Effectiveness Framework	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's Equity and Inclusive Education Strategy	http://www.edu.gov.on.ca/eng/policyfunding/equity.pdf
8	Ontario Skills Passport (OSP)	http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xhtml
9	OCTE Resources: SafeDocs, SafetyNet, Emphasis Courses	http://www.octelab.com/
10	Learning for All, Universal Design and Differentiated Instruction	http://www.edu.gov.on.ca/eng/general/elemsec/speced/LearningforAll2013.pdf
11	Kahoot	https://getkahoot.com/ways-to-play
12	Professional Learning Framework	http://www.oct.ca/-/media/PDF/Professional%20Learning%20Framework/framework_e.pdf

Activity 1 - Research

Minds On (Engaging Prior Knowledge)

Activity 1 Research
Activity Description: Research different types of wood joints that are available to them based on facilities and student skill and ability. They must also keep in mind the size of the parts and the orientation of the wood joints in the frame. Based on the prior experience of students, decide whether students should complete the assignment individually or in pairs. Decide what drawing format options may be used (e.g., CAD software or paper/pencil).

Activity 1 Criteria and Instructions
Provide students with a selection of resources outlining a variety of wood joints that they can choose to use on their frame, keeping in mind one of the joints must be a mortise and tenon joint. Students may choose to work individually or in pairs to make decisions, design, machine and assemble the frames, although each student will build their own whiteboard frame.

Activity 1 Prior Knowledge	Connections
• Which wood joints have the students previously learned and which ones will they need to learn for future projects? • Do students have experience in proper computer use? Review computer internet use on pg 122 of the	**Teacher Tips** It may be a good idea to create diagnostic assessment tools to determine specific prior knowledge. This could include a simple

SAFEdoc for Construction (Appendix 6) ● Do students have CAD drawing experience? ● Do students have experience in sketching and creating Orthographic Drawings? ● Mathematical skills relevant to drawing accuracy, measurement units, geometric shapes as well as Cartesian Plane used in learning CAD.	questionnaire, defining technical terms, sketching exercises, etc. ▪ Growing Success ▪ DI ▪ SEF . STEM . Math Literacy . Literacy . Ontario Curriculum **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. It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility
Activity 1 Planning Notes	**Connections**
▪ Review all student IEP's to be familiar with student learning styles and accommodations necessary for their success. ▪ Check all recommended resources prior to beginning lessons and activity ie. print material, websites, videos, exemplars. ▪ Be sure that all computers are in good working condition 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. ▪ Review steps of the Design Process on page 22-23 of the Curriculum Document)	**Teacher Tips** This activity is ideal for allowing students to use their own personal devices in their research. ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **Growing Success** 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 1 Instructional Strategies	Connections
Teacher will: ● Help students establish design teams of 2. Teacher may choose or modify the partners depending on individual strengths and weaknesses. ● Introduce the activity and the assessment criteria. Discuss with the class how the project links with the grade 12 TWJ 4E course TWJ 4E curriculum doc ● Discuss best practices regarding group work. ● Describe what students are expected to learn and how their learning will impact the overall project. Provide students a clear vision of where this activity will lead. ● Share learning goals for the project - Learning to research - Choosing the best joint options ● Discuss the sketching options for them to use in order to show the wood joints they have chosen and how they fit in the frame. ● List, describe and document a number of joint options based on their research. They can articulate this in many different ways. ● Provide exemplars and assessment checklist (Appendix 2) for sketching so that students can better understand the learning goals. ● Analyze their research and select the 3 joints they will use for their frame (mortise and tenon is not optional). ● Provide options for students to sketch their findings, ie. pencil and paper, computer aided sketching programs. This can be done on the sample drawings provided (Appendix 1) **Student will:** ● Establish design team of 2-3, based on teacher recommendations and guidelines. ● Participate in collaborative/cooperative learning through group research. ● Use proper research, group work and computer use skills throughout the activity. ● List, describe and document a number of possible wood joints based on their research. ● Analyze their research and select the 3 wood joints they will use for their frame. ● Produce a report of their research and final design choice.	**The Ontario Curriculum, Grade 11-12, Revised 2009** Overall Expectations: B1 Specific Expectations: B1.1, B1.2, B1.3, B2.1 **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. **DI Connections** Students work in short-term, flexible learning groups and educators are flexible in creating and altering instructional plans in response to learners. **Think Literacy** Oral Communications - Whole Class Discussion -Discussion Etiquette -Small group discussion strategies can also apply here. **Literacy Connection** 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 **Ontario Skills Passport** **Literacy** skills in planning, organizing, reading, writing, oral communications, document, computer use decision making, finding information, and critical thinking

• Use exemplars and checklist to help understand the learning goals and what quality work looks like • Sketch your findings using the methods described by the teacher.	**Numeracy** skills in measurement and calculations.
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. **Thinking** ▪ To assess students on their thinking skills, teachers will evaluate students' design choices before the start of Activity 2 **Communications** ▪ The sketch will be assessed in terms of format, content and overall appearance **Application** ▪ The sketch will be assessed in terms of clarity, lines and measurements **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 or at the end of the activity. Be sure to provide encouragement and praising effort, as tasks are complete building on a positive self-image. **Assessment Tools:** ▪ Sketch checklist (Appendix 2)	**SEF 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 . **SEF Indicator 3.3 -** Students are partners in dialogue and discussions to inform programs and activities in the classroom and school that represent the diversity, needs and interests of the student population. ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy

Activity 1 Accommodations	Connections
• Teachers are to be familiar with 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 and accommodations. • Students may choose to work individually or in pairs to make decisions, design, machine and assemble the frames, although each student will build their own whiteboard frame. • Based on classroom dynamics, the teacher can decide which students should work together Differentiated Instructional Strategies for all students and those with special needs may include: - Learning materials, including print, electronic, and interactive texts, are within comfortable reach of all students - Communicating consistent and achievable expectations - Arranging information sequentially to clarify its relative importance - Breaking instructions down into small steps - Providing descriptive feedback during the learning - Providing alternative instructional and assessment activities - Challenging students at an appropriate level - Use a variety of groupings to meet student needs – groupings students according abilities and building in peer support. Modify groupings and include opportunities for individual work depending strengths and weaknesses. Strategic pairing of students with experienced students to stretch student ability - Providing varying levels of text targeting the learner level ability - Collaborating with support staff to build in strategies that will assist the teacher in targeting the learner gaps resulting in more personalized instruction that engages and motivates the student	**SEF Indicator 2.3** -Organizational structures are coherent, flexible and respond to the needs of students. **SEF Indicator 3.1** - The teaching and learning environment is inclusive, promotes the intellectual engagement of all students and reflects individual student strengths, needs, learning preferences and cultural perspectives **SEF Indicator 3.3** -Students are partners in dialogue and discussions to inform programs and activities in the classroom and school that represent the diversity, needs and interests of the student population. **DI Connections** Students work in short-term, flexible learning groups and educators are flexible in creating and altering instructional plans in response to learners. **Learning for All - Universal Design and Differentiated Instruction:** In differentiating instruction according to students' interests, a teacher attempts to increase the likelihood that any given lesson or project is highly engaging and personally meaningful for each student in the class. Teachers who know students' interests can vary projects, themes, and examples used in instruction to reflect those interests.

Consolidation & Connections (Provide Opportunities for Reflection)

Activity 1 Reflection Activities/Exit Card	Connections
Have students reflect on why they made the choices they did, with respect to joints. Evaluate their participation during the activity? What did they do well? What would they like to do differently next time? Students can do this using the communication method of their choice (e.g., hand written, PPT, prezi, email ..etc)	Assessment as Learning **DI Connections** The student completes and exit card to demonstrate their learning. This will provide an informal measure of how well students understood design concepts. Teaching strategies may need to be changed based on student feedback

Materials, Equipment, Tools and Resources

Activity 1 Websites
Wood joints -https://en.wikipedia.org/wiki/Woodworking_joints -http://woodworking.about.com/od/joinery/tp/JoineryHub.htm -http://www.core77.com/posts/43001/Reference-The-Ultimate-Wood-Joint -Visual-Reference-Guide KREG JOINT - https://www.youtube.com/watch?v=x1edj581WJw&list=PLb16Q7MuBeV9WF54za1Fma2D9nC1w7RNK Mortise and Tenon- https://www.youtube.com/watch?v=aBodzmUGtdw Dowel Joint- https://www.youtube.com/watch?v=VkjTqHXFpNQ Lap joint - https://www.youtube.com/watch?v=esy25rsWtl4 Domino joint - https://www.youtube.com/watch?v=xCyyy5Jtf3E Biscuit joint - https://www.youtube.com/watch?v=TEhZnFquAV8 Ontario Technological Education Curriculum http://www.edu.gov.on.ca/eng/curriculum/secondary/2009teched1112curr.pdf School Effectiveness Framework Document 2013 http://www.curriculum.org/secretariat/framework/download.shtml

Activity 1 Publications

- Woodworking textbooks in the classroom
- Woodworking magazines in the classroom
- Joint Book: The Complete Guide to Wood Joinery Spiral-bound by Terrie Noll
- Good Wood Joints Paperback by Albert Jackson (Author), David Day (Author)

Activity 1 Computer Software

- Word Processing
- Internet Accessibility
- Accessibility to Google, Google Classroom, Google Drive

Activity 1 Human Resources

- Classroom teacher
- Other Technological teachers (Technological. Design)
- Student success teachers
- Special Education Department resources
- Peer Mentors
- Senior Student Mentors

Activity 1 Appendices

Appendix 1 - Whiteboard frame drawings (front and side view ***without joints***)
Appendix 2 - Sketch checklist

Activity 2 - Project Planning

Minds On (Engaging Prior Knowledge)

Activity 2 Project Planning - Orthographic Drawing and Bill of Materials

Activity Description:

In this activity, students will develop an orthographic drawing and a Bill of Materials for their whiteboard frame. The drawings can be produced using paper and pencil or by Computer Aid Design (CAD), depending on computer availability, time restrictions, classroom dynamics and student ability. The Whiteboard frame sample drawings (Appendix 1) can be used as well. Based on the student choice of joints, every drawing could be different from the others. Drawings will include part labels and dimensions. Students will then use their drawings to fill out a Bill of Material that they will use in Activity 3.

Activity 2 Criteria and Instructions

- Provide students with instruction on how they will be completing their orthographic drawings (either be done using paper and pencil or by CAD). Students may choose to work individually or in pairs to make their drawings.
- Give feedback on the accuracy of the details and measurements on their drawings
- Provide students with the blank Bill of Material sheet (Appendix 3) to fill out once they have made any corrections to joint details and measurements.

Activity 2 Prior Knowledge	Connections
• Review Orthographic Drawing concepts • Do students have knowledge of CAD? • Review computer internet use on pg 122 of the SAFEdoc for Construction (Appendix 6) • Review the purpose of the 'Bill of Materials' and its place in the successful completion of any woodworking project. • Interpreting basic working drawings • Review the use of metric and imperial measuring systems • Review basic math concept, such as fractions Math Literacy • **Terminology** - Bill of materials, 3-view working drawings, Dimensions (T, W, L – thickness, width, length; order of display), Board feet	**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 Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **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, Orthographic drawing activity, etc. It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility

Activity 2 Planning Notes	Connections
▪ Review all student IEP's to be familiar with student learning styles and accommodations, necessary for their success. ▪ Check all recommended resources prior to beginning lessons and activity ie. paper, pencils, print material, websites, videos, exemplars ▪ Be sure that all computers are in good working condition and that internet access is available (if using CAD in the drawing process.) ▪ Review all activities and prepare all resources (handouts, and materials) necessary for the delivery of activity content. ▪ Ensure learners feel safe and are appropriately challenged. ▪ When reviewing sketching techniques, teachers should demonstrate the techniques in progression starting with	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **Ontario Skills Passport** **Literacy** skills in planning, organizing, reading, writing, oral communications, document, computer use decision making, finding information, and critical thinking **Numeracy** skills in measurement and calculations.

simple two-dimensional shapes progressing to three ▪ Graphic communication requires a lot of practice exercises to develop drawing skills, some of which may be completed for homework. (blended learning opportunity)	It is recommended that all resources be posted to your board collaboration system to avoid too many handouts and to ensure full accessibility **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 Tech. Design teacher. Become a member of the Ontario Council for Technology (OCTE) where tech teachers can network and collaborate on common challenges and resource development.

Action (Introduce or Extend Learning)

Activity 2 Instructional Strategies	Connections
Teacher will: ● Using the CAD drawings provided in Appendix 2 and the sketch/es done in Activity 1, start drawing in the 3 joints and associated dimensions (mortise and tenon is provided). This will be done either using paper or pencil or a CAD program. ● Give students an overview (with criteria and instructions) of the drawing requirements for the whiteboard frame project. ● Discuss proper dimensioning standards for the orthographic drawings. ● Display a simple, completed woodworking project (e.g., basic tool box). Display the working drawings for the sample project. Make explicit connections between each part of the physical project with the corresponding representation on the working drawings. This will help students understand the connection between the drawing, individual parts and the Bill of Materials.	**The Ontario Curriculum, Grade 11-12, Revised 2009** Overall Expectations: B1, B2, B3, B4 Specific Expectations: B1.1, B1.2, B2.1, B2.1, B2.2, B3.2, B4.1, B1.2, B1.3, B1.4, B4.5 **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. **Ontario Skills Passport** **Literacy** skills in planning, organizing, reading, writing, oral communications, document, computer use decision making, finding information, and critical thinking.

- Extend the discussion by posing questions: Why is a Bill of Materials useful? Why is it essential?
- Provide students with a blank Bill of Material sheet (Appendix 3)
- Distribute and review the assessment criteria for the Orthographic drawing and Bill of Material checklist (Appendix 4), for the Whiteboard frame
- Monitor student progress and provide feedback frequently, emphasizing collaborative and cooperative group efforts.

Student will:

- Using the CAD drawings provided in Appendix 2 and the sketch/es done by the students in Activity 1, start drawing in the 3 joints and associated dimensions (mortise and tenon is provided). This will be done either using paper or pencil or a CAD program, as directed by the teacher.
- Using the overview (criteria and instructions) of the drawing requirements, exemplars for orthographic drawing and dimensioning standards.
- Using the blank Bill of Material sheet (Appendix 3), complete the chart with all of the parts, quantities and dimensions
- Use the assessment criteria for the Orthographic drawing and Bill of Material checklist (Appendix 4), to make sure all components are present before evaluation.

Numeracy skills in measurement and calculations.

SEF Indicator 2.1 -Collaboration with other teachers will inform instructional practices to meet the needs of students.

DI Connections

Students work in short-term, flexible learning groups and educators are flexible in creating and altering instructional plans in response to learners.

Teacher Tips

Note that joining methods and material selection lessons can be delivered while students are working on their drawings and Bill of Materials. This will allow 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

Activity 2 Assessment and Evaluation	Connections
Assessment strategies and tools in this activity will include opportunities to monitor student achievement levels, as well as learning skills. **Thinking** ▪ To assess students on their thinking skills, teachers will evaluate students' measurements on the Bill of Material **Application** ▪ The Orthographic drawing will be assessed in terms of drawing skill, measurement completion, content and overall appearance. **Communications** ▪ The Orthographic drawing will be assessed in terms of how the student communicates their understanding of Use the Appendix 4- Orthographic drawing and Bill of Material checklist and/or Appendix 5 - Orthographic Drawing rubric	**SEF 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 . **SEF Indicator 3.3** -Students are partners in dialogue and discussions to inform programs and activities in the classroom and school that represent the diversity, needs and interests of the student population. ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **Growing Success** Using checklists allow for assessment as learning, also have conversations 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. Assessment Categories K/U (30%), T/I (30%), A (30%), C (10%
Activity 2 Accommodations	Connections
● Teachers are to be familiar with 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 and accommodations.	**SEF Indicator 3.1** - The teaching and learning environment is inclusive, promotes the intellectual engagement of all students and reflects individual student strengths, needs, learning

• Students may choose to work individually or in pairs to make decisions, design, machine and assemble the frames, although each student will build their own whiteboard frame. • Based on classroom dynamics, the teacher can decide which students should work together. • Students with greater computer abilities could be paired with students who have less experience using CAD programs. • 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	preferences and cultural perspectives **SEF Indicator 3.3** -Students are partners in dialogue and discussions to inform programs and activities in the classroom and school that represent the diversity, needs and interests of the student population **SEF Indicator 2.3** -Organizational structures are coherent, flexible and respond to the needs of students. **DI Connections** Students work in short-term, flexible learning groups and educators are flexible in creating and altering instructional plans in response to learners.

Consolidation & Connections (Provide Opportunities for Reflection)

Activity 2 Reflection Paper/Exit Card	Connections
Students will share the difficulties they had in translating information from the sketch to the orthographic drawing. Was the process smooth or did they have to re-develop details as they went along? They can do this using the communication method of their choice (e.g., hand written, PPT, email ..etc)	Assessment as Learning **DI Connections** The student completes and exit card to demonstrate their learning. This will provide an informal measure of how well students understood design concepts. Teaching strategies may need to be changed based on student feedback

Materials, Equipment, Tools and Resources

Activity 2 Websites

Orthographic Drawing - http://www.engineeringessentials.com/ege/ortho/ortho_page2.htm
- https://www.youtube.com/watch?v=JGusKzEn8Gk
- https://www.youtube.com/watch?v=BKBC8-7SWGY

Bill of Materials - http://www.woodbin.com/ref/project-design-and-planning/bill-of-materials

http://www.octelab.com
http://www.edu.gov.on.ca/eng/curriculum/secondary/2009teched1112curr.pdf
http://www.curriculum.org/secretariat/framework/download.shtml

Activity 2 Publications

Woodworking textbooks in the classroom
Woodworking magazines in the classroom
Orthographic Projection Simplified, Student Text by McGraw-Hill Education

Activity 2 Computer Software

http://www.sketchup.com
CAD software

Activity 2 Human Resources

Classroom teacher
Other Technological teachers (Tech. Design)
Student success teachers
Special Education Department resources
Peer Mentors
Senior Student Mentors

Activity 2 Appendices
Appendix 3 - Whiteboard Frame Bill of Material Appendix 4- Orthographic drawing and Bill of Material checklist Appendix 5 - Orthographic drawing rubric

Activity 3 - Machining and Assembly

Minds On (Engaging Prior Knowledge)

Activity 3 Machining and Assembly
Activity Description: Using the Orthographic drawings and the Bill of Materials completed in Activity 2, students will machine the parts required for the Whiteboard frame. Once they are completed, they will then assemble the frame.

Activity 3 Criteria and Instructions
Accuracy, in measurement and part machining will increase success in this project. When machining the joints, it is advantageous to do a practise joint on a scrap piece of wood. Teachers should continue to monitor student safety and skill development throughout the project. As well, make sure that students are completing the 'Safety Passport,' as required.

Activity 3 Prior Knowledge	Connections
• Review safety in the woodshop using materials found in the SAFEdoc for Construction package (Appendix 6) • Measurement in imperial format • Location of materials, machines, hand tools and safety equipment. Sample assignment on page 109 of SAFEdoc for Construction (Appendix 6) • Material selection techniques • Breaking out stock and choosing materials • Squaring of stock • Housekeeping page 30 SAFEdoc for Construction (Appendix 6) • Proper sanding techniques • Proper gluing techniques	**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 **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, joint making activity, tool use demonstration, etc. ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy
Activity 3 Planning Notes	**Connections**
▪ Review all student IEP's to be familiar with student learning styles and accommodations, necessary for their success. ▪ If students are working in partners, re-evaluate to make sure they are working well together and change groups, if necessary. ▪ Check all recommended resources prior to beginning lessons and activity ie. print material, websites, videos, exemplars. ▪ Review all activities and prepare all resources (handouts, and materials) necessary for the delivery of content. ▪ Ensure all tools and machines, that are to be used for the project, are in good working condition ▪ Ensure all materials necessary to do the project are available for use. ▪ Some students may be new to the manufacturing shop for	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **DI, Edugains pg. 19** A safe and non-threatening learning environment encourages learning. Learners who experience discomfort in connection with rejection, failure, pressure, or

a variety of reasons, it will then be important to accommodate new students: the teacher may spend extra time with that student so that instruction is personalized. Furthermore, students can be paired up with strong student mentors. ▪ Consider organizing students into pairs to provide a sense of safety and comfort utilizing manufacturing equipment while stretching student ability. ▪ Ensure learners feel safe and are appropriately challenged	intimidation may not feel safe in the learning context. **2.** Learners must be appropriately challenged. The content of new learning should be neither too difficult nor too easy, so that learners can be comfortable enough to accept the challenge that new learning offers.

Action (Introduce or Extend Learning)

Activity 3 Instructional Strategies	Connections
Teacher will: If this activity is used to go through the Safety Passport process with the students, consider using the resources found in the OCTE SAFEdoc for Construction (Appendix 6) ● Safety Passport - pg 118-124 ● Student Conduct Agreement 19-20 ● General Shop Safety and Quiz - 35-36 ● Hand Tools and Quiz- 37-38 ● General Machine Safety and Quiz - 39-40 ● Hand Tools and Quiz - 102-103 ● Radial Arm Saw and Quiz - 65-67 ● Jointer and Quiz - 43-44 ● Planer and Quiz - 45-46 ● Table Saw and Quiz - 63-64 ● Drill Press and Quiz - 49-50 ● Router Table and Quiz - 63-64 ● Mitre Saw and Quiz - 41-42 If this activity is used as a Final Performance Task, the material blanks could be pre-machined to save time. The sample drawing could be used as well, to reduce planning time….see Appendix 7 - Whiteboard frame sample drawings	**The Ontario Curriculum, Grade 11-12, Revised 2009** Overall Expectations: A1, A2, A3, B5, C1 Specific Expectations: A1.7, A3.1 B4.4, C1.1, C1.2 **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 to learn. ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy

(front and side view ***with joints***). ***Make sure each student has a completed safety passport before starting the project.*** ***Machining the frame*** • Students will start to machine their material into individual parts, according to their drawings, for the frame (4 parts). • Have students do practise joints on scrap material (this could be pre-machined to save time). • The teacher should continue to check student progress while the joints are being cut and to assist them. • When all of the 4 joints have been cut, dry fit the frame together. Measure the width of the frame at the top and bottom to check for accuracy of squareness. If the measurement is not equal, adjustment is necessary. • Sand the frame parts before assembly making sure not to sand the joints. • Assemble and glue the frame together making sure it is square, flat in the clamps and the glue is removed using a wet rag. Have the teacher check the frame, for squareness, before leaving it to dry. • Once dry, the frame can be sanded around the outside and on the faces, to make sure the joint edges are flush. • A rabbet can be cut around the inside edges, on the back of the frame, using a router/router table. Whiteboard material can be inserted into the rabbet after finishing (if chosen). ***Machining the top*** • Students will start to machine their material into individual parts, according to their drawings, for the top moulding (2 parts). • Route around the front and both side edges of the 2 parts, with a decorative profile, on the router. • Assemble and glue the top moulding pieces together making sure it is square, flat in the clamps/vice and the glue is removed, using a wet rag. Have the teacher check the top, for squareness, before leaving it to dry. • Sand the top moulding parts, now that they are together. ***Machining the bottom***	**Ontario Skills Passport** **Numeracy** skills in measurement and calculations. **Growing Success** Ensuring multiple opportunities for students to demonstrate the full range of their learning by having practiced key skill development, and have received clear, specific and timely feedback to improve student learning **OCTE Resources:** SafeDocs, SafetyNet, Emphasis Courses **Safety Passport** **Teacher Tip** If you have access to strong students, and/or a senior student, have them mentor during the shop time to support students who may be less comfortable on machinery. **Teacher Tip** Reference the SAFEdoc http://www.octelab.com/content/safedoc-manufacturing - site has multiple resources; lessons, templates, safety information sheets, tests etc.

• Students will start to machine their material, for the bottom (1 part). • Cut a dado in the bottom according to their drawings, to hold a marker. • Route around the front and both side edges of the bottom part with a decorative profile, on the router table. ***Assemble the Whiteboard*** • Assemble the 3 components (frame, top and bottom) together with clamps and glue. Make sure they are square and flat in the clamps/vice and the glue is removed using a wet rag. Have the teacher check it for squareness, before leaving it to dry. • Touch-up sand, if required. • Install the whiteboard material into the back rabbet using clips or hot melt glue. Review the safe use of the hot melt glue gun, to prevent burns. **Student will:** • Students will be diligent in listening and following instruction on the safe use of materials, tools and machines. • Students will ***make sure they have a completed safety passport before starting the project.*** ***Machining the frame*** • Students will start to machine their material into individual parts, according to their drawings, for the frame (4 parts). • Students will do practise joints on scrap material to increase their success. • When all of the 4 joints have been cut, dry fit the frame together. Measure the width of the frame at the top and bottom to check for accuracy of squareness. If the measurement is not equal, adjustment is necessary. Ask your teacher for assistance, if necessary. • Sand the frame parts before assembly making sure not to sand the joints. • Assemble and glue the frame together making sure it is square, flat in the clamps and the glue is removed	

using a wet rag. Have the teacher check the frame, for squareness, before leaving it to dry. ● Once dry, the frame can be sanded around the outside and on the faces, to make sure the joint edges are flush. ● A rabbet can be cut around the inside edges, on the back of the frame, using a router/router table. Whiteboard material can be inserted into the rabbet after finishing (if chosen). ***Machining the top*** ● Students will start to machine their material into individual parts, according to their drawings, for the top moulding (2 parts). ● Route around the front and both side edges of the 2 parts, with a decorative profile, on the router. ● Assemble and glue the top moulding pieces together making sure it is square, flat in the clamps/vice and the glue is removed, using a wet rag. Have your teacher check the top, for squareness, before leaving it to dry. ● Sand the top moulding parts, now that they are together. ***Machining the bottom*** ● Students will start to machine their material, for the bottom (1 part). ● Cut a dado in the bottom according to their drawings, to hold a marker. ● Route around the front and both side edges of the bottom part with a decorative profile, on the router table. ***Assemble the Whiteboard*** ● Assemble the 3 components (frame, top and bottom) together with clamps and glue. Make sure they are square and flat in the clamps/vice and the glue is removed using a wet rag. Have your teacher check it for squareness, before leaving it to dry. ● Touch-up sand, if required. ● Install the whiteboard material into the back rabbet using clips or hot melt glue.	

Activity 3 Assessment and Evaluation	Connections
Application ● Assessing student's ability to demonstrate proper practice in the Construction facility to operate equipment in order to create products – evidence will be obvious as teacher supervises students as they perform machine routines/operations ● Assessing final product according to specifications and stated criteria – assessment "For Learning" will be ongoing through teacher/student/peer observations and conversations occurring daily – further evidence will result at project completion stage **Learning Skills and Assessment tools** Use Appendix 8, Whiteboard frame Assessment rubric, to have students describe their learning to the teacher. The teacher can then assess the student work using the same rubric. Use Appendix 9, Group Work Assessment checklist to help describe their learning to the teacher. The teacher can then assess the student work using the same rubric	**SEF 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 . ▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ STEM ▪ Math Literacy ▪ Literacy **Growing Success** As part of assessment for learning, teachers provide students with descriptive feedback and coaching for improvement. **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.

Activity 3 Accommodations	Connections
• Teachers are to be familiar with 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 and accommodations. • Students may choose to work individually or in pairs to make decisions, machine and assemble the frames, although each student will build their own whiteboard frame. • Based on classroom dynamics, the teacher can decide which students should work together and re-evaluate throughout Activity 3. • Students with greater technical abilities could be paired with students who have less experience using the woodworking machinery. • Additional time *could be made* available to students at lunch or after school (at the discretion of the teacher), to accommodate sickness, injuries, activities/sports and varied student abilities. • Physically disadvantaged students my need special attention to ensure they are comfortable operating machines – an example may be a raised platform is employed when this student operates machinery – or other assistive devices as needed	**SEF Indicator 3.**1 - The teaching and learning environment is inclusive, promotes the intellectual engagement of all students and reflects individual student strengths, needs, learning preferences and cultural perspectives **SEF Indicator 2.3** -Organizational structures are coherent, flexible and respond to the needs of students. **DI Connections** Students work in short-term, flexible learning groups and educators are flexible in creating and altering instructional plans in response to learners. **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.

Consolidation & Connections (Provide Opportunities for Reflection)

Activity 3 Reflection Paper/Exit Card	Connections
Ask students to name two things that they would change if they were to do the activity all over again or where they feel they could improve? Did they have any "any ah-ha moments" during the activity? What resources did they find most useful in their learning and skill development? Students can do this using the communication method of their choice (e.g., hand written, PPT, email ..etc)	**Assessment as Learning** **DI Connections** The student completes and exit card to demonstrate their learning. This will provide an informal measure of how well students understood design concepts. Teaching strategies may need to be changed based on student feedback. **Growing Success*: gradual release of responsibility*.** A high-yield instructional strategy that involves scaffolding instruction and providing appropriate amounts of support to students based on their needs – As students share their thoughts, the teacher can nurture conditions supporting scaffolding thereby elevating understanding across the whole class for all learners

Materials, Equipment, Tools and Resources

Activity 3 Websites

http://www.octelab.com
http://www.edu.gov.on.ca/eng/curriculum/secondary/2009teched1112curr.pdf
http://www.curriculum.org/secretariat/framework/download.shtml

Activity 3 Computer Software

- Word Processing
- Internet Accessibility
- Accessibility to Google, Google Classroom, Google Drive

Activity 3 Human Resources

- Classroom teacher
- Other Technological teachers (Construction)
- Student Success teachers
- Special Education Department resources

Activity 3 Appendices

Appendix 6 - SAFEdoc for Construction
Appendix 7 - Whiteboard frame sample drawings (front and side view ***with joints)***
Appendix 8 - Whiteboard frame evaluation rubric
Appendix 9 - Group Work Assessment Checklist