THJ4M

Green Industries

Native Bee Habitat Project

Abstract

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Project Overview

Students are introduced to essential roles that plants and pollinators play in the production of most of the food we eat. Pollination is not only important to crops such as fruits and vegetables, but it is required for the success of almost 90% of all plants on our planet and is a vital component of healthy ecosystems. Every year, just in Canada alone, pollinators assist in billions of dollars of food production including apples, pears, cucumbers, melons and berries, as well as many other pollinator-reliant industries, such as those involved in the production of wine, beer and medicine.

In this project students will research how bees are responsible for a large percentage of crop pollination. Although the European Honeybee is a long-time favourite of farmers, little known is the fact that native bees are equally proficient at pollinating and are believed to be responsible for a large portion of the economic benefits that are mostly attributed to honey bees. Widespread use of pesticides, loss of habitat and a general fear of these little winged workers are causing their populations to decline. Students can help the bees by planting pollinator plants, installing bee hotels, and by educating people on just how important bees are to us and a healthy ecosystem.

Project Challenge	Connections
Students are asked to research, design and build a native bee habitat. This will include a native bee hotel made from natural materials that will be placed in a new garden on the school property containing indigenous plantings using species attractive to the bees.	**Science, Technology, Engineering and Mathematics (STEM)** This project supports the fundamental principles round STEM. It encompasses all aspects of STEM; material properties, engineering concepts, design, and mathematics **Differentiated Instructions (DI)** Provide an open-end approach when having students design a bee hotel. Have students design their own habitat and compare designs on a choice board. Also, although the recommended material is noted as wood, challenge some students to research alternate material based environmental considerations and what is best for healthy bees. **Innovative, Creativity, Entrepreneurship (ICE)** This project can be part of an ICE initiative whereby, through collaboration with 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 native plantings and bee hotels.
Project Criteria (Instructions)	Examples

Instructions:
Students will research, design and build a bee hotel to accommodate multiple species of native bees.

Criteria:

- bee hotel to be constructed of natural materials such as wood, bamboo and reeds
- bee hotel to be installed facing south and surrounded by native plants species that are attractive to bees
- must include a sketch and working drawings for the bee hotel along with a material list and cost estimate
- must include a sketch and working drawings for the native plantings along with a material list and cost estimate

WEBSITE SAMPLES

http://www.xerces.org/wp-content/uploads/2008/11/nests_for_native_bees_fact_sheet_xerces_society.pdf

http://greatpollinatorproject.org/management/nesting-habitat

http://www.chch.com/niagara-bee-hotel/

http://www.ourhabitatgarden.org/creatures/bees.html

Project Synopsis and Timelines

Act #	Activity Title/Name	Time (hrs.)	Curriculum Expectations	Assessment & Evaluation	Connections?

1	Project Research and Planning	6.0	**A1.1, A1.3, A2.1, A2.3, A4.4, A4.1** **C1.1, C1.4, C2.1, C2.2** **D3.5, D3.6**	**K/U T C**	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ Math Literacy ▪ Literacy ▪ ICE ▪ OCTE ▪ FNMI First Nations, Metis
2	Project Design Development (Bee Hotel working drawings) (Landscape Design including Bee Hotel & Native Plants)	12.0	**A4.5,** **B1.1, B1.2, B1.4, B2.4, B3.3**	**K/U T A C**	▪ Ontario Curriculum ▪ Growing Success ▪ DI ▪ SEF ▪ OCTE ▪ Math Literacy ▪ Literacy ▪ Equity Inclusive… ▪ ICE ▪ FNMI First Nations, Metis
3	Construction/Installation	9.0	**A1.1, A3.1, A4.3, A4.5,** **B3.2, B3.3,** **D1.2, D1.3,**	**K/U T A C**	▪ Ontario Curriculum ▪ DI ▪ SEF ▪ Math Literacy ▪ Literacy ▪ ICE ▪ FNMI First Nations, Metis

Act 1 Project Research and Information Gathering

Activity Description:

When we picture bees, we most often associate them with the production of honey, beeswax and stingers! That image of the bee is far too narrow and only takes into account the honey bee (*Apis mellifera*) which is not North American but a European import brought over for the express purpose of producing honey and pollinating crops. Our native bees are equally proficient at pollinating. They do not swarm and generally, they do not sting. While native bees do not produce honey like its foreign counterpart, they still take on the vital role of pollination in the farm and garden. Our home grown bees are believed to be responsible for a large proportion of the economic benefits that are mostly attributed to honey bees.

Native bees work tirelessly to ensure that their offspring are fed, simultaneously providing the vital service of pollination to the many flowers they encounter. As native bee and pollinator habitat continues to feel the pressure from sprawling cities and urbanization, it is more important than ever to plant species beneficial to these important creatures in gardens everywhere. Creating a garden with plants that have a varied season of bloom is a great benefit to pollinators. Native Bee Hotels, constructed of natural materials and containing thousands of holes of varying sizes, will attract and provide refuge for our indigenous bees to flourish.

Student are to divide up into two equal teams. One team will research a list of native bee species, where they live, what size holes they require for their homes and how to construct a habitat that will accommodate them. The second team will research pollinator plants that can be incorporated into a

landscape plan for an area on the school grounds. These plants must be species that attract bees and other pollinators and create a long season of successive overlapping bloom.

Act 1: Criteria and Instructions

Native Bee Shelter Design Ideas (Group A)

- Research and describe a variety of styles of native bee hotels. Include a variety of ways to present your research….e.g., notes, images, photos, illustrations
- Research and list a variety of possible materials to construct a bee hotel

Pollinator Planting Design Ideas (Group B)

- Research and list a variety of plants attractive to native bees and pollinators
- Research and list soil and site requirements for these pollinator plants

Research Sources

- Use a variety of resources in collecting your information including magazines, newspapers, design books, Internet, and any other sources available. Show proof that a variety of sources were used for full marks
- Be sure to cite all sources of information

Research Activity - Presentation

- Each team must deliver a presentation to the rest of the class to share the related information that they gathered from their research.

MINDS ON ENGAGING PRIOR KNOWLEDGE

Act 1 PRIOR KNOWLEDGE	CONNECTIONS
Prior Knowledge Required **The student will have:** • group work skills; • research skills….ability to use a variety of resources (Internet, magazines, interviews, etc.) • skills in cooperative learning techniques (effective interpersonal skills) and an understanding of personal responsibilities and commitment required for group activities; • respect for the rights, responsibilities and contributions of self and others; knowledge of research report formats based	**Teacher Tips** It may be a good idea to review presentation formats. E.g., Powerpoint, Prezi, etc. **SEF Component 1 Assessment and Learning** **Indicator 1.7:** Clear learning goals and success criteria are identified, shared and clarified with students and parents. **OCTE Resources** SafeDocs, SafetyNet

on grade12 THJ4M course	
Act 1 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. • Review learning goals and success criteria so that they can be identified, shared and clarified with students and parents. • This activity is ideal for allowing students to use their own personal devices in their research.	

ACTION INTRODUCE OR EXTEND LEARNING

Act 1 Instructional Strategies	Connections
TEACHER **<u>The Challenge</u>** • Introduce the research challenge **(Appendix A).** Be sure to clearly describe expectations and provide exemplars if possible to help students develop a clear vision of the final product **<u>The Research Teams</u>** • Divide students into 2 research teams, one team to research native bee shelters (Group A). The other to research a native plant/pollinator garden (Group B). The teacher may choose or modify the teams depending on individual strengths and weaknesses.	**SEF Component 1 Assessment for, as and of Learning** **<u>Indicator 1.1 and 1.3:</u>** 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

- Discuss best practices regarding group work.

Research and Planning

- introduce a lesson on the importance of pollinators, bees and bee hotels **(Appendix B: Powerpoint - Native Bees)**
- Encourage open discussions on the lesson and share ideas of how students might go about researching and presenting their findings.
- Both design teams must be encouraged to create a log for the scheduling of activities to manage their time and document the shared responsibilities within their group. The log should be hand written and contain comments, criteria, sketches and anything discussed among team members.
- Introduce instructions for a research and report activity **(Appendix D: Research Project).**
- 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.
- Where possible, show students exemplars to better help them understand activity expectations.

Student:

- Use a log to record, plan and organize their work.
- Participate in collaborative/cooperative learning through group research.
- Make a class presentation of their research topic.
- Have open class discussions on their presentations to and discuss how it relates to next steps - designing a native bee habitat.

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 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 earning 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 and among students and teachers enables students to refine both thinking and products.

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 planting designs.

Ontario Skills Passport

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

Numeracy skills in measurement and calculations

	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.
Act 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 and Inquiry** ● To assess students on their thinking skills, teachers will evaluate students' research report in terms of using a variety of resources. **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: 1. the student's skills pertaining to conflict management 2. student's ability to work effectively as a team member; 3. 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:**	**Growing Success** Using the achievement chart to establish rubric **SEF Component 1 Assessment for, as and of Learning Connections** **Indicator 1.6-** The 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. Assessments will include communications, observation, performance assessment, and conferencing.

• Rubric **(Appendix C)**	
Act 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 and accommodations. • Teaching Strategies for students with special needs may include: 1. 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; 2. providing a list of designs and suggestions where enrichment and challenge is needed, allowing students to be peer tutors/mentors; 3. pairing experienced students with those who are not yet familiar with the techniques. 4. Presentation format may vary depending on student knowledge and ability.	**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). **Indicator 1.7:** Clear learning goals and success criteria are identified, shared and clarified with students and parents. **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.

CONSOLIDATION & CONNECTIONS **Provide Opportunities for Reflection**

Act 1 REFLECTION PAPER/LOGS	CONNECTIONS
Students will be asked to write a short **Reflection Paper** at the end of this activity **(Appendix D)**. The paper will include a summary of the activity. 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. Students will be asked to create daily logs pertaining to their research.	**SEF Component 2 Classroom Leadership Connections** **Indicator 2.2-** input, through the reflection papers will help refine instruction to improve student learning

MATERIALS, TOOLS and RESOURCES

Act 1 Websites:

Curriculum Websites

- Green Industries Curriculum Document
  - http://www.edu.gov.on.ca/eng/curriculum/secondary/teched.html
- Ontario's Equity and Inclusive Education Strategy
  - http://www.edu.gov.on.ca/eng/policyfunding/equity.pdf
- Ontario Skills Passport
  - http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xht
- Growing Success Document
  - http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf
- Student Success Differentiated Instructions Document
  - http://www.edugains.ca/resourcesDI/EducatorsPackages/DIEducatorsPackage2010/2010EducatorsGuide.pdf
- Student Effectiveness Framework Document
  - http://www.edu.gov.on.ca/eng/literacynumeracy/SEF2013.pdf
- Math Literacy Document
  - http://www.edu.gov.on.ca/eng/document/reports/numeracy/numeracyreport.pdf
- Think Literacy Document
  - http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/library.html
- First Nations, Metis, and Inuit Education Policy Framework
  - http://www.edu.gov.on.ca/eng/aboriginal/fnmiFramework.pdf

Various Native Plant and Pollinator Websites:

- http://www.xerces.org/wp-content/uploads/2008/11/nests_for_native_bees_fact_sheet_xerces_society.pdf
- http://greatpollinatorproject.org/management/nesting-habitat
- http://www.chch.com/niagara-bee-hotel/
- http://www.ourhabitatgarden.org/creatures/bees.html

Various Native Bee and Pollinator Websites:

- http://www.feedthebees.org/wp-content/uploads/2013/03/A-Landowners-Guide-to-Conserving-Native-Pollinators-in-Ontario.pdf
- http://www.ourhabitatgarden.org/creatures/bees.html
- http://www.davidsuzuki.org/what-you-can-do/food-and-our-planet/create-a-bee-friendly-garden/
- http://www.helpabee.org/farming-for-native-bees.html

Act. 1 Publications:

- Garden design magazines
- Outdoor Landscaping/Hardscaping Design Books

Act. 1 COMPUTER SOFTWARE

- Word Processing
- Internet Accessibility

Act. 1 HUMAN RESOURCES

- Guest Speakers: native bee/pollinator experts
- Special Education/Resource staff
- English Department Staff
- Local community: Niagara Parks Botanical Gardens staff

Act. 1 OTHER

- Board computer policies

Act. 1 APPENDICES

- **Appendix A:** Research and Information Gathering
- **Appendix B:** Native Bee and Pollinators Powerpoint
- **Appendix C:** Research and Presentation Rubric

- **Appendix D:** Research Activity Reflection

Act 2 Project Development

Activity Description:

In this activity students will develop a design based on the research they gathered in Activity 1.

The native bee shelter team (Group A) will be designing a bee shelter attractive to many different species of native bees. The bee shelter must be placed in an appropriate area on the school grounds and must include a sketch and working drawings with all parts and materials.

The native plant garden team (Group B) will design a native bee and pollinator landscape based on their research. This should be a garden that contains a variety of native plants attractive to a variety of species of native bees. It must follow all criteria defined below.

Act 2: Criteria and Instructions

Students are to create scale drawings for both the native bee shelter and pollinator garden.

Native Bee Shelter Design

- must be functional to attract variety of native bee species
- must be a structure no larger than 24 inches or 60 cm in size
- must be made of wood, and other natural materials, and be able to withstand the outdoor elements
- must be placed in an appropriate area on the school grounds
- must include a sketch and working drawings with a parts and materials list

Native Plant Garden Design

- must be functional to attract variety of native bee species
- must be attractive and connect with the surrounding school landscape
- must be of a sufficient size, minimum of 20 feet by 20 feet or 6 by 6 meters.
- must be placed in an appropriate area on the school grounds, approved by your teacher and principal
- must include recommended soil requirements
- must be presented as a proper landscape plan, drawn to scale with north orientation, showing features such as the location of the bee shelter, benches, pathways and any other related elements. It should also include locations for native plant species with both common and botanical names
- must provide a list of all required plants and materials, and their quantities and costs
- must provide a detailed schedule of maintenance requirements throughout the year for future

students to follow

MINDS ON ENGAGING PRIOR KNOWLEDGE

Act 2 PRIOR KNOWLEDGE	CONNECTIONS
Prior Knowledge Required; The student will have: • group work skills; • skills in cooperative 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; • mathematical skills relevant to drawing accuracy and measurement units • research information learned from Activity 1 • landscape design and drafting skills	**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. **Math Literacy** **SEF Component 4 Curriculum Teaching and Learning** **Indicator 4.2-**Numeracy specific concepts are explicitly used to deepen student learning and understanding in all subjects. **Ontario Skills Passport** Numeracy skills in measurement and calculations. http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xhtml
Act 2 PLANNING NOTES	**CONNECTIONS**
• Be sure that all computers are in working order and that the CAD software is functional if it is being used as a design tool • Review landscape design principles and drafting techniques. • 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	**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. Collaborate with other Green Industries teachers outside of your board to establish

• Consult with construction teacher to review cutting/fastening techniques if necessary • 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.)	best practices and curriculum improvements. Become members of HEA - Horticulture Educators Association http://www.greencareerscanada.ca/teachers-industry/horticultural-educators-association/ **OCTE Safe Docs/SafeNet/Safety Videos** Become a members of the Ontario Council for Technology (OCTE) where tech teachers can network and collaborate on common challenges and resource development. http://www.octe.on.ca/ **Ontario Skills Passport** Literacy skills in planning and organizing. http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xhtml **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, construction with the Construction Dept.

ACTION INTRODUCE OR EXTEND LEARNING

Act 2 Instructional Strategies	Connections
TEACHER **Design Challenge** • Introduce the design challenge **(Appendix E & F)** and coordinate open class/group discussions and brainstorming sessions to start the design process. • Check on group progress and help direct where applicable **Design Drawings** • Oversee the design development for both groups • Be sure that all students are included and contributing equally to their respective teams **STUDENT** **Design Challenge** • review the design challenge and participate in open class/group discussions and brainstorming sessions to start the design process. • Continue working in their respective groups and collaborate equally in the design process by working out an equal division of work and responsibilities • Ask teacher for guidance if required **Design Drawings** • Create working design drawings for each group as described in the handout • Students will become familiar with drafting standards allowing them to develop working scale drawings of their design proposal	**Think Literacy** Oral Communications-Whole Class Discussion-Discussion Etiquette http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/files/Oral.pdf **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. http://www.skills.edu.gov.on.ca/OSP2Web/EDU/DisplayEssentialSkills.xhtml **Teacher Tips** Note that joining methods and material selection lessons can be delivered while students are working on their design layouts. This will allow opportunities for just-in-time delivery of content.

	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. **SafeDocs/SafeNet/Safety Videos** Computer station and ergonomic safety awareness. **Think Literacy** Oral Communications-Whole Class Discussion-Discussion Etiquette Small group discussion strategies can also apply here. **Math Literacy** Establishing A Positive Classroom Climate 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. Building math literacy capacity is a strong component of this project. **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. **Math Literacy** Metric vs Imperial Units Dimensioning and Tolerancing
Act 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. **Application** • Students are assessed on their ability to draw a given object using sketching techniques and engineering standards learned. Using a checklist format, teachers can check the hand drawn detailed drawings of the wind powered generator. • The completed drawings will be evaluated individually or 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 and Inquiry** • 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. A rubric tool may be used in the evaluation of this package; **Knowledge and Understanding**	**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. **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.

• Upon completion of designs, 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. **Communications** • Reflections: Students will self-assess their experiences through a reflective journal entry. The journal entries are evaluated through a rubric evaluation format. **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 G)** • Test **(Appendix H)**	Input, through the reflection papers will help refine instruction to improve student learning
Act. 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 and accommodations. • 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. • 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.	**Differentiated Instructions (DI)** Encourage students to participate in skills competition. **SEF** **Component 1- Assessment for, as and of.** **Indicator 1.7-** Clear learning goals and success criteria are identified, shared and clarified with students and parents.

CONSOLIDATION & CONNECTIONS **Provide Opportunities for Reflection**

Act 2 REFLECTION PAPER/LOGS	CONNECTIONS
Students will be asked to write a short **Reflection Paper** at the end of this activity **(Appendix D)**. The paper will include a summary of the activity. 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. Students will be asked to create daily logs pertaining to their	**SEF Component 2 Classroom Leadership Connections** **Indicator 2.2-** input, through the reflection papers will help refine instruction to improve student learning **Think Literacy** Developing and organizing ideas: have students use mind-mapping techniques when brainstorming ideas

designs.	

MATERIALS, TOOLS and RESOURCES

Act. 2 Websites:
Various Native Plant and Pollinator Websites: • *https://www.crd.bc.ca/docs/default-source/Partnerships-PDF/water-in-our-community-learning-resource/design-a-native-plant-garden.pdf?sfvrsn=0* • *http://www.usask.ca/education/prairiehabitatgarden/teaching/downloads/habitat-start.pdf* • *http://www.nybg.org/exhibitions/2013/native-plant-garden/* • *http://dyckarboretum.org/how-to-design-a-native-plant-garden/* **Various Native Plant and Pollinator Websites:** • *http://www.xerces.org/wp-content/uploads/2008/11/nests_for_native_bees_fact_sheet_xerces_society.pdf* • *http://www.seeds.ca/pollination/making-bee-nests* • *http://tcpermaculture.com/site/2013/05/02/mason-bees-a-quick-overview/*
Act. 2 COMPUTER SOFTWARE
• CAD Software • Word Processor
Act. 2 HUMAN RESOURCES
• Guest speakers: local professionals • Special Education/Resource staff • Construction/Science teachers • School or board computer technician
Act 2 OTHER
• Board computer policies

- Niagara Parks Botanical Gardens tour of Pollinator Garden

Act. 2 APPENDICES

- **Appendix E:** Design Challenge #1 - Native Bee Shelter
- **Appendix F:** Design Challenge #2 - Native Bee and Pollinator Garden
- **Appendix G:** Rubric
- **Appendix H:** Test
- **Appendix I:** Self Assessment

Act 3: Construction/Installation

Activity Description:

Now that Group A has designed a native bee shelter, they must move forward and build their prototype. The structure must be built to scale using appropriate tools, following all safety standards set out by the teacher.

As well, now that Group B has designed a native plant garden, they must move forward and install their garden on the school grounds (as agreed upon by administration). The garden must be installed using appropriate tools and following all safety protocols.

Act 3 Criteria and Instructions

Native Bee Shelter

- must be fully functional to attract variety of native bee species and withstand the outdoor elements
- must be a quality finished product, well built and properly fastened
- must be placed in the native plant garden

Native Plant Garden

- must be fully functional containing native plant species to attract a variety of native bees throughout multiple seasons
- must be a quality finished product, well installed and properly watered and mulched
- must be placed in the appropriate approved location
- all plants should be labelled in with common and botanical names for easy identification
- a garden maintenance schedule must be created to pass along to future students

MINDS ON ENGAGING PRIOR KNOWLEDGE

Act 3 PRIOR KNOWLEDGE	CONNECTIONS
Prior Knowledge Required; The student will have: ● Completed Activity 2 ● group work skills; skills in cooperative learning techniques (effective interpersonal skills) and an understanding of personal responsibilities and commitment required for group activities; ● respect for the rights, responsibilities and contributions of self and others;	**Teacher Tips** It may be a good idea to review all safety protocols before build the native bee shelter and garden
Act 3 PLANNING NOTES	**CONNECTIONS**
● Checked all recommended resources prior to beginning lessons and activity. ● Collected and checked that all required tools are in working order and safe to operate/use ● Reviewed all safety procedures with regards to power tools and wood shop rules ● Kept all nursery plants well watered before and after planting, and reviewed planting procedures and plant identification for correct species placement	**Teacher Tips** It is recommended that the teacher oversees the plantings and support students with tips on proper planting techniques. **SEF Component 1** **Assessment *for, as* and *of* Learning** **Indicator 1.7:** Clear learning goals and success criteria are identified, shared and clarified with students and parents. **SEF Component 3** **Student Engagement** **Indicator 3.4:** Creative, innovative and diverse perspectives are encouraged and nurtured.

ACTION INTRODUCE OR EXTEND LEARNING

Act 3 Instructional Strategies	Connections
Teacher: ● Introduce the Build Challenge activity and criteria **(Appendix J)**. ● 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. ● Demonstrate safe use of all required tools **Student:** ● Build the native bee shelter as per design ● Build the native plant garden as per design	**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 **OCTE** - Health and Safety Resources **Math Literacy** Establishing A Positive Classroom Climate 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. Building math literacy capacity is a strong component of this project. **Think Literacy** Oral Communications-Whole Class Discussion-Discussion Etiquette Small group discussion strategies can also apply here.
Act 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 and Inquiry

- To assess students on their thinking skills, teachers will evaluate students' creativity in completing the bee shelter and garden

Communications

- To assess students based on their collaboration skills and demonstration of teamwork during the design/build process

Application

- Students are assessed on their effort and ability to build the native bee shelter prototype
- Students are assessed on their effort and ability to build the native bee garden

Knowledge and Understanding

- To assess students based on their knowledge and understanding of using tools, following safety protocols, plant species identification and planting procedures.

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:

- Rubric **(Appendix K)**

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 .

Act 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 and accommodations. • Teaching Strategies for students with special needs may include: - grouping design teams with varied abilities to allow for peer support, specially those who are not yet familiar with some techniques. The teacher may choose or modify the teams depending on individual strengths and weaknesses; - providing a list of designs and suggestions where enrichment and challenge is needed, allowing students to be peer tutors/mentors;	**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. **Component 1- Assessment for, as and of.** **Indicator 1.7-** Clear learning goals and success criteria are identified, shared and clarified with students and parents.

CONSOLIDATION & CONNECTIONS

Provide Opportunities for Reflection

Act 3 REFLECTION PAPER/LOGS	CONNECTIONS
Students will be asked to write a short **Reflection Paper** at the end of this activity **(Appendix D)**. The paper will include a summary of the activity. 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. Students will be asked to create daily logs pertaining to their group project.	**SEF Component 2 Classroom Leadership Connections** **Indicator 2.2-** input, through the reflection papers will help refine instruction to improve student learning **Indicator 3.2-** Educators and students collaborate to create a positive learning environment in the classroom and school that maximizes engagement, achievement and well-being.
Learning Skills Self-Assessment	

Have students complete a self-assessment form **(Appendix L).** This will increase responsibility for students' own learning as a result of more opportunities for self-reflection.	

MATERIALS, TOOLS and RESOURCES

Act 3 Websites:
Resource Websites • Canadian Living Magazine http://www.canadianliving.com/home-and-garden/diy-and-crafts/article/how-to-build-a-diy-bee-hotel • University of Nebraska http://extensionpublications.unl.edu/assets/pdf/g2256.pdf • Mother Nature Network http://www.mnn.com/your-home/organic-farming-gardening/stories/how-build-hotel-wild-bees • Steam Register Technology http://steamregister.com/summer-stem-lesson-build-a-condo-for-native-bees/ • OCTE Health and Safety Resources http://octe.on.ca/index.php?id=29
Act. 3 HUMAN RESOURCES
• Guest speakers: local professionals • Special Education/Resource staff • Construction/Science teachers • Industry technician demonstrations
Act. 3 APPENDICES
• **Appendix J:** The Build Challenge • **Appendix D:** Reflection Paper • **Appendix K:** Build Rubric

- **Appendix I:** Self Assessment