

**CODE/MOE/UOIT Makerspaces Project--Lesson Planning Template**

**School Board: Lakehead Public Schools**

**Lesson Plan: Grade 7 & 8 Science – Structures and Mechanisms**

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| **Lesson Objectives:**Students will plan, design, build and test dummies on skis that will compete in the Loch Lomond’s annual Dummy Downhill.**Science Curriculum Expectations:** Overall:* design and construct a variety of structures, and investigate the relationship between the design and function of these structures and the forces that act on them;
* demonstrate an understanding of the relationship between structural forms and the forces that act on and within them;
* investigate a working system and the ways in which components of the system contribute to its desired function;
* demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation.

Learning Skills: organization, independent work, initiative, self-regulationScientific Process Expectations: problem solving, reasoning and proving, selecting tools and computational strategies, representing |
| **Learning Goals:**“We are learning to…”plan, design, strategize, and build our Dummies to meet the criteria as outlined by the organizing committee. | **Success Criteria:** “We will be successful when…”we test our Dummies at the competition and review the videos to discuss design flaws, modifications and the outcome. |
| **Lesson Overview:**Plan, design, build Dummies in class to race at Loch Lomond in the 2018 Dummy Downhill. |
| **Materials and Technology:** Students are required to supply all building materials other than skis. |
| **Student Accommodations/Modifications:** If accommodations are needed students will be placed in groups. | **Lesson will be differentiated by:*** **Content, specifically:**
* **Process, specifically:**
* **Product, specifically:**
* **Environment, specifically:**
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| **MINDS ON: Getting Started** |
| During this phase, the teacher may: • activate students’ prior knowledge; • engage students by watching former Dummy Downhill videos• gather diagnostic and/or formative assessment data through observation and questioning; • discuss and clarify the task(s).  | During this phase, students may: • participate in discussions; • propose strategies; • question the teacher and their classmates; • make connections to and reflect on prior learning.  |
| Describe how you will introduce the learning activity to your students. What key questions will you ask? How will you gather diagnostic or formative data about the students’ current levels of understanding? How will students be grouped? How will materials be distributed? We will watch: Warren Miller’s Dummy Downhill <https://www.youtube.com/watch?v=HuL39TKpbTU>We will discuss the criteria as a class. What are the forces acting on the structure as it races down the hill? How can we design a structure that will counteract these forces?Students will choose their own groups.Students will supply all the material other than skis. |
| **ACTION: Working on it** |
| During this phase, the teacher may: • ask probing questions; • clarify misconceptions, as needed, by redirecting students through questioning; • answer students’ questions (but avoid providing a solution to the problem); • observe and assess; • encourage students to represent their thinking concretely;• encourage students to clarify ideas and to pose questions to other students. | During this phase, students may: • represent their thinking;• participate actively in whole group, small group, or independent settings; • explain their thinking to the teacher and their classmates; • explore and develop design and planning ideas and concepts.  |
| Describe the task(s) in which your students will be engaged. What misconceptions or difficulties do you think they might experience? How will they demonstrate their understanding of the concept? How will you gather your assessment data (e.g., checklist, anecdotal records)? What extension activities will you provide? After watching the video and discussing the criteria, the students will get into their groups and begin their planning and designs. The teacher will circulate among the groups and review plans and designs and ask questions regarding the form and function (forces on the dummy), and how groups will compensate for these. Students will be reminded that all materials should be pre-cut and drilled if necessary at home as they will only have access to drills, hand tools, and hand saws at school.Students will bring all their materials to class to begin the construction process. We will give the students 200 minutes to build their dummies.Teacher will use anecdotal records, planning and design pages, photos of dummies and video of the competition, and journal entries.Extension1. Follow up to Dummy Downhill, write a journal entry and discuss any design modifications and changes you’ll make for next time.
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| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher may: • bring students back together to share and analyse strategies; • encourage students to explain a variety of learning strategies; • ask students to defend their procedures and justify their answers; • clarify misunderstandings; • summarize the discussion and emphasize key points or concepts in their journals. | During this phase, students may: • share their findings; • use a variety of concrete (pictures/videos) to demonstrate their understandings; • justify and explain their thinking; • reflect on their learning. |
| How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)? What key questions will you ask during the debriefing? All groups will test their dummies at Loch Lomond.Process may be assessed through observations/conversations and anecdotal notes. Product may be assessed through a rubric or checklist (See PDF below) |

**Appendix A**

**The 2018 Dummy Downhill is taking place March 25th at Loch Lomond in honour of Warren Miller. Warren Miller is a ski filmmaker who came to Thunder Bay, making the race famous years ago. The Nor’wester View Academy Program is going to be a part of it!**

**Purpose:** This assignment has been created as a culminating task to observe your ability to apply your learning and understanding from the units “Form and Function” and ‘Mechanical Efficiency.” You will need to design a ‘dummy’ resembling a person that has impacted your Academy, that can get quickly down the “Giant” in the fastest time without falling apart/crashing etc.

**Requirements:**

\*Your group can have no more than 3 members.

\*Your dummy needs to resemble a person from your Academy and must not be the same person you portrayed during the Wax Museum.

\*The maximum weight allowed is 150lbs

\*The minimum height is 2’ the maximum is 6’

\*The dummy must be mounted on actual skis (provided).

\*No glass, sharps or explosives are allowed.

**Dates to Remember:**

**Thursday, March 8- detailed plans due**. Must be completed in three views (front, back and top) that are labelled. A detailed list of supplies is also required. General supplies along with skis will be provided- anything particular/special is the responsibility of each group.

**Wednesday and Thursday March 21st and 22nd are ‘Building Days**.’ Models will need to be constructed at school so that they can be assessed. Students will be required to bring it home and transport it to the hill for the race.

**Sunday, March 25th- Race Day**

**Tuesday March 27th**- **Reflections due.** Be sure to include adequate info: Pictures, stats of the performance, successes, areas for improvement etc.

**Important Information:**

\*A parent/guardian will need to accompany each group at the hill for the afternoon. Student’s will not be able to participate without one supervisor present.

\*Students will not be allowed to ski during this event or go on the chair lift.

\*Each dummy needs to arrive at Loch Lomond by 12:00 p.m on the day of the event. Your dummy must pass the inspection at 1:00 p.m. for it to participate in the race. **You are responsible for getting your dummy to the hill on race day.**

\* The launch time will be 3:00 p.m.

\*All dummies will be brought to the top of the hill by a staff member on a snow machine. Students will be required to watch from the bottom of the hill/chalet and cheer each entry on.

\*Dummies will be assessed for creativity, stability, and the overall result of how it does skiing down the Giant.

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| CATEGORY  | **4**  | **3**  | **2**  | **1**  |
| **Function**  | Structure functions extraordinarily well, holding up under atypical stresses.  | Structure functions well, holding up under typical stresses.  | Structure functions pretty well, but deteriorates under typical stresses.  | Fatal flaws in function with complete failure under typical stresses.  |
| **Scientific Knowledge**  | Explanations by all group members indicate a clear and accurate understanding of scientific principles underlying the construction and modifications.  | Explanations by all group members indicate a relatively accurate understanding of scientific principles underlying the construction and modifications.  | Explanations by most group members indicate relatively accurate understanding of scientific principles underlying the construction and modifications.  | Explanations by several members of the group do not illustrate much understanding of scientific principles underlying the construction and modifications.  |
| **Plan**  | Plan is neat with clear measurements and labeling for all components.  | Plan is neat with clear measurements and labeling for most components.  | Plan provides clear measurements and labeling for most components.  | Plan does not show measurements clearly or is otherwise inadequately labeled.  |
| **Construction -Materials**  | Appropriate materials were selected and creatively modified in ways that made them even better.  | Appropriate materials were selected and there was an attempt at creative modification to make them even better.  | Appropriate materials were selected.  | Inappropriate materials were selected and contributed to a product that performed poorly.  |
| **Construction - Care Taken**  | Great care taken in construction process so that the structure is neat, attractive and follows plans accurately.  | Construction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.  | Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.  | Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.  |
| **Journal/Log - Content**  | Journal provides a complete record of planning, construction, testing, modifications, reasons for modifications, and some reflection about the strategies used and the results.  | Journal provides a complete record of planning, construction, testing, modifications, and reasons for modifications.  | Journal provides quite a bit of detail about planning, construction, testing, modifications, and reasons for modifications.  | Journal provides very little detail about several aspects of the planning, construction, and testing process.  |
| **Modification/Testing**  | Clear evidence of troubleshooting, testing, and refinements based on data or scientific principles.  | Clear evidence of troubleshooting, testing and refinements.  | Some evidence of troubleshooting, testing and refinements.  | Little evidence of troubleshooting, testing or refinement.  |