

Teacher(s)	Amy Brodsky	Subject group and discipline	Design: Product Design		
Unit title	Rube Goldberg	MYP Year	Grades 5 & 6	Unit duration	2 weeks (7 hours)

Inquiry: Establishing the purpose of the unit

Key concepts	Related concept(s)	Global contexts
 Systems	 Design  Function  Form  Evaluation	 Scientific and technical innovation  <i>Exploration to Develop:</i> Systems, models, methods; products, processes and solutions

Conceptual Understanding

Students will understand the idea of a system by creating one in their Rube Goldberg device. With an emphasis on process, not product, students will be challenged to make changes to the way their system looks and functions in order to make it successful.

Statement of inquiry

 Manipulating form and function can cause change within a system.

Inquiry questions

Factual How does the incline of a ramp affect the speed or distance an object will roll?

- Students will be able to describe the principle of incline and how it affects distance and speed of a rolling object.

Conceptual How does one thing affect another?

- Students will be able to evaluate their devices to determine the butterfly effect of change.

Debatable Is simpler always better?

- Students will be able to evaluate their own devices and others to see in what ways is it better to create a more simple plan, and when is it appropriate to explore in more complexity.

Objectives

Summative assessment

B: Developing ideas

- ii. present feasible design ideas, which can be correctly interpreted by others
- iii. present the chosen design

Outline of summative assessment task(s) including assessment criteria:

Assignment  **Rube Goldberg (B, D)**

Relationship between summative assessment task(s) and statement of inquiry:

Students will be assessed on their design, and their ability to evaluate the design.
Students will show evidence of understanding by

<ul style="list-style-type: none"> iv. create a planning drawing/diagram, which outlines the main details for making the chosen solution. <p>D: Evaluating</p> <ul style="list-style-type: none"> i. outline simple, relevant testing methods, which generate data, to measure the success of the solution ii. outline the success of the solution against the design specification iii. outline how the solution could be improved 		<p>planning 2 designs for possible devices, and through problem-solving in class to fix problems that arise in their devices.</p>
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Approaches to learning (ATL)

IB ATL CATEGORY	MYP ATL CLUSTER	SPECIFIC ATL SKILL	LEARNING EXPERIENCES
 <p>Social</p>	<p>II. Collaboration skills</p>	<p>Working effectively with others</p> <ul style="list-style-type: none"> • Delegate and share responsibility for decision-making • Take responsibility for one’s own actions • Manage and resolve conflict and work collaboratively in teams • Build consensus • Make fair and equitable decisions • Negotiate effectively • Encourage others to contribute 	<p>At the beginning of the project, students are asked to develop their own design ideas independently. Once they have their individual ideas, they collaborate as a group to come up with a group plan. I encourage groups, after sharing, to pick at least one aspect of each person’s design to include in their final design. They work together to make sure everyone is included. While building, I work with groups to help every person find their role in the group and make decisions together.</p>
 <p>Self-management</p>	<p>V. Reflection skills</p>	<p>(Re-)considering the process of learning; choosing and using ATL skills</p> <ul style="list-style-type: none"> • Develop new skills, techniques and strategies for effective learning • Consider content <ul style="list-style-type: none"> - What did I learn about today? - What don’t I yet understand? - What questions do I have now? 	<p>To begin each day, instead of posting my learning expectation for students, we work together to craft this as a group. I go over my plan for the day, and together we brainstorm:</p> <ul style="list-style-type: none"> -Today I am... -So that I can... -I know I’ve got it when... <p>Students are asked to put in their own words what they will be doing, reflect on why, and how they will know if they are successful. I find this exercise helps students to really think about the purpose of what they are doing each day and know my expectations.</p>



VIII. Critical thinking skills

IX. Creative thinking skills

Analysing and evaluating issues and ideas

- Propose and evaluate a variety of solutions

Generating novel ideas and considering new perspectives

- Use brainstorming and visual diagrams to generate new ideas and inquiries
- Consider multiple alternatives, including those that might be unlikely or impossible
- Create novel solutions to authentic problems

Throughout the project, students will need to think critically about their devices and analyze why a part might not be working. They will have to devise a solution to make it work better, whether it be manipulating the form or the function. At the beginning, they are asked to come up with multiple ideas for the solution and have to evaluate these ideas and pick the one they think will work best.

Action: Teaching and learning through inquiry

Content	Learning process
<p>Knowledge & Skills:</p> <ul style="list-style-type: none"> • From Grade 6 Science Content Statements: -Use appropriate mathematics, tools and techniques to gather data and information; -Develop descriptions, models, explanations and predictions • From National Technology Standards: -Apply existing knowledge to generate new ideas, products, or processes -Identify and define authentic problems and significant questions for investigation - Collect and analyze data to identify solutions and/or make informed decisions <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p>Standards</p> <p>Subject: Physical Education</p> <p>Year: Grade 7, Grade 8, Grade 10</p> <p>Start Date: W2 September Duration: 6 weeks</p> </div>	<p>Learning Experiences</p> <p>How will students know what is expected of them? Will they see examples, rubrics, templates, etc.? How will students acquire the knowledge and practice the skills required? How will they practice applying these? Do the students have enough prior knowledge?</p> <p>Students will know what is expected of them by going over the IB Design Rubric for Criteria B (Developing Ideas) and D (Evaluating). They will see examples of Rube Goldberg devices on Youtube, as well as exemplars from past year's 6th graders. The exemplars will help the students see the scope of what is expected.</p> <p>Day 1: Introduce key concept, global context, statement of inquiry. Read and talk about who Rube Goldberg was and how he has left an impact; analyze his cartoons; watch videos of Rube Goldberg devices in action; go over expectations for final project; decide with group on outcome of final project.</p> <p>Day 2: go over rubric for evaluating final project; define success criteria; create individual design specifications Day 3: share design specifications with group and decide on group design using features from each group member; list steps; request materials</p> <p>Days 4,5,6: Building Rube Goldberg devices and testing</p> <p>Day 7: Present final device to class; evaluate project and group work; fill out student rubric</p> <p>It is unlikely that most students have heard of Rube Goldberg devices. This will serve as an introduction. I will</p>

question students at the beginning of the unit and share examples of these devices to help activate prior knowledge. We will connect these devices to the idea of one thing affecting another- students will be able to give examples of this idea.

Teaching strategies

How will we use formative assessments to give students feedback during the unit?

What different teaching methodologies will be employed?

How are we differentiating teaching and learning for all? Have we considered those learning in the language other than their mother tongue? Have we considered those with special educational needs?

The goal of this project is to work on the process. Throughout the unit, students will be reminded and encouraged that there is no part of their grade tied to their device actually working. They will be evaluated on their design, and their ability to evaluate the design.

Through the unit, I will observe each group and make notes as to how they tackle each problem. When they encounter a step of their device that is not working, what changes do they make? How do they make adjustments of the design to make it work better on the next test run? I will question students as to how they have changed the form and function to cause change within their system.

Upon presenting their devices, students will be asked to identify the steps that they struggled with the most, and asked to reflect on what changes they made to make it work better.

During the beginning of the unit, there will be some direct instruction and shared reading as we learn about Rube Goldberg- who he was and what his devices are. Students will view video examples.

There will be extensive group work as students collaborate to plan ideas, draw designs and build. There will be parts of the project in which students are responsible for their own individual work, as well as contributions to the group as a whole.

At the end, students will orally present their devices to the class and test their effectiveness.

Modifications to the assignments are made on a case by case basis according to the needs of a student's IEP. For example, a student may be asked to draw just one design with pros and cons instead of two. Students may be given writing support in filling out their self reflection at the end of the unit.

Assessment Task

Describe how you will differentiate teaching & learning for this unit?
 Students will be working in mixed ability groups to design and build their devices. One on one support will be provided for those students who need assistance. Scaffolding will be provided for those students to reach the goals of the project with support.

Learner Profile

Inquirers: During the building stage of the project, students need to be inquirers as they are trying new ideas and trying to find ways to make their designs work effectively.

Thinkers: During the beginning stages of the project, students need to be thinkers as they are brainstorming ideas for their designs and evaluating the pros and cons.

Open minded: Students will need to be open-minded when they share their design ideas with their group and make selections as to which parts to include in their final group designs. They need to be open to trying ideas and making changes if they don't work.

Reflective: At the end of the project, students will fill out a self-evaluation looking at their individual and group success. They will be asked to reflect on ways they overcame challenges with their group and how they could have contributed more.

Resources

- File:** rube_goldberg_cartoon_examples.docx
- Youtube:** <https://www.youtube.com/watch?v=i5ZXdlfjeUQ>
- Youtube:** <https://www.youtube.com/watch?v=rozV07bwebE>
- Youtube:** <https://www.youtube.com/watch?v=0uDDEEHdf1Y>
- Journal:**
- Lab materials for building

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
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Why do we think that the unit or the selection of topics will be interesting?
What potential interdisciplinary connections can we identify?

Many students have seen Rube Goldberg devices in action, even if they didn't know what it was. I think students will be excited when they see video examples of these devices to create their own. Wherever possible, I will make connections to science. In 6th grade science, students learn about potential and kinetic energy. There should be many opportunities within this project to build student understanding of energy.

I am the only teacher who teaches this unit. However, I collaborate with the art and computer teachers who also teach IB Design to develop common rubrics and expectations. The science classroom teachers are involved in the lab with me, so I receive constant feedback from them on the effectiveness of the unit and how it is meeting the students' needs.

Students were definitely able to demonstrate their learning. Through questioning, I am able to formatively assess throughout the project. Students demonstrate their understanding when presenting to the class at the end and through their final self evaluations.

The best part of this unit for me was sitting back and watching students struggle through the process. When I told them that it didn't matter in their grade if their device worked perfectly, it was like a huge weight was lifted and they were able to really just focus on the process instead of the final product. Students were incredibly engaged. I enjoyed observing groups trying to problem solve and figure out ways to make each step work better instead of just rushing to a book or teacher to get the "right answer." Next year I will add a day to the project. While most groups were able to build successful devices, I think one additional day for building would really benefit the students. I will also likely change the evaluation form a bit. I got great information about how they evaluated their work ability, but I want more about the changes they made to their devices along the way and why. Maybe I will incorporate a log/journal for the students to keep. As they test each step of their device, they can record if it worked or not. If it didn't work, I can have them keep a record of the changes they made and evaluate its effectiveness. This will help me collect better evidence on the evaluation criterion for their final grade.

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