

Lesson Plan

IMVR LESSON PLAN

Immersive Physics with Rube Goldberg Machines

Learning Area	Science	Kit	Lumination Immersive Virtual Reality (IMVR) Kit OR Lumination Learning Lab
Year Level	Year 7	Duration	1x 60 minute Lesson

Introduction/Description

Rube Goldberg machines are widely known for their ridiculousness in having a complex machine perform a simple task. What Rube Goldberg machines also have, is the ability to teach students about simple (or more complex) forces in physics.

Learning Intentions

Students will apply their understanding of physics (simple forces) through designing and prototyping chain reaction machines in Virtual Reality (VR).

Task Summary

Students will create a Rube Goldberg machine using Virtual Reality (VR) and other technologies

Preparation

Students are expected to:

- Have some background knowledge of simple forces
- Have knowledge about Rube Goldberg machines from a previous lesson
- Have prepared a design of a Rube Goldberg machine to perform a simple task (as directed by the teacher)
- Have some background in using Immersive Virtual Reality (IMVR) Headsets
- Have a basic background in building on CoSpaces. If not, please add at least a 1x 60 minute lesson for learning the basics. There are tutorials linked in the resources section

Teachers should make sure that:

- IMVR headsets must be calibrated and charged
- *Gadgets* to be installed on IMVR headsets
- Students are able to access YouTube videos.
- Ensure that links to any Rube Goldberg machine games are not blocked by school firewalls.
- Slide deck has been checked and the teacher has enabled the deck's accessibility so students can access them.

- A copy of the Student Digital Notebook has been distributed to students and they have downloaded/ made a copy for themselves.
- Have prepared students with knowledge about Rube Goldberg Machines, forces, and given them time to prepare a design of their own Rube Goldberg Machine
- Students are divided into pairs or groups depending on how many devices are available. A suggested rotation cycle may be:

Group	Round 1	Round 2	Round 3
Group 1	IMVR	Build	Explore
Group 2	Explore	IMVR	Build
Group 3	Build	Explore	IMVR

This may differ based on student numbers and number of HHVR headsets/ devices.

Resources

- IMVR Apps
 - [Gadgeteer](#)

Gadgeteer is a physics-based VR puzzle game where you build chain reaction machines to solve fun, intricate puzzles. Your machines will use gadgets to launch, bump, twist, and turn—creating chain reactions that may even end up tearing apart the fabric of space-time.

- Hardware:
 - Student laptops
 - IMVR Headsets
- Videos
 - [This Too Shall Pass](#) (3:53)

The official video for the recorded version of "This Too Shall Pass" off the album "Of the Blue Colour of the Sky" by band Ok, Go. The video was filmed in a two story warehouse, in the Echo Park neighborhood of Los Angeles, CA. The "machine" was designed and built by the band, along with members of Syyn Labs (<http://syynlabs.com/>) over the course of several months.

- Apps:
 - [CoSpaces EDU](#) (VR creation tool)
 - [Tinkercad](#)

Tinkercad is a free web app for 3D design, electronics, and coding.

- Teaching Materials:
 - [Rube Goldberg Machines: Teaching Deck](#) (slide deck)
 - [Rube Goldberg Machines: Student Digital Notebook](#) (slide deck)

Other Learning Areas

- Design and Technology

Learning Sequence

1

Introduction
(5–8 mins)

- Show students [This Too Shall Pass](#) (3:53) by OK Go as an introduction to Rube Goldberg Machines.
- Ask students to recap how this video could relate to physics and the idea of forces.
- Explain that students will be spending some time creating and exploring Rube Goldberg machines virtually. They will need to have their machine designs completed previously with them (see example on [Rube Goldberg Machines: Teaching Deck](#) slide deck)

2

Development
(30–40 mins)

Introduce the stations students will be engaging in

Station-based Learning in 10–15 min interval rotations

Station 1 – IMVR

- In pairs, students are to use the [Gadgeteer](#) app on their IMVR Kit or the Learning Lab to create their Rube Goldberg Machine Take turns in the group and document decisions or ideas.

Station 2 – Explore

- Students can play some online challenge games that require them to make Rube Goldberg type machines to achieve tasks;
 - [The Incredible Machine](#) ([TIM Backup link](#))
 - [Tinkerball](#)
 - [Dynamic Systems](#)
 - [Simple Machines](#)

Station 3 – Build

- Students are to use [Tinkercad](#) and [CoSpaces EDU](#) to create their Rube Goldberg Machines they designed earlier. They can include their description of the forces at play through coding information panels or using text/ speech options.

3

Conclusion
(5–8 mins)

- Ask students to share their city designs/creations using [CoSpaces EDU](#) by sharing the link/ QR code. Students will be able to view each other's creations in VR or AR by scanning each other's QR codes.

Modifications

Adaptations

Students may build their Rube Goldberg machines using lego, blocks, or recycled materials

Extension Ideas

Students may film themselves explaining their Rube Goldberg machine they created in the IMVR using *Gadgeteers* or their one CoSpaces.

Curriculum Connections

Australian Curriculum	NSW Curriculum	Victorian Curriculum
Year 7 - Science Science Understanding Investigate and represent balanced and unbalanced forces, including gravitational force, acting on objects, and relate changes in an object's motion to its mass and the magnitude and direction of forces acting on it (AC9S7U04) Science Inquiry Analyse methods, conclusions and claims for assumptions, possible sources of error, conflicting evidence and unanswered questions (AC9S7I06)	Stage 4 - Science Skills Selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems (SC4-8WS) Knowledge and Understanding Describes the action of unbalanced forces in everyday situations (SC4-10PW) Discusses how scientific understanding and technological developments have contributed to finding solutions to problems involving energy transfers and transformations (SC4-11PW)	Year 7 & 8 Science Physical Sciences Change to an object's motion is caused by unbalanced forces acting on the object; Earth's gravity pulls objects towards the centre of Earth (VCSSU103) Energy appears in different forms including movement (kinetic energy), heat, light, chemical energy and potential energy; devices can change energy from one form to another (VCSSU104) Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (VCSIS112)

Year 7/8 - Digital Technologies Generate, modify, communicate and evaluate alternative designs (AC9TDI8P08)	Stage 4 - Information and Software Technology Designs, produces and evaluates appropriate solutions to a range of problems (4.2.2)	Levels 7 & 8 - Digital Technologies Design the user experience of a digital system, generating, evaluating and communicating alternative designs (VCDTCD041)
Year 7/8 - Design and Technology (for adaptation activity) Knowledge and Understanding Analyse how motion, force and energy are used to manipulate and control electromechanical systems when designing simple, engineered solutions (ACTDEK031)	Stage 4 - Design and Technology (for adaptation activity) DT4-6 identifies creative, innovative, and enterprising design ideas and solutions DT4-7 communicates design ideas and solutions using a range of techniques	Levels 7 & 8 - Design and Technology (for adaptation activity) Analyse how motion, force and energy are used to manipulate and control electromechanical systems when creating simple, engineered solutions (VCDSTC045) Generate, develop and test design ideas, plans and processes using appropriate technical terms and technologies including graphical representation techniques (VCDSCD050) Effectively and safely use a broad range of materials, components, tools, equipment and techniques to produce designed solutions (VCDSCD051)

Analyse how force, motion and energy are used to manipulate and control engineered systems (AC9TDE8K03) Processes and Production Skills Generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques, including using digital tools (AC9TDE8P02) Select, justify and use suitable materials, components, tools, equipment, skills and processes to safely make designed solutions (AC9TDE8P03)		
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Cross-Curriculum Priorities

- ☐ Aboriginal and Torres Strait Islander Histories and Cultures
- ☐ Asia and Australia's Engagement with Asia
- ☒ Sustainability (adaptation activity)

Capabilities

- ☐ Literacy
- ☒ Numeracy

- ✓ Digital Literacy
- ✓ Critical and Creative Thinking
- ☒ Personal & Social Capability
- ☒ Ethical Understanding
- ☒ Intercultural Understanding