Nerdy Debry

Basic

Stimulate problem solving	**Bronze**	**Stimulate entrepreneurship**	**Bronze**
Stimulate creativity	**Bronze**	**Informal learning enviro.**	**Bronze**
Stimulate critical thinking	**Bronze**	**Technology use**	**Bronze**
Stimulate group work	**Bronze**		

Practicalities

Preparation: 1h

Duration: 50’

Material needs:

- Cardboard
- Paper
- Stickers
- Isomo or insulation foam
- Foamcutter
- Wood (small)
- tooth picks
- rope
- 3D-printer or plastic cups
- Tape
- Scissors
- Paper clips
- Cotton buds
- Marbles
- Small rocks
- Elastic bands
- Plastic bags
- Staples
- Stapler
- Glue sticks
- Etc.

Group size range: individual
Ideal sub-group size: 1 (individual)

Workshop made for: -12/12-16
Easily transferable to workshops for ages between: +16

Environment FabLab necessary: no, if you have pre-lasercutted boxes and a racetrack (parcours) available.

Educational area:
* Engineering
* Science
* Technology
* (Visual) Arts

Precognition

The participants do not need to know anything about cars and immediately start with all the available material.

(see box ‘content links’ below)

Preparation

Let people work individually (ideally).

Set up a work station per person (preparation for the teacher).

Workshop Guidelines

Phase 1: Orientation and instruction phase

Material needs:
Essential: Essential: tinkering material to build a car: cardboard or wood, small sticks, rope, staples, stapler, glue, pair of scissors, glue sticks, glue gun, screws, screwdrivers
Optional: small tinkering material

Goals:
Skill Goals (**Blue**)
(S1) working alone or working in pairs
(S2) collecting material
(S3) assembling material (later phase)
(S4) problem solving: solve the problems that arise (construction too light or too heavy)
(S5) social skills: waiting in line, collecting goods in an orderly manner
(S6) Self-regulation
(S7) Critical thinking
(S8) Creative thinking

Content Goals (**Green**)
(C1) *Spatial insight*
(C2) Insight in weight distribution
(C3) Research based learning
(C4) Insight in gravity, mass, acceleration and friction

Background story:

The students need to build a car that can reach the end of a pre-built race track. The car can't fall off the track and has to reach the end.

Expected outcome = known (they get all the materials to assemble)

Process = recipe

Goals	Activities	Duration
S1-S8 C1-C4	Give the problem which the students have to solve: *Build a car that can drive to the end of the track. The car has to get over the ramp (bump) and the car can't skip out of the racetrack.* Give them the amount of time they have: usually 50' (short).	10' (short)

Phase 2: Design phase

Material needs:
Essential: Essential: tinkering material to build a hot air balloon: plastic or paper cups, plastic or paper bags, small sticks, rope, staples, stapler, glue, pair of scissors, glue sticks, glue gun
Optional: small tinkering material

Goals:
Skill Goals (**Blue**)
(S1) working alone or working in pairs
(S2) collecting material
(S3) assembling material (later phase)
(S4) problem solving: solve the problems that arise (construction too light or too heavy)
(S5) social skills: waiting in line, collecting goods in an orderly manner
(S6) Self-regulation
(S7) Critical thinking
(S8) Creative thinking

Content Goals (**Green**)
(C1) *Spatial insight*
(C2) Insight in weight distribution
(C3) Research based learning
(C4) Insight in wind capture

Goals	Activities	Duration
S1-S8 C1-C4	Checklist: - Collect the following materials: 4 wheels, 8 ball bearings, 4 screws, one lasercut chassis, a screwdriver, a piece of Styrofoam,	15’ (short)

Phase 3: Making phase

Material needs:
Essential: Essential: tinkering material to build a hot air balloon: plastic or paper cups, plastic or paper bags, small sticks, rope, staples, stapler, glue, pair of scissors, glue sticks, glue gun
Optional: small tinkering material

Goals:
Skill Goals (**Blue**)
(S1) working alone or working in pairs
(S2) collecting material
(S3) assembling material (later phase)
(S4) problem solving: solve the problems that arise (construction too light or too heavy)
(S5) social skills: waiting in line, collecting goods in an orderly manner
(S6) Self-regulation
(S7) Critical thinking
(S8) Creative thinking

Content Goals (**Green**)
(C1) *Spatial insight*
(C2) Insight in weight distribution
(C3) Research based learning
(C4) Insight in wind capture

Goals	Activities	Duration
S1-S8 C1-C4	Assemble your contraption: - Assemble the chassis, put wheels on the chassis using the ball bearings and screws. Don't put the screws on too tight! - Tape or glue 4 pieces of rock/marbles in the front part of the car (inside) - Your car is ready to be tested!	15' (short)
	A car with weight in front will be easier to keep close to the track	

Phase 4: Operational Phase

Material needs:
Essential: Essential: tinkering material to build a hot air balloon: plastic or paper cups, plastic or paper bags, small sticks, rope, staples, stapler, glue, pair of scissors, glue sticks, glue gun
Optional: small tinkering material

Goals:
Skill Goals (**Blue**)
(S1) working alone or working in pairs
(S2) collecting material
(S3) assembling material (later phase)
(S4) problem solving: solve the problems that arise (construction too light or too heavy)
(S5) social skills: waiting in line, collecting goods in an orderly manner
(S6) Self-regulation
(S7) Critical thinking
(S8) Creative thinking

Content Goals (**Green**)
(C1) *Spatial insight*
(C2) Insight in weight distribution
(C3) Research based learning
(C4) Insight in wind capture

Goals	Activities	Duration
S1-S8 C1-C4	Operational phases will take place in production and testing (feedback on designs): Does it work? What needs to be altered? How can we improve? What doesn't work? 1. User check: Does your car stay on track? Maybe adjust the wheels (tighter or looser)? Does it get over the hill? Perhaps make it a bit heavier (extra rocks/marbles)? Does it fly of the ramp? Is the gravitational point at the front of the car? Perhaps make it lighter or put extra friction on the wheels (fasten them)?	5' (short)

Phase 5: Evaluation phase

Material needs:
Essential: Essential: tinkering material to build a hot air balloon: plastic or paper cups, plastic or paper bags, small sticks, rope, staples, stapler, glue, pair of scissors, glue sticks, glue gun
Optional: small tinkering material

Goals:
Skill Goals (**Blue**)
(S1) working alone or working in pairs
(S2) collecting material
(S3) assembling material (later phase)
(S4) problem solving: solve the problems that arise (construction too light or too heavy)
(S5) social skills: waiting in line, collecting goods in an orderly manner
(S6) Self-regulation
(S7) Critical thinking
(S8) Creative thinking

Content Goals (**Green**)
(C1) *Spatial insight*
(C2) Insight in weight distribution
(C3) Research based learning
(C4) Insight in wind capture

Goals	Activities	Duration
S1-S8 C1-C4	Evaluation will take place every testing phase. If it doesn't work, it is adjusted. If it works, it's used. Completion: When your car is ok, you can personalise it: Customize your car so it isn't the same as everybody else (who followed this checklist). Examples: pimp your car with stickers, with fabric, tin foil, markers, Styrofoam, etc.	
	Teacher and others are called when they want to show and tell → the contraption will be put to the test on the race track	5' (short)

Pedagogical tips

Strive to make teams of 1: only allow pairs when someone drops out due to specific reasons.

Use a large room with an open path in between tables to put al the constructions. Avoid working on the ground – make workstations (tables for group work).

Visit a fablab or makerspace that has a Nerdy Derby. It's easier than building one yourself.

How to transfer to non-Fablab environment

Build a Nerdy Derby yourself: online inspiration:

https://nerdyderby.com/resources-1#resources

http://www.frisdenker.nl/frisdenken/follow-up-on-the-nerdy-derby-story/

https://github.com/pkropf/nerdyderby

http://rasterweb.net/raster/2012/08/23/nerdy-derby/

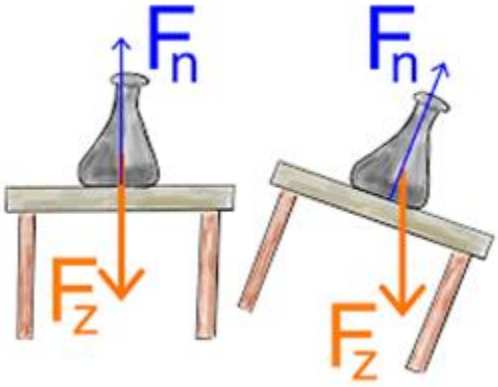
https://peterkropf.com/archives/tag/nerdy-derby

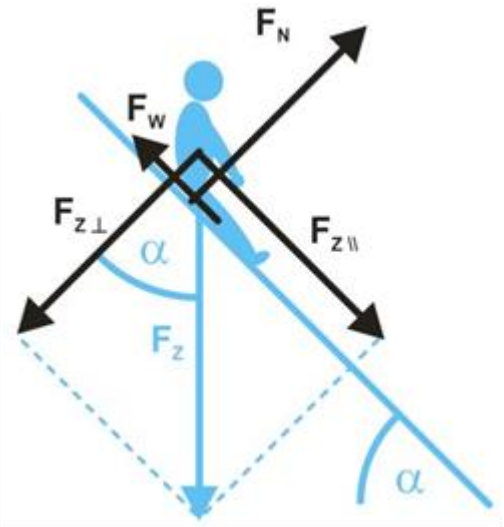
Evaluation of achievements

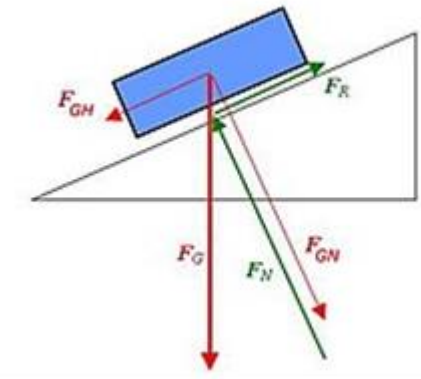
Every test-moment is an evaluation, but the final feedback round is the moment to gather the entire group and ask what they learned from each other during the research, the making and the testing + WHAT they altered and WHY.

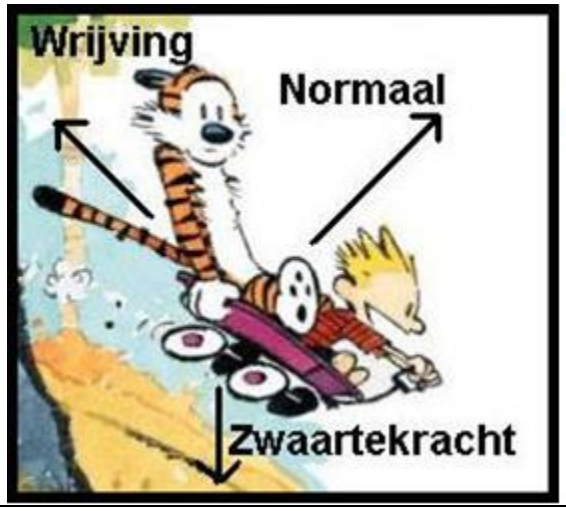
Content links

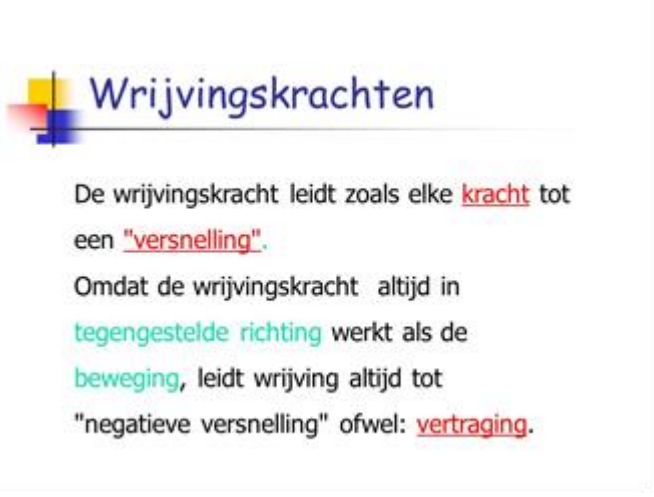
Tips/background on material:



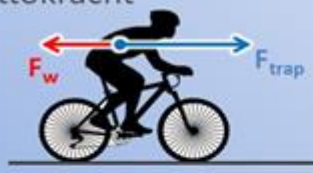






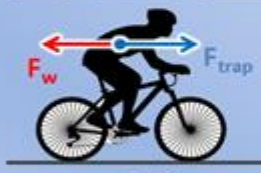


Nettokracht



aandrijfkracht groter dan wrijvingskracht

De snelheid wordt groter.



aandrijfkracht gelijk aan wrijvingskracht

De snelheid blijft gelijk.

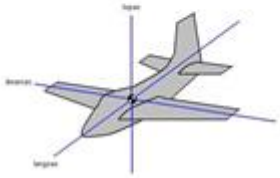
Dit kan bij elke snelheid, ook bij stilstaan!

aandrijfkracht kleiner dan wrijvingskracht

De snelheid neemt af.

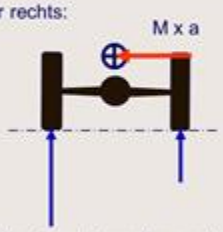
Zwaartepunt

Het zwaartepunt van een voorwerp is het punt waar de zwaartekracht aangrijpt. Dus waar je alle massa samengeklonterd mag denken.

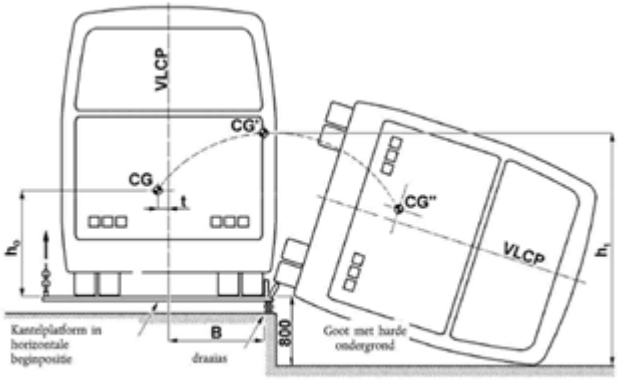


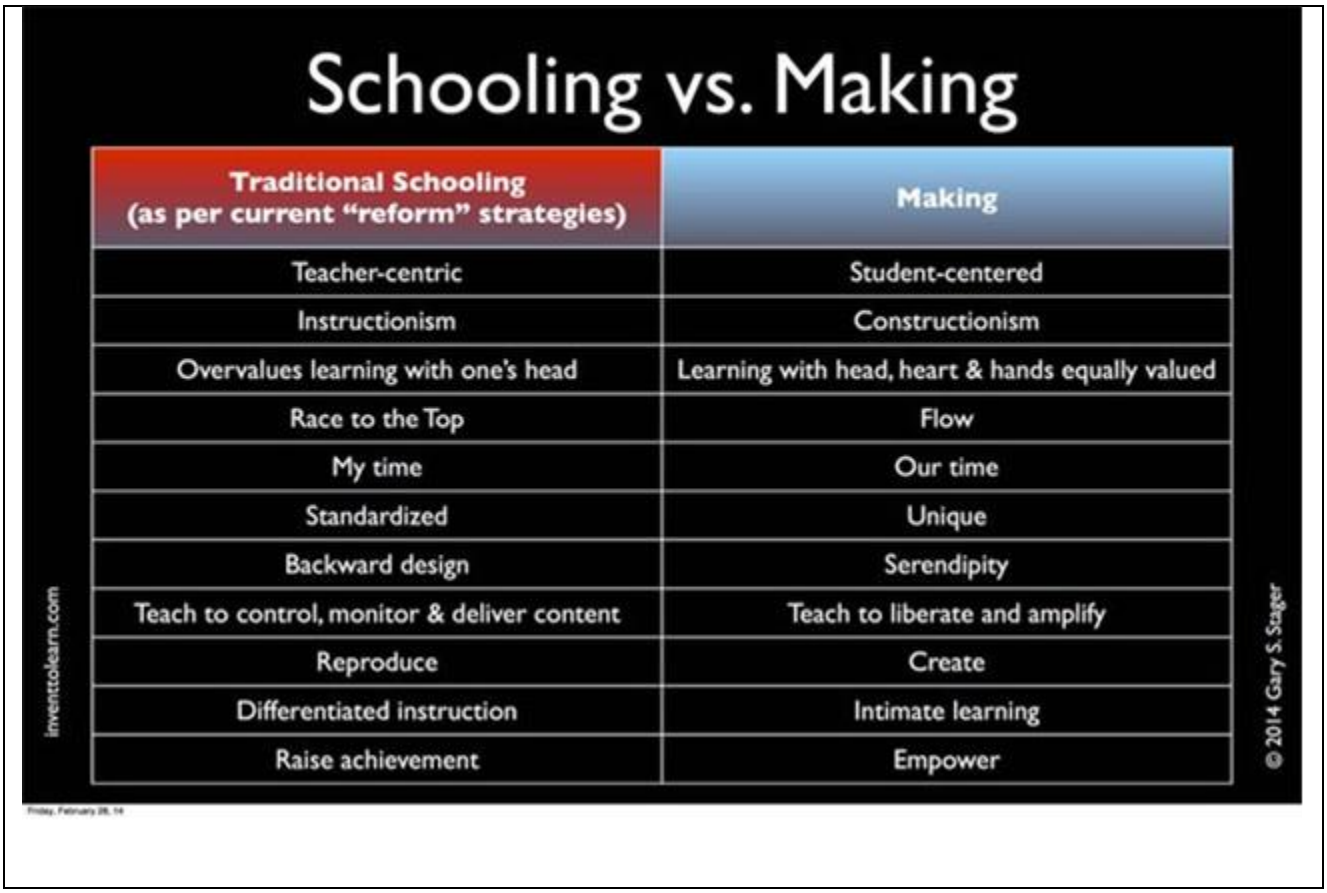
Invloed van het zwaartepunt

Bocht naar rechts:



Het buitenste wiel wordt zwaarder belast; het binnenste minder zwaar.





Resources

STEM-education with design thinking:
https://youtu.be/YB_QhFFPpLs

Different version (bit more difficult version) of this workshop available at: http://www.teachstem.eu/workshops

Handout for the students on the last page:

a checklist to use

NERDY DERBY – BASIC LEVEL: Checklist

Expected outcome = known

Process = recipe

1. Build a cart which can make it to the end of the race track. The car can't go off track and has to make it to the finish.

2. Plan:
    a. Gather the following items: 4 wheels, 8 ball bearings, 4 screws, a lasercut chassis), a screw driver, a piece of styrofoam, 4 pebbles (small rocks), sticky tape
    b. Assemble the lasercut chassis. Put the wheels on the chassis using the screws, ball bearings and screw driver, focus on NOT tightening the screws too hard
    c. Tape the 4 pebbles inside the chassis on the front side (weight at the front)
    d. Your car is ready to be tested.

3. Check: Does your car stay on track? Maybe your wheels need tightening?
   Does your car get over the hill? Maybe you need to weigh it down more (make it heavier?
   Does it launch of the hill? Did you put the weight in front? Maybe you can make it lighter OR tighten the screws a bit more?

4. Finishing touch: When the car is ok (it finishes the race track) you can pimp it:
    a. Personalize your car so it stands out! Examples: pimp your car using stickers, design a styrofoam shape to put on top of your car, use markers, etc.