

AirFab

Advanced

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

Practicalities



Preparation: < 1 h



Duration: 50'



Material needs:

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



Group size range: maximum 2
Ideal sub-group size: 1 (individual)



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



Environment FabLab necessary: no, but you'll need an AirFab (a vertical wind tunnel, which can be made in a fablab, makerspace or science center)



Educational area:

- * Engineering
- * Mathematics
- * Science
- * Technology
- * (Visual) Arts

Precognition

The participants do not need to know anything about air contraptions but you want them to look this up.

(see box 'content links' below)

Preparation

Let people work individually (ideally) or create groups of maximum 2 participants.

Set up a work station per person or install a material area where all the material is situated.

Workshop Guidelines

Phase 1: Orientation and instruction 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



Background story:

This workshop is based problem solving while testing your device: adjust your design to gain success.

The students need to build a contraption that is NOT a balloon and that floats upwards inside the AirFab and it has to float to the top side of the AirFab, without flying out of the AirFab.

Expected outcome = unknown

Process = design process

Goals	Activities	Duration
S1-S8 C1-C4	Give the problem which students have to solve: Build an object (something?) which floats up in the AirFab. This construction can't float out of the AirFab and has to float at the top side of the AirFab.	10'

	<p>Give them the amount of time they have: usually 50', but you can lengthen or shorten this, but you need to communicate in order to let them plan.</p> <p>Show them the infrastructure they can use: guide them through the fablab/makerspace or show them what you have in your classroom or project room.</p>	
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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	<ol style="list-style-type: none"> 1. You start informing first: what is the problem? Collect info, inform (= DISCOVER). Find info online or in the school library. 2. CONCEPTUALIZE: Begin sketching and select an idea to work from. 	15'

Phase 3: Making phase



Material needs:

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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	<ol style="list-style-type: none">1. DESIGN = you chose a concept, make a plan and collect the material you need (= organise).2. MAKE = Assemble the material until you have a prototype of which you suspect it works.	15'

Phase 4: Operational Phase



Material needs:

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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? USE = Test: When this contraption floats too high or too low, you adjust your design while you are testing (= feedback). Experiment with different options. Stress your design.	5'

Phase 5: Evaluation phase



Material needs:

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Goals:

Skill Goals (**Blue**)

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Goals	Activities	Duration
S1-S8 C1-C4	Evaluation will take place every testing fase. If it doesn't work, it is adjusted. If it works, it's used. EVALUATE = Optimise, reflect, improve and share (present) to others.	5'
	Teacher and others are called when they want to show and tell → the contraption will be put in the AirFab	



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 an AirFab or windtunnel. It's easier than building one yourself.



How to transfer to non-Fablab environment

Build an AirFab yourself: you can use ventilator or inflator of the engine of a bouncy castle



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.



Tips/background on material:

Picture of AirFab:



Video online of AirFab:

YouTube:

Instruction video: <https://youtu.be/RsL3jclWYXA>
<https://youtu.be/LTDtj5UmbBM>

Twitter:

<https://twitter.com/janzondervrees/status/934864472203780097>
<https://twitter.com/janzondervrees/status/920734852978282498>
<https://twitter.com/janzondervrees/status/934864880951332866>

Resources

Different versions (4 versions) of this workshop are available at: www.teachSTEM.eu/workshops