

AirFab

Focus on tinkering

Stimulate problem solving	Silver	Stimulate entrepreneurship	Bronze
Stimulate creativity	Silver	Informal learning enviro.	Silver
Stimulate critical thinking	Silver	Technology use	Silver
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. (everything you can tinker with is applicable)



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



Workshop made for: -12/12-16 years old
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 centre)



Educational area:

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

Precognition

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

(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 tinker 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 on tinkering: problem solving while testing your device: adjust your design (trial and error) to gain success.

The students need to build a hot air balloon that floats upwards inside the AirFab and it has to float to the top side of the AirFab, without flying out of the AirFab.

Goals	Activities	Duration
S1-8 C1-4	Give the problem which students have to solve: <i>Build a hot air balloon that floats upward inside the AirFab. The balloon can't float outside the AirFab and it has to float in the top side of the AirFab.</i>	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
S1-8 C1-4	You start tinkering with all the available material: collect and assemble material until you get a construction that resembles a hot air balloon.	15'-20'

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
S1-8 C1-4	Assemble your contraption	15'-20'
	<p>Here are some example which you can use if you're stuck.</p> <p>A balloon with plastic bag will be the most commonly chosen path: it's easy, floats up and out of the AirFab, so making it heavier will be the issue to fix</p> <p>A balloon with paper bag will probably also be popular. It's heavier, but also easy to adjust the weight and cords (sometimes too short or too long (air flow)</p> <p>A helicopter or drone like balloon is possible if you have some creative minds, but time will be limited! This is easier if you have more time available.</p>	

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
	<p>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?</p> <p>When the balloon floats too high or too low, adjust your design (= trial & error). This way of working is very associative and doesn't require any planning. This is the reason this method is very much liked by youngsters.</p>	5'

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
	<p>Evaluation will take place every testing phase. If it doesn't work, it is adjusted. If it works, it's used.</p> <p>Completion: with tinkering you can still make your design unique, but most of the time you will have a piece unique. Your design can always be decorated.</p>	
	<p>Teacher and others are called when they want to show and tell → the contraption will be put in the AirFab</p>	5'



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 all 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.



Content links

Tips/background on material:

Picture of AirFab:



Video online of AirFab:

Facebook:

Primary school teachers experimenting with the AirFab in teacher training:

<https://www.facebook.com/fablabplus/posts/1753143838154677>

YouTube:

<https://youtu.be/LTDtj5UmbBM>

instruction video: <https://youtu.be/Cw-Js8x4nnQ>

Twitter:

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

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

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

Resources

Different versions of this workshop are possible: you can find them on our website:

www.teachSTEM.eu/workshops