

# AirFab

## Intermediate

Stimulate problem solving	Gold	Stimulate entrepreneurship	Bronze
Stimulate creativity	Gold	Informal learning enviro.	Silver
Stimulate critical thinking	Gold	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.



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

### Precognition

The participants do not know anything about hot air balloons and you want them to look this up online.

(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 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.*

*Expected outcome = known*

*Process = delayed feedback, conceptualize, make and test cycle*

*Extra info = thinking before you act. Designing as a separate phase*

Goals	Activities	Duration
S1-S8 C1-C4	<p>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></p> <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>	10'

## 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*
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- (C4) Insight in wind capture*

Goals	Activities	Duration
S1-S8 C1-C4	You start by conceptualizing. You design by sketching or drawing OR you can find inspiration online.	15'

### 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	Next collect and assemble material until you get a construction that resembles a hot air balloon.	15'

## 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?  Testing: When this balloon floats too high or too low, you adjust your design while you are testing (= feedback). This way of working introduces designing, making and usage of the technological process (= fabprocess (diagram below).	5'





1. Discover
2. Conceptualise
3. Design
4. Create
5. Use
6. Evaluate

## Phase 5: Evaluation phase



### Material needs:

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*Optional: small tinkering material*



### Goals:

#### Skill Goals (**Blue**)

- (S1) working alone or working in pairs*
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#### Content Goals (**Green**)

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Goals	Activities	Duration
S1-S8 C1-C4	<p>Evaluation will take place every testing fase.                      If it doesn't work, it is adjusted.                      If it works, it's used.</p> <p>Completion: with this way of working you can still make your design unique, but most of the time you will have a piece unique. Your design can always be perfected.</p>	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 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**.



Tips/background on material:

Picture of AirFab:



**Video online of AirFab:**

**YouTube:**

Instruction video: [https://youtu.be/nMUc7\\_XOzwQ](https://youtu.be/nMUc7_XOzwQ)  
<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](http://www.teachSTEM.eu/workshops)