



Erasmus+

## Report of educational activity

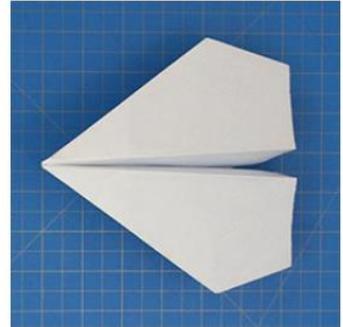
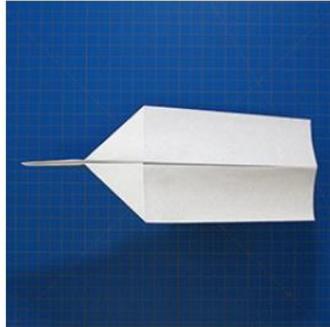
<b>Title of activity</b>	Paper Planes
<b>School and level</b>	Secondary education, high school
<b>Date</b>	November - December 2018
<b>Country</b>	Greece
<b>Teaching subject</b>	Sciences/Physics, Technology, Engineering
<b>Number and age-range of students</b>	10 pupils, age 15-17
<b>Working language</b>	Greek
<b>Type of activity</b>	In-school classroom activity
<b>Level of difficulty</b>	Medium to high
<b>Learning objectives</b>	<p>The theoretical knowledge of air lift was one on the main learning goals of the activity. To achieve this through this activity the attitudes and competences of pupils were also engaged, in particular collaboration, experimentation, creative thinking, coping with failure. They also practice scientific method of hypothesis-experiment-collect data-extract conclusions and engineering process of design-test-improve</p> <p>In more detail the following related skills and competences were addressed:</p>

	<p>Specific STEM-skills</p> <ul style="list-style-type: none"> <li>• Understanding of air lift</li> <li>• Understanding of forces in flight (lift, drag, thrust, weight)</li> <li>• Understanding and practicing scientific method</li> <li>• Practicing engineering design process</li> <li>• Experimenting, collecting and analysing data</li> </ul> <p>Transversal skills</p> <ul style="list-style-type: none"> <li>• Willingness to learn</li> <li>• Problem solving skills</li> <li>• Creativity and design thinking</li> <li>• Ability to communicate on different levels</li> <li>• Being able to work in group</li> </ul>
<p><b>General description of activity</b></p>	<p>Pupils were formed in teams of about 2 to 3 persons each or could opt to work individually. They all were very engaged and creative. They were challenged to design and build with paper materials in limited time a model plane with certain constraints of weight and dimensions (e.g. length or wingspan) that can fly the longest distance possible. Teams or individuals conducted experimentation to identify the effect of different design variables, collected data in spreadsheets, draw conclusions from analysis of data.</p>
<p><b>Learning outcomes</b></p>	<p>Content knowledge</p> <ul style="list-style-type: none"> <li>• Understand and acquire content knowledge of subjects like forces, lift, drag, thrust, weight, mass, area, volume etc</li> <li>• Experiment, identify and understand different design variables</li> <li>• Balancing the role of different design variables</li> <li>• Understanding scientific method and engineering process of optimal design</li> </ul> <p>Skills and competences</p> <ul style="list-style-type: none"> <li>• To be able to model</li> <li>• Abstraction of an idea to a 3-dimensional prototype object or model</li> <li>• Working in group</li> <li>• Working under constraints (time pressure, limited materials, compete with others)</li> <li>• Trial and error / Deal with failure</li> <li>• Competing with others</li> </ul>
<p><b>Materials or equipment that are required</b></p>	<ul style="list-style-type: none"> <li>• Paper sheets</li> <li>• Rulers</li> <li>• Scissors</li> </ul>

- Measuring tape
- Weight scale
- A4 paper for spreadsheets

**Photos or other relevant material**

Example models to test



Spreadsheet table to log data

Model	Weight	Wingspan	Length	Wingspan/ Length	Max distance reached



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## Interview with teachers

### Questions about the classroom application

First: collecting metadata about the event

- What workshop was your application based on?  
Paper Planes
- Number of pupils and their level?  
10 pupils ages 15-17
- Where did you execute the workshop and what was the timing?  
3 sessions in 3 weeks, 30/11-14/12/18, about 90-120 mins per session

How did it go?

- What went well, what was difficult?

Overall it went very well. Pupils were engaged and interested. They quickly started to create their own designs to test

Did you make changes to the material used in the workshop?

- Were there any challenges in making certain material available?

The main change is the introduction and use of spreadsheets and tabulated worksheets to log in data measurements. Overall the activity flow was changed so that it is focused more on scientific method of investigation, experimentation, collection of data, analysis, conclusions/results, revision of design

If you look back to the goals of your workshops/lesson, what was the most important part?

The knowledge, the attitudes or the competences?

The most important part is pupils to understand and practice themselves the different phases of a development cycle with design-test-revise. They unconsciously do that all the time and initially this depends on their attitudes and their competences. Gradually as they acquire knowledge and understanding by reflecting on the results and on their findings of what works well and what does not they do this process more focused and consciously.

### Questions about student/pupil skills

**What is your expectation of the students after the class**

According to you: What were the learning goals?

What are you hoping that they for sure will remember from the session? (see skill list on bottom)

How have you tried to achieve this?

Specific STEM-skills (subject-related)

- Example: Working with a laser cutter
- Example: Understanding of fluid dynamics

Understanding of air lift

Understanding of forces in flight (lift, drag, thrust, weight)

Transversal skills

Yes - Willingness to learn

Yes - Problem solving skills

Yes - Creativity

Yes - Ability to communicate on different levels

Yes/No - Being pro-active

No - Sense of entrepreneurship

Yes - Being able to work in group

Yes - Flexibility

- .....(Other)

Which level (STEM-ladder) would you say your students have? And how have you tried to improve their level.

Difficult to say in one level, they can be in multiple levels depending on specific tasks or activities

Questions about teacher's own skills

**What was the biggest challenge /difficulty when you look back at the class you gave?**

- Describe two situations where you were confronted with a problem. What was your reaction to this problem?

In the standard school curriculum the main challenge is the time constraint. In addition opportunities for extra curriculum activities are scarce especially in upper secondary school level

If you were allowed to choose a seminar to further develop your professional competences for these kind of applications, which course would you choose?

e.g. technically oriented (how to use equipment, tools etc)

or theoretically oriented (pedagogical methodologies)

or assessment focused (how to assess progress and skills acquired by students)

A technical oriented seminar

Questions about the past workshop

Which two talents or skills do you pre-possess that were useful in these workshops?

Interdisciplinary/multidisciplinary thinking and knowledge of multiple domains

If you were allowed to choose a teaching assistant for this workshop, what qualities would he or she ideally have?

Organizational skills, communication skills, willingness to learn and practice new knowledge, technologies etc.

According to you, what things should students definitely acquire from this workshop? Describe also, how did you try to reach this goal?

Problem-solving, innovative and creative thinking, understanding of scientific method and development cycle

Optional: In which way differs teaching in a Fablab from teaching in a traditional classroom? If possible, mention one or two main advantages and disadvantages in each case.

The main advantage is the availability and use of technological equipment (e.g. 3D printing, woodcutting, lasercutting). A disadvantage can be safety concerns, limited space, proximity to school.

Overall, if you could change, add or improve one thing in the workshop you attended what would it be?

Opportunity for a follow-up workshop, maybe at the end of the school year, where teachers present their work to each other, discuss their experiences, reflect on their practice or collaborate further.