Hot-air balloon

General information			
Respective blueprint	Hot air ballon		
Description	Build a lantern for a special occasion at school (end of year, graduation ceremony, special birthday) and discover the historical background to the invention of the hot-air balloon.		
Learning objectives	At the end of this session, pupils will be able to : • explain how hot-air balloons work • understanding the invention of hot air balloons in its own cultural and historical contexts • understand the basics of Archimedes' principle and atmospheric pressure		
Related curricular subjects	Mathematics – Sciences - Engineering		
Duration	Project to be carried out over several weeks		
Level of difficulty	Basic	Medium	Advanced
	☐	☐	☑
Inclusivity guidelines			
How to integrate students with SLD	• Formulate simple instructions that only require one action at a time. For example, cut 4 pieces of tissue paper measuring 50cm by 70 cm. • If you give oral instructions, make sure you keep track of them in the form of pictograms or written on the board. For example, you can place a scissor picture and write the measure next to it. • When you give instructions (oral or written), make sure to highlight the word of action so pupils know what they are expected to do. • When it's possible, you can show the expected result of the manipulation. It's easier for students to see the finished lantern to understand how the different parts fit together. • When creating groups, try to place students who are having difficulties with students who are generally more advanced so that they can help each other (for example, a dyspraxic student will have a lot of difficulty with cutting tasks).		

How to integrate students who work faster	• Ask the pupils who finished their tasks earlier to do some research on flying lanterns (legends, funny anecdotes, dangers, etc.). They can present their findings to the class orally or with a poster.

Step by step description of the lesson

Step 1: Introduction	**Estimated time: Half a day**

As part of a school celebration (graduation ceremony, special birthday, end of year), suggest that the pupils build lanterns.
In fact, "In all the territories that made up historic China, celestial lanterns, which became popular with children, were later used for popular festivals, in particular for special occasions such as weddings or various celebrations, as good luck charms or to grant wishes. They are used in large quantities for celebrations such as the Chinese New Year lantern festival, or for festivals such as Pingxi in Taiwan... (Contributors to Wikimedia projects, 2023) "
Form groups of no more than 3-4 students and give each group the construction plan. The teacher must be available to help and answer any questions the pupils may have.
The teacher can carry out the last stage of the construction (making the burners) if he or she feels that this stage is too complicated for the pupils.

Step 2: Hot air balloon history	**Estimated time: Several hours**

The teacher then asks if they know when hot-air balloons were invented and why. The students can be placed in groups and asked to research the history of hot-air ballooning. Once they have done their research, they will have to present the information they have found by producing a medium (timeline, map, panel, etc.).
Complete history of hot-air balloons can be found on this link :
https://en.wikipedia.org/wiki/Hot_air_balloon
The sequence is a good way of reviewing the periods of history and geography of the European continent.

Step 3: Hot air balloon science	**Estimated time: 20 minutes**

The teacher collects the pupils' initial ideas by asking them how and why they think the lanterns will fly away. Why do you think a heat source should be placed under the balloon?
"Under the action of heat, air expands. Its density decreases: therefore, at the same pressure, hot air is lighter (for the same volume) than cold air. This phenomenon can be verified in a quiet room (so the pressure inside is constant), where the air on the ceiling is warmer than the air on the floor: it is lighter and accumulates higher up".
The teacher can try to find examples from everyday life to illustrate this principle by asking the pupils if they have a bedroom in the roof of the house, taking the temperature at the ceiling and the temperature at the floor.

Step 4: take-off of the lanterns and extension	Estimated time: /
To illustrate the principle, it's time to get the pupils' lanterns off the ground first, by holding an awareness-raising session. It is important to check with the local authorities to obtain authorisation, and to do this on a day when there is little wind and no drought. This awareness-raising session can be a good introduction to talking about the risks of fires or global warming	

Assessment activities

Activity 1: Self-assessment activity

As the activity progresses, observe the pupils' ability to work in groups, find solutions and get involved in the task.
Ask the students to self-assess their performance during the group activity, using the grid on page 4.
Self-assessment encourages learning and improves performance. Self-evaluation is systematically formative. Its aim is to highlight areas for improvement.

Activity 2: Assessment of the presentation of a research project on the history of hot-air balloon.

Students can be assessed when presenting their research on the history of hot-air ballooning.
Different skills can be assessed (formatively or certifiably if the skill has already been explained and worked on)

- Ability to find relevant information;
- Ability to synthesise information;
- Accuracy of historical facts;
- Correct location of historical facts on a map of Europe;
- Ability to work in a team;
- Oral expression ;
- Written expression (on the material presented);

➔ See example of evaluation grid on page 5

References:

Contributeurs aux projets Wikimedia. (2023). Lanterne céleste. fr.wikipedia.org. https://fr.wikipedia.org/wiki/Lanterne_c%C3%A9leste

Contributeurs aux projets Wikimedia. (2023b). Montgolfière. fr.wikipedia.org. https://fr.wikipedia.org/wiki/Montgolfi%C3%A8re

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Self-assessment grid

Work in group

	☺	😐	☹
I took part in organising and carrying out the task.			
I cooperated actively within the group.			
I respected the other group members at all times.			
I was able to recognise and accept the skills and knowledge of the other members of the group.			
Everyone took part in our group discussions			
We asked the other members of our group for help when we needed it.			
I respected the deadlines			
I've finished my work.			
I've made an effort and I did my best			
I knew how to ask for help when I needed it			
The manipulation helped me understand the concepts			
I'm proud of my work and the result I've achieved			
I enjoyed taking part of this activity !			

☺ = Absolutely / 😐 = Partially / ☹ = Not at all

Teacher's comments :

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Oral presentation – evaluation grid

	Note
Oral expression	
During my presentation, I paid attention to the volume of my voice	**/1**
During my presentation, I paid attention to the speed of my voice.	**/1**
My sentences were well constructed.	**/2**
I answered the questions clearly, precisely and in well-constructed sentences.	**/1**
Written expression (on the material presented)	
My sentences are well constructed.	**/2**
My handwriting is neat and legible.	**/1**
I didn't leave any spelling mistakes.	**/2**
Team work	
I cooperated actively within the group.	**/1**
I respected the other group members at all times.	**/1**
I respected the deadlines	**/1**
I was able to recognise and accept the skills and knowledge of the other members of the group.	**/1**
I knew how to ask for help when I needed it	**/1**
Research and presentation of information	
The historical facts presented are accurate.	**/2**
I have summarised the information presented, selecting the most important.	**/2**
I have correctly located the historical facts on the map of Europe.	**/2**
The historical facts are correctly placed on the timeline.	**/2**
The information presented is sufficient and useful for understanding	**/2**
	/ 25

STEAM IN TIMES

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