

OVERVIEW OF THE TASK "Aeolus' chariot"

NOTE: This LES was designed within the framework of training sessions. It may require adaptation before being used with students.

Target audience: 2nd cycle of secondary school (secondary 5) physics

Team or individual work Individual and in teams of two

Class time required: 8 - 75 minute periods

Intentions:

Educational intention:

- Allow the student to appreciate what scientific and technical knowledge brings to the history of economic activity and great explorations, as well as to contemporary leisure activities.

Pedagogical intention:

- Allow the student to follow an experimental process in order to become familiar with concepts in physics and to explain the principles involved in an application using these concepts.

Targeted disciplinary competencies:

C-2 Makes the most of his/her scientific and technological knowledge

C-3 Communicates in the languages used in science and technology

Competencies 2 and 3 are targeted. The student is at the heart of an experimental process guided by and based on modeling a sail. (S)he will become familiar with various concepts in physics involved in applications relating to the use of wind. (S)he must explain the movements observed on land sails using his knowledge of physics.

Each student will be called on to interpret and produce scientific messages of various natures depending on the activity included in the LES. (S)he must produce an explanation by consulting experimental data and various sources of information.

Targeted cross-curricular competencies: No cross-curricular competency is targeted in this training activity.

Broad Area of Learning	Environmental awareness and consumer rights and responsibilities <i>Focus of development:</i> — Knowledge of the environment • awareness of the interdependence between the environment and human activity;
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Compulsory concepts	<p>Kinematics:</p> <ul style="list-style-type: none"> - Reference system - Uniform rectilinear motion <ul style="list-style-type: none"> • Relationship among position with respect to the point of origin, velocity and time • Displacement and distance - Uniformly accelerated rectilinear motion <ul style="list-style-type: none"> • Relationship among acceleration, change in velocity and time • Relationship among acceleration, distance and time • Average velocity and instantaneous velocity <p>Dynamics:</p> <ul style="list-style-type: none"> - Newton's law - Free-body diagram - Equilibrium and resultant of several forces - Force of friction - Gravitational acceleration
Contextualization possibilities	<ul style="list-style-type: none"> — Means of locomotion (sailing) — Aerodynamics
Previously seen concepts	<ul style="list-style-type: none"> — Force — Equilibrium between two forces — Labour — Potential gravitational energy — Kinetic energy — Bernoulli (for students from AST-ES only) — Guidance function
Methods	<p>Modelling, experimental and analytical methods are at the heart of this LES.</p> <p>The student is called upon to model the behaviour of a mobile in the laboratory in order to study the principles involved in its motion.</p> <p>Each of the activities in the LES allow him, in varying degrees, to understand the premises of sailing (wind) and to make the most of his newly acquired and previous knowledge to implement an analytical process starting from a film sequence.</p>

Strategies, attitudes and techniques	<p><i>Exploration strategies:</i></p> <ul style="list-style-type: none"> — Amass as great an amount as possible of scientific, technological and contextual information that may eventually be useful to outline a problem; — Generalise from several specific structurally similar cases. <p><i>Analytical strategies:</i></p> <ul style="list-style-type: none"> — Determine the constraints and critical elements for the resolution of the problem. <p><i>Attitudes:</i></p> <ul style="list-style-type: none"> — Intellectual rigour — Concern about accurate measurements — Methodical approach to work — Perseverance — Concern for a job well done <p><i>Techniques :</i></p> <ul style="list-style-type: none"> — Checking the reliability, accuracy and sensitivity of measuring instruments (calibration, adjustment) — Using measuring instruments
Possible evaluation:	
This type of task allows for the evaluation of C-2 and C-3.	
<p>Global context: For the longest time, sailing was the only way to navigate long distances over water. Sailboats drove commerce, exploration and the conquest of new territories. Today, sailboats no longer hold this strategic advantage, but sport sailing is still alive and well.</p> <p>Several questions may come to mind.</p> <ol style="list-style-type: none"> 1. How does the force of wind act on the sails to make the mobile (boat, board or chariot) move? 2. How can a mobile, propelled by wind, sail into it? 3. How can it attain the greatest possible speed? 4. How can this mobile be made more efficient? <p>To answer these questions, we have designed a very special vehicle as well as various other devices. You will have to analyse the operation of this mobile, equipped with a rigid, pivoting sail. We have named it Aeolus' chariot.</p>	