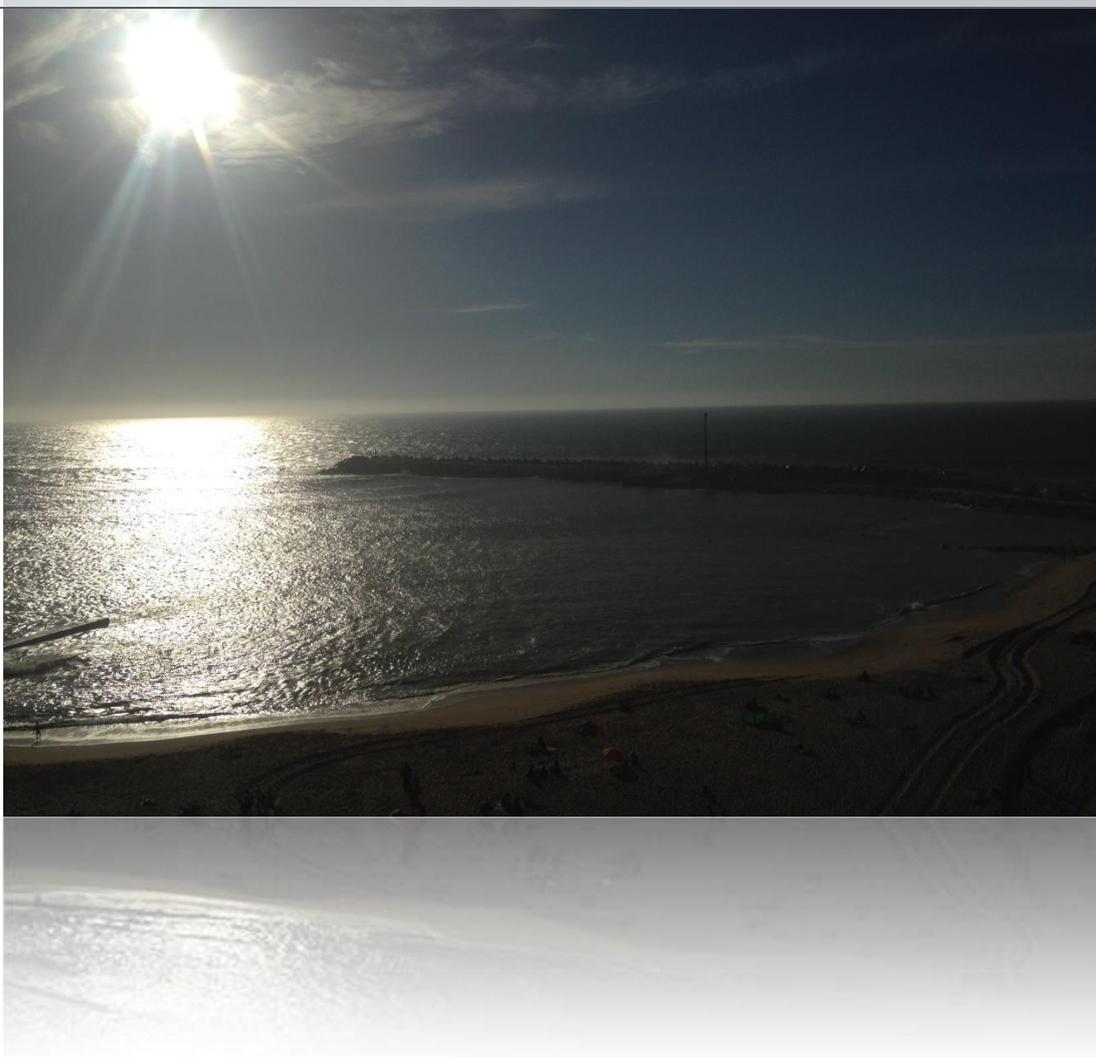


LEARNERS' GUIDELINE

HOW CAN YOU PRODUCE OXYGEN FASTER TO MAKE MARS HABITABLE?



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**PROJECT DETAILS**

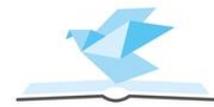
SCHOOL YEAR	2017-2018	
SCHOOL YEAR LEVEL	8 th (13-14 year old)	
TERM		
SESSIONS		
TITLE	“HOW CAN YOU PRODUCE OXYGEN FASTER TO MAKE MARS HABITABLE?”	
SUBJECTS	Mathematics, Physics-chemistry, Mother tongue, Arts, English	
UNIFYING THREADS (DRIVING QUESTIONS)	What is the constitution of the Mars atmosphere? What factors influence the speed of a chemical reaction?	
KEY COMPETENCES	A: TRANSVERSAL COMPETENCES	
	COMPETENCE (EU)	TASKS
	1.Learning to learn	4
	2.Sense of initiative and entrepreneurship	3-4-5-12-18
	3.Social and civic	1-2-3-10-14-18-19
	B: SUBJECT COMPETENCES	
	COMPETENCE (EU)	TASKS
	4.Communicating in the mother tongue	11-15-17-18
	5.Communicating in a foreign language	16-17
	6.Digital	3-4-13
7.Mathematical, scientific and technological	6-7-8-9-18	
8.Cultural awareness and expression	12	





MULTIPLE INTELLIGENCES	INTELLIGENCE	TASKS
	1. Interpersonal	1-3-4-10-14-17-18-19
	2. Intrapersonal	3-4-5-10-14
	3. Visual-spatial	5-12-13
	4. Bodily-kinesthetic	
	5. Musical-rhythmic	
	6. Verbal-linguistic	2-11-15-16-17-18
	7. Logical-mathematical	9
	8. Naturalistic	6-7-8-18

DISCIPLINARY OBJECTIVES and CROSS-DISCIPLINARY OBJECTIVES	DISCIPLINARY OBJECTIVES and CROSS-DISCIPLINARY OBJECTIVES
	<p>MAIN OBJECTIVE:</p> <p>Identify the factors that influence the speed of a chemical reaction</p> <p>0.General objectives</p> <p>0.1. To Work as a team and take responsibility</p> <p>1.Mathematics</p> <p>1.1. Collect and process data</p> <p>1.2. To define one math function to translate the collected data</p> <p>2.Foreign Language (English)</p> <p>2.1. Learn specific vocabulary: percentage; Mars Speed; Reactions; Concentration; Catalysts ...</p> <p>2.2. Improve communicating and writing skills</p>



	<p>3.Mother Tongue</p> <p>3.1. To improve communicating and writing skills</p> <p>3.2. To Improve and enrich vocabulary in mother tongue</p> <p>4.Arts</p> <p>4.1. Analyse the comic strip as a graphic-verbal representation in the learning concepts</p> <p>4.2. Illustrate in graphic / plastic support the sequence of story produced experimental activity</p> <p>5.Physics-Chemistry</p> <p>5.1. Identify the factors that influenced the speed of chemical reactions</p> <p>5.2. Interpret the variation of the speed of the chemical reactions in the control of the factors that change it</p> <p>6.ITC</p> <p>6.1. Illustrate in digital support the sequence of the experimental activity</p>
PROJECT PRESENTATION	<p>A challenge will be proposed to the students, to construct a Comic Strip with a history related to identifying the factors that influence the speed of the chemical reaction.</p> <p>Presentation of the Comics in several school networks and in several spaces of the school and local community.</p>
FINAL PRODUCT	<p>A Comic Strip with a history related to identifying the factors that influence the speed of the chemical reaction</p>



SEQUENCE OF TASKS

Tasks in bold are necessary, and the rest are optional. They depend on the teachers involved in the project and the school facilities.

A. PREVIOUS TASKS

1. **Task: Team dynamics**
2. **Task: Project presentation in library school and the social networks**
3. **Task: Team planning**
4. **Task: What I know - What I need to know**
5. **Task: Specify Comics design and appoint the responsibilities**

B. RESEARCH / DEVELOPING TASKS

6. **Task: What are the factors that can influence the speed of chemical reactions? (Brainstorming)**
7. **Task: How to speed up chemical reactions?**
8. **Task: How do factors influence the speed of chemical reactions? - Test the factors in the laboratory**
9. **Task: Treatment of data collected in the performance of the experimental activity**
10. **Task: Team planning assessment**
11. **Task: Construction of comic strip (plot, scenarios, characters...) on "How can you produce faster oxygen to make Mars habitable?"**
12. **Task: How to make a comic book?**
13. **Task: Construction of on-line Comics**
14. **Task: Team planning assessment**
15. **Task: Construction of the texts for the Comic Strip**
16. **Task: Learning vocabulary in English**

C. FINAL TASKS

17. **Task: Comics presentation**
18. **Task: Comics dissemination**
19. **Task: Final team planning assessment**



**INDICATORS****MAIN OBJECTIVE**

The Student indicates the factors that influence the speed of a chemical reaction

0. General objectives

- 0.1.1. The student achieves team objectives
- 0.1.2. The students achieves individual objectives
- 0.1.3. The student fulfils his/ her responsibilities

1. Mathematics

- 1.1.1. The student is able to collect, organize and process the data
- 1.1.2. The student is able to construct tables, graphs, diagrams or lists for visualization of results
- 1.2.1. The student is able to identify one math function to translate the collected data

2. Foreign Language (English)

- 2.1.1. States the names about the factors that influence the speed of chemical reactions: percentage; Mars; Speed; Reactions; Concentration; Catalysts...
- 2.1.2. Expresses technical verbs in the foreign language

3. Mother Tongue

- 3.1.1. The student demonstrates improvement in communication and writing skills
- 3.1.2. The student uses new words related to factors that influence the speed of chemical reactions: Speed; Reactions ; Concentration ; Catalysts ...

4. Arts

- 4.1.1. The student identifies comics as a graphic-verbal representation of learning concepts
- 4.1.2. The student is able to illustrate in the graphic / plastic support the sequence of the story produced in the experimental activity

5. Physics-chemistry

- 5.1.1. The student identify the possible factors that can influence the speed of chemical reactions
- 5.1.2. The student explain correctly how factors influence the speed of chemical reactions

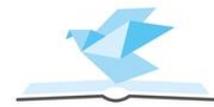
6. ITC

- 6.1.1. Development of comics using various computer tools

TOOLS:

- Rubrics





- Checklist; "3T - TEAM PLANNING_Task3_Portugal.xlsx"; "cartoons_evaluation.xlsx".

- The table filled in by each student

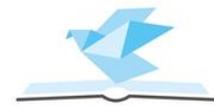
- Report with a qualitative analysis of the Comics

- **Reflections and evidences**

Reflection (Tasks: "10. Task: Team planning assessment; 14. Task: Team planning assessment; 19. Task: Final team planning assessment")

Protocols (see annexes: "Activity Objective-catalyst.docx; Activity Objective - Concentration.docx; Activity Objective - light.docx; Activity Objective - temperature.docx".



**TASKS****PREVIOUS TASKS**

1. Task: Team dynamics*		Sessions: 20 min	
COMPETENCES	Social and civic	INTELLIGENCES	Interpersonal
GOALS	Learning to work in teams		

*(Attention: If the student group persists from the previous task, it will not be necessary to implement this task)

Task description:

We will suggest a team dynamics so that students get to know each other.

2. Task: Project presentation		Sessions: 25 min	
COMPETENCES	Social and civic	INTELLIGENCES	Verbal-linguistic
GOALS	To motivate students		

Task description:

Schools may invite an element from an organization related to the planetarium or from an astronomy centre to present the project. From issues such as:

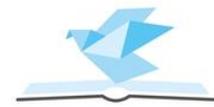
“But is it that in the whole cosmos there is only one planet that meets all the conditions for life?”

Why is it that places like Mars, Europe and Titan are most promising for the pursuit of Life?” The students debating with the guest examine "how can we control habitability on other planets?"

A challenge will be given to the students to make a small comic book with the findings on: "How can you produce Oxygen faster to make Mars habitable?".

At the end a comic strip will be built to introduce the school community. The comic strip can be distributed by the astronomy centres and planetariums of the region.





3. Task: Team planning			Sessions: 45 min
COMPETENCES	Social and civic Sense of initiative and entrepreneurship Digital	INTELLIGENCES	Interpersonal Intrapersonal
GOALS	Learning to work in teams and to control teamwork		

Task description:

Each team will define its team planning, which will consist of three parts: team objectives, individual objectives and responsibilities.

Team objectives:

All teams will have objectives: Each team will be responsible for their own task concerning “How can you produce Oxygen faster to make Mars habitable?” and will be responsible, as well, to add their presentation in the Comics.

Individual objectives:

Each student will have 2 individual objectives: one about their role in the task and another about the deadlines accomplishments.

Responsibilities:

Responsibilities will be assigned by the teacher.

Assessment tools (rubrics...):

- Checklist;

3T - TEAM PLANNING_Task3_Portugal.xlsx

4. Task: What I know – What I need to know			Sessions: 30 min
COMPETENCES	Learning to learn Sense of initiative and entrepreneurship Digital	INTELLIGENCES	Interpersonal Intrapersonal
GOALS	Learning to work in teams		



**Task description:**

Each team will consider what they already know about the task and what they need to know in order to carry it out.

What I know (in this column you take note of what you already know about it ...)	What I need to know (in this column you take note of the aspects or details you need to know ...)

5. Task: Specify the parts of Comics and appoint the responsibilities			Sessions: 30 min
COMPETENCES	Sense of initiative and entrepreneurship	INTELLIGENCES	Interpersonal Visual-spatial
GOALS	Learning to work in teams		

Task description:

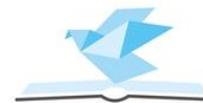
After specifying the amount parts of Comics, each team will designate one member of the group to take part of another team who will do the final version of the Comics.

In order to do that, it is necessary that all the students reach an agreement.

RESEARCH / DEVELOPING TASKS

6. Task: What are the factors that can influence the speed of chemical reactions? (Brainstorm)			Sessions: 1 h
COMPETENCES	Mathematical, scientific and technological	INTELLIGENCES	Naturalistic
GOALS	Identify possible factors that can influence the speed of chemical reactions		

Task description:



Students will be asked to indicate factors that may influence the rate of chemical reactions. They will be recorded in the table and discussed.

7. Task: How to speed up chemical reactions?			Sessions: 1 h
COMPETENCES	Mathematical, scientific and technological	INTELLIGENCES	Naturalistic
GOALS	Identify factors that can influence the speed of chemical reactions		

Task description:

Students will explore a video on the factors that influence the speed of chemical reactions.

8. Task: How do factors influence the speed of chemical reactions? - Test the factors in the laboratory			Sessions: 90 min
COMPETENCES	Mathematical, scientific and technological	INTELLIGENCES	Naturalistic
GOALS	Check how the factors affect the speed of the chemical reaction		

Task description:

Perform the experimental activities according to the indicated protocols (see annexes: Activity Objective - catalyst.docx; Activity Objective - Concentration.docx; Activity Objective - light.docx; Activity Objective - temperature.docx)

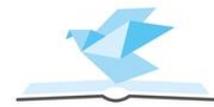
Assessment tools (rubrics...):

The evaluation will be done through the conclusion obtained after the experimental activity.

- cartoons_evaluation.xlsx

9. Task: Treatment of data collected in the performance of the experimental activity			Sessions: 30 min
COMPETENCES	Mathematical, scientific and technological	INTELLIGENCES	Logical-mathematical
GOALS	Collect, organize and process the data obtained To define one math function to translate the collected data		



**Task description:**

Students will do the processing of collected data and build graphs:

- Temperature as a function of time;
- Concentration as a function of time;
- With light / without light as a function of time;
- With and without catalyst as a function of time.

Assessment tools (rubrics ...):

The evaluation will be done through the results obtained after the activity.

- cartoons_evaluation.xlsx

10. Task: Team planning assessment			Sessions: 15 min
COMPETENCES	Social and civic	INTELLIGENCES	Interpersonal Intrapersonal
GOALS	Learning to work in teams		

Task description:

We will assess all the objectives established in the 3rd task, individual and team objectives as well as the responsibilities to reflect upon the things we are doing well and the issues that must be improved.

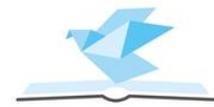
Assessment tools (rubrics...):

Students' will self-assess the objectives and responsibilities established in team planning (see Checklist Example 3^a Task):

- Checklist;
- 3T - TEAM PLANNING_Task3_Portugal.xlsx

11. Task: Construction of comic strip (plot, scenarios,	Sessions: 2 h
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characters...) on "How can you produce faster oxygen to make Mars habitable?"			
COMPETENCES	Communicating in the mother tongue	INTELLIGENCES	Visual-spatial Verbal-linguistic
GOALS	Analyse the comic strip as a graphic-verbal representation in the learning concepts Illustrate in graphic / plastic support the sequence of story produced experimental activity		

Task description:

Students will create the plot, scenarios, characters... with a view to building the comic strip.

Assessment tools (rubrics ...):

The evaluation will be done through the results obtained after the activity, using:

- cartoons_evaluation.xlsx.

12. Task: How to make a comic book?		Sessions: 8 h	
COMPETENCES	Cultural awareness and expression Sense of initiative and entrepreneurship	INTELLIGENCES	Visual-spatial
GOALS	Analyse the comic strip as a graphic-verbal representation in the learning concepts Illustrate in graphic / plastic support the sequence of story produced experimental activity		

Task description:

Students describe events through comic book methodologies:

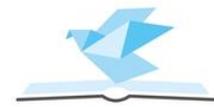
- They illustrate a story.
- Make the Frames (Drawings) in Comic Strip
- They draw a comic strip.

Assessment tools (rubrics...):

The evaluation will be done through the results obtained after the activity.

- cartoons_evaluation.xlsx



**Sites to explorer:**

<http://www.creativebloq.com/comics/guide-create-publish-comic-book-71515975>

https://www.youtube.com/watch?v=1Nb_ZDvoWEg

https://www.youtube.com/watch?v=m_nevXPyh0w

<https://www.youtube.com/watch?v=UVRBKja5fEk>

<https://www.youtube.com/watch?v=IK-yBU9k27w>

13. Task: Construction of on-line Comics			Sessions: 6 h
COMPETENCES	Digital	INTELLIGENCES	Visual-spatial
GOALS	Illustrate in digital support the sequence of the experimental activity Know how to use various computer tools for the development of Comics		

Task description:

Students will explore the various computer tools for the development of comics.

Students will develop various comics (group or individual).

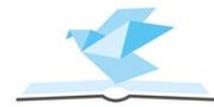
Assessment tools (rubrics ...):

The evaluation will be done through the results obtained after the activity.

- cartoons_evaluation.xlsx

14. Task: Team planning assessment			Sessions: 45 min
COMPETENCES	Social and civic	INTELLIGENCES	Interpersonal Intrapersonal
GOALS	Learning to work in teams		

Task description:



We will assess all the objectives established in the 3rd task, individual and team objectives as well as the responsibilities to reflect upon the things we are doing well and the issues that must be improved.

Assessment tools (rubrics...):

Students' will self-assess the objectives and responsibilities established in team planning (see Checklist Example 3^a Task):

- Checklist;
- 3T - TEAM PLANNING_Task3_Portugal.xlsx

15. Task: Construction of the texts for the Comic Strip			Sessions: 1 h
COMPETENCES	Communicating in the mother tongue	INTELLIGENCES	Verbal-linguistic
GOALS	To improve communicating and writing skills To Improve and enrich vocabulary in mother tongue		

Task description:

All the texts built in this task will be the basis for the comic book production. New words should be pointed out to search for their meaning (for example, in dictionaries, encyclopedias ...)

Assessment tools (rubrics...):

The evaluation will be done through the results obtained after the activity.

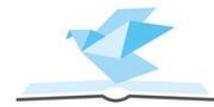
- cartoons_evaluation.xlsx

16. Task: Learning vocabulary in English			Sessions: 2 h
COMPETENCES	Communicating in a foreign language	INTELLIGENCES	Verbal-linguistic
GOALS	Learn specific vocabulary: percentage; Mars; Speed; Reactions; Concentration; Catalysts ... Improve communicating and writing skills		

Task description:

Students will build and translate texts for comics.





Recourse to dictionaries for translation.

Assessment tools (rubrics...):

The evaluation will be done through the results obtained after the activity.

- cartoons_evaluation.xlsx

FINAL TASKS

17. Task: Comics presentation			Sessions: 2 h
COMPETENCES	Communicating in the mother tongue Communicating in a foreign language	INTELLIGENCES	Verbal linguistic Interpersonal
GOALS	To explain what students have worked on and learn throughout the making of Comics		

Task description:

The students will propose some spokesmen chosen from those who participated in the preparation of the Comics, to present the project to parents. Students should try to organize it as much as possible and invite more people than their parents.

Assessment tools (rubrics...):

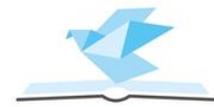
Report with a qualitative analysis of the Comics: Evaluation of scientific content (Mathematics, Physical-chemical). The construction of sentences and the use of correct scientific terms (English; Mother tongue). Use of the main commands of the different software used to construct the Comics (ITC). Quality of the Comics (Mathematics; Physical-chemical; Arts; English; ITC).

The evaluation will be done through the results obtained after the activity.

- cartoons_evaluation.xlsx

18. Task: Comics dissemination			Sessions: 1 h
COMPETENCES	Sense of initiative and entrepreneurship Social and civic Communicating in the mother tongue	INTELLIGENCES	Interpersonal Naturalistic Verbal linguistic





	Mathematical, scientific and technological		
GOALS	To improve communicating and writing skills in the mother tongue		

Task description:

Students will have to prepare in the classroom what they will say when the comic strip is released.

Students will identify the appropriate places where they can disseminate the booklet.

After identifying the places, the students will be divided into groups to complete the task. All groups need to participate in the activity.

19. Task: Final team planning assessment			Sessions: 1 h
COMPETENCES	Social and civic	INTELLIGENCES	Interpersonal
GOALS	Learning to work in groups		

Task description:

Students will self-assess the objectives and responsibilities established in team planning.

Assessment tools (rubrics...):

Students' will self-assess the objectives and responsibilities established in team planning (see Checklist Example 3^a Task):

- Checklist;
- 3T - TEAM PLANNING_Task3_Portugal.xlsx

Afterwards the students will do a reflection on the things they did well or not.

