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TITLE:

CLIL and Gamification:

A new perspective in bilingual learning

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'*It is fun to have fun but you have to know how*.' — Dr Seuss

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Abstract

This work is based on Gamification in CLIL context. Through the creation of an Innovation Project named 'Our Spacecraft: The Earth' and its further implementation in a Biology & Geology Class- 1st of Compulsory Education-. This dissertation aims to create a meaningful proposal for students in a CLIL scenario. To this end, a dual methodology- theoretical and empirical- will be conducted. For the theoretical framework, bibliographic sources and related references will be used to chart the state of the issue. The empirical framework will analyse the creation of an innovative proposal related to the Biology & Geology syllabus for 1st of Compulsory Education. On the other hand, putting into practice the proposal, applicable results will be obtained for the development and progress of the Innovation Project.

Key-words: Gamification, CLIL, Biology and Geology, games

Introduction

Teaching trough CLIL is frequently a demanding task. Teaching any subject through an additional language may lead to misunderstandings, stress in students and sometimes a lack of motivation. That is the reason behind game-based learning and gamification, giving a twist to education and finding motivational tools for students. This dissertation will be focusing on gamification and the creation of an interesting proposal to apply in a CLIL scenario.

This work comes from the author's interest in education and her artistic background. Thanks to her teaching experience, she has found it very useful in order to motivate students and make those lessons more appealing and engaging for them.

Aim Of This Dissertation

The main purpose of this dissertation is designing a project with gamification and implementing it in a class of 1st of Compulsory Education, in order to observe if there is a change in students' motivation, interest and participation in the subject.

Justification

This work is in close relationship with the author's professional interests and educational point of view: learning and having fun. Not only will this work help to develop new tools in CLIL teaching and learning, but it will also help the author to go deep into her gamification knowledge and the way to create a more enthralling way of teaching.

Methodology

This dissertation is based on a dual methodology, theoretical and empirical. For the theoretical framework, bibliographic sources and related references will be used to chart the state of

the issue. The empirical framework firstly analyses the creation of an innovative proposal related to the Biology & Geology syllabus for 1st of Compulsory Education. Secondly and more importantly, applicable results will be obtained for the development and progress of the Innovation Project.

Theoretical Framework

The theoretical framework is grounded on bibliographic sources and related references to Gamification in a CLIL context and with regard to the Biology & Geology subject for 1st of Compulsory Education.

All these references will create the foundation with reference to the status of the issue in order to present the conceptual framework in which this work is going to be based on.

Empirical Framework

This dissertation has a very obvious empirical and practical component of the issue, which will be reflected on the implementation and the consequent students' engagement. The empirical framework has a profound importance within the study. This consists in developing the following aspects:

- The creation of an Innovation Project named 'Our Spacecraft: The Earth', based on gamification, which will be applied along the school year.

- The implementation of the project, in order to obtain significant results for the development and progress of it.

Structure

This dissertation will be organized in a brief presentation and exposition about the state of the issue in the Theoretical Framework. Moreover, this paper will include key term definitions in order to help and guide the reader.

All of this information will be expanded and compared on the Empirical Framework, along with the creation of the innovation project. Then it will be closed with the conclusions obtained from the implementation of the innovation project.

Theoretical Framework

Due to the characteristics of this dissertation it is key to know what Gamification is, its main goals and, very importantly, explain the difference between Game-Based Learning and Gamification. The following definitions will help us explain it:

Gamification

Gamification is the use of game structures and tools into lessons or even syllabus. It helps to create motivation and engagement in students producing learning outcomes. Some game tools used in gamification can be badges, points and a varied set of incentives.

Game-Based Learning

Game-based learning is the use of a game for learning purposes. We adapt a game in order to learn some concepts, vocabulary or ideas related to a lesson. It takes your core content and objectives and makes them gratifying. Some examples are bingo games or playing hangman with the purpose of learning the lesson's vocabulary.

Observing these definitions we can conclude that the main difference between the two of them is the integration in the lessons/syllabus of the whole structure of games in gamification or the use of a game with a concrete purpose in a lesson.

Bearing this in mind, it is very important the practice of gamification in the Education framework because it has been displayed in many others, such as in big corporations in order to keep up with their employees' motivation and company engagement. The use of games and their structure in Education has been giving tangible results over the years. The seriousness of learning has been turned into 'pleasure' and 'fun'. Thanks to gamification among other factors.

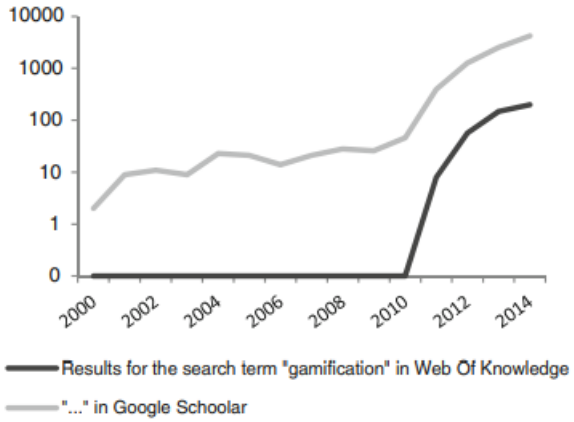
Status Of The Issue

Gamification has a significant influence from motivation theory, achievement goal theory and flow theory. 'It is an interdisciplinary approach seeking to motivate users to achieve certain behavioural or psychological outcomes.' (Lattemann, Robra-Bissantz, Zarnekow, Brockmann, & Stieglitz, 2017, p. 3).

The term gamification itself first appeared in published articles in late 2010 (**Error! Reference source not found.**, although it started just some years before to appear in search engines (**Error! Reference source not found.**). We have to clarify that this term it is not only used in the educational field but also in marketing and within companies to engage their consumers and employers. Along this dissertation the focus will be on the educational field.

Fig. 1

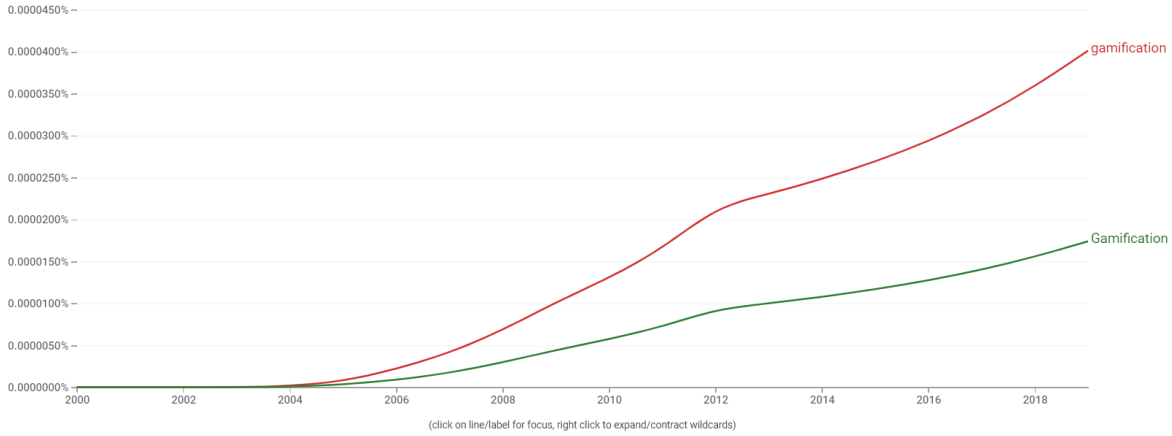
Published articles per year according to databases



NOTE: Adapted from *Gamification* (p.4), by Lattemann et al., 2017, Springer

Fig. 2

Use over time for Gamification



NOTE: Extracted from a search on Google Ngram Viewer using the word '*Gamification'*.

(https://books.google.com/ngrams/graph?content=gamification&year_start=2000&year_end=2019&corpus=26&smoothing=7&case_insensitive=true)

In order to speak about Gamification and how to develop a project, we should start by saying that its background and structure come from games, originally from Multi-User Dungeons -from now on known as MUDs-. Firstly and foremost, Richard Bartle joined Trubshaw's 1978 MUD's game developing a new way of understanding players and their engagement and developing a highly used Taxonomy known as Bartle's Taxonomy, which will be described further on this dissertation.

Gamification Elements

We have to take into account some elements in order to create a project based on Gamification:

Goals

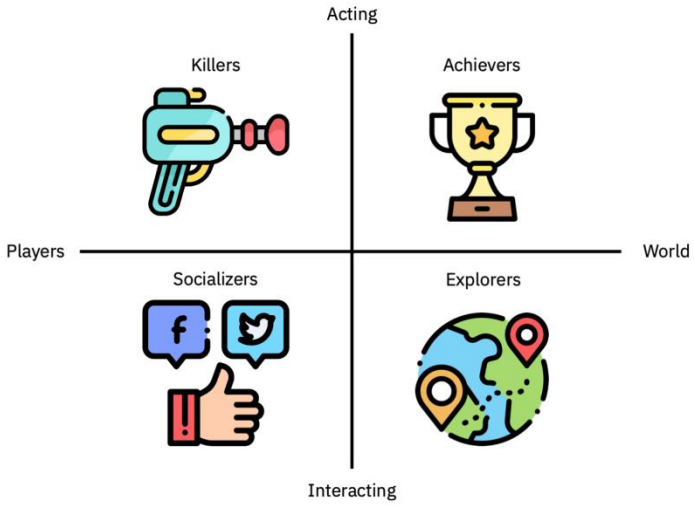
Learning goals to acquire within the gamification.

Student's Profile

The student's profile will be assigned taking into consideration Bartle's Taxonomy (Bartle, 1996). Bartle developed a player's taxonomy regarding the player's in-game motivations, and how these are expressed by how they act on and interact with other players and the world; with these four variants he created a graph to explain the types of players.

Fig. 3

Representation of Bartle's Taxonomy Graph



According to it there are four types of players:

Killers (Competitive): These players are defined by a focus on winning, rank and direct peer-to-peer competition. They get engaged by leaderboards and ranks.

Achievers (Treasure hunters): These players are defined by a focus on attaining status and achieving present goals quickly and/or completely. They get engaged by achievements.

Explorers: These players are defined by a focus on exploring and a drive to discover the unknown. They get engaged by obfuscated achievements.

Socializers (Enjoy interacting with other players): These players are defined by a focus on socialising and a drive to develop a network of friends and contacts. They get engaged by newsfeeds, friends lists and chats.

In order to classify the students, they will have to take a test answering some questions and they will get what type of player they are.

Narrative

Describe the story and the context of the Gamification Process. It should be inspired by a theme that motivates students.

Mechanics

The rules of the game and the interaction strategies used to build interest, create motivation, fun, pleasure inter alia. These along with the components that comprised them are the key elements to create motivation and engagement in students.

Components

All the concrete resources of the game that students will be dealing with to progress along the mechanics.

According to Lattemann et al. (2017) game mechanics performed in gamification usually involve:

Points: used as a reward for students through the different stages of the process.

Leaderboards: using them allows students to compare themselves to their classmates, producing some competitiveness. While creating these leaderboards, it is very important to ensure that they encourage students' motivation instead of creating more pressure or negative rivalry.

Levels: they are applied as indicators of the student's progress. They do not always develop linearly and can be substituted by a badge strategy.

Achievement Systems: these can be described as parallel tasks that can be developed independently of the main goal.

The diagram shown in Fig. 4 shows an interpretation of an achievement system class. Observing this diagram we can extract that achievements are composed mainly of the following parts:

• *Identifier*, made of a name that gives uniqueness along with a description of it and a badge to support the image.

• *Unlocking-Logic*, composed by:

A trigger: it could be a specific action or an event.

Conditions: on which the trigger is based.

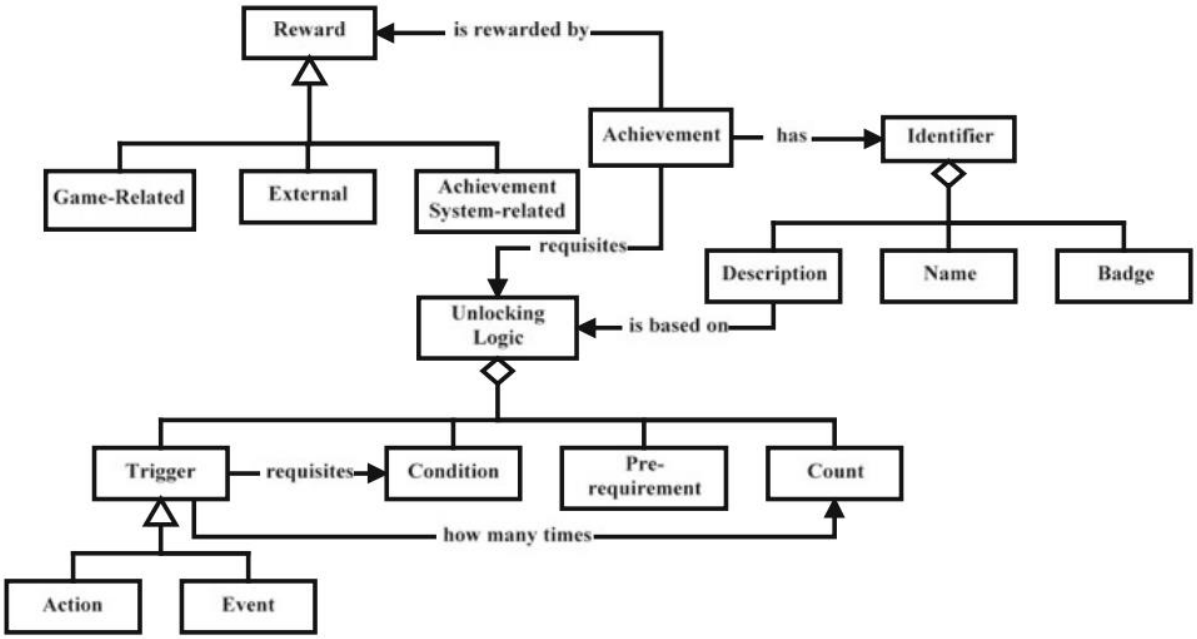
Count: the number of times in which the trigger is activated.

Pre-requirements

• *A reward,* obtained when the student unlocks an achievement. Rewards Game-Related, Achievement System-related or External to the game.

Fig. 4

Achievement system class diagram



NOTE: Adapted from *Achievement system class diagram (Matallaoui et al. 2015)*, as cited on *Gamification* (p.9), by Lattemann et al., 2017, Springer

Apps

ICT (Information and Communicative Technologies) tools help to develop the different gamification elements and they open more options for designs and implementations.

Key Terms

CLIL

The term CLIL (Content and Language Integrated Learning) is an educational approach in which an additional language is used as lingua franca for the learning and teaching purposes of the content and language itself. With this approach the objective is to promote not only the content learning but the additional language itself.

MUDs

These are the initials for Multi-User Dungeons.

A computer-based text or virtual reality game which several players play at the same time, interacting with each other as well as with characters controlled by the computer. (Oxford University Press, 2022)

Innovation Project.
'Our Spacecraft: The Earth'

Description Of The Project

Create a Gamification Proposal for BIOLOGY and GEOLOGY on 1st Compulsory level. The main goal of this dissertation is putting into practice an innovative gamification project. Taking this into account the design is going to be outlined for a Unit, with the main purpose of implementing it in class.

Unit Syllabus

The unit chosen to develop this project is related to: Solar System and Constellations, Lunar Cycle, Tides, the Earth (Movement, Seasons, Layers and Resources). The syllabus and the main concepts to obtain along this unit will be the following:

The Universe

The Solar System

Its planets and main characteristics from each of them -Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune-.

The Sun.

- It is the star on our system, and its name comes from it.

- It is in the middle of its lifecycle. At present, the Sun is in a stage called Yellow Dwarf.

- The Sun's gravity holds our entire solar system together.

- Without light from the Sun, there would be no plants or animals on Earth.

Mercury.

- Its name was given by the Romans after their God of Messengers, Mercury.

- It is the closest planet to the Sun.

- It is the smallest planet of the Solar System.

Venus.

- Its name means 'Love and Beauty'.

- It is the Earth's twin sister. It has the same size.

- It is the hottest planet on the Solar System. The temperature on it is 500ºC.

The Earth.

Mars.

- It is also called the Red Planet.

- There is water on it.

- The temperature on it is -60ºC.

Jupiter.

- It is the biggest planet on the Solar System.

- It has moons around it.

- The temperature on it is -156ºC and in there you weigh 3 times more.

Saturn.

- It has moons and rings around it.

- It is made of Gas (mostly hydrogen with some helium).

- A year on Saturn is over 10,000 days.

Uranus.

- It has the coldest atmosphere on the Solar System.

- It is the only planet that rotates on its side.

- It has rings like Saturn but they are thin and dark.

Neptune.

- It has rings like Saturn but they are thin and dark.

- Its gravity is similar to the Earth's.

- The surface of Neptune swirls with huge storms and powerful winds.

The Constellations

There are groups of stars that seem to be near in the sky and look like drawings if they are joined with lines.

Main constellations: Ursa Major, Ursa Minor, Cassiopeia, Pisces, Taurus, Sagittarius.

The Moon

It is the satellite of the Earth.

Movements Of The Moon.

- Rotation: The Moon rotates on itself.

- Revolution: The Moon revolves around the Earth.

The Phases Of The Moon.

- New Moon: The Moon cannot be seen because the Sun illuminates its back.

- First quarter: With each passing day we glimpse at a slightly larger area of the moon illuminated. It looks like a "D".

- Full Moon: The Moon is completely illuminated by the Sun.

- Last quarter: With each passing day we notice a slightly smaller area of the moon illuminated. It looks like a "C".

Eclipse

It is a phenomenon by which a celestial body cannot be perceived, because it remains hidden in whole or in part.

Lunar Eclipse.

It occurs when the Moon cannot be noticed because it is in the shadow of the Earth. May be:

- Full eclipse of the Moon: If we cannot observe anything of the Moon.

- Partial eclipse of the Moon: If we contemplate part of the Moon.

Solar Eclipse.

It occurs when the Sun cannot be spotted because the Moon is between the Sun and the Earth. There are two major types:

- Full eclipse of the Sun: If we cannot distinguish anything from the Sun.

- Partial eclipse of the Sun: If we observe part of the Sun.

The Tides

They are periodic variations on the sea level caused by the attractions of the Moon and of the Sun -to a lesser extent-.

Every day has two high tides and two low tides.

The highest level of water is called High Tide and the lowest level is called Low Tide.

When the Earth, the Sun, and the Moon are in line, the gravitational forces of the Moon and the Sun both contribute to the rising of the tides and its higher points. The highest tide is called Spring Tide.

When the Earth, the Sun, and the Moon are not in line –at an angle of 90º-, the attractions of both are reduced a bit and the tides are not so high. This tide is called Neap Tide.

The Earth

Movement Of The Earth.

- Movement of Rotation: The Earth rotates around its axis once every 24 hours (1 day) and this is the cause of day and night.

- Movement of Revolution: The Earth turns around the Sun once every 365 days and 6 hours. This movement along with the inclination of the Earth is responsible for the seasons. As the year has 365 days, six hours are left behind each year, and after 4 years we have a leap year with 366 days.

The Seasons.

As the axis of the Earth is tipped, the Sun does not shine on our planet in the same way throughout the year.

• Summer: The sun's rays hit the Earth more perpendicular and, therefore, they produce more heat.

• Winter: The sun's rays hit the Earth obliquely and, therefore, they produce less heat.

• Spring: This is the season between winter and summer.

• Autumn (Fall): This is the season between summer and winter.

The Layers Of The Earth.

- Atmosphere: The gaseous layer that surrounds the Earth. It consists of a mixture of gases we call air.

- Hydrosphere: The layer formed by all the water that there is on the planet: oceans, seas, lakes, rivers, groundwater and so on.

- Geosphere: The solid or molten layer of the Earth. It consists of rocks and minerals. It in turn has three layers:

Crust: the solid layer most external.

Mantle: the intermediate layer. The materials are molten.

Core: the layer more internal and is a compound overcoat of metals. It has in turn two parts: the outer core and the inner core.

- The Biosphere: The part of the Earth where living creatures inhabit. The Biosphere covers the bottom of the Atmosphere, Hydrosphere and the superficial part of the Geosphere.

Resources.

- Natural Resource: It is any material or energy that is useful for human beings and is originated in a natural process.

- Renewable Resources: They are those that we can use and in the given time the will replenish. They can be naturally regenerated.

- Non Renewable Resources: They are those that waste away and cannot be regenerated.

- Problems In The Use Of Natural Resources: When considering our well-being, we increase the consumption of natural resources. This is causing:

- The exhaustion of natural resources.
- The degradation of the environment due to the exploitation of natural resources.
- The existence of grave social injustices, as rich countries benefit from natural resources of undeveloped countries.

- A Solution: Sustainable Development: We should understand that less consumption of these resources does not diminish our quality of life. Sustainable development consists of:

- Reducing the consumption of resources and distributing them equally.
- Substituting the use of polluting energy (not renewable) for that of less polluting energy (renewable).
- Reducing the quantity of residues that we generate, recycling and reusing material, and reducing the consumption of non-biodegradable materials.

Project Structure

The project 'Our Spacecraft: The Earth' will be implemented along 8 sessions, being the first one to introduce the project and the last one for the Final Activity.

All along the projects there will be individual and collaborative activities taking into account the syllabus and the different abilities that we want students to develop. Adding to that, we have ensured while designing the gamification to cover all types of players' needs.

Goals

The main goal to achieve with this gamification project is to motivate students and help them learn without even noticing while they are enjoying it. What is more, this goal will also be focused more on obtaining points or rewards more than having to study by heart.

The content-unit implemented in this project is 'The Universe'. The goal is that students learn to identify the planets in the Solar System, some important constellations and the Earth with its satellite the Moon.

The Final Activity for this project will consist of doing a 'Camping under the Stars' in class with stargazing: projecting stars and constellations on the ceiling.

Student's Profile

One of the first activities in the project will be defining what type of player students are. For this purpose, an online test will be implemented. It consists of only 8 questions with two options to choose from, obtaining at the end the result on what type of player you are.

The link used for this matter will be the next: https://tastygames.outgrow.us/player-quiz

Narrative

We are astronauts in training and we need to know our Universe, mostly the Solar System and our planet the Earth. Every phase of our training gets us closer to being floating on Space. In order to be successful, all astronauts in training will need to collect badges and prizes along the training to use them when in orbit.

Mechanics

In order for the 'astronauts in training' to be successful and progress along the project, they need to obtain points and different rewards that will help them to be highly positioned in the leaderboards -not only in the individual classification but also in the Teams' one-.

In order to fulfil their 'training' and complete the Astronaut's Avatar, they need to win 7 badges obtained during the sessions. There are also some secondary paths that will lead to enriching our astronauts' knowledge and rewards.

Components

Points

Points will be obtained with each activity. Not only will activities be done in class but also some extra materials that will be uploaded to Google Classroom. There will be different sets of activities, worksheets and exercises.

Points will be up to date at the end of each session, summing up the activities done in class during the session and the ones that the student has finished online since the previous session.

Leaderboards

There will be two leaderboards posted on a corkboard at the end of the class and will be updated after every session with the corresponding points. One of the leaderboards will be an Individual Ranking and the other one will correspond to the Team Leaderboard.

Both leaderboards will be themed with our gamification topic: the Universe.

Fig. 5

Individual Ranking Leaderboard

Fig. 6

Teams Leaderboard

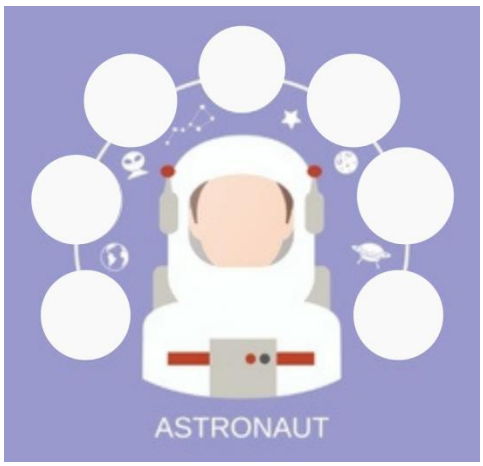
Badges

In order for students to receive indicators on their progress they will receive a badge after every session if they have completed all activities and tasks. Badges will be related to the lesson's information.

Students will have to stick all the badges on their astronaut's avatar -they will receive it on the first session- and in order to have it completed, they will need 7 badges -corresponding to the seven sessions of this project, not having one on the last session, that will have the Final Activity-. The Avatar previously has the circles in blank in order to motivate students' to achieve the final goal: having the image completed with all the badges in place.

Fig. 7

Astronaut's Avatar



NOTE: The Astronaut's Avatar will be customized by students during the first session. It will have A5 size.

Fig. 8

1st Badge - Spaceship

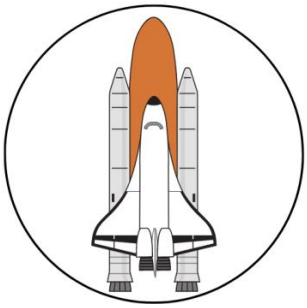


Fig. 9

2nd Badge - Mars Rover: Perseverance

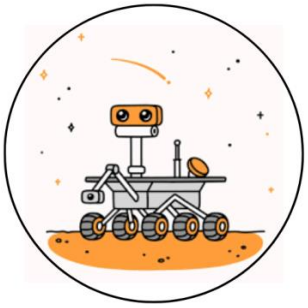


Fig. 10

3rd Badge - Constellations

Fig. 11

4th Badge - The Moon

Fig. 12

5th Badge - An Observatory

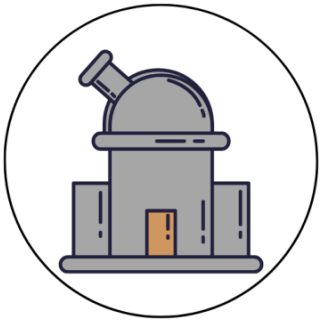


Fig. 13

6th Badge - The Earth

Fig. 14

Last badge of the collection. 'You Are Out Of This World'

Achievement Systems

As explained before, within the theoretical framework, the achievement systems can be described as parallel tasks that can be developed independently of the main goal. This will be displayed with some extra activities (non-compulsory) which will give students some extra points and as well as rewards of different kinds (certificates, extra badges)

Apps

Google Classroom

The project will be also created on Classroom. In it, students will have access to the Unit syllabus and also plenty of extra activities and games that will give them points and help them obtain the badges while going further in the topic.

It will also be a helpful guide for students along the Unit.

Genially

This web-based tool will be introduced in some activities in class.

Activity 1 (session 3): The Solar System. Place the planets in the correct order

https://view.genial.ly/60506e4dd5eff00d6ee55623/interactive-content-the-solar-system

Jamboard

This digital whiteboard will be used for collaborative work in class at the end of some sessions to reflect on the session's topic. It is a very useful online tool for this purpose due to the fact that everybody can be connected at the same time working. The teacher will be projecting the slides on the whiteboard while everybody can see what they are working on live.

Quizziz.

This online app will be used to go over the unit's vocabulary. Because of its gamified style it fits perfectly with the design of the project. This web-based tool gives students badges and prizes according to their correct answers.

Sessions

Session 1: Project's Presentation

In this first session, the project 'Our Spacecraft: The Earth' will be introduced. Students will be presented with this project theme based on 'The Universe' Unit.

The teacher will explain some of the mechanics and components that students will deal with and collect along the project. However, it will be a general approach to them because part of the motivation for students is having the element of surprise.

Two Leaderboards will be hung on the class: an Individual Ranking and a Teams Leaderboard.

Activities To Do In Class.

1. Students will take the test: *What type of player are you?* Once finished they will have to upload to the Classroom the result of their test with the classmates on a forum created for that purpose.

https://tastygames.outgrow.us/player-quiz

2. Customizing their astronaut's avatar where they will have to stick the tool badges obtained along 7 sessions.

   Points: 1 individual

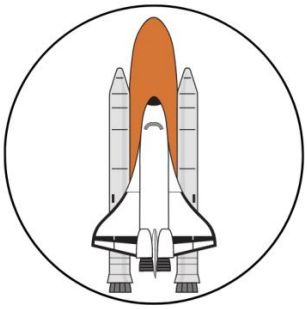
Components Given.

1st Badge - Spaceship.

Students will get the 1st badge of the project at the end of the session if they finish all the session activities.

Fig. 8

1st Badge - Spaceship



Rewards.

All students that have uploaded the results of their test on the Classroom forum will get a special badge related to their player type.

Fig. 15

Killer's Badge

Fig. 16

Achiever's Badge

Fig. 17

Socializer's Badge

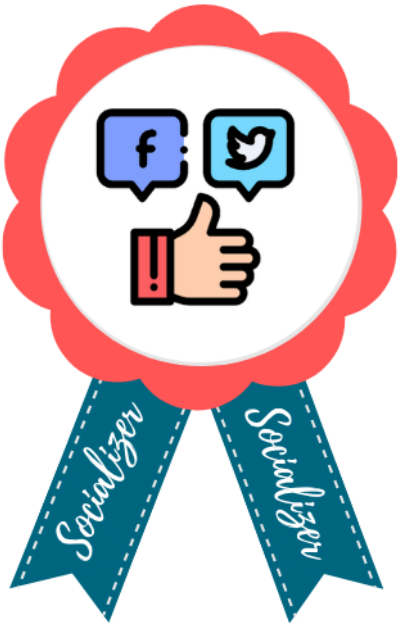


Fig. 18

Explorer's Badge

Session 2: Solar System (From Sun to Jupiter)

In this session, the Solar System will be introduced. In order not to overload students with information, it will be separated into two sessions. In the first session, related to the Solar System, students will learn from the Sun to Jupiter (the 5th planet in our system).

Activities To Do In Class.

1. At the end of the class, there will be a quiz projected on the whiteboard to answer orally, in order to see what students have learned during the class.

   Points: 1 individual point per each correct answer

Extra Activities.

1. Mission to Mars: A Scavenger Hunt!

Worksheet[1] uploaded on Classroom with the instructions.

To obtain a Certificate from NASA, the student must upload the solution for the 'Secret Word' at the end of the worksheet to the Classroom.

Points: 1 individual point

Components Given.

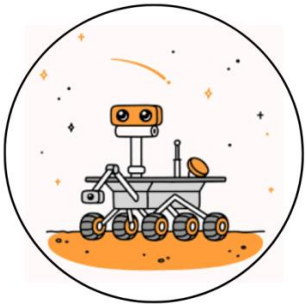
2nd Badge – Mars Rover: Perseverance.

Students will get the 2nd badge of the project at the end of the session if participating in the final quiz.

[1] *See* Appendix

Fig. 9

2nd Badge - Mars Rover: Perseverance



Rewards.

NASA Certificate[2].

Students completing the extra activity 'Mission to Mars: A Scavenger Hunt!'.

Session 3: Solar System (From Saturn to Neptune) & the Constellations

In this session, we will finish with the Solar System, and will also know what constellations are and their relevance.

Students will be divided into 6 groups of four or three people. These groups will remain the same along the entire project. Each group will have a name proposed by their members in order to create unity and to appear in the Teams Leaderboard.

Activities To Do In Class.

1. Activity to work in Teams: Students will have to elaborate a 'Constellations' Visor'. Each group will be assigned with one of the main six constellations learned: Ursa Major, Ursa Minor, Cassiopeia, Pisces, Taurus, and Sagittarius.

[2] *See* Appendix

With a piece of cardboard they will have to draw the constellation assigned and then pierce it in the places where the stars go. Once all finished, all 'Constellations' will be placed one by one on a visor provided by the teacher and observed by all the class.

Points: 2 Team points for the work finished and 1 extra point for the group with the visor most nicely done.

Extra Activities.

1. 'The Solar System. Place the planets in the correct order'

https://view.genial.ly/60506e4dd5eff00d6ee55623/interactive-content-the-solar-system

When finished students will have to upload a screenshot on Classroom.

Components Given.

3rd Badge - Constellations.

Students will get the 3rd badge of the project at the end of the session if they correctly solve the activities.

Fig. 10

3rd Badge - Constellations

Rewards

All students that have uploaded a screenshot with their image of the Solar System in correct order will get a special badge.

Fig. 19

Extra Badge - Solar System Activity

Session 4: The Moon -Movement and Phases-

In this session, students will know the Earth's satellite, how it moves and its phases.

Mandatory Activities.

1. Create a Moon Journal for this month: In it they will have to draw the moon every 3 nights; write down the name on the phase and the date.

   In order to obtain the 4th badge, they will have to deliver this activity properly done in the last session. They should observe the moon, starting one hour after the sunset.

   Points: 5 individual points when the journal is properly delivered. 2 extra points given per organization and presentation.

Components Given.

4th Badge – Moon.

Students will get the 4th badge of the project on the last project session if they deliver the Moon Journal adequately completed.

Fig. 11

4th Badge - The Moon

Session 5: Eclipses -Lunar and Solar- and Tides

In this session, students will learn about Eclipses and the relation between the Sun, the Moon and our planet. In relation to that, they will learn how this influences the Earth, even changing and producing the Tides.

Activities To Do In Class.

1. Activity to work in Teams: 'Creating an eclipse'

   Students will work with their teams making a handcraft for explaining eclipses, following some steps given by the teacher.

   Points: 1 Team Point for finished work. 1 extra team point for the team with the clearest resolution and beautifully done.

2. Jamboard:

   Every student will create a post-it in one of the common slides from the program with information related to Tides without writing their name in the 'post-it'.

Points: 2 individual points. The class will vote for the best and clearest one in order for students to obtain the points.

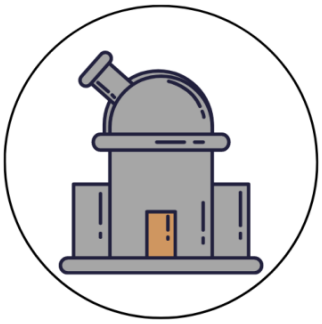
Components Given.

5th Badge – Observatory.

Students will get the 5th badge of the project at the end of the session if they correctly solve the activities.

Fig. 12

5th Badge - An Observatory



Session 6: The Earth -Movement and Seasons-

In this session, students will get to know our planet: the Earth. Students will learn the Earth's movements and why there is a day and night, and also what produces the different seasons and the differences between the hemispheres.

Activities To Do In Class.

1. Activity to work in teams: 'The Earth along the Year'

   Working in the same groups as in previous activities, students will create a timeline on cardboard showing the characteristics of every season, and what inspires students each season.

When finished, they will show it to their classmates and hang it on the class.

Points:

Team Points: 2 team points for all the finished works. After the presentations, the class will vote for the best work and presentation which will obtain 1 extra team point.

Individual Points: Students will do a Peer-to-Peer assessment[3] within the members of the group. The one getting a better evaluation in each group will receive 2 extra individual points.

Components Given.

6th Badge – The Earth.

Students will get the 6th badge of the project at the end of the session if finished 'The Earth along the Year' properly.

Fig. 13

6th Badge - The Earth

Session 7: The Earth –Layers and Resources-

In this session, students will continue to know our planet: the Earth. Students will learn what is within and outside of our planet.

[3] *See* Appendix *for the Peer-to-peer Rubric*

We will also learn and reflect about the Earth's resources.

Activities To Do In Class.

1. Activity to work in teams: 'Our Spacecraft: The Earth'

   In the next session, we will create a mural in the class representing the Earth and its layers. With that purpose in mind, in this session every team will be assigned with one of the following layers: Atmosphere, Hydrosphere, Geosphere's Crust, Geosphere's Mantle, Geosphere's Outer Core and Geosphere's Inner Core. Each layer will have a representative colour that will be decided during this session and students will have to bring objects from home with the colour of its layer -originally with that colour or painted by them-. They will decide during some time given in this session what object they can bring and what they should look for in order to complete the task the following day.

Extra Activities.

1. Creating a Sundial

   Students will have in Classroom the instructions to create a Sundial. When finished they should take it to class. Later, the teacher can check their work.

   Points: 3 individual points for the Sundial properly done.

Components Given.

7th Badge – You Are Out Of This World.

Students will get the 7th badge of the project when completing the mural 'Our Spacecraft: The Earth'.

Fig. 14

Last badge of the collection. 'You Are Out Of This World'

Session 8: Final Activity 'Sleeping Under The Stars'

At the beginning of the class students will stick the object to the wall creating the representation of the Earth and its layers with the mural 'Our Spacecraft: The Earth'.

In the meantime, the teacher will prepare the class for the Final Activity of this project. It will consist of doing a 'Camping under the Stars'. It will represent a camping night and stargazing. Sleeping bags will be laid out across the class and it will be projected on the ceiling the night sky with all the constellations.

Implementation

For implementing this project 8 sessions will be needed, being the first one dedicated to the presentation of the project and the last one for the epic final with the 'Sleeping Under The Stars'.

Conversely, due to different activities organized in the school along with the regular classes taught by the teacher, it was only possible to put into practice the project through three sessions, not having enough time to implement the whole project. We have to bear that in mind when analysing the results.

Having said that, I was able to follow through the project design for the first three sessions with no issues or difficulties in the implementation, even though the student's motivation and eagerness this day was high due to all the new possibilities.

Session 1: Project's Presentation

In this first session, I explained to students that during the following three session we were going to be working a little bit differently and explained the project 'Our Spacecraft: The Earth', the mechanics and components that were going to be dealt with.

Once the explanation was done, the Leaderboards were hung on the class and students took the online test through their personal or school devices. They were eager to find out their player type, and also share and compare with their classmates.

Afterwards they were given the astronaut's avatar in order to attach it to their notebook and customize it.

At the end of the class, the points were given and leaderboards were updated. This day there were no differences because all students were highly motivated and all received the correspondent points. Students also received their 1st badge and also the one related to their player type; we have

to point out here that few students who did not upload the results of their test on the Classroom forum on time, did it once they saw the badge and that mostly all of their classmates had it.

Session 2: Solar System (From Sun to Jupiter)

In this session, we continued with the syllabus during the class, but it was evident that students were paying more attention and they even asked at the beginning of the session how they could get points that day and the 'prizes' -as they referred to the badges-.

At the end of the class, there was a quiz projected on the whiteboard to answer orally, in order to see what students had learned during the class. When explaining that, they will obtain points for each correct answer and the badge of the day for properly participating; there were plenty of hands raised. All students tried to participate in order to, at least, win the new badge, which they were curious to know about how it was.

Once the quiz was finished, the points were given and leaderboards were updated. This day some differences appeared between students due to the answers correctly answered. Students also received their 2nd badge if they participated in the quiz. Before closing up the class, students were told about the extra activity in Classroom and the reward to obtain if done.

Session 3: Solar System (From Saturn to Neptune) & the Constellations

In this session, we finished with the Solar System and constellations.

Once the theoretical part was completed, students were distributed in 6 groups of four or three people and they decided about its name. Afterwards, each group was assigned with one of the main six constellations learned: Ursa Major, Ursa Minor, Cassiopeia, Pisces, Taurus, and Sagittarius; and they received instructions about how to elaborate a 'Constellations' Visor' and the cardboards were distributed.

Once the time for the elaboration was finished, all constellations were projected for all the class to observe and enjoy.

At the end of the class, the points were given to all the teams with their constellations properly finished -all the groups except for one- and the most nicely done visor was voted and received the extra points. That day not all students received the 3rd badge, because there was one group that did not finish the 'constellations' visor'.

Before closing up the class students were told about the extra activity in Classroom and the reward to obtain if done.

Conclusions

In general terms it was a very successful implementation. Nevertheless, we have to bear in mind that it was not fully implemented and the data and feedback obtained is partial. For a proper analysis and evaluation of the project as a whole a new and complete implementation should be needed.

Having said that, I will try to answer some questions, taking into account the project as if it was only composed of the implemented part -the first three sessions-.

Assessing the Project

Was the goal achieved?

One of the main goals proposed in this dissertation was to motivate students and increase their participation in class and doing the suggested activities.

It was clearly observed in class that most of the students were eager to have Biology and Geology, mainly because they wanted to win points and rewards and also discover what new activity they were going to have. There was a peak in the participation and mainly all students also did the extra activities in order to get the NASA's Certificate and the extra badge, so we can affirm that the motivation and participation goal was achieved.

It would be interesting when implementing the full project to observe if these levels of participation keep on going throughout the full project or if it diminishes with time.

Was the design correct?

Once the project was implemented, I could observe if it worked properly and the mechanics and components were adequate for the sessions and the unit at hand.

The sessions implemented worked without any problem, so it is not wrong to think that it was correctly designed. However, we cannot assume that would be the result with the full project without putting it into practice, so we need to be cautious with the current results regarding the first 3 sessions, even when these are very promising.

Asking students

At the end of the third session of the implementation, students were asked orally about the three sessions and their opinion about this way of learning in order to receive their feedback.

All students agree that they find it more engaging and interesting, because they did not feel that they were doing homework and they even wanted to do more activities in order to receive more points or 'prizes'.

This oral feedback was possible thanks to the trust environment created by the teacher in the class, so students felt comfortable to share their opinions.

Improvement plan

The main point to follow in our improvement plan is to fully implement the project and its 8 sessions, with the purpose to obtain relevant data to analyse and decide if any other changes are needed, because this first implementation takes into account only a third of the project.

What is more, taking into account the wideness and depth of the design of this gamification project, it should be implemented not only in one Unit, but what will be more enriching to be implemented along a full trimester. The whole design of the project -mechanics, components and structure- will be the same, only adding modifications to adjust it to the topic of the unit at hand. For example, in we are in the 'Mineral and Rocks' Unit, we can call that project 'In Search Of Rough Diamonds' and our students can be miners with the purpose of collecting a Special Rough Diamond. They will obtain themed badges and have a special final activity related to the theme; the design of

the gamification still the same, just with a new theme. With this implementation in a longer period of time we could obtain relevant data and analyse if the project results are relevant independently from the Unit adapted.

We could also observe if students get better results in the exams done at the end of the unit and if there are any differences before implementing the gamification project.

Having in mind the collection of data and information, an anonymous students' feedback questionnaire will be added with some close questions and a final open space to express their opinion. With this I pretend to eliminate any bias from students' feedback, because anonymity guarantees their sincerity and useful data for the investigation purposes.

On another subject, due to the fact that students loved the given badges and specially those related to their type of player, I think it would be very interesting that those badges were stickers, because during the implementation they were made of paper and glued to a sized cardboard. It would be much more enthralling for them to be stickers, because, that way, they could stick them wherever they wanted to as they unsuccessfully tried to do with the original ones.

It is safe to say that probably there will be some students that will fall behind during the project. In order to bring them back in the game and try to keep them motivated, we should add for these students scaffolding in some activities to facilitate them working at their own pace but continue with the project like the rest of the class and being able to get points and some badges as their classmates.

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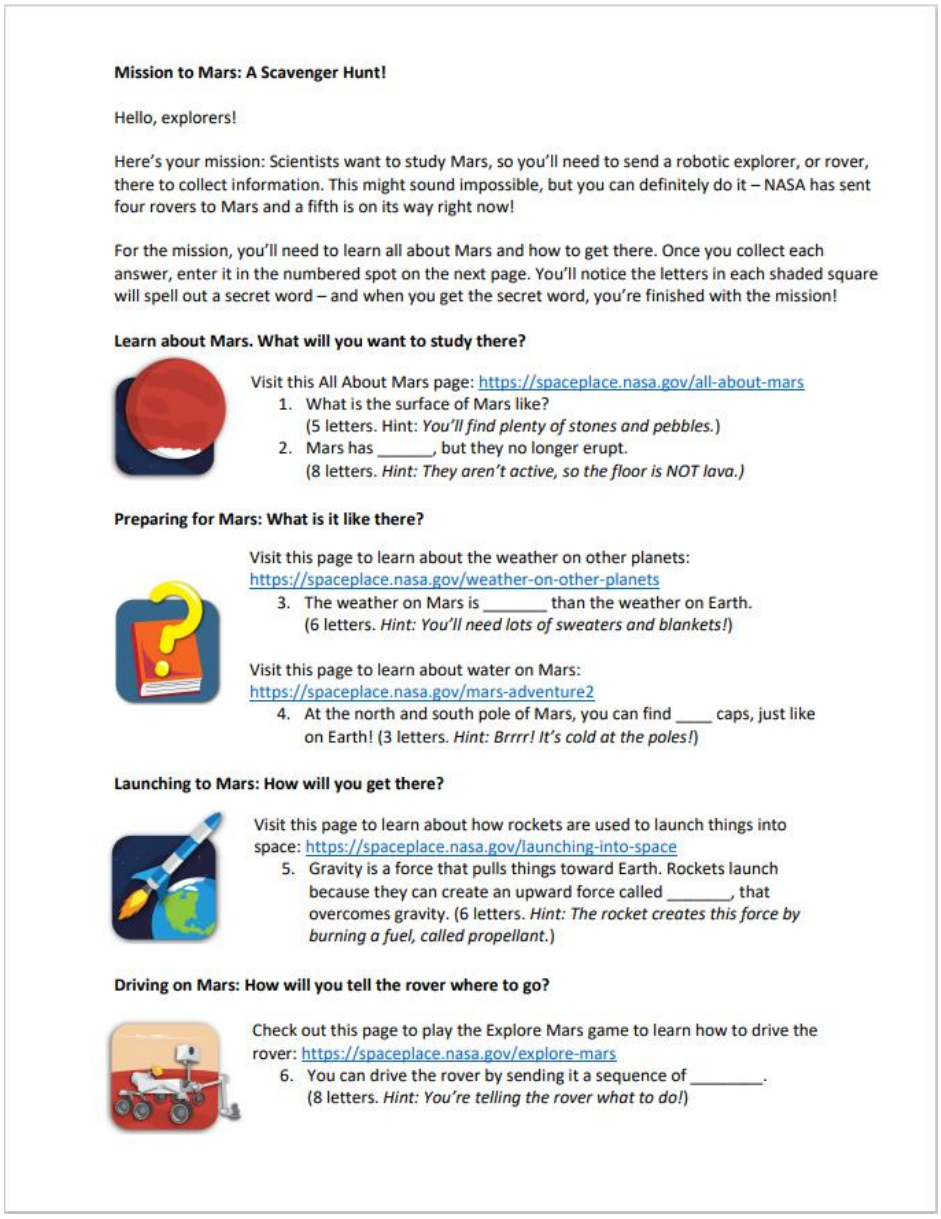
Appendix

Documents And Materials

Worksheet 'Mission to Mars: A Scavenger Hunt!'

Fig. 20

Worksheet 'Mission to Mars: A Scavenger Hunt!' (Pag.1)



Mission to Mars: A Scavenger Hunt!

Hello, explorers!

Here's your mission: Scientists want to study Mars, so you'll need to send a robotic explorer, or rover, there to collect information. This might sound impossible, but you can definitely do it – NASA has sent four rovers to Mars and a fifth is on its way right now!

For the mission, you'll need to learn all about Mars and how to get there. Once you collect each answer, enter it in the numbered spot on the next page. You'll notice the letters in each shaded square will spell out a secret word – and when you get the secret word, you're finished with the mission!

Learn about Mars. What will you want to study there?

Visit this All About Mars page: https://spaceplace.nasa.gov/all-about-mars

1. What is the surface of Mars like?
   (5 letters. Hint: *You'll find plenty of stones and pebbles.*)
2. Mars has _____, but they no longer erupt.
   (8 letters. *Hint: They aren't active, so the floor is NOT lava.)*

Preparing for Mars: What is it like there?

Visit this page to learn about the weather on other planets:
https://spaceplace.nasa.gov/weather-on-other-planets

3. The weather on Mars is _____ than the weather on Earth.
   (6 letters. *Hint: You'll need lots of sweaters and blankets!*)

Visit this page to learn about water on Mars:
https://spaceplace.nasa.gov/mars-adventure2

4. At the north and south pole of Mars, you can find ____ caps, just like on Earth! (3 letters. *Hint: Brrrr! It's cold at the poles!*)

Launching to Mars: How will you get there?

Visit this page to learn about how rockets are used to launch things into space: https://spaceplace.nasa.gov/launching-into-space

5. Gravity is a force that pulls things toward Earth. Rockets launch because they can create an upward force called _____, that overcomes gravity. (6 letters. *Hint: The rocket creates this force by burning a fuel, called propellant.*)

Driving on Mars: How will you tell the rover where to go?

Check out this page to play the Explore Mars game to learn how to drive the rover: https://spaceplace.nasa.gov/explore-mars

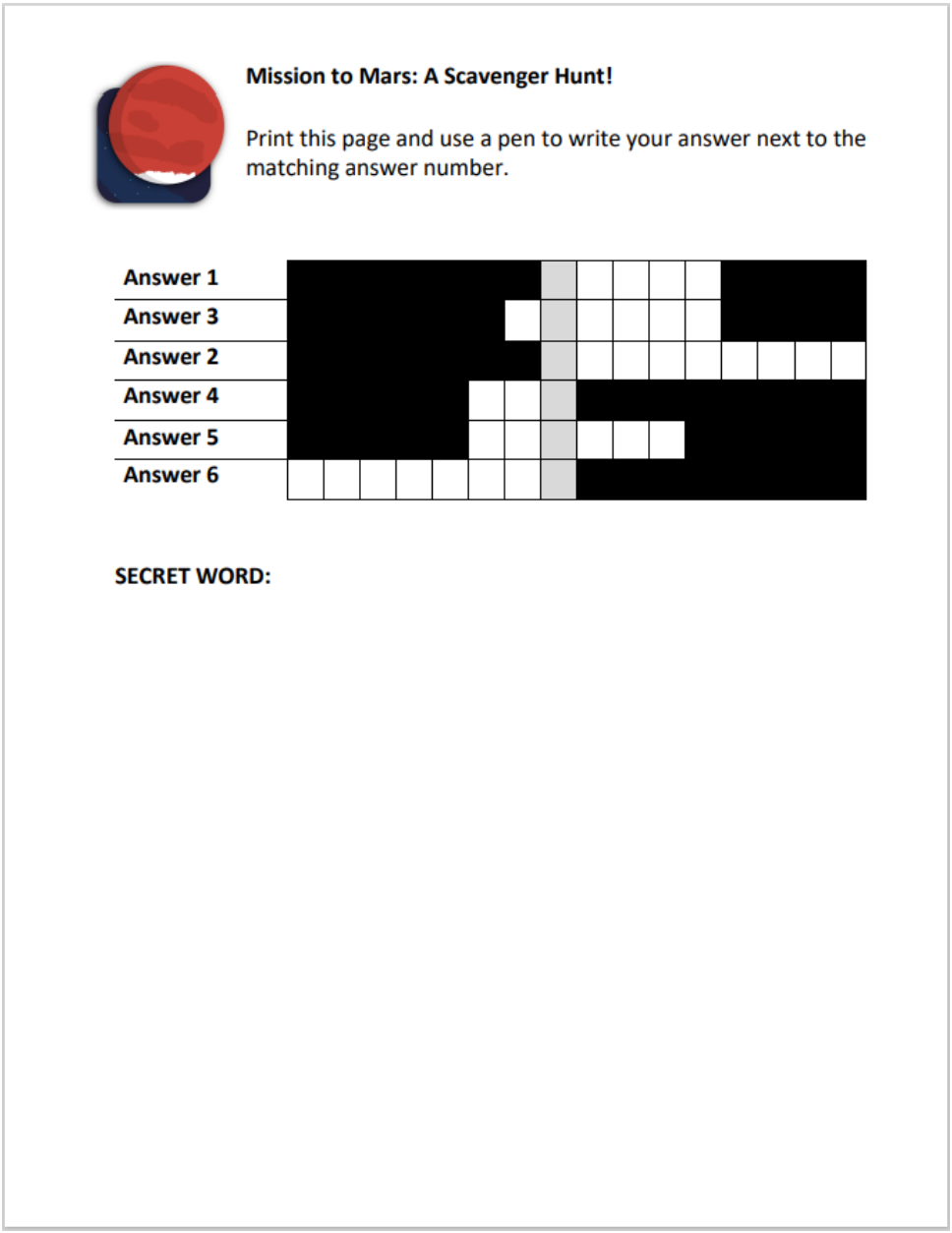
6. You can drive the rover by sending it a sequence of _____.
   (8 letters. *Hint: You're telling the rover what to do!*)

NOTE: Downloaded from *NASA Scavenger Hunts* in NASA Science. Space Place

(https://spaceplace.nasa.gov/scavenger-hunts/en/)

Fig. 21

Worksheet 'Mission to Mars: A Scavenger Hunt!' (Pag.2)



Mission to Mars: A Scavenger Hunt!

Print this page and use a pen to write your answer next to the matching answer number.

Answer 1
Answer 3
Answer 2
Answer 4
Answer 5
Answer 6

SECRET WORD:

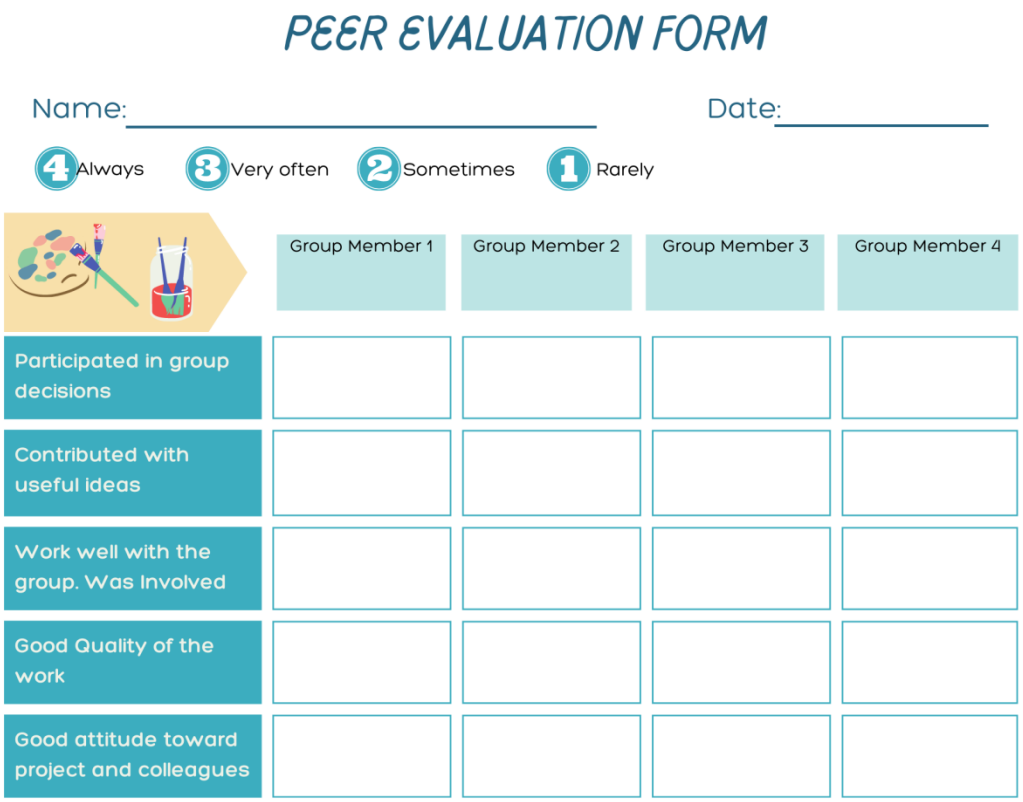
NOTE: Downloaded from *NASA Scavenger Hunts* in NASA Science. Space Place

(https://spaceplace.nasa.gov/scavenger-hunts/en/)

Peer-to-peer Assessment Rubric. 'The Earth along the Year'

Fig. 22

Peer-to-peer Assessment Rubric for the activity 'The Earth along the Year'



PEER EVALUATION FORM

Name: _____ Date: _____

4 Always 3 Very often 2 Sometimes 1 Rarely

	Group Member 1	Group Member 2	Group Member 3	Group Member 4
Participated in group decisions				
Contributed with useful ideas				
Work well with the group. Was involved				
Good Quality of the work				
Good attitude toward project and colleagues				

Rewards

Fig. 23

Mission to Mars Student's Challenge Certificate

NOTE: Adapted from NASA Mission To Mars Student Challenge [photography], by NASA. Jet Propulsion Laboratory, 2022. NASA. Jet Propulsion Laboratory

(https://www.jpl.nasa.gov/edu/mission-to-mars-student-challenge/#education-plan.all.week7)

'*Tell me and I forget. Teach me and I remember. Involve me and I learn.*' – Benjamin Franklin