

OUTSTE(A)M Games and Toys

Solar System Game

Title

Solar System

Creator

Technological Institute for Pupils' Products and Leisure (AIJU)

Summary

This outdoor educational game motivates pupils to know more about the solar system in a playful way. Pupils take the roles of different planets, the sun and comets and start moving according to the characteristics of their celestial body. Throughout the game, children learn concepts of natural sciences and basic astronomy, such as the position of the planets, orbital movements, and the interaction between celestial bodies. In addition, they develop physical skills, motor coordination, strategic thinking, and teamwork, while integrating elements of mathematics (counting, scoring) and artistic expression (movement and dramatization). The Solar System game combines experiential learning with outdoor physical activity, fostering scientific curiosity, creativity, and cooperation among pupils, becoming a comprehensive educational tool to reinforce knowledge about the universe in a fun and active way.

Keywords

Solar system, Outdoor learning, Celestial bodies, Astronomy

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Overview

Subjects	Natural Sciences, Technology, Engineering, Mathematics, Art, and Interdisciplinary Learning.
Topics	Solar system, planets, sun, comet, orbits, natural sciences.
Age of Pupils	3-8 years
Indicative preparation time	30 minutes
Indicative game time	30–60 minutes
Materials	Role cards (see Annex 1) 22 Velcro balls or equivalent Customized Velcro t-shirts (see Annex 1, optional) Chalk or ropes to mark the orbits Blindfold Appropriate clothing and footwear to move freely Cameras or mobile phones to document the movements or alignments of the planets (optional)
Guiding comments	Before playing this game, it is important to remind pupils that the rules and actions in the games' activities are only a playful representation of how the Solar System works. Explain for example that in real science, the Sun's rays do not "paralyze" the planets, and planets do not try to avoid sunlight. This idea is simply used in the game to make the activity more dynamic and fun. Explain to students that the game is meant to help them understand key scientific concepts, such as: • The structure of the Solar System (Sun, planets, moons, and other celestial bodies) • The concept of orbits and how planets move around the Sun • The difference between rotation and revolution

- The occurrence of eclipses (solar and lunar) and their alignments
- The relative positions and movements of celestial bodies

Before starting the game, teachers should briefly review these ideas so that students can recognize what is scientifically accurate and what is a symbolic or imaginative element of the game. By clarifying this, pupils will better understand that while the game is fun and interactive, it is not meant to be taken literally, but rather as a way to reinforce and visualize real scientific knowledge.

Game Objectives

- **Educational:** Pupils get to understand the structure of the solar system, the position of the planets, the sun and their relationships. They learn more about concepts of natural sciences and basic astronomy, such as orbits, alignments, and other planetary phenomena. They also get to develop observation, counting, and recording skills, integrating basic mathematics in a practical way. This strengthens the connection between theory and physical experience, linking scientific knowledge with movement and dramatization.
- **Playful:** Pupils get to promote teamwork and cooperation through roles and group dynamics. They develop motor coordination, balance, and movement by representing planetary motions. They also stimulate creativity and artistic expression using gestures and dramatization of the planets and the comet. This encourages strategic thinking and decision-making while having fun in an outdoor learning environment.

Game Plan (Step by Step)

Begin by determining a safe outdoor environment for you the game (park, garden, or playground). You can boarder this outdoor learning environment with ropes, chalk, or cones, ensuring there are no dangerous obstacles.

When this is done, review all safety rules to pupils and remind them to respect the game's rules (i.e. no pushing, respect others' space, and move carefully). When pupils agree on the rules begin explaining the game dynamics and the objectives of each role:

- **Sun:** Reaches the planets with its rays (velcro balls), leaving them paralyzed.

- Planets: Avoid the sun's rays and aliens. Each planet must move through its orbit, avoiding being tagged by the sun's rays (velcro balls).
- Comet: Moves between the orbits with the intention of colliding with a planet and leaving it paralyzed.

When this is done explain the different movements that each planet can perform:

- Mercury: Runs
- Venus: Runs sideways
- Earth: Hops on one leg + "moon" ball
- Mars: Jumps like a frog
- Jupiter: Jumps with feet together
- Saturn: Walks with tied shoelaces, without jumping
- Uranus: Crawls
- Neptune: Walks with heels together
- Comet: Moves while being blindfolded

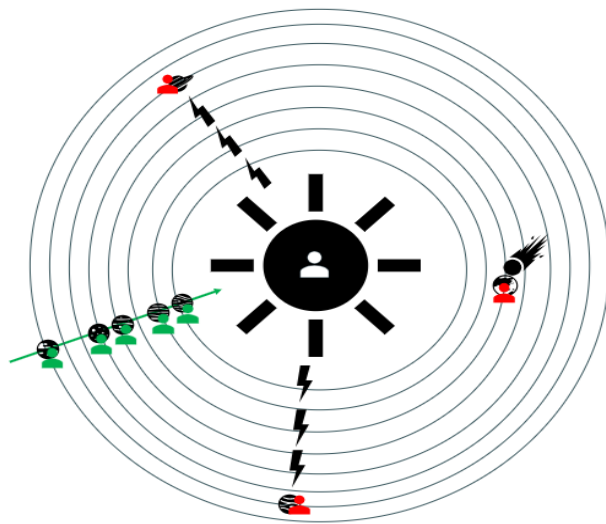
Assign roles based on pupils' interests, skills and needs. You can also choose to distribute different t-shirts and cards, which will remind each pupil of their role and movement that they and other have chosen.

Regarding the planets' movements, explain to pupils that they must move (in the specific way assigned to their planet) but only through their orbit. Each one should be avoiding the sun's rays from sticking to them. When a planet player is hit by a ray, they must remain still and therefore are out of the game. There are also some extra possible effects:

- **Solar Eclipse:** Alignment Sun–Moon–Earth. If Earth has been paralyzed after being hit by a Sun ray, the player representing Earth can attempt to free themselves using an extra ball called the "Moon." To do so, they must throw the Moon ball at the Sun, simulating that the Moon is blocking the solar rays. If the ball successfully hits the Sun, the block is considered neutralized, and Earth is allowed to move again along its orbit.

Then game begins when each player takes their initial position in their orbit according to their role and it ends:

1. If 5 planet players manage to align themselves while safe from the sun's rays, the planet players win the game. You can look at Figure 1 which illustrates this situation in a visual way.



GAME OVER OUTSTEAM

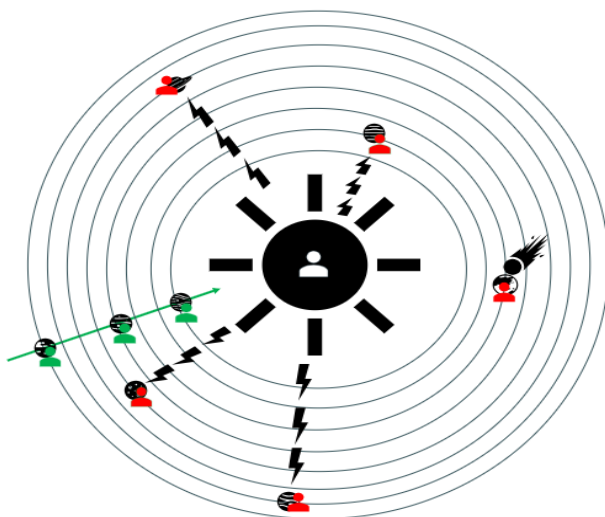
- When 5 planet players manage to align themselves while being safe from the sun's rays, the planet players win the game.

Aligned player

Paralyzed player

Figure 1. Visual representation of a scenario when 5 planets win the game by managing to align themselves without getting hit by Sun's rays. Created by AIJU colleagues. Reproduced with permission and explicit approval from the authors.

2. If the Sun player and the Comet player manage to paralyze 5 planet players, they win the game. You can look at Figure 2 which illustrates this situation in a visual way.



GAME OVER OUTSTEAM

- If the Sun player and the Comet player manage to paralyze 5 planet players, they win the game.

Aligned player

Paralyzed player

Figure 2. Visual representation of a scenario when the Comet or the Sun player manage to win the game by paralysing 5 planet players. Created by AIJU colleagues. Reproduced with permission and explicit approval from the authors.

At the end of the game, a brief group reflection can be carried out in which children are asked how they felt during the activity, whether they enjoyed the game, what aspects could be improved, and, above all, what they learned about the solar system, the planets, and their

orbits. This reflection helps consolidate learning, foster the expression of emotions and opinions, and connect the playful experience with the scientific concepts addressed.

Variants and Adaptations

- For children with motor difficulties, allow reduced movements or simulations from their spot instead of long displacements.
- Use pictograms or colours to identify planets if there are reading difficulties.
- For older children, more complex challenges can be introduced.
- For younger children, the number of planets and comets can be reduced to simplify the activity, or some movements can be changed.
- The game can be made more cooperative to achieve common goals, such as keeping all planets in orbit for a certain amount of time.
- Quick astronomy question rounds can be added after completing an orbit to reinforce learning and connect movements with real phenomena (gravity, orbital speed)

Didactic Keys for Teachers and Families

BEFORE THE ACTIVITY

- **Enhance pupils' understanding:** Before playing this game, remind pupils that its rules and actions are a playful representation of how the Solar System works (i.e the Sun's rays do not "paralyze" the planets, and planets do not avoid sunlight). These elements are included only to make the game more dynamic and enjoyable. Emphasize that the activity is not a science lesson itself but a fun way to explore ideas such as planetary movement, orbits, and eclipses.
- **Preparation:** Prepare the space and materials in advance. Set up a safe outdoor perimeter and create orbits with chalk, ropes, or cones.
- **Review the basic rules of collaboration:** Remind pupils of safety rules and respect for the environment and others.
- **Ensure that pupils know a few things about the solar system and planets positions:** Before playing the game spend some time talking about the solar system and answer a few of pupils' questions. This game itself will then motivate them further by sparking curiosity about this topic.

DURING THE ACTIVITY

- **Teach problem-solving skills:** If a player has difficulties understanding the game or following the rules, help them as needed and encourage them to think and propose creative solutions.

- **Encourage pupils while playing:** Promote active communication and joint decision-making.

AFTER THE ACTIVITY

- **Reflection:** Ask children how they felt during the game, whether they enjoyed the activity, and which parts they found most fun.
- **Provide prompts when needed:** Pose reflective questions to check if they learned new concepts about the solar system, planetary orbits, and phenomena such as alignments and eclipses.

Assessment

ONGOING AND FORMATIVE ASSESSMENT:

- Observe each child's participation during the activity and monitor any difficulty that may occur.
- Evaluate motor coordination, balance, and body expression in relation to the assigned roles (planets, comet, sun).

ASSESSMENT OF TEAMWORK AND SOCIAL SKILLS:

- Analyse how pupils collaborate, communicate, and solve problems as a group to achieve the game's objectives.
- Observe joint decision-making, leadership, and peer support.

POST-ACTIVITY REFLECTION:

Ask guided questions to help children express what they have learned:

- "Which planets do you know now and how they move around the sun?"
- "What did you learn about orbits and alignments?"
- "Which strategy worked best for your team and why?"

Comments for Teachers

- It is recommended to play in a large, safe, and supervised space.
- Ideally this game can be used as a complementary activity for Natural Sciences, Astronomy, and STEAM, integrating solar system and orbit concepts in a playful way.
- Encourage teamwork, cooperation, and communication among pupils, as well as problem-solving and group decision-making.

- After the game's completion, you can complement pupils' learning with follow-up activities such as drawings, murals, or solar system representations. This will reinforce pupils' learning and make connections with creativity.

About OUTSTE(A)M

[OUTSTE\(A\)M](#) is a project funded by the European Union's (EU) Erasmus+ programme under the Grant Agreement (101133868), running from 1 January 2024 to 31 December 2026. Coordinated by European Partnership aislb (EUN), a network of 30+ education ministries, OUTSTE(A)M brings together 3 partners to develop a toolkit that will help teachers and educators promote high quality outdoor learning experiences in the field of STE(A)M, as a means of addressing the insufficient attention given to STE(A)M education in early childhood education and care settings (ECEC) as well as in primary schools.

Annexes

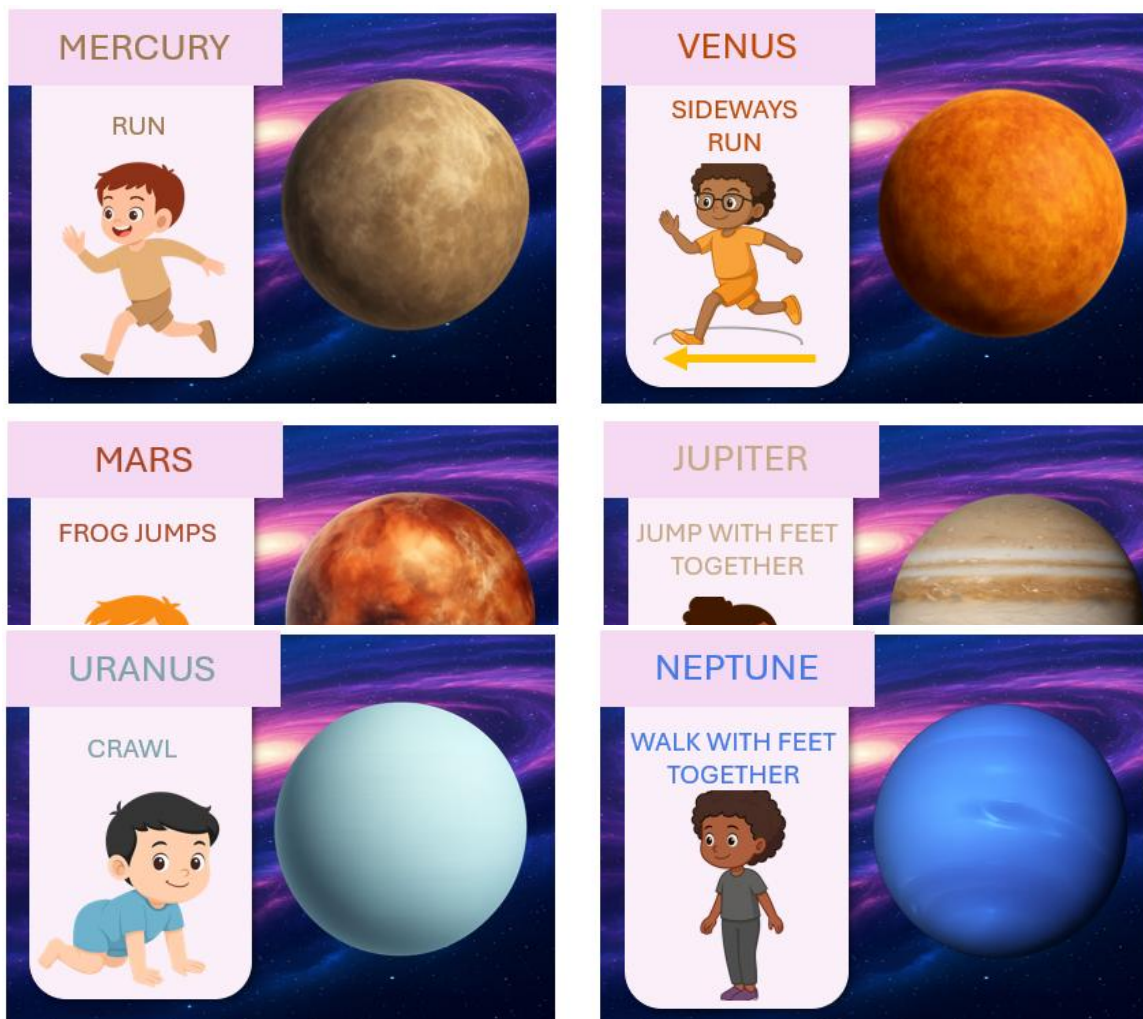
Annex 1. Features of the Solar System game.

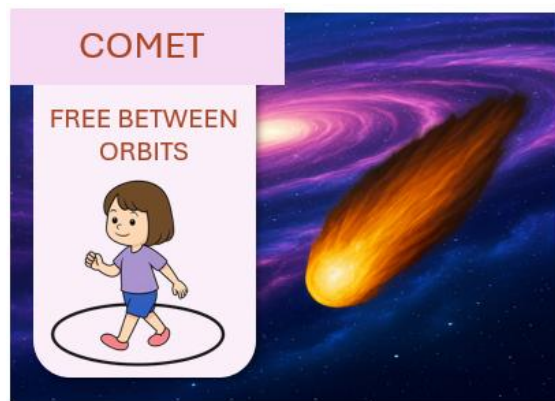
The images, visuals and photographs below highlight various features of the Solar System game and scenes of pupils playing the game.

All photographs were taken by AIJU colleagues. Reproduced with permission and explicit approval from the authors.

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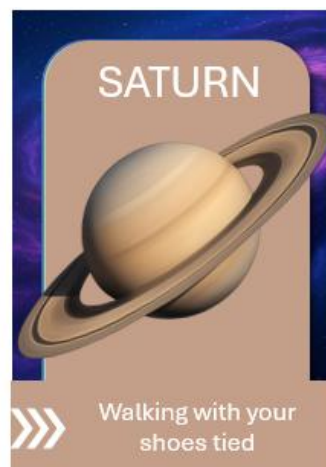
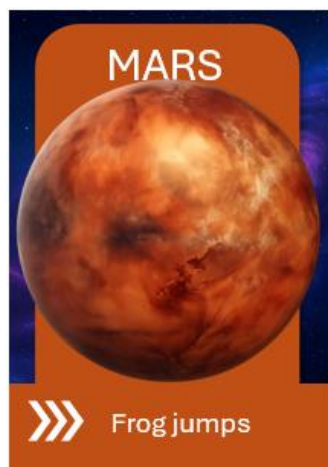
- o Role Cards 3–5 Years.





- o Role Cards 5-8 Years.





- Photos of the Materials.



- Photos of the Activity.

