



Lights, Sounds... and Action!

Stage: First cycle of Primary Education

Educational level: Second level

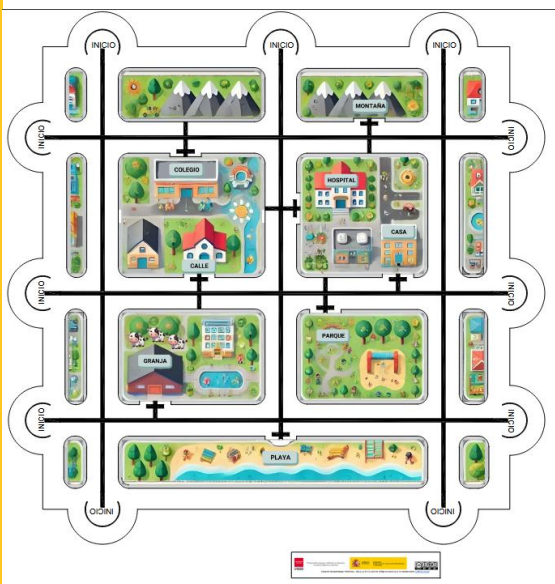
Curricular areas: Natural Sciences

Timing: 3rd Term

Number of lessons: Four lessons



Introduction



"**Lights, Sounds... and Action!**" is a learning situation designed for second-grade students in the first cycle of Primary Education, within the subject area of Natural Sciences. Spanning four sessions, this didactic and engaging proposal invites students to explore physical phenomena such as sound and light through observation, hands-on experimentation, and basic programming using the TRUE TRUE robot. The main goal is to spark

scientific curiosity, foster critical thinking, and encourage creativity by integrating active methodologies such as challenge-based learning, cooperative work, and the use of educational technology. The approach also emphasizes inclusive teaching practices, aligned with the principles of Universal Design for Learning (UDL), to



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accommodate the diverse needs of all learners. Through activities like creating a sound map, narrating auditory stories, simulating light paths with mirrors, and investigating materials based on their transparency, students not only gain scientific knowledge but also develop digital, communication, and social skills in a motivating and meaningful learning environment.



Guidance

The learning situation titled **"Lights, Sounds... and Action!"** is designed for second-grade students in Primary Education, within the subject of Natural Sciences. Over the course of four sessions, it offers a didactic journey that blends scientific exploration with basic programming, using the TRUE TRUE educational robot as a central learning tool.

The primary objective is for students to understand physical phenomena—specifically sound and light—through observation, experimentation, and hands-on manipulation. Beyond acquiring scientific knowledge, students are encouraged to develop critical thinking, creativity, collaboration, and digital competence.

The methodology is grounded in active and participatory approaches, including challenge-based learning, cooperative learning, gamification, and an age-appropriate adaptation of the scientific method. These strategies empower students to take ownership of their learning, solve real-world problems, and work collaboratively toward shared goals.

Each session is carefully structured to address a specific aspect of sound or light, incorporating playful and hands-on activities that enhance content comprehension. From creating a sound map to simulating the path of a light beam reflected in mirrors, all activities are contextualized within the students' everyday environment,



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making learning more relevant and meaningful.

Assessment is conceived as a continuous and formative process. It includes direct observation, self-assessment, peer assessment, and the creation of student-generated products. A variety of tools—such as rubrics, checklists, and learning journals—are used to evaluate both the learning process and outcomes.

Diversity is addressed through the application of Universal Design for Learning (UDL) principles. Tasks, products, and assessment criteria are adapted to meet individual student needs, ensuring an inclusive and equitable learning experience for all.

In summary, this didactic guide presents an innovative and engaging educational proposal aligned with contemporary pedagogical principles. It aims to awaken students' scientific curiosity and promote meaningful learning through action, experimentation, and collaboration.



General Stage Aims

The following are the general objectives for the Primary Education stage, as established in Decree 89/2014 of July 24. Primary Education aims to support the development of students' abilities in the following areas:

- a) To understand and appreciate values and norms of coexistence, act accordingly, and prepare for active citizenship by respecting and defending human rights and embracing the pluralism inherent in a democratic society.
- b) To develop and consolidate habits of discipline, study, and both individual and collaborative work as essential conditions for effective learning and personal growth.
- c) To acquire skills for the prevention and peaceful resolution of conflicts, enabling



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students to function independently in family, school, and social settings.

- d) To recognize, understand, and respect cultural and personal differences, promote equality of rights and opportunities, and reject discrimination, including that based on disability.
- e) To master the Spanish language, appreciate its communicative potential, and develop reading habits as a fundamental tool for learning across subjects.
- f) To gain foundational knowledge in Natural Sciences, Social Sciences, Geography, History, and Culture.
- g) To acquire basic communicative competence in at least one foreign language, enabling them to understand and express simple messages and interact in everyday situations.
- h) To develop basic mathematical skills and begin solving problems involving simple calculations, geometric concepts, and estimations, applying them to real-life contexts.
- i) To begin using information and communication technologies (ICT), developing a critical mindset toward the content they consume and produce.
- j) To explore and use various artistic forms of expression and begin creating visual representations.
- k) To value hygiene and health, accept and respect their own body and others', and use physical activity and sports to promote personal and social development.
- l) To understand and care for animals, especially those closest to humans, and adopt behaviors that support their well-being.
- m) To develop emotional intelligence in all areas of personal and social life, and to adopt attitudes that reject violence, prejudice, and gender stereotypes.
- n) To promote road safety education and respectful behaviors that contribute to the prevention of traffic accidents.

These objectives aim to foster a comprehensive and practical understanding of the natural and social world, equipping students with the knowledge, skills, and attitudes necessary to engage critically and responsibly with their environment.



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Specific Goals

The following are the specific objectives for the area of Natural Sciences in the first cycle of Primary Education, as outlined in Decree 89/2014 of July 24, which establishes the curriculum for the Community of Madrid. These objectives are addressed throughout this learning situation:

Matter and Energy | Technology, Objects, and Machines

1. Observe and describe the characteristics of various materials based on attributes such as color, shape, plasticity, and hardness.
2. Identify everyday machines and devices, explaining their basic functions and uses.
3. Construct a simple device and explain its purpose.
4. Explain how key inventions and discoveries—such as fire, the wheel, or the plow—have transformed human life.

These objectives are designed to help students:

- Understand the physical properties of materials.
- Recognize the role of technology in daily life.
- Develop basic engineering and problem-solving skills.
- Appreciate the historical impact of scientific and technological advances.

Specific Competence	Assessment Criteria	Key Core Subject
1. Use digital devices and resources safely, responsibly, and efficiently to search for	<ul style="list-style-type: none">• Observe and describe the characteristics of materials based on color, shape, plasticity,	Sound as a Form of Energy <ul style="list-style-type: none">• Sound sources:



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information, communicate, collaborate individually or in teams, and create digital content suited to the educational context.

2. Pose and respond to simple scientific questions related to Natural Sciences using various techniques, tools, and models of scientific thinking to interpret and explain phenomena in the natural, social, and cultural environment.
3. Conduct guided school-based investigations using an adapted scientific method to observe, experiment, record, and clearly communicate results.
4. Identify and appreciate the importance of certain inventions, machines, and technologies in daily life, explaining their basic functions and

hardness, etc.

- Identify and explain the function and operation of everyday machines and devices (including the use of technological tools such as the TRUE TRUE robot).
- Explain the impact of key inventions and discoveries (e.g., fire, the wheel) on human life.
- Identify the basic characteristics of sound and how it propagates (intensity, transmission through air, water, solids).
- Conduct simple experiments to observe how sound is produced and transmitted (applying an adapted scientific method).
- Describe and communicate observations using basic scientific vocabulary.
- Understand how light travels and interacts with different materials (reflection, transparency, opacity, straight-line

natural and artificial.

- Vibrations and sound propagation.
- Mediums of transmission: air, water, and solids.
- Musical instruments and everyday objects that produce sound.

Light and Its Properties

- Light travels in straight lines.
- Reflection of light using mirrors.
- Classification of materials based on transparency:
 - Opaque
 - Translucent
 - Transparent

Technology, Objects, and Machines

- Identification and use of everyday machines and devices (including the TRUE TRUE robot).
- Construction and basic programming of a simple device.
- The usefulness of inventions and



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<p>usefulness.</p> <p>5. Recognize and classify materials and objects in the environment based on observable properties, explaining their use and behavior in relation to physical phenomena such as light and sound.</p> <p>6. Participate in cooperative science-related activities, demonstrating respect, active listening, responsibility, and teamwork.</p>	<p>propagation).</p>	<p>discoveries in daily life.</p> <p>Digital Competence and Computational Thinking</p> <ul style="list-style-type: none">• Use of the TRUE TRUE robot for basic programming tasks.• Associating sounds with actions and movement paths.• Solving challenges through sequential programming. <p>Adapted Scientific Method</p> <ul style="list-style-type: none">• Observation, question formulation, and simple experimentation.• Recording results and communicating conclusions.• Use of basic scientific vocabulary.
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Methodology

To develop this learning situation, a variety of methodologies have been selected with the aim of creating an effective and dynamic learning environment. These methods have been chosen according to the degree to which they encourage students to learn in a meaningful way.

The different methodological approaches to be implemented should be:

- **Learning by doing:** based on constructivist principles, this approach allows students to learn by creating digital artifacts. Through hands-on project work, they develop practical skills and deepen their understanding of theoretical concepts.
- **Challenge-Based Learning (CBL):** students are presented with real-world challenges that require them to apply their knowledge to produce a final product. This method enhances creativity, critical thinking, and problem-solving skills.
- **Peer Learning:** students are grouped heterogeneously to support one another in completing tasks. This fosters collaboration and allows students to learn from each other's strengths.
- **Cooperative Learning:** students work in small, diverse teams with assigned roles. This method promotes:
 - Shared responsibility
 - Respectful communication
 - Positive interdependence
 - Development of social and collaborative skills
- **Project Based Learning:** students engage in long-term projects that integrate multiple subject areas. This approach encourages deep exploration, research, planning, and execution skills.



Grouping

This learning situation demonstrates different types of grouping in activities:

1. **Small Groups:** Groups of 3 to 6 students work together on specific tasks or projects. This format encourages communication, cooperation, and the



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development of social skills.

2. **Whole-Class Group:** The entire class participates in shared activities such as discussions or collective reflections. This promotes critical thinking and inclusive participation.
3. **Cooperative Groups:** Students work in structured teams with assigned roles to complete a task. This method fosters shared responsibility, teamwork, and mutual support.



Space

In this learning situation the following rooms are used:

1. **Classroom:** Equipped with an interactive whiteboard, this is the primary space for instruction and group activities.
2. **Future Classroom** (if available): A flexible, technology-enhanced learning environment that supports innovation and collaboration.



Resources

Human	Material	Digital
<p>Teachers: Guide and facilitate the learning process.</p> <p>Students: Collaborate and learn together through shared activities.</p> <p>Families: Support and motivate learning from home.</p>	<p>Didactic materials: Educational games, maps, mats, etc.</p> <p>Office supplies: Pencils, pens, markers, paper, scissors.</p>	<p>Devices and tools: Projector, interactive whiteboard, TRUE TRUE robot.</p> <p>Digital platforms: Online resources such as Bamboozle.</p>



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Assessment

In order to evaluate the learning situation appropriately, there are established procedures, assessment activities and tools that accurately reflect the stated objectives and competences. The evaluation not only allows to measure the level of development and achievement of the students, but also provides valuable information to adapt and improve the teaching process. These aspects are described in detail below:

Procedures	Assessment activities/ products	Assessment Tools
<p>Direct observation of student performance during activities.</p> <p>Oral exchanges in debates, assemblies, and group discussions.</p> <p>Student-created products (e.g., drawings, programs, etc).</p> <p>Self-assessment using tools such as target charts, traffic lights, or learning journals.</p> <p>Peer assessment during group activities.</p> <p>Individual written tests at the end of sessions.</p> <p>Ongoing assessment throughout the sessions using rubrics.</p>	<p>Daily participation and group discussions.</p> <p>Programming the TRUE TRUE robot to follow paths based on sounds.</p> <p>Classifying natural and artificial sounds.</p> <p>Creating and narrating stories.</p> <p>Simulating light paths using mirrors and the robot.</p> <p>Drawing light trajectories (reflection).</p> <p>Classifying materials based on transparency.</p> <p>Conducting a "light race" with TRUE TRUE based on material types.</p>	<p>Rubrics (for both teachers and students).</p> <p>Checklists (to observe specific skills).</p> <p>Rating scales (e.g., excellent, satisfactory, needs improvement, insufficient).</p> <p>Self-assessment traffic lights (green, yellow, red).</p> <p>Target charts (for individual reflection).</p> <p>Learning journals (to record learning).</p> <p>Portfolios (to collect evidence of learning progress).</p> <p>Class notebooks (to track activities and reflections).</p>



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Teacher's Assessment

Observable items: the teacher identifies observable items of the activity for active analysis of the classroom dynamics:

- Programme is correctly planned.
- Explains the programme appropriately.
- Use materials correctly and accurately.
- Constructs the model correctly.
- ...

Teacher's Rubric for Assessment ([Download document](#))

	Excellent	Satisfactory	Improvable	Need to improve
Understanding of the Phenomenon	Demonstrate s a complete and accurate understanding of the phenomenon.	Understands the phenomenon with minor inaccuracies.	Shows partial understanding of the phenomenon.	Does not demonstrate understanding of the phenomenon.
Use of Scientific Vocabulary	Uses scientific vocabulary correctly and precisely.	Uses scientific vocabulary with some inaccuracies.	Uses scientific vocabulary in a limited way.	Does not use scientific vocabulary.
Teamwork	Actively participates and collaborates	Participates and collaborates with some	Participates minimally in team	Does not participate or collaborate with the



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	effectively with the team.	difficulties.	activities.	team.
TRUE TRUE Robot Programming	Programs the robot independently and correctly.	Programs the robot with occasional support.	Requires continuous assistance to program the robot.	Does not complete the programming task.
Presentation of Work	Presents work clearly, neatly, and creatively.	Presents work clearly and neatly.	Presents work in a disorganized or unclear manner.	Does not present the work or does so inadequately.



Student's Assessment

Individual Test: [\(Download document\)](#)

At the end of the activity, it is proposed that the students are asked to develop a test to check the level of knowledge acquired when carrying out the activity.

Peer evaluation: [\(Download document\)](#)



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Activities

Number of lesson	1. The Sound Map
Timing	Third term
Type of activity	Group work
Description	<p>Objective: The goal of this activity is to identify different environmental sounds and program the TRUE TRUE robot to navigate a “sound map.” In this activity, TRUE TRUE becomes a sound explorer, allowing students to associate specific environments with characteristic sounds while practicing sequential programming and teamwork.</p> <p>Examples of Sound-Environment Associations:</p> <ol style="list-style-type: none"> 1.- Street – Car horn 2.- Park – Birdsong 3.- School – School bell 4.- Home – Laughter, ticking clock 5.- Hospital – Ambulance siren 6.- Farm – Cow mooing 7.- Beach – Sound of ocean waves 8.- Mountain – Echo <p>Initial Activity: Students listen to various sounds and are asked where they are most commonly heard. Sounds are grouped into natural (wind, rain, birdsong) and artificial (horns, sirens, music, school bell), using images or flashcards.</p>



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	<p>Development:</p> <ul style="list-style-type: none"> • Students place each sound card on the corresponding location on the mat. • The teacher introduces the TRUE TRUE robot, its sensors and actuators and demonstrates how to move it to a specific location that is associated with a certain sound. • Students then listen to a sound and program TRUE TRUE to reach the correct location.
<p>Resources</p>	<ul style="list-style-type: none"> • Printable cards with images of sound sources (birds, horns, sirens, laughter, bells, music, etc.) and environments (street, park, school, home, countryside). • Audio recordings of environmental sounds. • Floor mat.

<p>Number of lesson</p>	<p>2. Sound Story</p>
<p>Timing</p>	<p>Third term</p>
<p>Type of activity</p>	<p>Group work</p>
<p>Description</p>	<p>Objective: To relate different types of sounds to movement sequences of the TRUE TRUE robot. This activity allows students to explore sound and its characteristics while developing auditory perception, computational thinking, and creativity in a fun and meaningful way.</p> <p>Robot Programming: Students program TRUE TRUE to follow a path based on a sound story narrated by the teacher (an example is provided in the materials).</p> <p>Initial Activity: Students listen to various sounds and classify them as loud or soft.</p>



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	<p>Development:</p> <ul style="list-style-type: none"> • The teacher tells a story that includes different locations and sounds from the mat. • Students draw the path of the story on the mat using erasable markers. • In groups, students program TRUE TRUE to follow the path described in the story. • Team roles can be assigned as follows: <ul style="list-style-type: none"> • Two guides draw the path. • Two planners select the cards for the robot's route. • One programmer inserts the cards into the robot. <p>Extension Activity: In groups, students create their own sound story and corresponding path for the robot.</p>
<p>Resources</p>	<ul style="list-style-type: none"> • TRUE TRUE robot • Location map mat (having multiple mats makes group work easier) • Various sound recordings • Cards with symbols representing different sound types (e.g.: birds, siren...).

<p>Number of lesson</p>	<p>3. Mission – Mirrors and Reflection</p>
<p>Timing</p>	<p>Third term</p>
<p>Type of activity</p>	<p>Group work</p>
<p>Description</p>	<p>Objective: To explore how light travels and what happens when it encounters an object (in this case, a mirror) and to program the TRUE TRUE robot to simulate the path of a light beam.</p> <p>Initial Activity: The teacher demonstrates how a mirror changes the direction of a laser pointer beam.</p>



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	<p>Development:</p> <ul style="list-style-type: none"> • Students experiment with a laser pointer (preferably) or a flashlight and a mirror to observe how light travels and how its path changes upon reflection. • In groups, students place small mirrors on the floor over an A3 sheet and draw the path followed by the light beam. • They trace the path with a thick black marker. Optionally, they can outline the sides of the black line with another color to trigger LED color changes in the robot. • Students program TRUE TRUE to follow the path that a reflected light beam would take, using the line-following card. • Challenge: The robot must reach a target point (a “source of energy”) using the fewest possible reflections.
<p>Resources</p>	<ul style="list-style-type: none"> • TRUE TRUE robot • Location map mat (having multiple mats makes group work easier) • Various sound recordings • Cards with symbols representing different sound types (e.g.: birds, siren...).

<p>Number of lesson</p>	<p>4. The Path of Light</p>
<p>Timing</p>	<p>Third term</p>
<p>Type of activity</p>	<p>Group work</p>
<p>Description</p>	<p>Objective: To understand how light travels in a straight line and how different materials can either block or allow light to pass through.</p> <p>Initial Activity: Students are shown a variety of materials (opaque, translucent, and transparent) and classify them accordingly.</p>



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Development:

- Each student team uses a “light race” mat (printed on A3 paper) and advances based on the materials shown by the teacher as follows:
 - Transparent materials: TRUE TRUE moves forward two steps (light passes through easily).
 - Translucent materials: TRUE TRUE moves forward one step.
 - Opaque materials: TRUE TRUE does not move (light is blocked).
- The teacher checks for understanding by observing whether all teams reach the finish line at the same time.

Extension Activity:

- Teams start from the “start” square on the light race mat.
- Each team chooses a number from 1 to 20 on Bamboozle:
 - If the object shown is opaque, TRUE TRUE stays in place.
 - If it is transparent, it moves forward two steps.
 - If it is translucent, it moves forward one step.
- The winning team is the one whose TRUE TRUE reaches the finish line first.
- **Challenge:** TRUE TRUE must complete the course by following paths where light can pass through. Students can rearrange obstacles and observe which routes become blocked.

Resources

- Flashlight
- Black cardboard (to block light)
- White cardboard
- Cardboard with cut-out “windows”
- Translucent and opaque objects (e.g., tracing paper, plastic, cardboard)
- [A3 “light race” mat](#) (4 lanes)
- [A3 “light race” mat](#) (5 lanes)
- TRUE TRUE robot



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Cater for diversity

As a teacher committed to the inclusion and success of all students, it is essential to adapt the tasks and activities to face the diversity of the class. Following the principles of **Universal Design for Learning (UDL)**, flexible and personalised strategies are implemented to individual needs of each student.

Next, guidelines and measures are detailed to be applied to promote an inclusive and effective learning environment are detailed below:

- **Classroom Arrangement and Grouping:** students who require additional support are seated near the teacher to receive extra guidance and students who thrive in collaborative settings are grouped at shared tables to encourage cooperation.
- **Task Product Options:** students may choose the format in which to present their work: a written document, a digital presentation, or a poster. This allows each student to work in the format that best suits their abilities and preferences.
- **Adaptation of Rubrics:** evaluation rubrics are modified to include specific criteria tailored to individual student needs.
- **Flexible Grading Criteria:** the weight of grading criteria is adjusted based on students' abilities. For example, students with difficulties in written expression may be assessed more heavily on oral components.
- **Reinforcement of Core Knowledge:** additional materials and support sessions are provided for students who need to consolidate foundational concepts. These may include educational videos and extra hands-on activities.
- **Adjusted Expectations:** learning expectations are adapted to align with each student's capabilities, ensuring that all learners can engage meaningfully with the content.