



SPACE[☆]
awareness

**JOURNEY
THROUGH THE UNIVERSE:
A PUPPET SHOW**

DIDACTIC COURSE FOR PRIMARY LEVEL

TSOURLIDAKI ELEFThERIA

IOANNA KASAMPA

Curriculum topic:
Universe basics

Category:
Our Wonderful Universe

Keywords:
Solar system, Mercury,
Venus, Earth, Mars, Jupiter,
Saturn, Uranus, Neptune

Age range:
8–10, 10–12, and 12–14
years

Education level:
Primary

Language:
English

Students' prior knowledge:
The names of the planets

Didactical hours:
11 didactical hours

Orientation-
Conceptualisation: 1 did.
hour

Investigation: 6 did. hours

Conclusion: 2 did. hours

Discussion: 2 did. hours

BRIEF DESCRIPTION

Students stage a puppet show called A journey through the Universe to present to the public the wonders of the Universe as well as the importance of collaboration.

EDUCATIONAL OBJECTIVES

- Cognitive Objectives (Types of Knowledge): Factual, Conceptual, Procedural, Meta-cognitive
 - Cognitive Objectives (Processes): To think critically and creatively
 - Affective Objectives: To form and follow a system of values
 - Psychomotor Objectives: To adapt and perform creatively
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STEPS

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ORIENTATION

Show your students a video like the following:

https://www.youtube.com/watch?v=Ufl_Nwbl8xs (Length, 6.30 minutes), and as they watch, initiate a discussion.

“Wouldn’t it be amazing to be able to travel around our Universe?

Can you imagine all the wonderful things that we would see?

If you could pick any celestial object to have a closer look at, which would it be?”

Try to spark students’ interest in informing younger students about the wonders of our Universe.

“Wouldn’t it be great if we could introduce all these amazing objects to younger students who don’t know about them yet?

How do you think you can introduce our wonderful Universe to young pupils?”

Guide your students towards the idea of creating a theatrical play, a shadow theatre show, or a puppet show. The idea is to create a multifaceted project that not only involves communication of information about the Universe but also promotes collaboration and teamwork.

EXTRA GUIDELINES

Use of ICT tools

Students often do not like long talks. Try to be as creative as possible and include exciting materials in your initial presentation so you can provoke their curiosity. For your initial presentation, you can use

- Online videos (YouTube, TED, Teacher Tube)
- Images and interactive images (Picasa or Flickr)

Try searching online for videos and images. You may also wish to create your own images in order to make a more personalised presentation.

Tips for a diverse classroom

- Invite all students to contribute to class discussions even if they don’t know the right answers. Ask them what points they found confusing.
- Invite them to speak. The sense that they are welcome to speak without being put on the spot can be a strong inducement to participate.
- Give students time to answer and be sure to pay as much attention to the hesitant ones as to others.

Main skills involved

- Active listening – Paying complete attention to the teacher while he/she is presenting the problem statement and aphorism and to other students' ideas about how to solve the problem. -
- Speaking – Speaking their minds on each problem/aphorism and pointing out key points of the problem that may lead to a solution.

CONCEPTUALISATION

The idea is to create a multifaceted project that not only involves the communication of information about the Universe but also promotes collaboration and teamwork. To this end, try to guide your students towards script ideas that celebrate collaboration. For example, consider scripts where two astronauts of different cultures or a human and an alien go on an adventure in space. Have a look at this video that focusses on different cultures working together <https://youtu.be/nCLGQL5OzN4?t=1h19m9s> (From point 1:19:09 onwards).

The guidelines relate to designing a puppet show for young students. Consider involving the following in your puppet show:

- Information about the Universe (planets, stars, galaxies, nebulas, black holes, and neutron stars)
- Global citizenship
- Art and the Universe

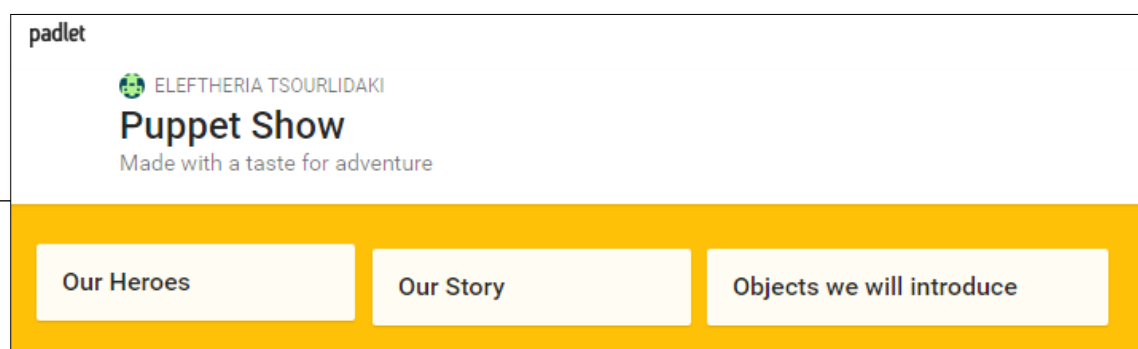
Question

"In order to start designing our puppet show, what are the main parameters we need to decide on?"

In this part, students need to think about the main aspects of the show. In order to start designing their show, they need to make decisions on the following issues:

- The heroes of the story;
- The idea of the story (scenario);
- The celestial objects that will be involved in the show.

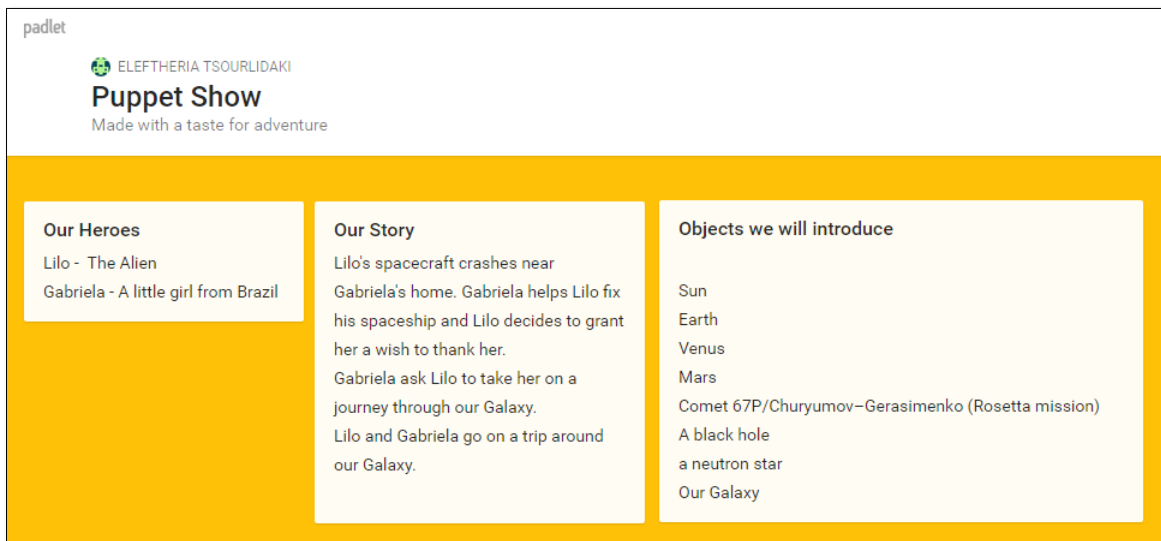
Based on these, the students will later need to decide on the dialogues and the set they will use. At this point, you can create a Padlet entry in order to organise the activities of your class.

A screenshot of a Padlet board. At the top left is the 'padlet' logo. Below it is the name 'ELEFThERIA TSOURLIDAKI' with a small globe icon. The main title is 'Puppet Show' in a large, bold font, with the subtitle 'Made with a taste for adventure' below it. At the bottom, there are three yellow buttons with white text: 'Our Heroes', 'Our Story', and 'Objects we will introduce'.

Before finishing this part, ask your students to do a little homework. Ask them to think about whom they would want as the heroes of their puppet show as well as what the story could be. Encourage them to find inspiration in movies and comics.

Hypothesis

Initiate a discussion so students can present their ideas. During this phase, the class has to finalise the story of the puppet show, the heroes, and the objects introduced.



padlet

ELEFThERIA TSOURLIDAKI

Puppet Show
Made with a taste for adventure

Our Heroes	Our Story	Objects we will introduce
Lilo - The Alien Gabriela - A little girl from Brazil	Lilo's spacecraft crashes near Gabriela's home. Gabriela helps Lilo fix his spaceship and Lilo decides to grant her a wish to thank her. Gabriela ask Lilo to take her on a journey through our Galaxy. Lilo and Gabriela go on a trip around our Galaxy.	Sun Earth Venus Mars Comet 67P/Churyumov-Gerasimenko (Rosetta mission) A black hole a neutron star Our Galaxy

Heroes

Encourage your students to pick heroes from different cultural backgrounds so as to promote the idea of global citizenship and collaboration. Make sure that not all heroes are of the same gender. In addition, as this is going to be a puppet show for students, it would be fun to add some fictional features to it, like superpowers. At a later stage, you can use any superpowers the students mention to discuss physical phenomena and check for misconceptions.

“Who are going to be the heroes of our story?
What do they look like?
Where do they come from? Do they speak the same language?
Do they have any superpowers?”

Story

Guide your students to create an engaging and appealing story. Unexpected turns of events, funny lines, and interactions with the audience are always nice features.

“What is our story going to be?”

Are our heroes going to journey into the Universe?
Does something unexpected happen to them? How do they deal with it?
How about we give a little role to the audience as well?"

Objects introduced

Try to include in your story as many celestial objects as possible. You can use the images from the *Images* folder as inspiration for the students.

"Which celestial objects do we want to include in our puppet show?"

EXTRA GUIDELINES

Use of ICT tools

In this part of the activity, you can use the Padlet (<http://padlet.com/>) tool as an online blackboard to write down the parameters the students suggested or a drawing programme such as Paint. You can also use a projector and type the ideas the students mention or to show their drawings.

- <https://youtu.be/nCLGQL5OzN4?t=1h19m9s>

Inspiration for students on deciding the story and heroes of the puppet show.

- http://www.esa.int/SPECIALS/Kids_Comic/
- <http://www.esa.int/esaKIDSen/index.html>

Tips for a diverse classroom

- Encourage everyone to express views and concerns. If you wish to check if some concepts are clear to some students, direct your question to the entire class and not just those to whom you think the question applies.
- Including the idea of an alien helping out the astronaut and the two of them becoming friends could be a nice way of showing how people from different cultures can be friends and collaborate.

Main skills involved

- Critical thinking - Using logic and reasoning to identify the concepts involved, provide preliminary explanations and hypotheses, and map approaches to problems.
- Use of science – Referring to previous knowledge and scientific rules related to the subject.
- Systems evaluation - Identifying the variables involved in the problem and the relationships between them so as to make a rational hypothesis.

INVESTIGATION

Exploration

Once the story, heroes, and objects are finalised, it is time to think about how to build the show. In the exploration phase, students brainstorm and explore ways of presenting their puppet show. Students will have to think about

- what puppets they want to use (maybe they want to make their own)
- the set of the puppet show
- the materials they will have to use for the puppets and set
- music and other miscellaneous things

You can choose to divide the class into groups either at this point or at a later stage. Either way, make sure all students are involved in searching for information about the objects. When assigning roles, make sure they are in accordance with the character of each student.

“Let’s learn a few things about the objects we have to investigate. Go online and search for the basic characteristics of your objects.

What information would you choose to include in your play? Which pieces of information are most useful for our play?

How would you like to present them in your play?

How could this object interact with your main character?”

Students are going to need a lot of guidance here in order to choose the correct information and filter to find out which is the most important to their play. Consider what is really important for students to learn and guide them in that direction. Remember to avoid the trap of sticking to the basics (size, distance, age, etc.) and focus on what is really exciting and worth remembering and mentioning. For example, explore how important the Sun is to Earth, the fact that we are all made of stardust, and the extreme phenomena that occur in a black hole.

In order to make your play appealing, encourage students to use comparisons and symbolism. In additions, students can make use of different materials and tools that stimulate the senses (textures, colours, and music). For example, in order to build the Sun for their set, they can use bubble wrap to show that the Sun’s surface is very hot (to mimic boiling) and paint it yellow, orange, and red. Make sure that the sets or scenario is not creating any misconceptions. For example, there can’t really be an alien in our Solar System,

right? For any imaginary elements you introduce in the play, it needs to be made clear that they are fictional (a narrator could be useful for this).

Ensuring the correct scales of objects is one point that may need special attention. If it is difficult to make the objects in the right scale, you can make them all in the same size and make sure you mention this before, during, or after the play.

Students need to interact with each other while they are working on the research and share ideas in order to come to final results. Make sure that all students are involved in the search for information and that they speak their minds. By the end of this part, students need to have finished their research on the objects they will present. They also need to have finalised the brainstorming on how to build their set, puppets, and scenario based on the information they have collected.

Puppets

Lilo is Green

Gabriela has long black hair

Materials

For Puppets

- felt
- ribbons
- buttons
- glue
- sewing materials

For the set

- colorful papers
- glue
- glitter
- acrylic paints
- paint brushes

Other stuff

- Music
- Lights
- Flyers

Roles

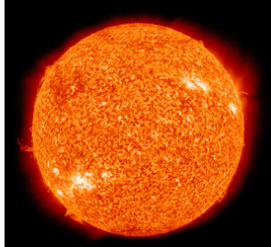
Lilo: Andrew
 Gabriela: Jenny
 Narrator: Alice and Jakob
 Set coordinator: Anna
 Music: Jared

Teams

Team1: Dialogs
 Team2: Making the puppets
 Team3: Sun-Earth- Venus
 Team4: Mars-Comet-Black hole
 Team5: Neutron star - Our Galaxy - Galaxy in a Jar

Sun

- Diameter 109 times that of Earth
- Super hot!



- Use bubble wrap for texture
- Orange string for loops
- COLOURS: red, yellow and orange.

EXTRA GUIDELINES

Use of ICT tools

Building puppets

- <http://www.wikihow.com/Make-Puppets>
- <http://www.kidspot.com.au/things-to-do/activities/activity-ideas-and-printables/5-fun-puppets-to-make>

DIY Galaxy and Nebulas in a jar

- <https://www.youtube.com/watch?v=-cK0ymM5azE>
- <https://www.youtube.com/watch?v=0WwtI-zeW3Q>
- <http://www.momdot.com/diy-nebula-jar-instructions/>

Comets

- <http://www.kiwicrate.com/projects/Foil-plus-Ribbon-equals-Comet/502>

Constellations

- <http://www.nanowerk.com/news2/space/newsid=33670.php>

Galaxies

- <https://www.esa.int/esaKIDSen/Starsandgalaxies.html>
- <http://www.space.com/15947-milky-andromeda-galaxies-collision-simulated-video.html>

Moon

- <http://www.schoolobservatory.org.uk/activ/moonsaic>
- <http://www.space-awareness.org/en/activities/1408/meet-our-neighbours-moon/>

Sun

- <http://www.space-awareness.org/en/activities/1308/meet-our-neighbours-sun/>

Nebulas

- <http://www.space.com/8059-truth-photos-hubble-space-telescope-sees.html>

Planets

- http://www.iceagenow.com/Solar_System_Relative_Size.htm
- <https://www.esa.int/esaKIDSen/Planetsandmoons.html>

Stars

- <https://lcoqt.net/education/starinabox/>
- <http://www.mrsgeology.com/hertzprung-russell-diagram/>

Simulation for motion in our Solar System

- <http://earthexplorer.usgs.gov/>
- <https://www.google.com/earth/>
- <http://soho.nascom.nasa.gov/gallery/>
- <http://sciencenetlinks.com/interactives/messenger/psc/PlanetSize.html>
- <http://www.solarsystemscope.com/>

Wiggio to organise their research

Dropbox or Google Docs (for storing their investigation sheets)

Movie maker, in case they want to present a small video

- <http://windows.microsoft.com/el-gr/windows/movie-maker/>

Dramatic music app. Provides different sounds for plays.

- <https://itunes.apple.com/us/app/dramatic-music-app/id417696249?mt=8&ign-mpt=uo%3D8>

Tips for a diverse classroom

- Develop a positive atmosphere in the classroom that promotes excellence. Encourage your students (as a group or individually) to consult you if they have problems during their inquiry. This is also an indirect way to get to know your students and thus tackle assumptions you might have about their learning behaviours and capacities based on their gender or cultural background.
- Encourage teams to communicate and have all of them up-to-date about what others are doing.
- Have high expectations from all your students. Keep an eye on teams and make sure you spot cases in which a student underperforms.
- Encourage the formation of heterogeneous groups across certain characteristics such as gender, race, and level of achievement. You may choose to assign students randomly or ask them to form their own groups.
- Pay attention to the length of time students remain in a group, particularly if the group is not working well.
- Make sure the same students do not always put themselves in the position of leadership. Assigning roles (deliberately or randomly) may assist in ensuring that all students get a chance to take on different responsibilities (manipulating equipment, recording results, reporting back, etc.).
- Take care to reduce cases in which a student may feel isolated. Working in pairs can be a solution in such cases.
- Make sure that you give girls as well as boys opportunities to assume leadership.
- Assign all roles to girls as much as you do to boys.
- Create a cooperative instead of a competitive environment within each group and among groups.

Related careers

While doing their research, students can get a very brief idea of how scientists search for existing knowledge on a subject.

To further inspire the students and relate their research to the work of an astronomer, you can print out the tags in the *Students_Tags* file and hand them out to them based on the planet they choose. They can use these tags throughout the activity.

Main skills involved

- Complex problem solving – Understanding the research questions.

- Critical thinking – Using logic and reasoning to understand the investigation plan and its implementation. Proposing modifications if needed and assessing the validity of data received and of the final results of data interpretation.
- Judgment and decision making – Considering possible pathways for recognising errors in the experimentation and data manipulation process. Assessing teammates' proposals and opinions.
- Active listening – Paying full attention to the opinions of teammates.
- Reading and comprehension – Understanding instructions and the relevant theory.
- Monitoring – Assessing self-performance and team performance and taking corrective actions if needed.
- Active learning – Understanding the implementation process and its relation to the problem at hand. Relating information derived from experimentation and data interpretation to knowledge acquired previously and to the problem at hand.
- Time management – Managing experimentation time and not letting the team spend more time than foreseen on the task at hand.
- Systems analysis – Understanding the experimental set-up and how each variable affects the experiment. Manipulating and interpreting the data received. Identifying sources of error and proposing refinements in order to overcome them.
- Coordination – Cooperation within teams, ensuring harmonious and balanced collaboration.
- Social perceptiveness – Being aware of teammates' reactions and understanding why they react as they do.
- Use of science – Using scientific rules and methods effectively to perform experimentation and data interpretation.
- Systems evaluation – Assessing the experimentation process and understanding whether the experiment has been carried out correctly or not. Being able to take the actions needed to improve or correct performance.
- Use of mathematics – Using mathematics to manipulate data and produce final results.
- Quality control analysis – Assessing the results derived as well as the quality of the gathered data. Being able to estimate the sources of error in the experiment.

CONCLUSION

It is now time to take an overall look at the work done so far. Ask your students to do a rehearsal of the puppet show for the entire class. They'll need to review the play and point out any parts they think might need editing. There may be a need to change some things or leave some things out in order for everything to work together. If your students have made any mistakes they failed to notice, make sure you bring them to their attention.

EXTRA GUIDELINES

Use of ICT tools

Tools that could be useful in the conclusion phase are as follows:

- Online collaboration documents for sharing inputs and ideas (Google Docs)
- Shared space (Dropbox)
- Virtual classroom walls (Padlet, Popplet) (for reflecting on the conceptualisation phase)
- Study cards (Studyblue) (for reflecting on the conceptualisation phase)

Tips for a diverse classroom and ensuring gender balance

- Encourage students to include multiple perspectives and consider alternative explanations.
- Don't allow students to be interrupted or intimidated.
- Encourage hesitant students to speak their mind and show them you are especially interested in what they have to say.
- Give students time to draw their conclusions and be sure that you are paying attention to all of them equally.
- Refer to a silent student's work in an affirming way.
- Credit a quiet student by making her or him the expert for a task.
- Ask all students to take turns in forming conclusions.

Main skills involved

- Critical thinking – Assessing the results derived in order to draw the correct conclusion. Considering alternative explanations.
- Active listening – Paying attention to the opinions of classmates and taking into account their proposals.
- Reading and comprehension – Referring to the literature and relevant theory in order to draw conclusions.
- Speaking – Communicating conclusions to teammates based on thoughts and solid arguments.
- Monitoring – Assessing other teammates' arguments and their degree of contribution to the team. Encouraging quiet teammates to participate more.
- Active learning – Paying attention to classmates and combining opinions to draw correct conclusions.
- Writing – Being able to produce a written report of the experimentation process and how the team came to its conclusions based on scientific knowledge and rational arguments.
- Systems analysis – Being able to comment on the overall quality of the experiment and deciding on whether it was successful or not based on the conclusions drawn.
- Social perceptiveness – Being aware of teammates' reactions and understanding why they react as they do. Understanding if all teammates agree with the team's conclusions and if not, then why.
- Use of science – Using scientific rules and prior and new knowledge in order to draw conclusions based on the data gathered and rational arguments.

- Systems evaluation – Being able to draw conclusions on the overall experimental process.

DISCUSSION

Communication

This part of the activity is where the puppet show is presented to the audience. The play can take place in a classroom, at a science festival, or anywhere else the students want.

“How about making some invitations or posters for our show?”

Should we document our play?

How will we know if the audience enjoyed the show?”

Ask your students to brainstorm on how to collect information about the effect their play had on the audience. They can make a small questionnaire or have some members of the team interact with the visitors and ask them their opinion about the play. Photos are always a nice way to keep record of an event. Make sure that the students are aware of their duties on and behind the stage, under your supervision and guidance. When it comes to assessing the impact of the puppet show, ask your students to question the audience members about the scientific knowledge they obtained from the play.

Reflection

Encourage your students to reflect on the experience of organising a puppet show about the wonders of the Universe. Help them to identify barriers and difficulties they faced or things they could have done better. Encourage them to refer, also, to the success factors.

“Did you enjoy making the puppet show?”

What was the most interesting thing you learned?

Do you think your show helped the students in the audience learn about the Universe?”

EXTRA GUIDELINES

Use of ICT tools

- Presentation tools (MS PowerPoint, Open Office Impress, Prezi)
- Movie- and animation-making tools (Windows Movie Maker, Animoto)
- Photo-sharing and editing tools (Picasa, Instagram, Snapchat, Flickr, Photobucket)

Tips for a diverse classroom and ensuring gender balance

- Allow the presentation of multiple opinions and perspectives.
- Use examples from multiple backgrounds and perspectives. The same groups should not always be used for demonstrating positive or negative examples.
- Be sensitive to cultural differences in writing styles, recognising that many standards apply to the evaluation of good writing and presenting.
- Be explicit about what is expected and show examples of good writing done by other students.
- Not all students from a particular group share the same views. Respect the different opinions of students.
- A writing exercise may allow all students to express their thoughts on the discussion topic.
- Be sensitive to the experiences of visibly underrepresented students in your class.

Main skills involved

- Active listening – Paying full attention to classmates and to what other teams are presenting. Taking the time to understand what other teams did. Asking questions on their work and results.
- Reading and comprehension – Being able to understand the written reports of other teams and assess them. Being able to read the relevant theory and reflect on new knowledge.
- Speaking – Being able to communicate the work of the team as well as the results derived using scientific terms properly and scientifically valid arguments.
- Active learning – Paying full attention to classmates, taking the time to understand their point of view and compare different points of view.
- Time management – Being able to prepare the team’s play on time and make it fit in the timeframe allowed for presentation.
- Social perceptiveness - Being aware of teammates’ reactions and understanding why they react as they do while making the final play. Being aware of others teams’ reactions during the play and understanding why they react as they do.



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