

IO2 – Space program for science centers and NGO's

"WANDERING IN THE UNIVERSE" INTERACTIVE PLANETARIUM PRESENTATION

NOESIS - Thessaloniki Science Center and Technology Museum June 2021







1. Introduction

Planetariums are specially-designed theaters with a domed ceiling that is able to project a realistic image of the night sky indoors. They are unique, inspirational places, that immerse visitors in a 2D or 3D environment that evokes realism. The sight of stars appearing in a dark sky, often being lost to light pollution in many areas nowadays, immediately captures attention and evokes awe. Digital planetariums, zooming from Earth to the Moon, other planets, stars, and distant galaxies, enable the visitor to see objects from different perspectives and offer them the opportunity to understand our true place in space.

Planetariums have a long history in supporting the astronomy interest both for the public in general, but also in supporting the education of children and students. Initially used to educate about stars, planets, and constellations, planetariums today are considered as unique immersive facilities often used to support Science, Technology, Engineering, and Mathematics (STEM) learning and to cross learning disciplines into art, culture, and history.

A planetarium visit proved to be a powerful and memorable experience that can encourage learning. Immersion sparks interest and engagement and the whole experience triggers curiosity in ways that normal school classes would difficult achieve. As planetariumsaim not only to educate but also to enlighten, entertain and inspire, they operate in all three realms of learning: in the thought-processing of the cognitive realm; in the psychomotor area as they offer more interactive experiences involving physical action; and in the affective realm, the realm of feelings, as they encourage greater appreciation and enjoyment of the sky and try to cultivate a sense of the adventure of science.When planetarium experience is combined with lessons and activities in classrooms before and after the visit, the effects on student's learning seem to be even greater.

The activity "Wandering in the Universe" developed by NOESIS for the Space program for science centers and other informal organizations (SScP) in the context of FUTURE SPACE EU project. It is an interactive experience, which uses the immersive environment of the planetarium, combined with ICT tools, to offer a unique journey from the Earth to the so far observable Universe.

The activity targets secondary school students and adults and lasts 45 minutes. In PART A, an interactive presentation, through a live quiz motivates visitors to answer questions using their mobile phones and to find the answers via short explanatory immersive dome videos. In PART B, the activity is completed with the projection of an 8min movie that travels visitors from Earth to the edge of the so far observable Universe.

The following paragraph 4.2.2. gives a complete and detailed description of the activity and acts as an implementation guide for those organizations, which would like to adopt and perform the activity on their premises. Its first part, namely the "Activity's profile", is the part that briefly describes the activity (content, aims, setting, time scale) and gives guidelines for those who will run it. The next part presents the "Elements of the Activity" describing in detail the three elements of which the activity is comprised: the interactive presentation, the short full-dome explanatory videos and the 8min movie. The last part, namely "Materials for the Activity" is an index of the digital materials that have to be downloaded and prepared in order for the activity to be implemented.







Resources

-International Planetarium Society Official Statement on the Role of Planetariums in Education, www.ipsplanetarium.org/page/edstatement

- The value of education in the planetarium: a white paper https://www.ips-planetarium.org/page/planetariumeducationvalue

- Manning, J. G. (1995). "The Role of Planetariums in Astronomy Education." An Address to the Education Symposium of the Astronomical Society of the Pacific, June 24, 1995. Retrieved from www.ipsplanetarium.org/page/a manning1995.

- Yu, K.D. (2005). "Digital Fulldomes: The Future of Virtual Astronomy Education." Planetarian 34(3). pp. 6-11.https://cdn.ymaws.com/www.ips-planetarium.org/resource/resmgr/planetarian/v34-3.pdf







2. The Activity

Wandering in the Universe

An interactive planetarium presentation revealing the beauty of the so far observable Universe Developed by NOESIS during the Erasmus+ EU project "Future Space" (2019-2021)







Activity's profile

AT A GLANCE

Title	Wandering in the Universe	
Age Group	Secondary school students/ adult visitors	
Format	Live Interactive presentation inside the dome	
Duration	45- 60 minutes	
N. participants	Depends on seats available	
N. facilitators	1	

OVERVIEW

The observable universe is the spherical region of the universe comprising all matter that can be observed from Earth or its space-based telescopes and exploratory probes at the present time. This is the subjectof the activity takes place inside the planetarium dome.

Visitors, participating in an interactive presentation with their mobile phones are motivated through a live quiz to answer questions and to find out the answers via short explanatory dome videos. A short moviefollowing, travels visitors through an immersive journey from our planet to the edge of the so far observable Universe and back to Earth.

AIMS

- Helps students/visitors experience the awesome scale of the observable Universe.
- Offers students/visitors the chance to acquire knowledge on basic astronomy topics, through the entertaining experience of taking part in an online quiz inside a planetarium dome.

ELEMENTS AND SETTING

The activity comprises of a 2D interactive presentation, six short full-dome explanatory videos and an 8min planetarium movie. It is designed to take place inside a digital planetarium for a group of students/visitors participating with their mobile phones.

However, if all requirements are not met, making small or bigger adjustments, the interactive activity can be implemented inside a properly equipped room, instead of a digital planetarium, using the flat versions of the short explanatory videos. Similarly, the 8min movie can be projected as VR material for VR head-sets, using the VR version of the movie, which is also provided as an alternative choice.







TIME SCALE

- <u>Introduction</u>– 2 min Welcome
- <u>Part A</u>– 30 min Implementation of the interactive presentation (live quiz and short full-domeexplanatory videos).
- <u>Part B</u> 10 min Projection of the 8min planetarium movie.
- <u>Closure</u>– 2mi<u>n</u>

FACILITATION

The activity is presented by a facilitator, who is in constant cooperation with the planetarium operator. The role of the facilitator is to guide the students/visitorsthrough the whole activity, giving information and instructions when needed, keeping the timeline and coordinating the interaction presentation with the quiz.

A good communication between the facilitator and the planetarium operator is required during the whole activity. Especially during PartA, when the interactive presentation, that includes the quiz, appears as 2D projection on the dome, while the short explanatory videos following are projected as digital material on the planetarium dome.

In particular, the facilitator:

- Helps the group of students/visitors to enter planetarium and take their seats.
- Makesashort introduction about what is going to happen, starting with an interactive presentation with a live quiz and ending up with the projection of an 8min movie on the dome.
- Gives instructions and guides students/visitors to connect to the interactive presentation with their mobile phones.
- Starts the interactive presentation and runs the quiz, presenting the questions one by one, summarizing each time the results and moving after each explanatory video to the next question, till the end of the presentation.
- After the end of the presentation, informs students/visitors to relax in their seats and enjoy the short full-dome movie that follows.
- At the very end, thanks students/visitors for their participation and helps the group to leave the room.







Elements of the activity

1. The interactive presentation

The interactive presentation is a "six-stops iconic journey" starting from the Earth, continuing on the Moon, the Solar System, the Sun and the Milky Way and ending up in the whole Universe.

For each one of the stops, a characteristic image and one or two questions have been prepared.

The images are shown in the table below.









The suggested questions of the quiz per each stop, are summarized in the table below.

	Stop	Questions		
1	Earth -	1. How old do you think Earth is?		
		2. What percentage of the Earth's surface is covered by water?		
2	Moon - our natural satellite	 How much do you think is the average distance between the Earth and the Moon? What is the approximate duration between two successive "Full 		
		Moons"?		
3	Solar System - our neighborhood	 Which planet is most likely to be visited by humans in the near future? Mar's atmosphere compared to Earth's atmosphere is 		
4	Sun - our star	 How long does it take for light to reach the Earth from the Sun? What is the energy source of the Sun? 		
5	Milky Way - our galaxy	1. What do you think is at the center of our Galaxy?		
6	Universe - the unknown	1. What is the most accepted cosmological theory for the creation of the Universe?		

The interactive presentation appears as a 2D projection on the planetarium dome and the visitors/studentsconnect via their mobile phones. The questions of the quiz are appearing both on the dome and on the screens of the connected mobiles phones as well.

The questions addressed to the students/visitors, challenge them to give their answers making predictions and estimations, based on their existing knowledge and their critical thinking. Some of them are multiple choice questions, some are open questions. The students/visitors, using their mobile phones, answer the questions and their answers are appearing on the dome, in real time, as part of the presentation.

The quiz is not competitive and its aim is not to find the ones who gave the right answers or the ones who are the faster. That's why the right answer for each questionis not given as an immediate feedback, but through the content of the following corresponded short explanatory video presented on the dome.

The software used to create the interactive presentation, is the free version of the *Mentimeter Interactive* presentation software. However, another similar software could be used to prepare the same or another version of the presentation, with different questions as well.

Table 1 and Table 4, in the last part of the document, summarizes the files of the images used and print screens of the whole presentation.









2. The short full-dome explanatory videos

For each stop/topic of the interactive presentation, a short full-dome explanatory video (0,5 - 2,5min) has been developed.

The Uniview software for digital planetariums was mainly used to create the six videos, but some free fulldome scenes by ESO have been included in the final montage, as well.

During the interactive presentation, the short full-dome videos are projected on the planetarium dome, one by one, after participant's answer to the corresponded questions. The content of each video (visualization and narration) gives interesting information on the topic and of course the answer to the respective questions.

The short explanatory videos are available in flat versions as well. Using the flat versions, the interactive activity can be implemented inside a properly equipped room instead of the dome of a digital planetarium.

Table 2, in the last part of the document, is an index of all the files available.

3. The 8min planetarium movie

An 8min full-dome production with English narrationhas been developed by NOESIS, using the Uniview software for digital planetariums and it is based on the idea of the AMNH production"The Known Universe".

During a journey that compresses almost 14 billion years into 8 minutes and starting from the surface of the Earthwe travel through the solar system and the Milky Way stars to the realm of the galaxies and across to the edge of the observable Universe, and then back to our planet, seeing how the known Universe mapped by astronomical research looks like.

The movie is projected in the planetarium dome, right after the end of the interactive presentation, helping students/visitorsrealize the awesome scale of the known universe and completing the whole experience.

The 8min movie is available in dome version for digital planetariums, and in VR and flat versions as well. Using the VR version, the movie can be projected as VR material in VR head-sets, simulating the immersive experience of a planetarium. The flat version can be used as video material for any flat screen.

Table 3, in the last part of the document, is an index of all the files available.







Materials for the Activity

All the materials that have been developed and are necessary for the adoption and implementation of the activity are summarized in the following tables.

The files are available for downloading from the activity's webpage: <u>https://www.noesis.edu.gr/en/eu-programs/wandering-in-the-universe/</u>.

To gain access to the activity's webpage, follow the next steps:

Step 1: Submit your request sending an email at <u>futurespace@noesis.edu.gr</u>.

As the subject of the email use your organization's name and the activity's name: "Wandering in the Universe". At the body of the email don't forget to introduce a contact person.

After submitting your request, you will receive an approval email with a password to enter the activity's website, where all materials needed to implement the activity are available.

Step 2: Visit the activity's webpage and enter the password.

Step 3: Download the flies.

Table 1. Files for the interactive presentation

	Stop	Image files (jpg)	Print screens (pdf)	
1	Earth	1_EARTH_image	Wandering in the Universe_	
2	Moon	2_MOON_image	presentation_prtscr	
3	Solar System 3_SOLAR SYSTEM_image			
4	Sun 4_SUN_image			
5	Milky Way	5_MILKY WAY_image	_	
6	Universe	6_UNIVERSE_image		

Table 2. Files for the short full-dome explanatory videos

	Stop	Video files - Flat versions (mp4)	Video files -dome versions	Audio files (wav)	Narration (pdf)
1	Earth	1_EARTH_flat version	1_EARTH_dome	1_EARTH_audio_backround	Explanatory
		(1'16'')	version	1_EARTH_audio_mixed	videos_ENG
				1_EARTH_audio_narration	narration
2	Moon	2_MOON_flat version	2_MOON_dome	2_MOON_audio_backround	
		(1'49'')	version	2_MOON_audio_mixed	
				2_MOON_audio_narration	
3	Solar	3_SOLAR	3_SOLAR	3_SOLAR	
	System	SYSTEM_flat version	SYSTEM_dome	SYSTEM_audio_backround	
		(2'31'')	version	3_SOLAR SYSTEM_audio_mixed	
				3_SOLAR SYSTEM_audio_narration	







4	Sun	4_SUN_flat version	4_SUN_dome 4_SUN_audio_backround		
		(0'50'')	version	4_SUN_audio_mixed	
				4_SUN_audio_narration	
5	Milky Way	5_MILKY WAY_flat	5_MILKY	5_MILKY WAY _audio_backround	
		version	WAY_dome version	5_MILKY WAY _audio_mixed	
		(2'20'')		5_MILKY WAY _audio_narration	
6	Universe	6_UNIVERSE_flat	6_UNIVERSE_dome	6_UNIVERSE_audio_backround	
		version	version	6_UNIVERSE_audio_mixed	
		(1'41'')		6_UNIVERSE_audio_narration	

Table 3. Files for the short planetarium movie

	Video files - Flat version (mp4)	Video files - dome version	Video files - VR version (mp4)	Audio files (wav)	Narration file (pdf)
Shot planetarium movie	PLANETARIUM MOVIE_flat version	PLANETARIUM MOVIE_dome version	PLANETARIUM MOVIE_VR version	PLANETARIUM MOVIE_audio _backround PLANETARIUM MOVIE_audio _mixed PLANETARIUM MOVIE_audio _narration	PLANETARIUM MOVIE_ENG narration





Table 4. Print screens of the interactive presentation (mentimeter software)













