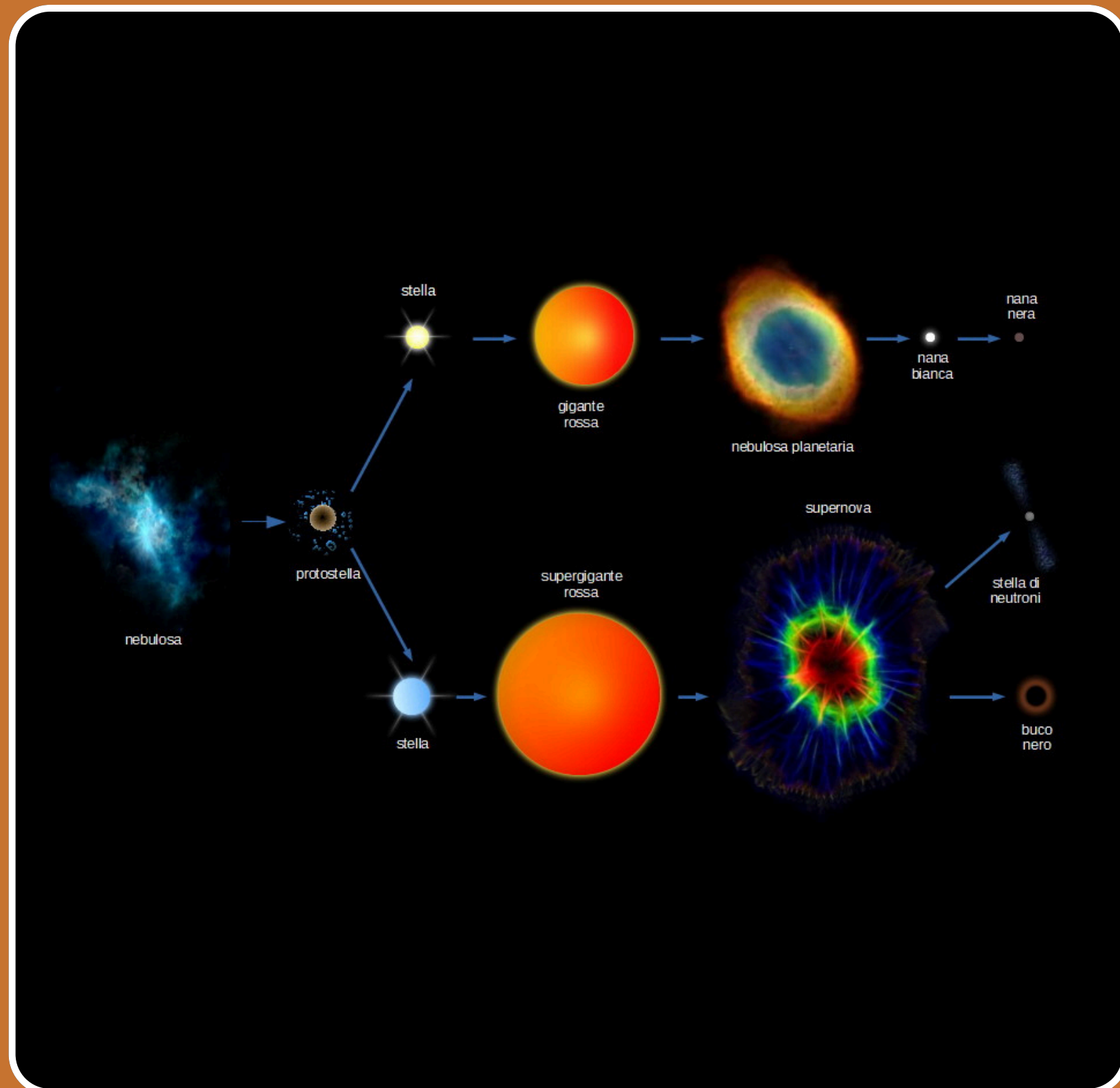


# ASTRO-TAMAGOTCHI, LIGHT-UP A VIRTUAL STAR

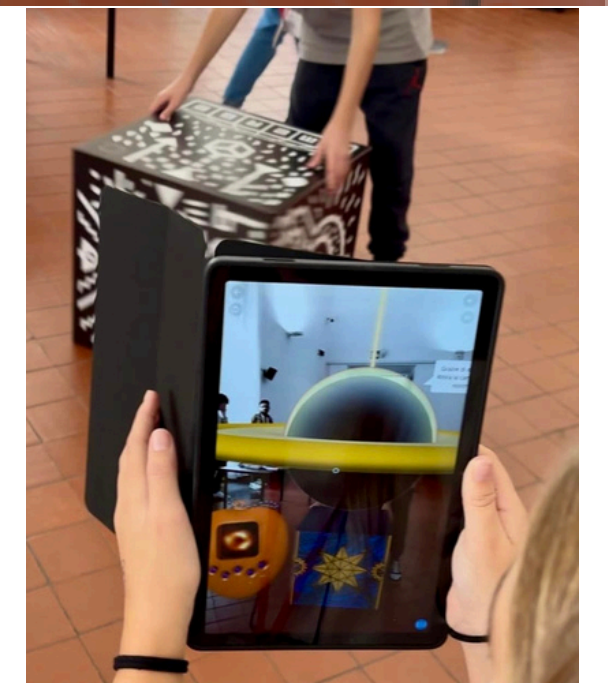
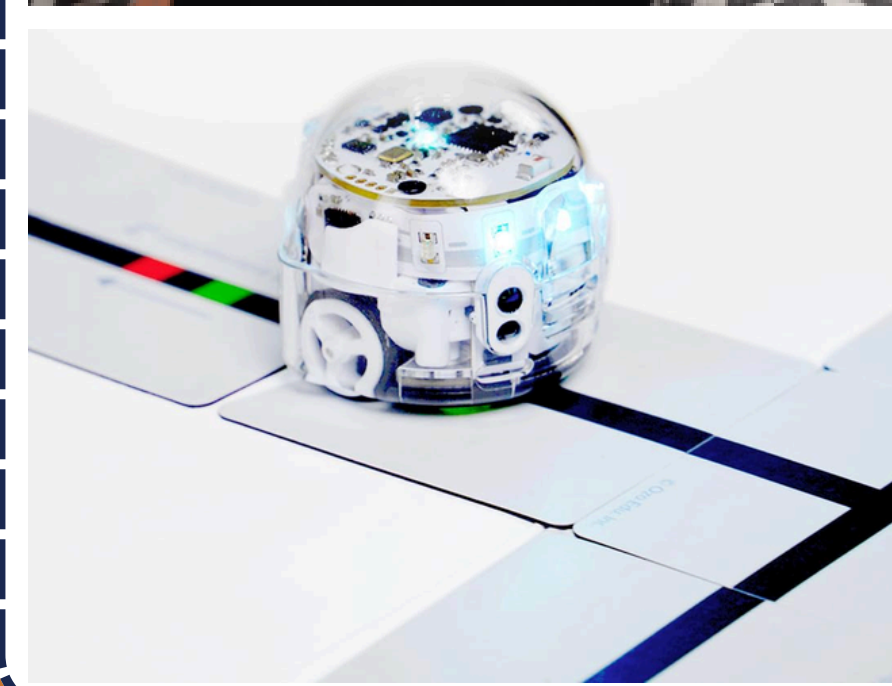
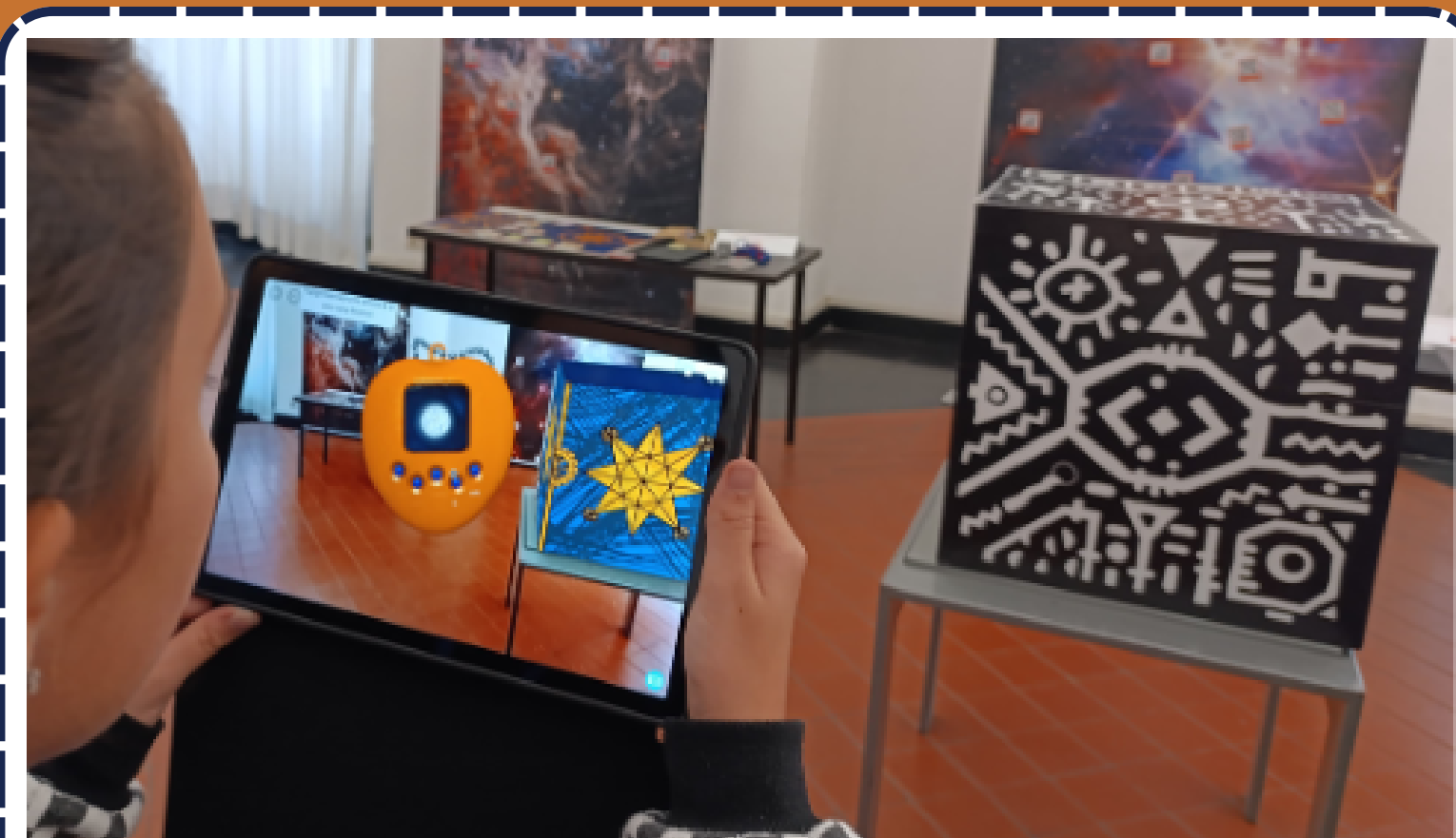
Laura Leonardi et al.  
National Institute for Astrophysics (INAF)



# Science



# Tools





# Introduction

**This study outlines the game dynamics we designed to help students intuitively grasp stages of stellar evolution, from the birth of a star in a nebula to its potential final forms.**



The gamified structure plays a key role in sustaining student motivation



The activity prompts learners to apply coding principles to control and discover the evolution of virtual stars



Astro-Tamagotchi exemplifies how digital technologies can transform traditional science education by combining game design principles with rigorous scientific content



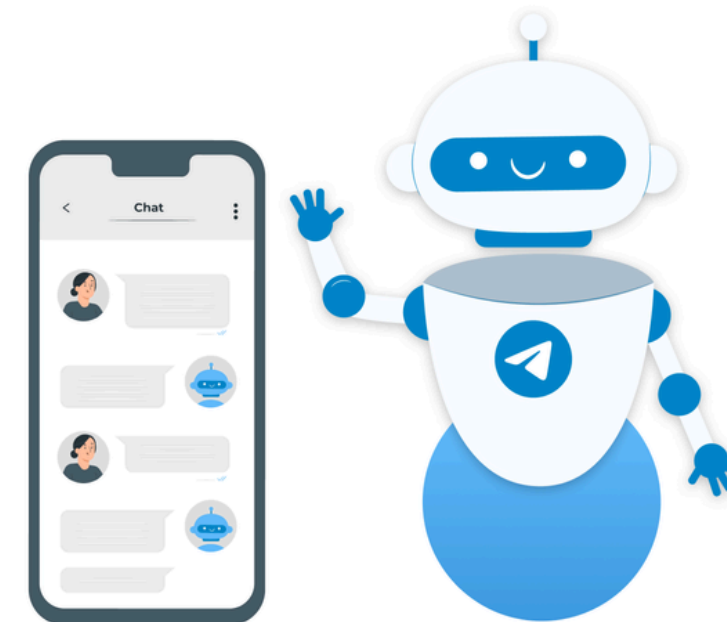
**What is a  
tamagotchi?**





# Game design

- The game is run by a Telegram Bot (@astrotam)
- To play it is necessary to install the CoSpaces Edu application on a mobile device





# Game design



## Start the game (birth)

- Welcome QR code
- The Telegram bot will recognize the QR code where a protostar could be hidden
- When the correct QR code is found, the challenge begins!



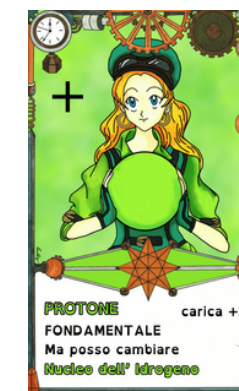


# Game design



## Light up the protostar (growth)

- Players have to solve simple "equations" using a card game
- Fundamental particles and atomic nuclei must be combined to reproduce the chain of nuclear reactions that take place within a star while evolving



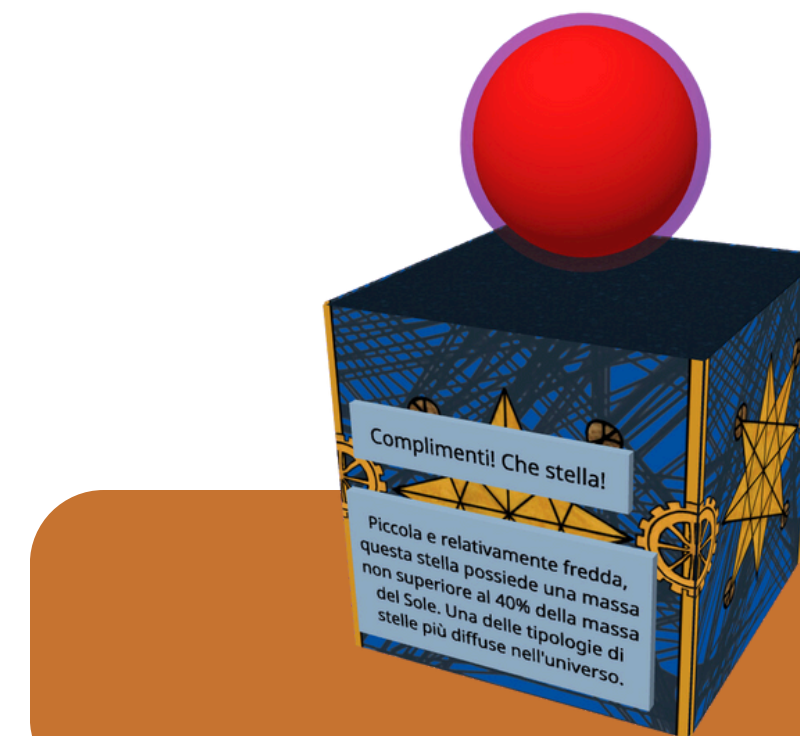


## Game design



### Light up the protostar (growth)

- If the solution is correct, the bot will provide a code that can open a cryptex
- The cryptex contains information about the mass of the star and a QR code to "meet" the star using augmented reality
- Augmented reality activates a bot command that tells players to solve quizzes





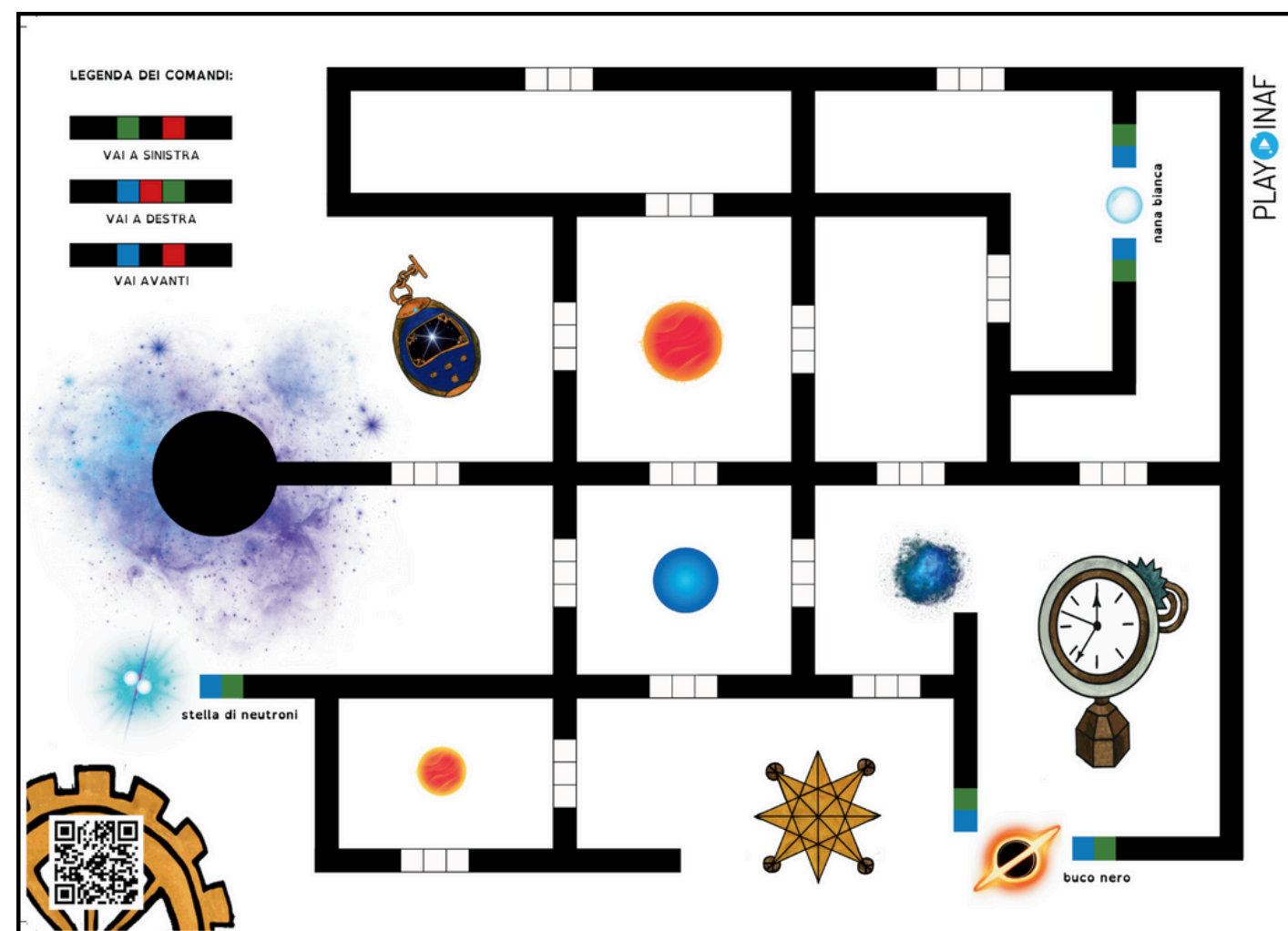


# Game design



## The Labyrinth of Ozobot (the final stages)

- The code obtained in the previous phase must be interpreted to program the robot Ozobot
- Players discover their star's final stage: white dwarf, neutron star, or black hole.



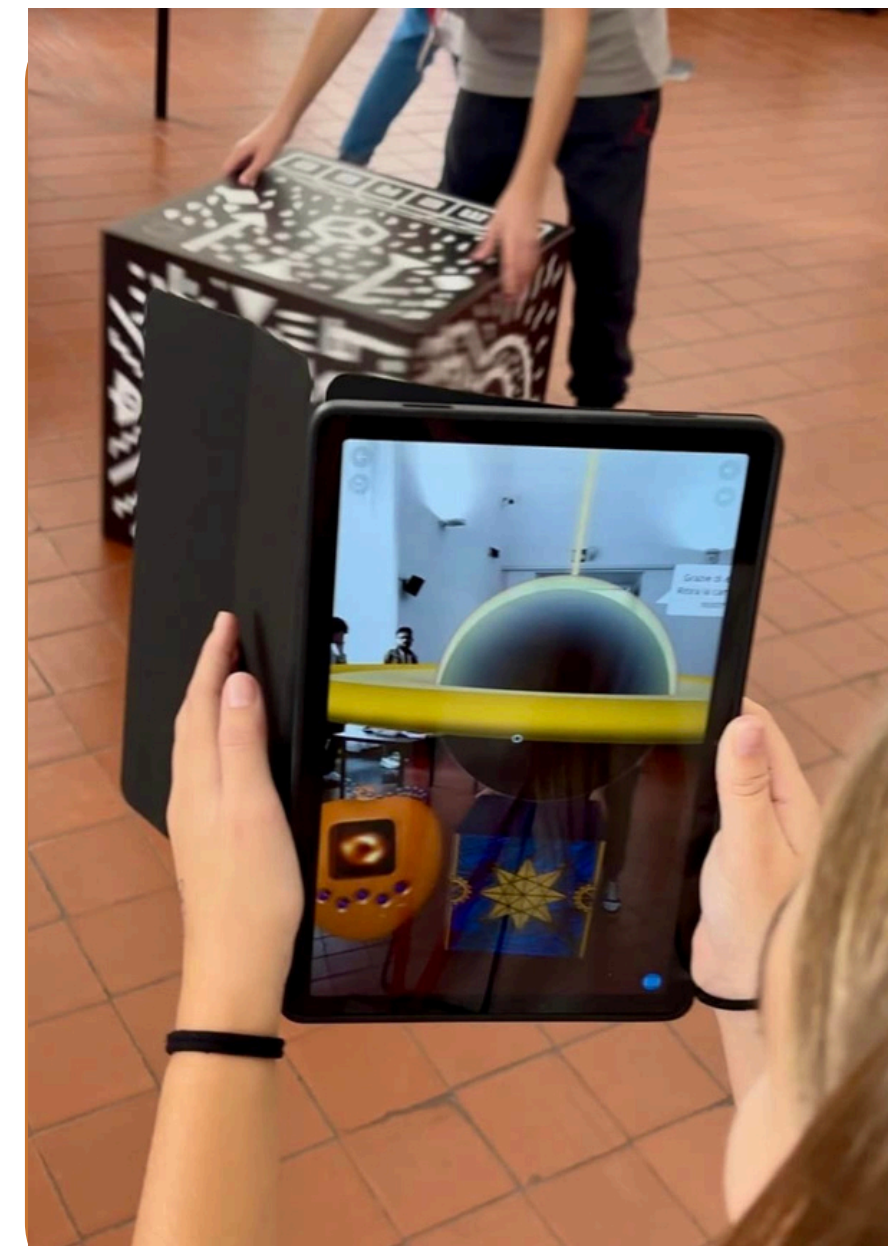
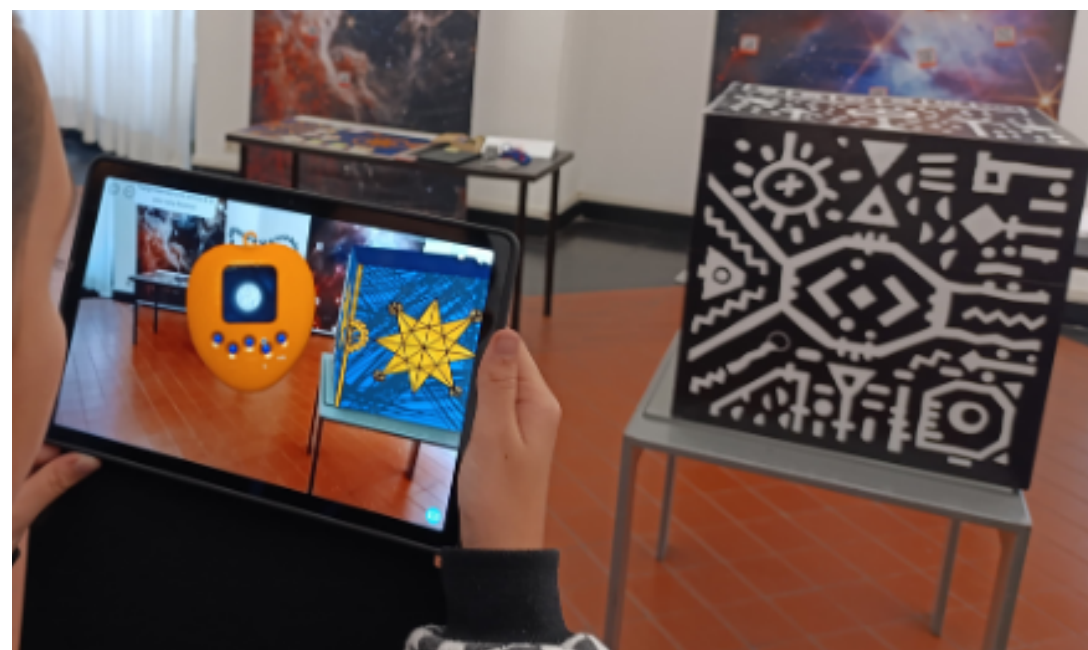


# Game design



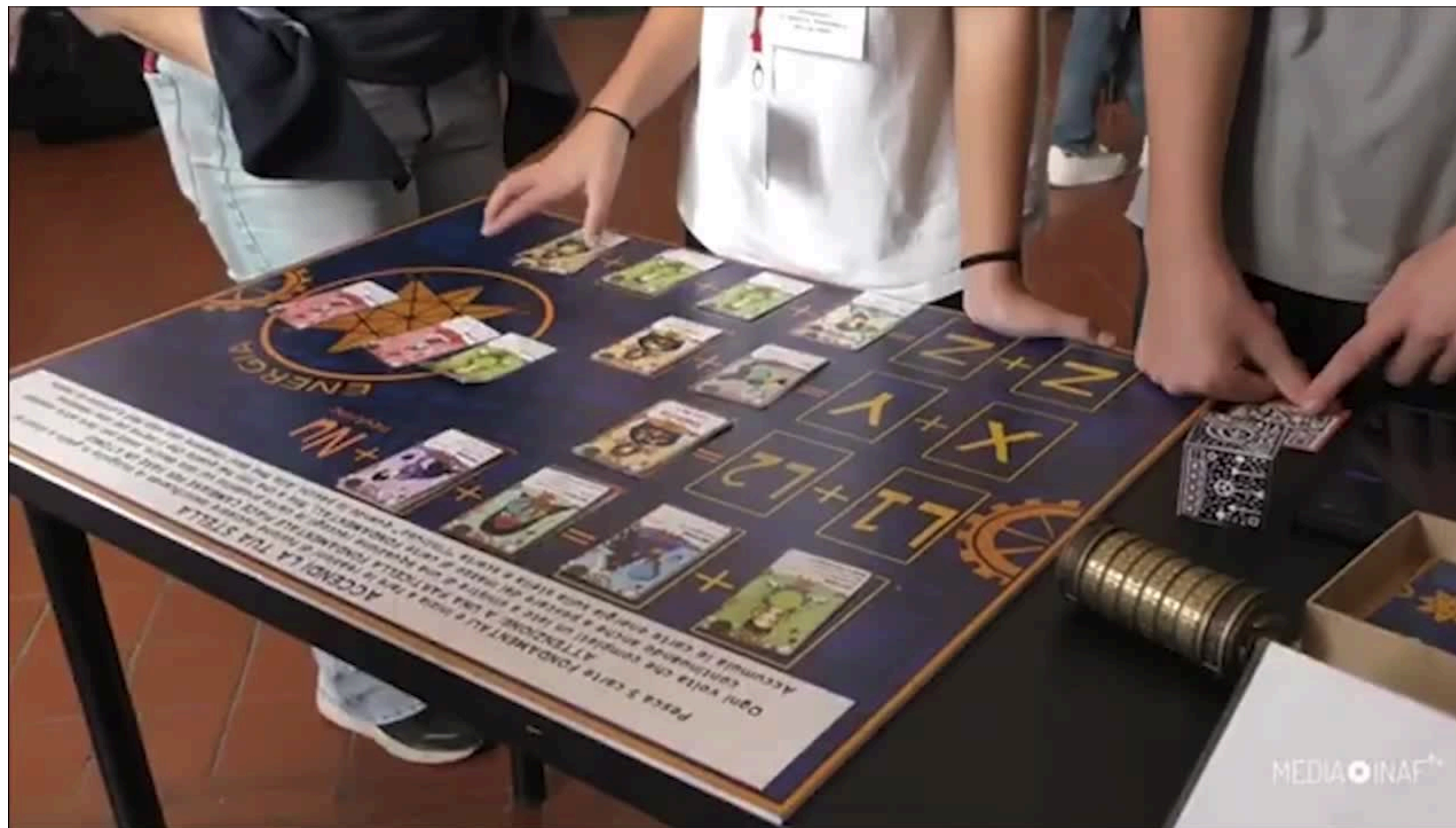
## The Labyrinth of Ozobot (the final stages)

- At Genoa Science Festival 2024, we prepared a 60x60 cm Merge Cube and placed it in the middle of the room





# Game design





# Game design



## The prize

- The prize for each player was a postcard showing the evolutionary moments of the star in augmented reality





# Game design



## The prize

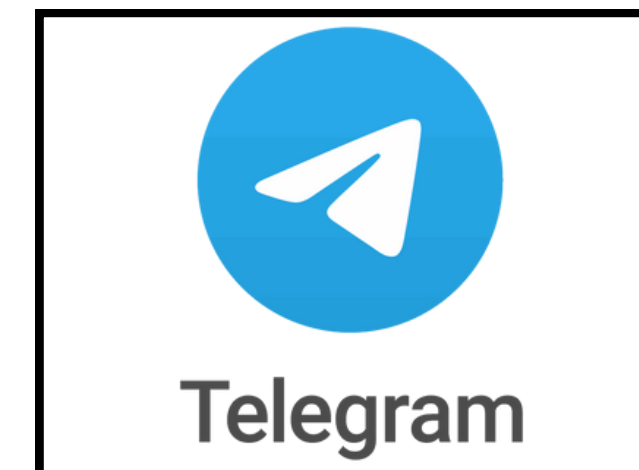
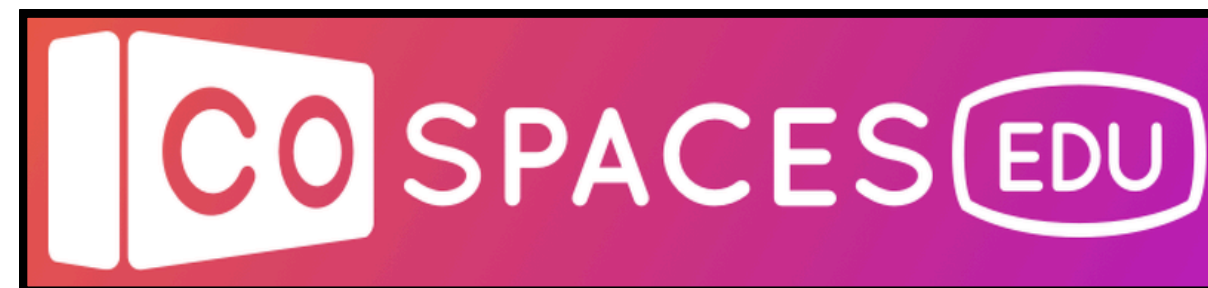
- In VR and AR
- Certificate

Il nostro viaggio insieme  
attraverso la vita di una stella.  
Puoi rivedermi a questo QR code



# Technological Implementation

Several interactive tools were chosen and used to support the educational activity.  
Can you imagine life before this technology? :-)



# Methodology of evaluation

- Pre and post-activity feedback survey to collect quantitative and qualitative data
- Responses provide valuable insights into the students' experiences
- Feedback

## Data:

1,964 participants

Around 400 students completed the pre-activity form

Only 80 who filled out the post-activity form

Questions and results

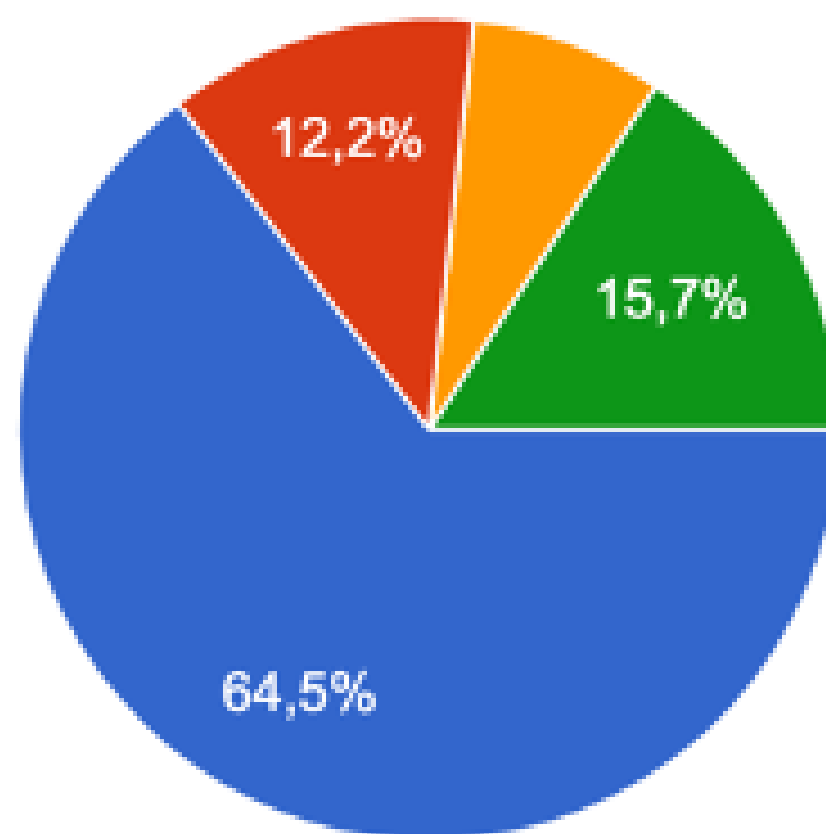




## Methodology of evaluation

### *The fate and life of a star*

What determines the fate of a star?



- Its mass
- The time
- Its galaxy
- The pressure

**PRE**

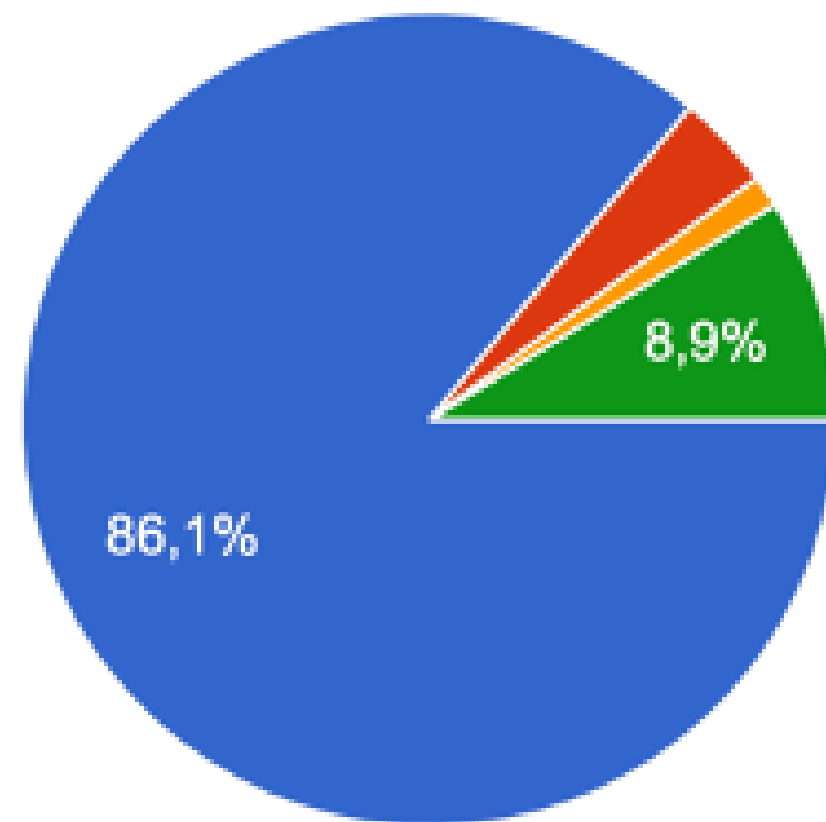




## Methodology of evaluation

### *The fate and life of a star*

What determines the fate of a star?



- Its mass
- The time
- Its galaxy
- The pressure

**POST**





## Methodology of evaluation

*What is augmented reality (AR)?*

Write down three words that come to mind when you think of augmented reality:



**POST**

# Feedbacks

“The activity was super fun and helped me understand what stars are made of and how they change over time”

“It was a wonderful experience, the best laboratory”

“The AR experience made it so much clearer”

“A truly unique and fun experience.”



# Conclusions

Astro-Tamagotchi seems to have bridged the gap between education and entertainment

As Institution we will continue to refine and expand on these methods, to help students developing a solid understanding of both the technology and the science

**CoSpaces Ambassador**, the international program for the guidance and support to educators interested in integrating CoSpaces into their teaching practices



CO SPACES EDU  
Ambassador

**So, contact me!**



# Conclusions

# MACCHINE DEL TEMPO



# Thank you

You can find out more on:



# Thank you

**Astro-Tamagotchi** was developed by Laura Leonardi, Daniela Paoletti, Maura Sandri, Silvia Galletti, Chiara Badia, Maria Teresa Fulco, Claudia Mignone, Laura Daricello, Diego Molinari, Marco Malaspina.

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Salvatore Orlando, researchers at INAF  
Palermo

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