

# Innovative methods for education and scientific outreach



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université  
PARIS-SACLAY

AstroParticle Symposium  
Université Paris-Saclay

# Content

## **1. Introduction**

1. Welcome and Objectives of the Activity
2. Overview of Innovative Approaches to Education and Outreach

## **2. Seminar: Exploring New Horizons**

1. The Role of New Technologies in Education and Outreach
2. Bridging Science and the Arts: Theater, Literature, Cinema, Music, ...
3. Case Studies: Successful Interdisciplinary Projects

## **3. Round Table Discussion: Fostering Creativity and Impact**

1. **Topic 1:** Engaging Audiences with Interactive Digital Tools
2. **Topic 2:** Storytelling and Narrative Techniques in Science Communication
3. **Topic 3:** Art as a Medium for Scientific Expression
4. **Topic 4:** Challenges in Implementing Creative Outreach Strategies

## **4. Closing Remarks**

1. Invitation to Stay Connected for Continued Learning

# Introduction

## **1. Welcome and Objectives of the Activity**

1.1. Opening Remarks and Welcome Address

1.2. Purpose and Goals of the Activity

1.3. Importance of Innovation in Education and Outreach

1.4. Agenda Overview and Structure of the Session

# Introduction

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- 1.1. Opening Remarks and Welcome Address
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**Why do we care about outreach?**

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A.- It is important for getting positions or funding.

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- A.- It is important for getting positions or funding.
- B.- It is part of our work

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## **Why do we care about outreach?**

- A.- It is important for getting positions or funding.
- B.- It is part of our work
- C.- We enjoy it

# Innovative Approaches

## **2. Overview of Innovative Approaches to Education and Outreach**

2.1. Definition and Scope of Educational Innovation

2.2. New Technologies: Opportunities in Digital Learning and Engagement

2.3. The Role of Arts in Communicating Science

- 2.3.1. Theater as a Tool for Learning and Outreach

- 2.3.2. Literature and Narrative Techniques in Science Communication

- 2.3.3. Cinema and Music: Visual and Emotional Connections to Science

2.4. Benefits of Interdisciplinary Approaches in Outreach Initiatives

2.5. Key Challenges and Questions to Address During the Activity



# Discussion

# Opening questions

## 1. Setting the Stage:

1.1. Are you involved in outreach activities?

1.2. Why?

1.3. What are the most significant challenges in engaging diverse audiences?

1.4. Do you find helpful the use of innovative methods?



# Interdisciplinary Approaches with the Arts

## 2. Interdisciplinary Approaches with the Arts

2.1. Do you find interesting using arts to communicate science?

2.2. What do you think it is more efficient:

theater, literature, cinema, music, dancing, comics,...

2.3. Have you work with artists?

2.4 What difficulties did you find?



# Exploring New Technologies

## 3. Exploring New Technologies

3.1. What role do emerging technologies (e.g., virtual reality, augmented reality, or AI) play in enhancing science education and outreach?

3.2. Can digital tools make more accessible complex scientific concepts?

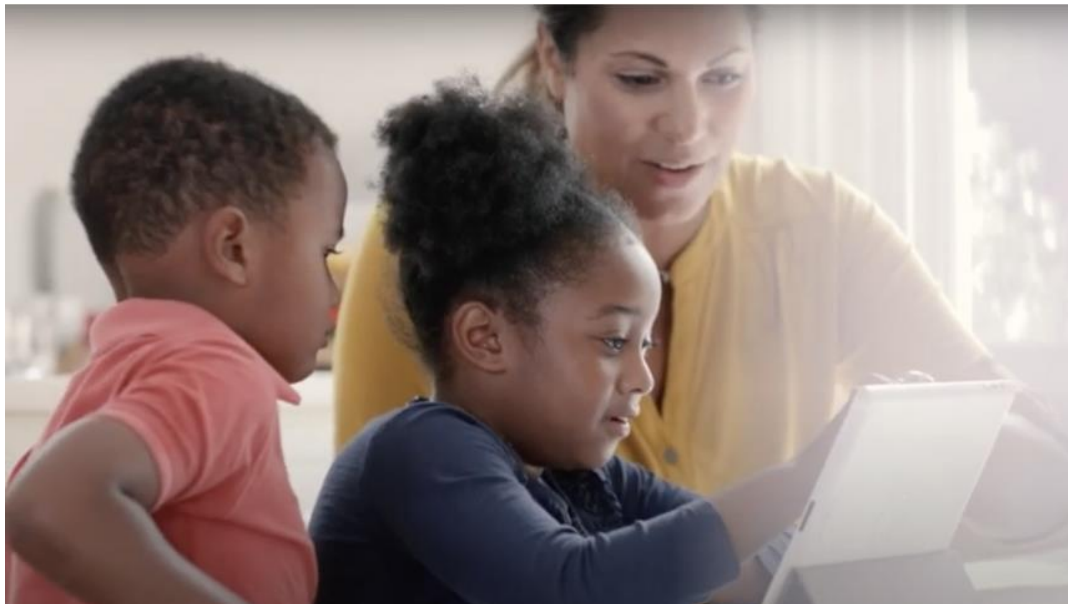


# 4. Inclusivity and Impact

## 4. Inclusivity and Impact

4.1. Are innovative methods efficient tools to ensure inclusivity, particularly for underrepresented or underserved communities?

4.2. What strategies can be used to evaluate the impact of creative educational initiatives?



# 5. Looking Ahead: Future Trends

## 5. Looking Ahead: Future Trends

5.1. What emerging trends do you foresee in the intersection of science, technology, and the arts?

5.2. How can educators and outreach professionals stay updated on innovative tools and methods? Is the effort worthy?

The roll of the institutions  
versus  
The effort of the professional



# 6. Closing Questions

## 6. Closing Questions

6.1. What key message or advice would you give to someone looking to innovate in education or outreach?

6.2. How can the insights shared today be applied in participants' own projects or contexts?



# 6. Closing Questions

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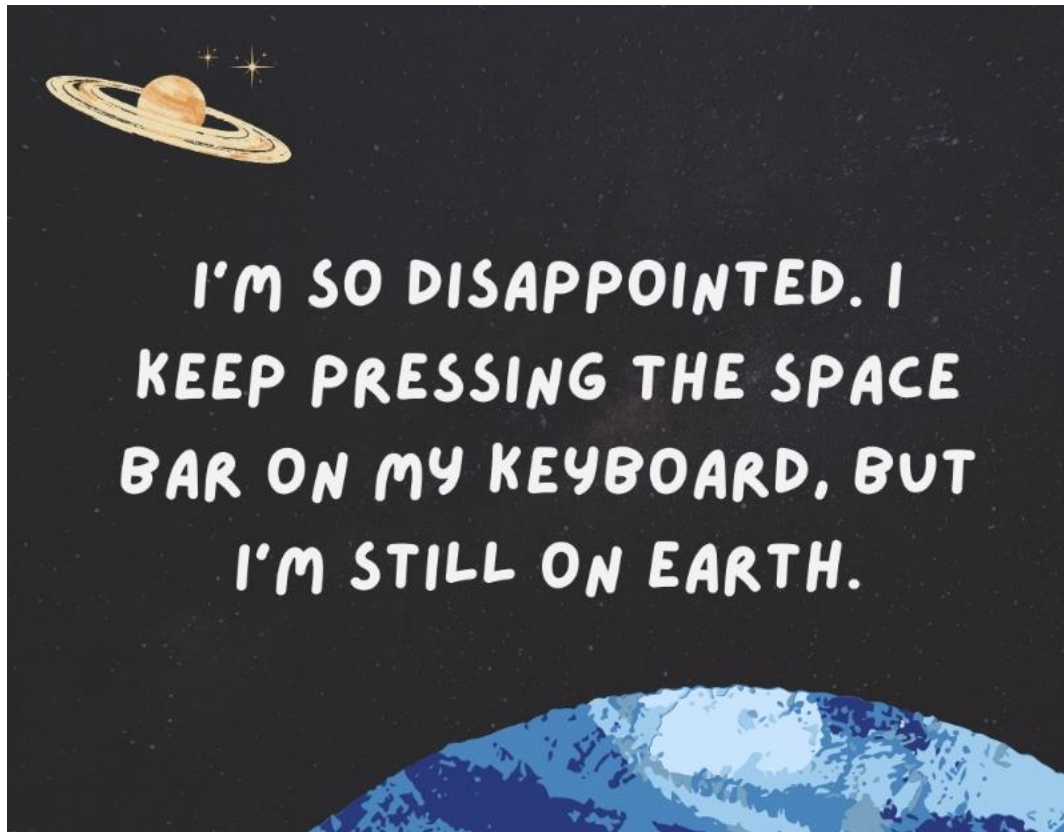
6.1. What key message or advice would you give to someone looking to innovate in education or outreach?

6.2. How can the insights shared today be applied in participants' own projects or contexts?

- A.- Adapt the activity to the audience
- B.- Make the audience to participate
- C.- use of humor as a tool



# Humor



<https://www.weareteachers.com/space-jokes/>

# Humor



NO PRESSURE.

<https://www.weareteachers.com/space-jokes/>

# Humor

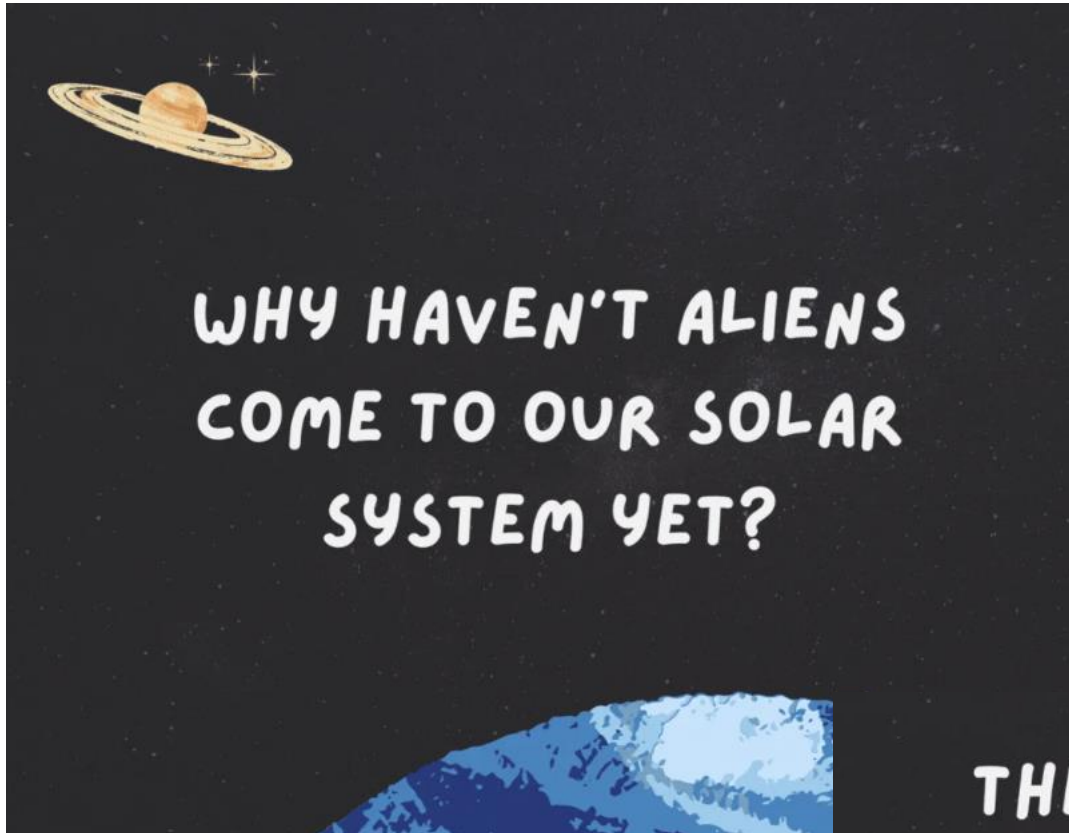


WHY DOES THE MOON  
NEED MONEY?

IT'S ON ITS LAST  
QUARTER.

<https://www.weareteachers.com/space-jokes/>

# Humor



THEY READ THE  
REVIEWS: ONE STAR.

<https://www.weareteachers.com/space-jokes/>

# Humor



HE WAS HOT!

<https://www.weareteachers.com/space-jokes/>

# 6. Closing Questions

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6.1. What key message or advice would you give to someone looking to innovate in education or outreach?

6.2. How can the insights shared today be applied in participants' own projects or contexts?

A.- Adapt the activity to the audience

B.- Make the audience to participate

C.- use of humor as a tool

D.- Be flexible

E.- Look for help

F.- Enjoy!

# Humor



# Humor



*Why don't we like to  
talk about our  
research with our  
families and friends?*

*Because it's  
a dark matter*



# Back up: Examples

- Project: The cosmology and the story
  - Literature and science
- Project: Theater and relativity
  - Theater and science
- Project: CompluSalud
  - Healthy nutrition
  - Sustainable mobility
- Project: VisualClass and DIGIMAGEN
  - Selfproduction of Audiovisual contents
  
- Conclusions

# Project: The cosmology and the story



Teaching innovation and STEAM promotion through joint practices of cosmology and literature

# Project: The cosmology and the story

*Stories written by students of the Emilio Prud'Homme Campus*



*September 5, 2019*



*April 28, 2022*

# Project: The cosmology and the story

## *What do we need to be able to write a story?*

### *Disciplinary domain*

In this case, knowing about science, knowing about astrophysics (which stars emit light and which do not)

### *Creativity*

Ability to recreate reality, this implies having knowledge of the world and knowing writing strategies.

### *Text structure*

Formal y conceptual: esquema, elementos constitutivos, secuencias narrativa y descriptiva

### *Pictures*

Techniques, coherence with the text





# Project: The cosmology and the story

## *Ideas to become a reading encourager*

*1. Establish reading routines.*

*2. Plan the books you will read to your students.*

*3. Ask challenging questions that help develop the imagination.*

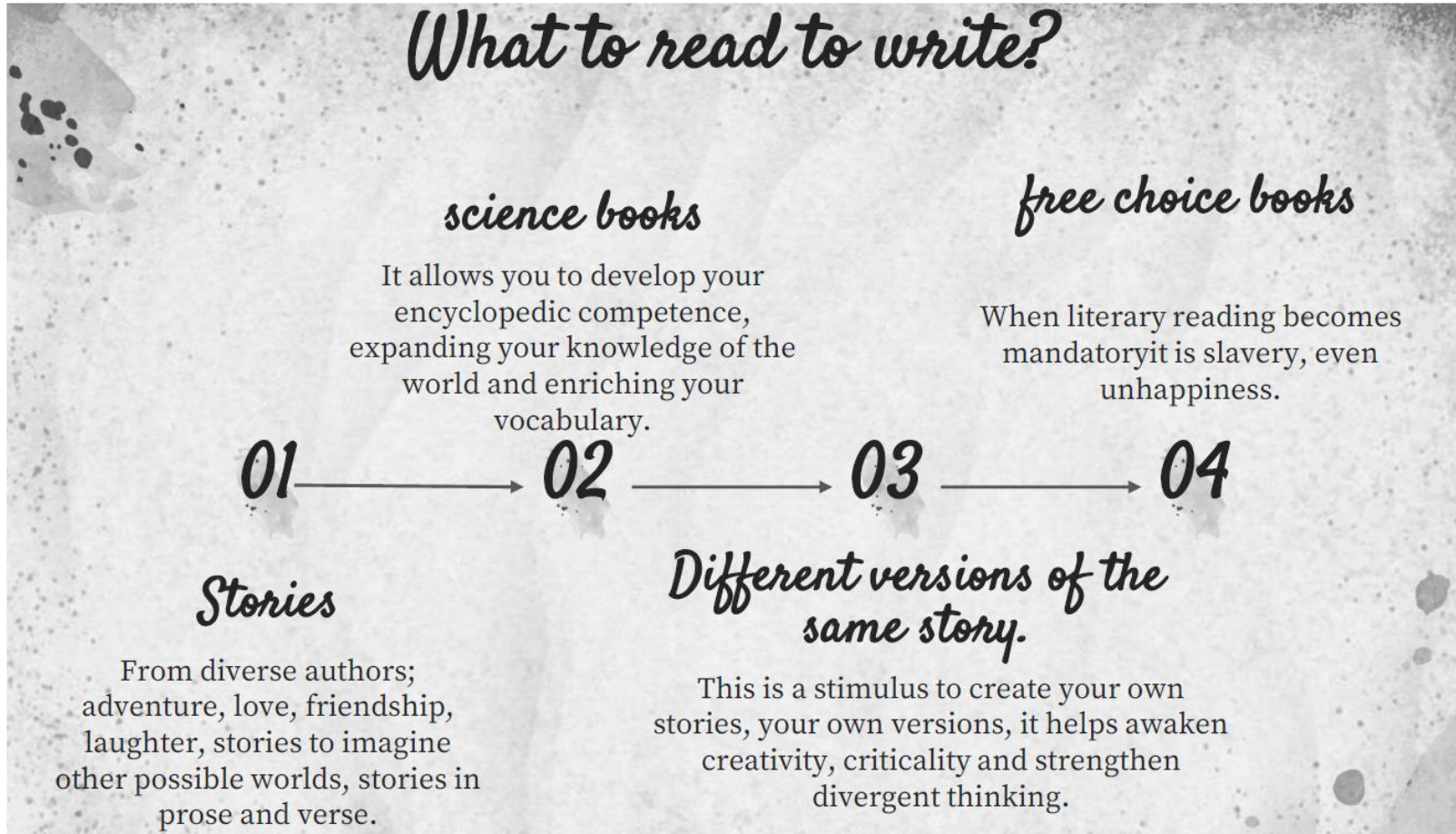


*4. Arouse curiosity and the desire to want to read.*

*5. Be a model reader.*

*6. Have books read as a means of recreation and enjoy.*

# Project: The cosmology and the story



# Project: The cosmology and the story

## Organization of the sessions

**01** *Openness and motivation*

Monday, 20/03/2023

**02** *Special relativity*

Monday, 27/03/2023

**03** *To Like and Understand  
the Story*

Monday 03/04/2023

**04** *General relativity*

Monday, 10/04/2023



# Project: The cosmology and the story

## Organización de las sesiones

**05** *Mission take off*

Monday, 17/04/2023

**06** *The Expansion of the Universe*

Monday, 24/04/2023

**07** *Strategies for the Production of Stories*

Wednesday, 03/05/2023

**08** *Dark energy*

Monday, 08/05/2023



# Project: The cosmology and the story

## Organización de las sesiones

**09** *Creativity is the Key*

Monday, 15/05/2023

**10** *Dark matter*

Monday, 22/04/2023

**11** *Illustrations in stories*

Monday, 29/05/2023

**12** *Closing and delivery of certificates*

To be announced



# Project: The cosmology and the story

## Criteria to obtain the certificate



### Attendance

You can only miss 2 sessions.



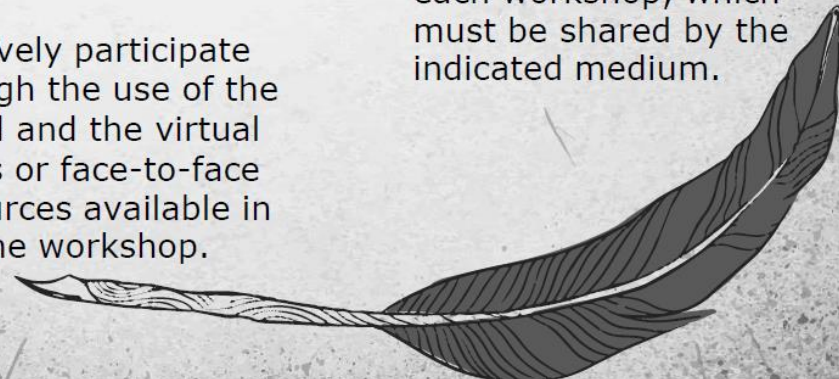
### Participation

Actively participate through the use of the word and the virtual tools or face-to-face resources available in the workshop.



### Responsibility

Carry out the exercises proposed in each workshop, which must be shared by the indicated medium.



# Project: The cosmology and the story





# Project: The cosmology and the story

## *José Alberto Ruiz Cembranos*



Researcher, scientist, university professor and director of doctoral theses. Physicist with a degree in Audiovisual Communication. He has taught courses and workshops at various institutions in Europe, America and Africa. He has participated in different activities to promote scientific culture, technology and innovation from gender, accessibility and vulnerability perspectives. Within this context, he has been the PI of four Teaching Innovation Projects, two Learning and Service Projects, and a Sustainable Mobility and Healthy Eating Project. Every year, he coordinates different workshops within the Madrid Science Week. He has also been a founding member of TeatrIEM since 2013, a scientific theater group associated with the Institute for the Structure of Matter of the Higher Council for Scientific Research of Spain, for a career of nearly ten years.

# Project: The cosmology and the story

## *Neftalí Eugenia Castillo*



Graduate in Philosophy and Humanities from INTEC University. He has a master's degree in Systematic Theology from the Pontificia Universidad Javeriana in Bogotá and is currently a master's degree in Educational Science from the Open University for Adults. He is a university teacher, poet, narrator and communicator. Among his published books are: *Even if your eyes cloud*, *The ray that does not stop* and *Parallel rivers*. He is also part of several anthologies of contemporary Latin American poetry.





# Project: The cosmology and the story



*Laura Polanco*

She has a degree in Elementary Second Cycle with a master's degree in Neuropsychology and Education. She works full time on her project called the Skillbox Learning Center. She has won several contests to promote reading and story writing.



*Vianibel Valerio*



Teacher of Spanish Language and Oriented Literature at the secondary level, teacher of Literary Appreciation and Production in first and fifth grade. Since she was little, she was interested in reading and writing, since she considered it as the ideal means of expression of the inner world.

# Project: The cosmology and the story

## *Mawdy Dismer Canela*

She is a teacher of primary education, second cycle. She has stood out for her participation in two contests held at this institution, being the winner in both with the stories "La señora araña y la gran aventura de ella en el valle del naranjal" and "Globby, la historia de un número muy curioso".





# Project: The cosmology and the story



*Yolanda De Jesús*

Educator by vocation, writer by conviction. She graduated in Education with a mention in Modern Literature. She has a master's degree in Applied Linguistics in the Teaching of Spanish at ISFODOSU, she also has a master's degree in Teaching Spanish as a Foreign Language at the University of Salamanca, Spain. She is a member of the Movimiento Interiorista del Ateneo Insular, where she has published several essays. She works as coordinator of the Second Cycle of the Secondary Level, also a teacher at the ISFODOSU Emilio Prud'Homme campus in Santiago.

*Juan Casillas Álvarez*



Poet, essayist and educator born in Puerto Rico. Álvarez completed her bachelor's degree in literature and history at the University of Puerto Rico and his master's at the University of Connecticut. His first book of poetry, *Lugar Profano*, was published in 2015 by Isla Negra. He has been a featured poet at many literary conferences and festivals in the United States. His poetry and political essays by him have been published in various literary magazines and newspapers. He has taught in the public schools of Chelsea and Cambridge, Massachusetts.



# Project: The cosmology and the story



*Leonardo Nín*

Dominican poet, short story writer, novelist, essayist and linguist graduated from Harvard University.

He is one of the main representatives of the Dominican literature of the Diaspora.



*José Acosta*

Poet and narrator. Since 1995 he has lived in New York. He has won the National Prize for Literature of the Dominican Republic eight times in the genres of novel, short story and poetry.

# Project: The cosmology and the story



*Camila Zambrano Fernández de Córdova*



Illustrator, university professor, mediator of reading and Ecuadorian plastic artist. Master's Degree in Children's and Youth Books and Literature. She is a specialist in illustration for children's and youth publications. Graduated in Design. Technologist in Graphic Design. She has taught the subjects of Illustration, Graphic Representation, Semiotics and Creativity; Illustration in literature for children and young people, among others. Currently, she is part of Girándula, the Ecuadorian Children's and Youth Book Association (IBBY Ecuador) and is co-founder of the cultural enterprise LIBRIPILIBRI, which generates various practices around artistic education, books and reading.

# Project: The cosmology and the story

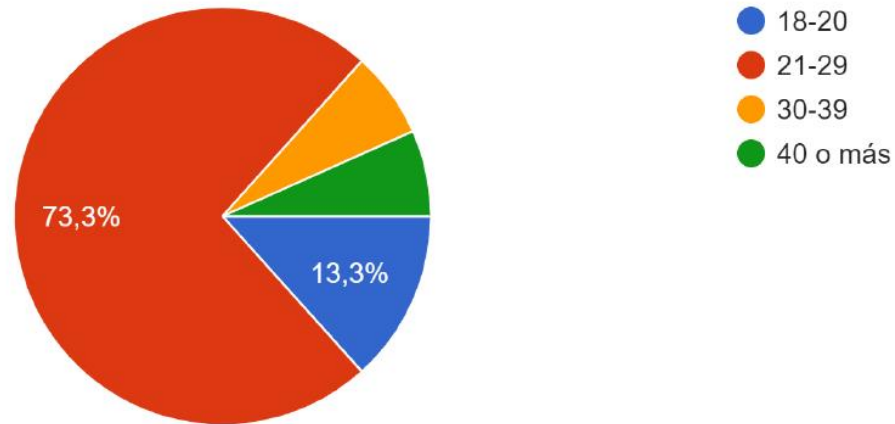




# Project: The cosmology and the story

## Demographics

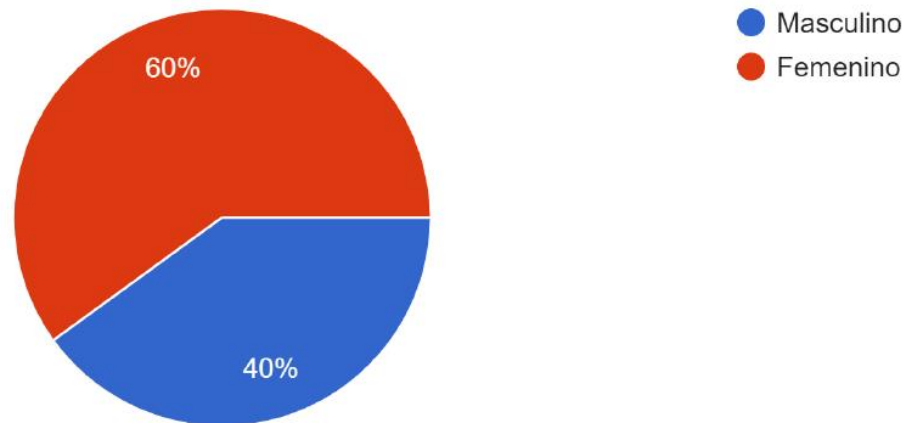
### Demographics



# Project: The cosmology and the story

## *Gender*

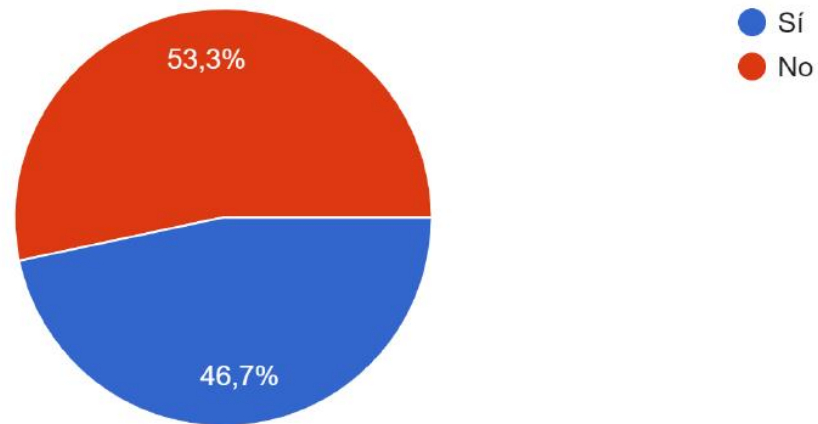
Gender



# Project: The cosmology and the story

## *Attendance*

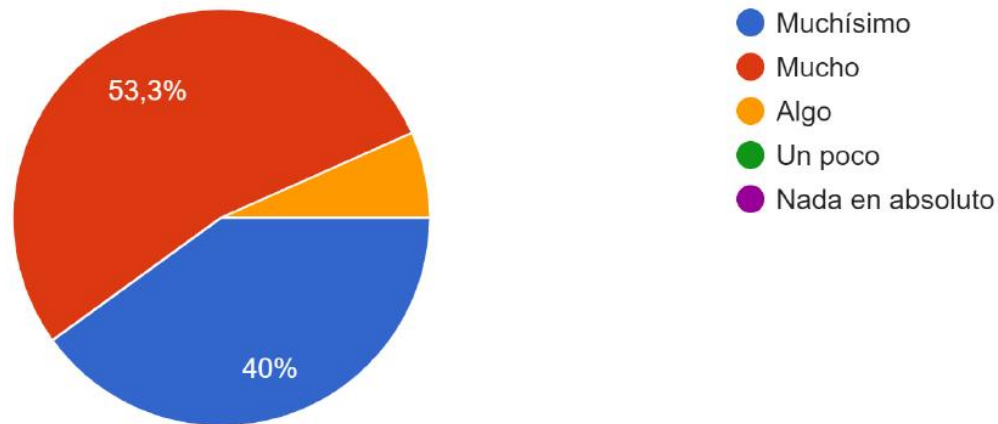
Could you attend every season of the workshop?



# Project: The cosmology and the story

## Learning

How much have you learned about cosmology?

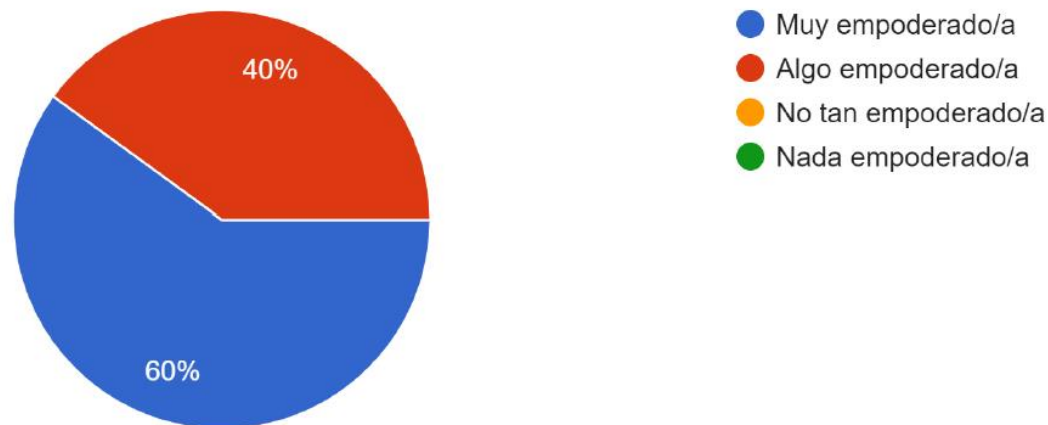




# Project: The cosmology and the story

## *Empowerment*

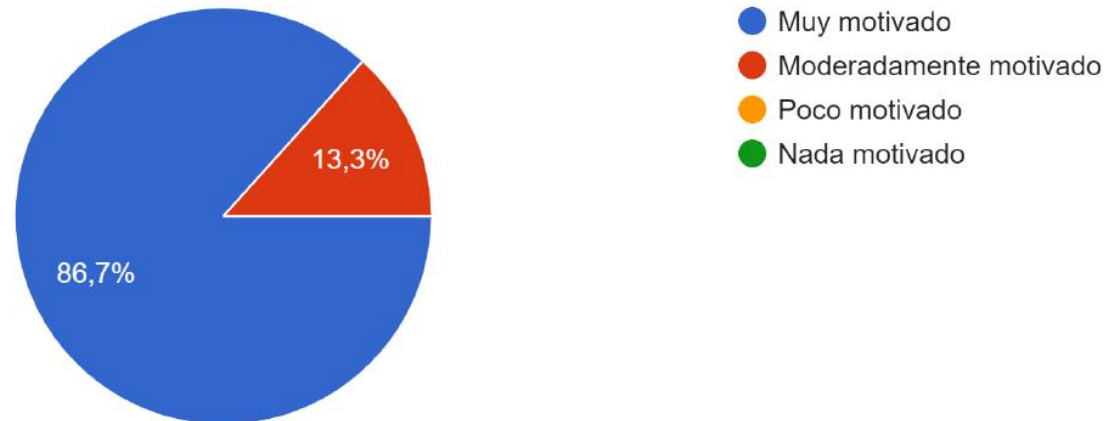
How empowered do you feel to write stories whose plot or characters are related to the cosmos?



# Project: The cosmology and the story

## *Continuation*

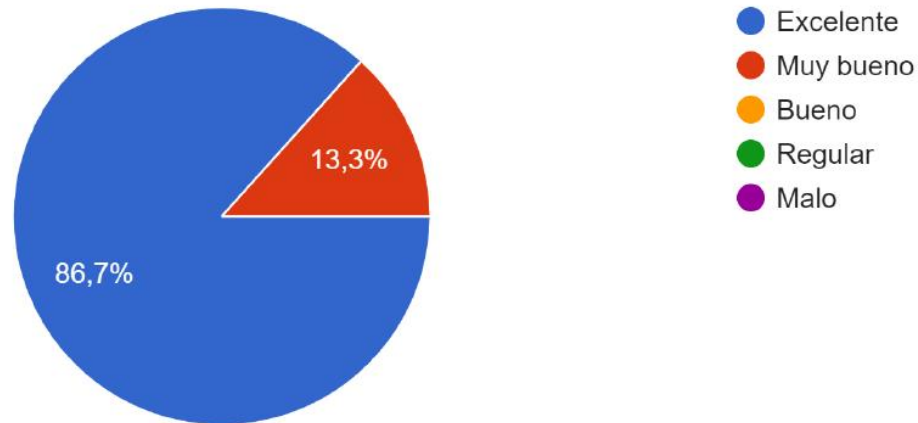
How motivated do you feel to continue with the second phase of these workshops?



# Project: The cosmology and the story

## Overall Rating

How would you rate the workshops in general?



# The cosmology and the story: Results

1. Integration of cosmology and literature in education can foster interdisciplinary learning and promote a holistic understanding of the world.
2. By combining the fields of cosmology and literature, educators can ignite students' curiosity and engage them in exploring complex scientific concepts in a creative and relatable manner.
3. Joint practices of cosmology and literature provide a unique platform for students to develop critical thinking skills, enhance their scientific literacy, and strengthen their language and communication abilities.
4. Teaching innovation through cosmology and literature encourages students to think beyond traditional disciplinary boundaries, enabling them to make connections and draw parallels between different areas of knowledge.

# Project: Theater and Relativity

The project is aimed at people interested in having a first contact with the basic concepts of theatrical activity and the foundations of Albert Einstein's theory of relativity.

The activities are optimized for students who do not have prior knowledge in either field.

The novelty of this course lies in the fact that it uses the concepts of relativity to introduce dramatic practices and techniques and, reciprocally, uses different theatrical exercises and workshops to illustrate and consolidate the ideas of Einstein's theory.

# Objectives

- Understand the theory of relativity in modern physics.
- Acquire a basic knowledge of the Big Bang theory and standard cosmology.
- Explore the consequences that Quantum Physics induces in the understanding of nature.
- Analyze dramatic texts comprehensively by working on the writing and representation processes.
- Develop creative and expressive capacity through different workshops and exercises.
- Learn expression techniques.
- Enjoy dramatic play in a group setting.
- Use theatrical tools in conflict resolution.

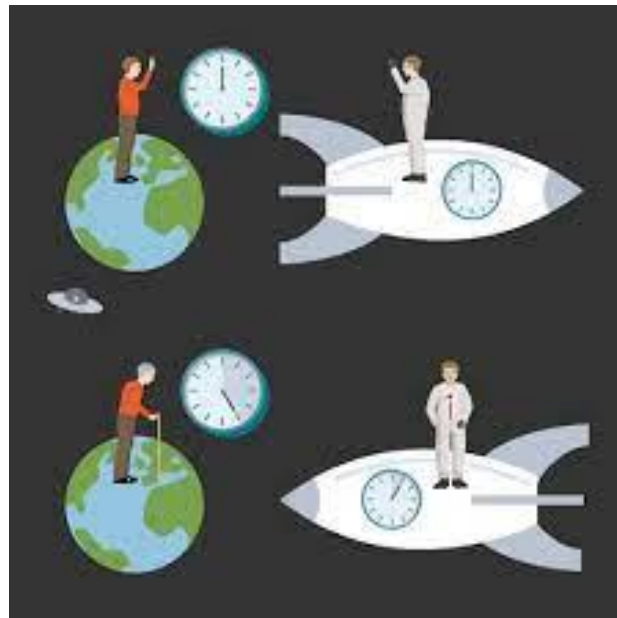
# Practical Activities





# Workshop 'The theatrical paradox of twins'

The time that passes in a theater is not the same for the audience as for the acting cast, and not even between the different people who act. Who has aged the most when the show's journey ends? In this workshop you will experiment with time on stage and in life, through movement and improvised action.



# Workshop 'And yet it moves'

Eppur si muove is the hypothetical phrase that, according to tradition, Galileo Galilei would have uttered after abjuring the heliocentric vision of the solar system before the court of the Holy Inquisition. In this workshop, movement and body expression practices will be carried out that will seek conflict with verbal language.



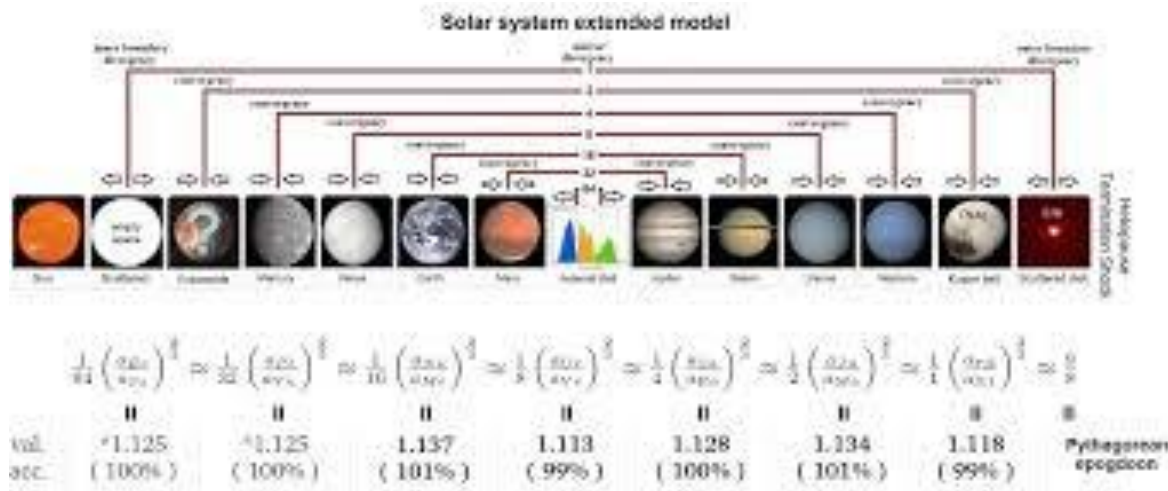
# Workshop 'The Incredible Shrinking Actress'

Lorentz contraction is a relativistic effect that consists of the contraction of the length of a body in the direction of movement as its speed approaches the speed of light. This workshop will propose interpretation exercises related to size variations and group dynamics associated with workspace deformations.



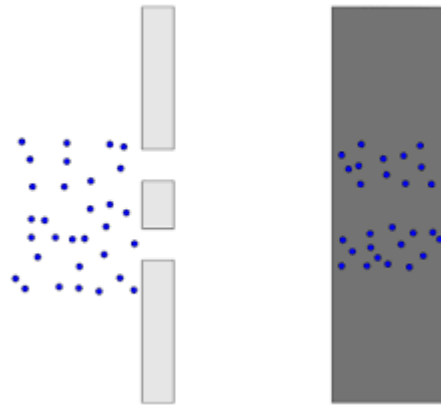
# Workshop 'The music of the spheres'

In this workshop we will work with voice and music. To do this, exercises associated with the change in frequency produced by the relativistic and gravitational Doppler effect will be proposed. The acoustic translations of gravitational waves produced in black hole collapses will also be analyzed in contrast to the universal harmony associated with the Pythagorean vision of the cosmos.



# Workshop 'The double scenario experiment'

Quantum physics is partly complementary and partly opposite to Einsteinian relativity. One of the experiments in which its properties are most clearly revealed is that of the double slit. This experiment clearly establishes the double nature of things and the abandonment of classical trajectories. In this workshop, dramatic creation exercises associated with this principle will be proposed.





# Workshop 'The writer does not play dice'

This literary creation workshop will propose dramatic writing exercises from two points of view. On the one hand, we will work on projects that contain concepts of relativity as protagonists in the plot of the texts, and on the other, relativistic structures will be proposed for the creation of new works.



# Conclusions

1. The integration of STEAM (Science, Technology, Engineering, Arts, and Mathematics) principles into science and theater can help cultivate a well-rounded skill set that is increasingly valued in the modern education.
2. Joint practices involving science and theater foster a sense of wonder, awe, and appreciation for the mysteries of the universe, inspiring students to become lifelong learners and explorers of knowledge
3. Collaboration between educators from diverse backgrounds, including experts in science and theater, is essential for developing comprehensive and effective curricula that seamlessly merge different skills and abilities.

# Project: CompluSalud

Project about health nutrition habits and sustainable mobility in vulnerable population at Universidad Complutense of Madrid



COMPLV  
SALVD



# Introduction

Sustainability should be a fundamental guidance principle for present innovations in education methods

Education centers should improve the management of their resources.

They must evaluate and compensate for the environmental and social footprint from their own activities.

# Complutense University of Madrid (Spain)

- Professors: 5825
- Students: 71,806 (65,445 in own centers)
  - Undergraduate: 53,092
  - Postgraduate: 6488
  - PhD: 5385
  - Other: 6361

(Data from 2018-2019)





# Methodology

We adopt a research-action-participation methodology:

- 1) Analysis of mobility and eating habits of students through questionnaires and discussion groups.
- 2) Design of alternative and viable healthy and sustainable practices that have the flexibility to accommodate different options capable of facing a diverse reality.
- 3) Implementation and observation of the operation of the new designs and analysis of their success and viability.
- 4) Dissemination and publicity of specific proposals for the organization of university management, teacher training and student awareness that allows improving the aforementioned habits.

# Objectives

In this project we intend to achieve two main objectives:

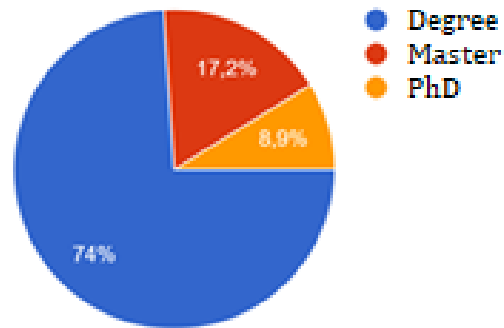
1. The first is to obtain information on the mobility and eating habits of university students.
2. The second aims to carry out actions and proposals that allow these habits to be improved. These actions and proposals can also be divided into two types.
  1. Activities of a local nature with very limited influence, but with useful short-term results.
  2. The dissemination of the results obtained and seek a more global awareness and influence in the medium or long term.

# Healthy nutrition

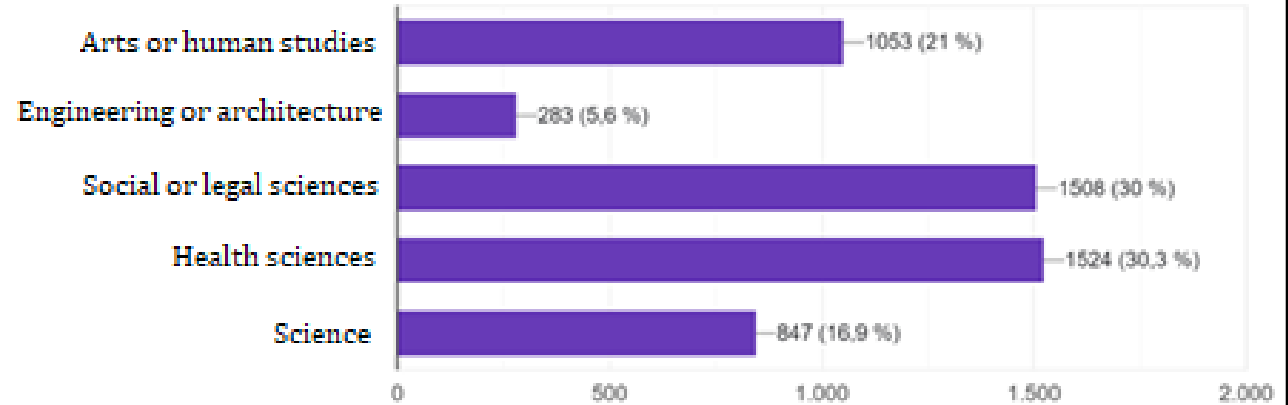


# Population

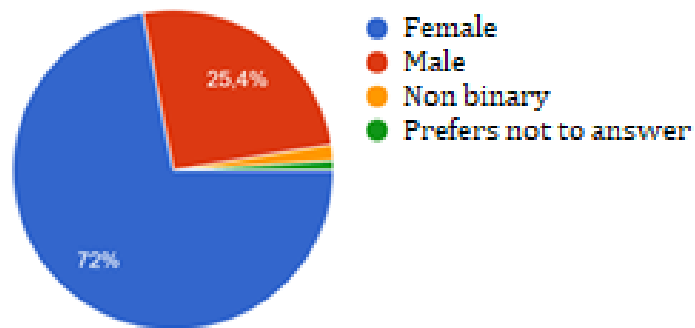
## Studies at UCM



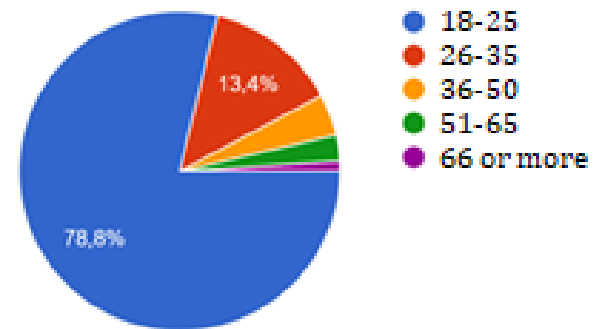
## Field of knowledge



## Genre

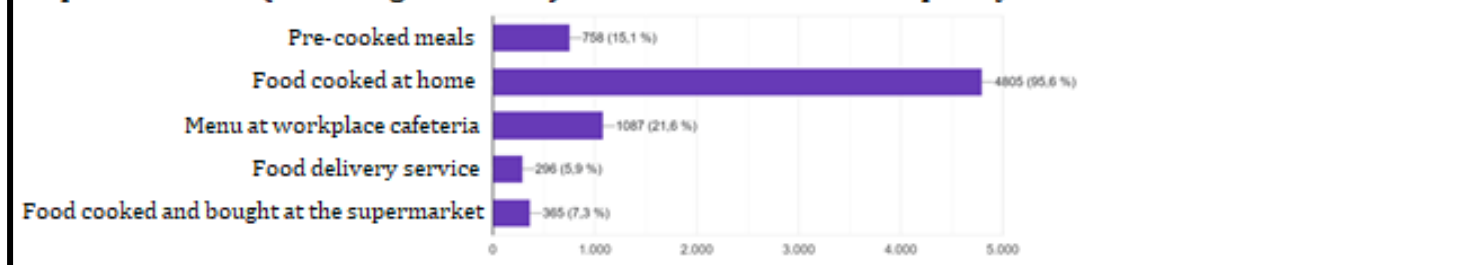


## Age

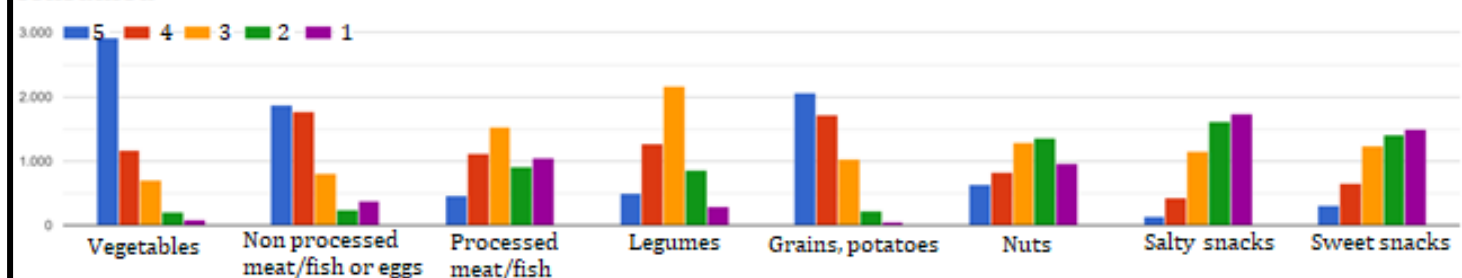


# Diet composition

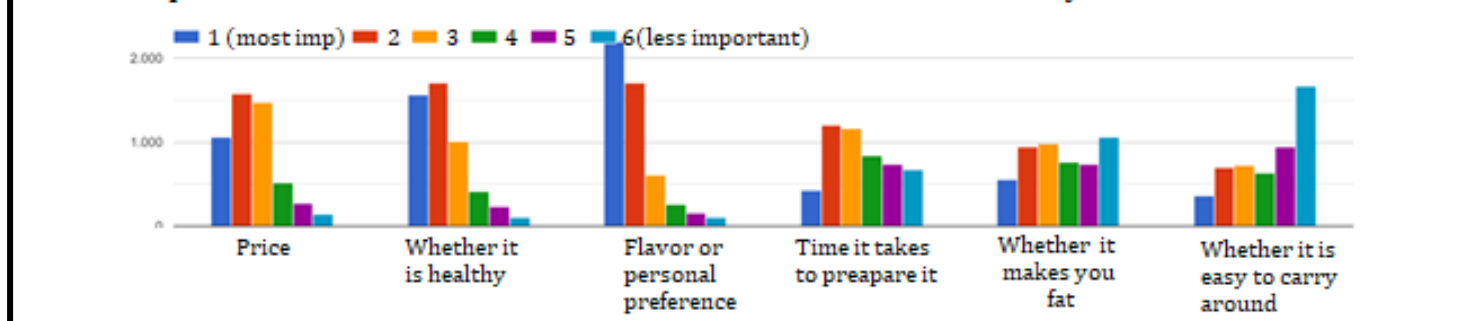
Preparations that (excluding weekends) have a 2-times a week frequency or more



Consumption frequency: 5 if consumed 5-7 days a week, 4 if consumed 3-4 days a week, 3 if consumed 1-2 days a week, 2 if consume is greater than once a month but less than once a week; 1 if they are rarely consumed



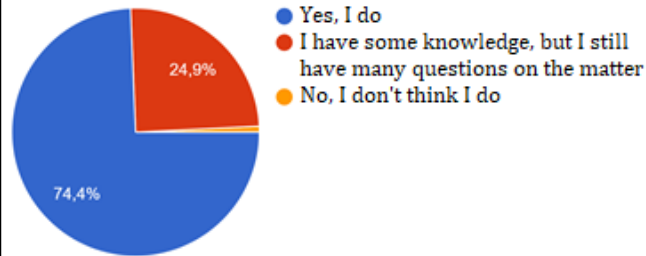
Order of importance of the factors that determine which foods or meals we buy



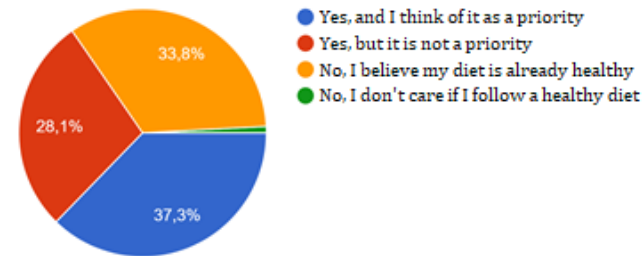


# Changes on diet

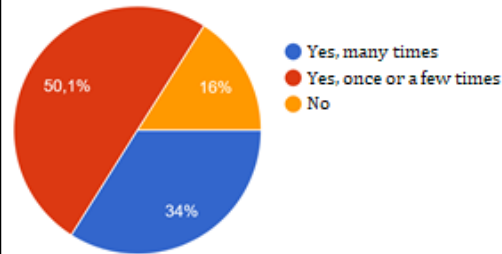
Answers to the question: Do you believe that you know what a healthy diet consists on?



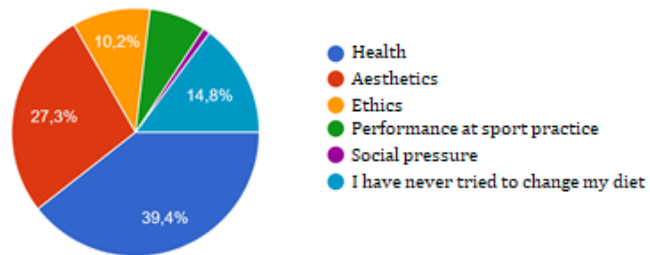
Answers to the question: Would you rather have a healthier diet?



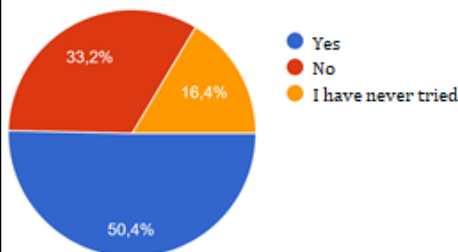
Answers to the question: Have you ever tried to change your diet?



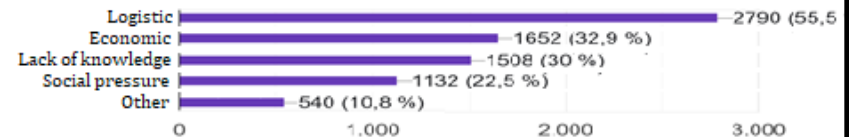
Answers to the question: Which was the main reason for wanting to change your diet when you tried?



Answers to the question: If you ever have tried to change your diet, have you been able to maintain the change for 6 or more months?



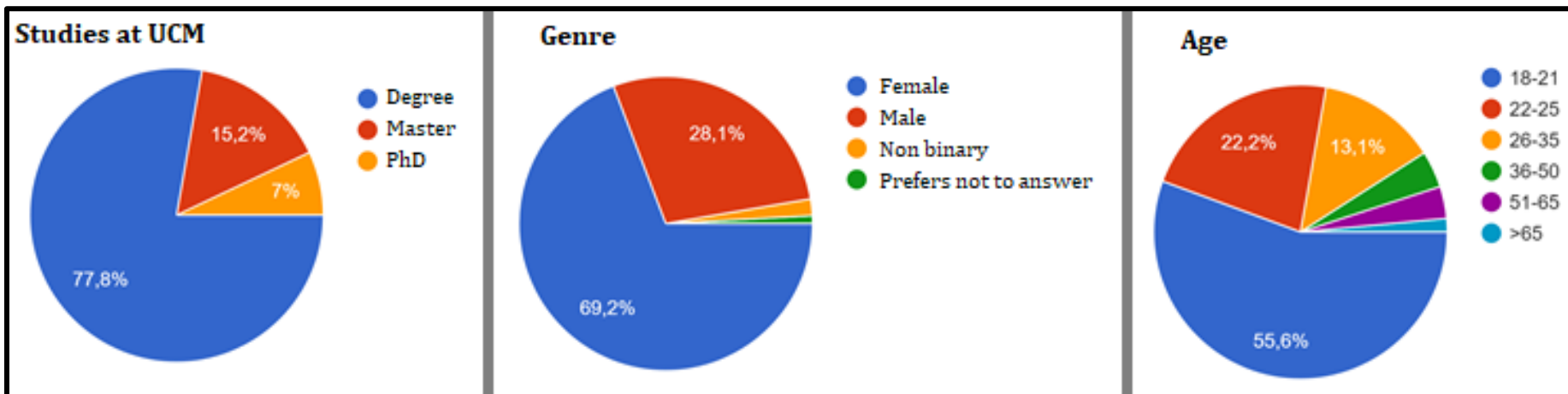
Main obstacles found when trying to follow a healthier diet



# Sustainable mobility

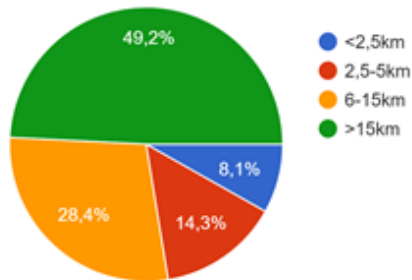


# Population

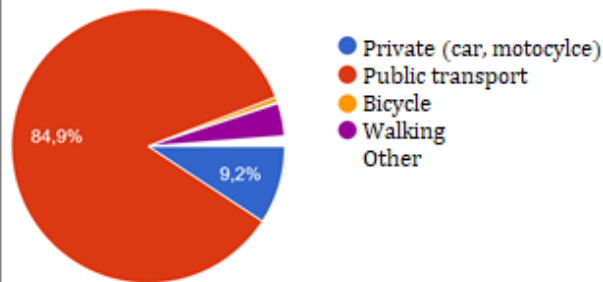


# Current scenario

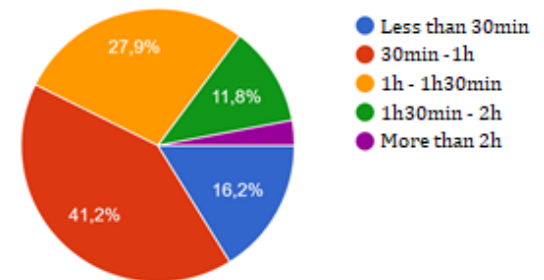
Traveling distance from home to UCM



Main means of transport used by UCM students

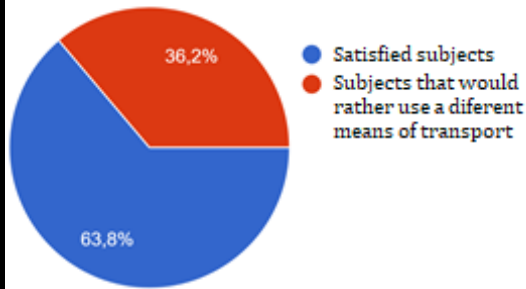


Traveling time in public transport (just one-way journey)

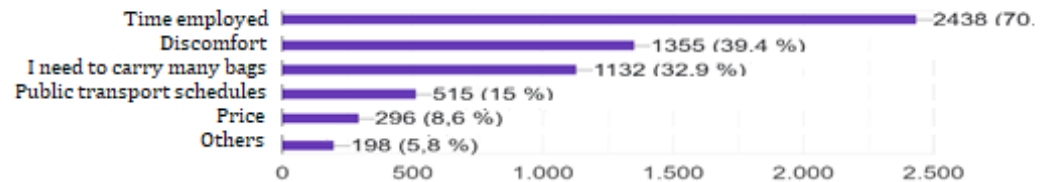


# Desired scenario

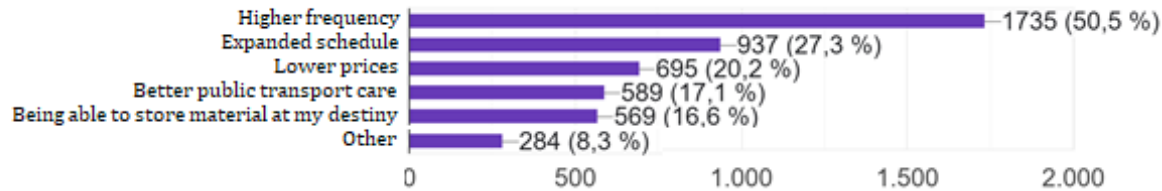
Satisfaction with the means of transport employed currently



Answers to the question: Which of the following elements prevents you from using public transport?



Answers to the question: Which aspects ought to change in order for you to consider public transport as your main means of transport?





# Conclusions and Suggestions

Proposals that have been carried out in other universities:

- 1- Free loan of bicycles (University of Barcelona, Lleida, Santiago de Compostela, La Rioja and Valladolid)
- 2- Loan of folding bicycles (University of Seville)
- 3- Facilitate the buying and selling of second-hand bicycles among the university community (Universidad de León)
- 4- Construction of closed car parks that guarantee greater security for bicycles (University of Seville)

# Conclusions and Suggestions

Proposals that have been carried out in other universities:

5- Start-up of a bicycle workshop where there is also a set of basic tools for self-repair and tuning (Universidad de Alcalá, Autónoma de Madrid and Stanford)

6- Free delivery of fruit, instead of pastries, to students at different events (University of Lund and Munich)

7- Substitution of vending machines for sugary drinks and pastries for juices and fruit (University of California)

8- Creation of a three-credit subject that offers training on these topics and that is open to all students of the University (University of Seville)

# Project: VisualClass

Project about self-production of audiovisual contents for university education.



# Introduction

In recent years, there has been a growing emphasis on incorporating audiovisual content into university teaching methods to enhance student engagement and learning outcomes. This study explores the concept of student audiovisual self-production to empower students in the creation of educational content for their own learning and for sharing with their peers. The aim of this research is to investigate the effectiveness of student-led audiovisual production in university teaching environments and its impact on student learning experiences.

# Introduction

The study adopts a mixed-methods approach, combining quantitative data analysis and qualitative inquiry. A sample of university students has participated in the research, undertaking audiovisual self-production projects as part of their coursework. The students have been guided through the process of planning, editing, and evaluating their productions. Quantitative measures, such as surveys, will be used to assess changes in student engagement, self-efficacy, and learning outcomes. Additionally, qualitative methods, including interviews and focus groups, have been employed to explore student perceptions, experiences, and challenges encountered during the process.



# Introduction

The findings of this study are expected to provide valuable insights into the benefits and limitations of incorporating student audiovisual self-production into university teaching. It is anticipated that this approach will enhance student motivation, critical thinking skills, collaborative abilities, and creativity. Furthermore, the study will shed light on the potential challenges students may face, such as technological barriers, time management, and the need for guidance and support from instructors. The research outcomes will inform pedagogical practices and provide recommendations for effectively integrating student audiovisual self-production into university curricula.

# Complutense University of Madrid (Spain)

- Professors: 5825
- Students: 71,806 (65,445 in own centers)

- Undergraduate: 53,092
- Postgraduate: 6488
- PhD: 5385
- Other: 6361

(Data from 2018-2019)



# Methodology

We adopt a research-action-participation methodology:

- 1) Analysis of results through questionnaires and discussion groups.
- 2) Design of production and edition of audiovisual content with the flexibility to accommodate different options capable of facing a diverse reality.
- 3) Implementation and observation of the operation of the audiovisual content and analysis of their success and viability for educative and outreach purposes.
- 4) Dissemination and publicity of results.

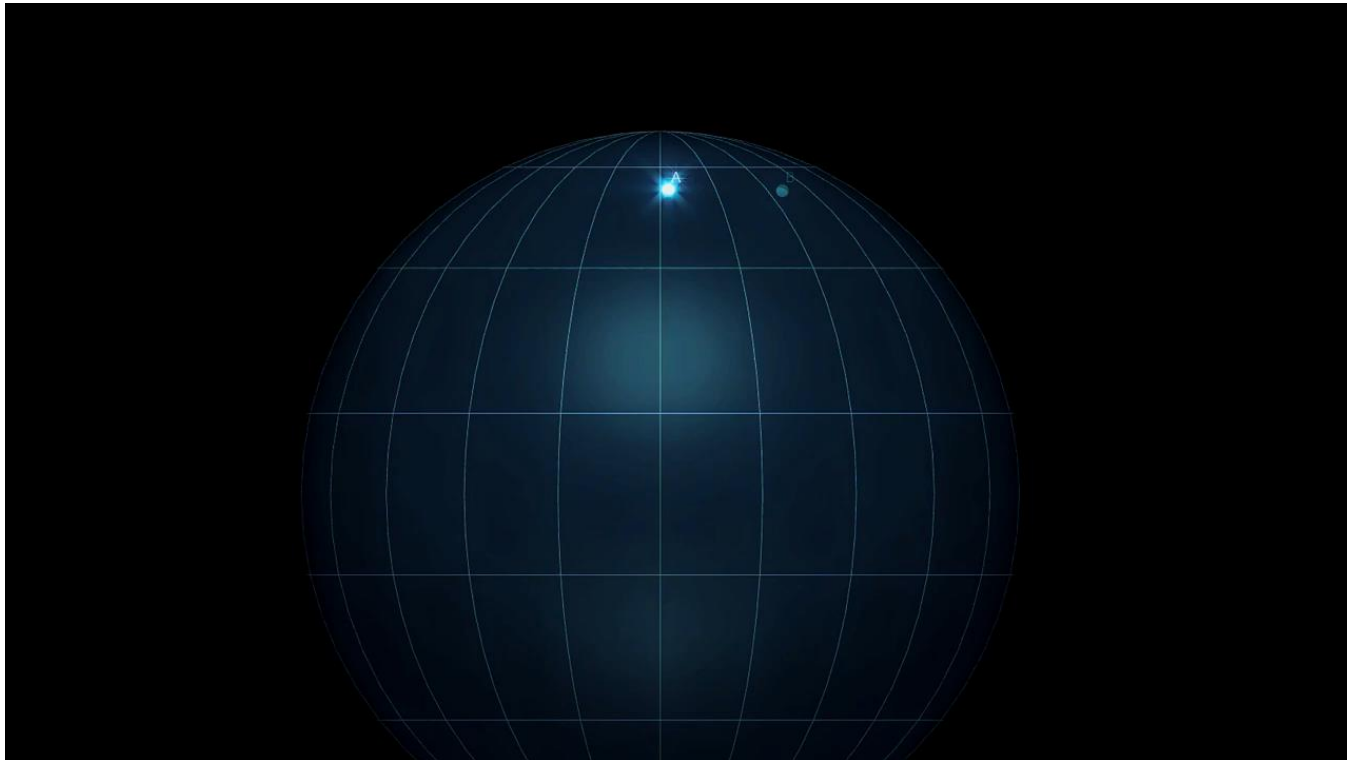
# Objectives

In this project we intend to achieve two main objectives:

1. The first is to provide students with knowledge and abilities for audiovisual production and edition.
2. The second aims to carry out actions and proposals that allow these habits to increase academic results. These actions and proposals can also be divided into two types.
  1. Activities of a local nature with very limited influence, but with useful short-term results.
  2. The dissemination of the results obtained and seek a more global awareness and influence in the medium or long term.

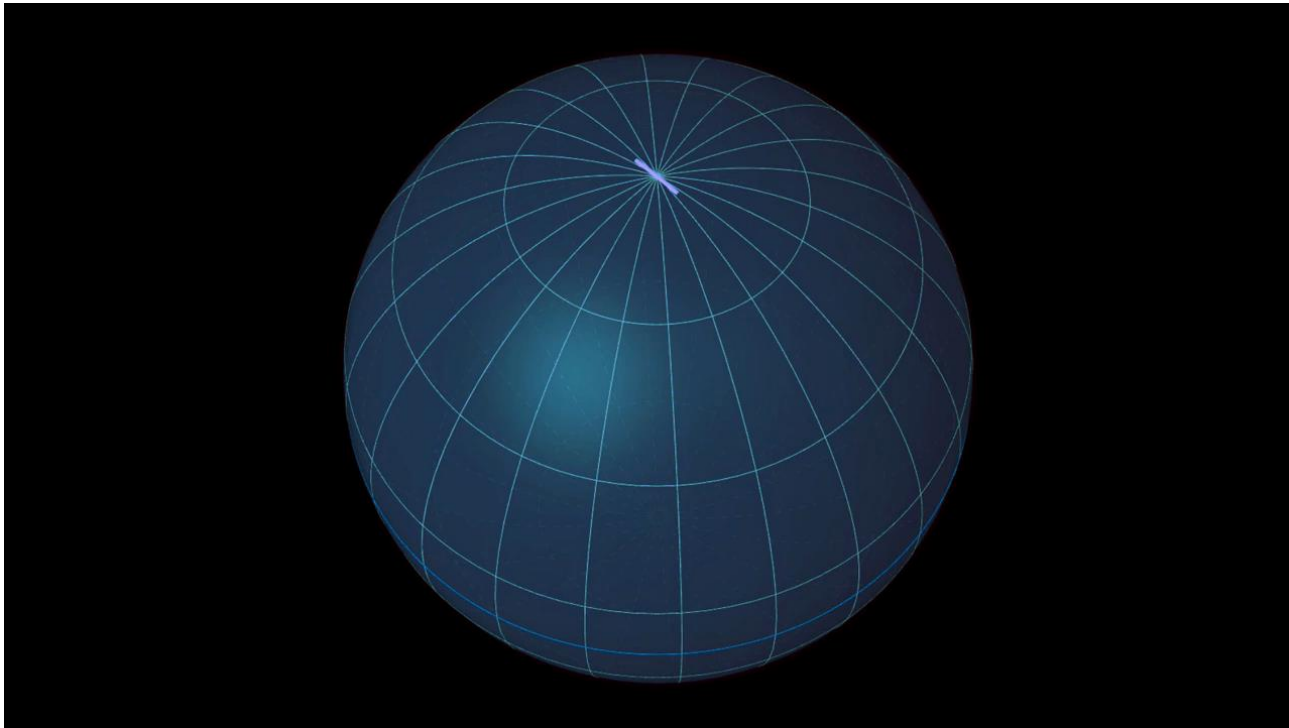
# Examples

Animations performed with Geogebra and Sony Vegas.



# Examples

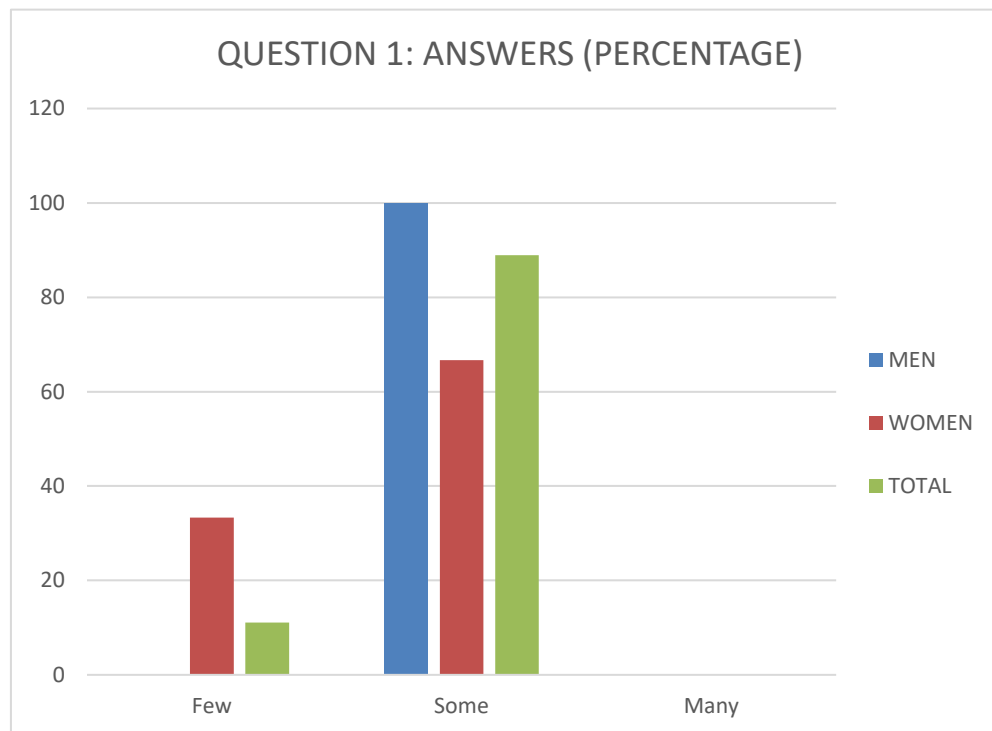
Animations performed with Geogebra and Sony Vegas.





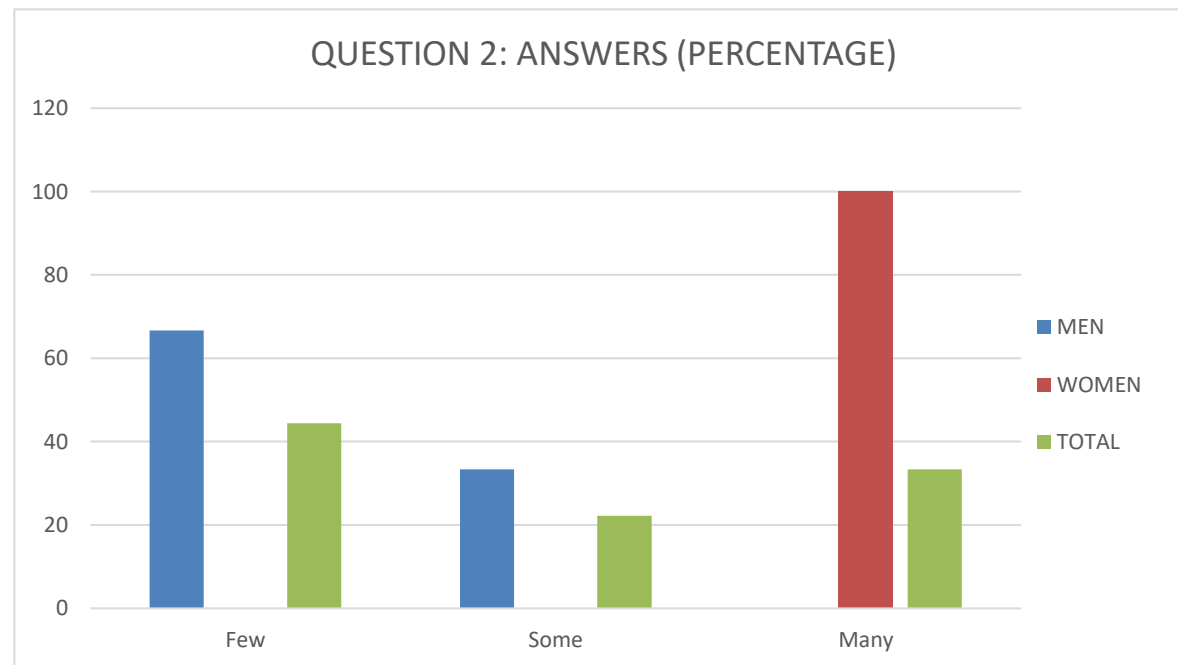
# Audiovisual edition knowledge

Do you have any knowledge regarding audiovisual edition?



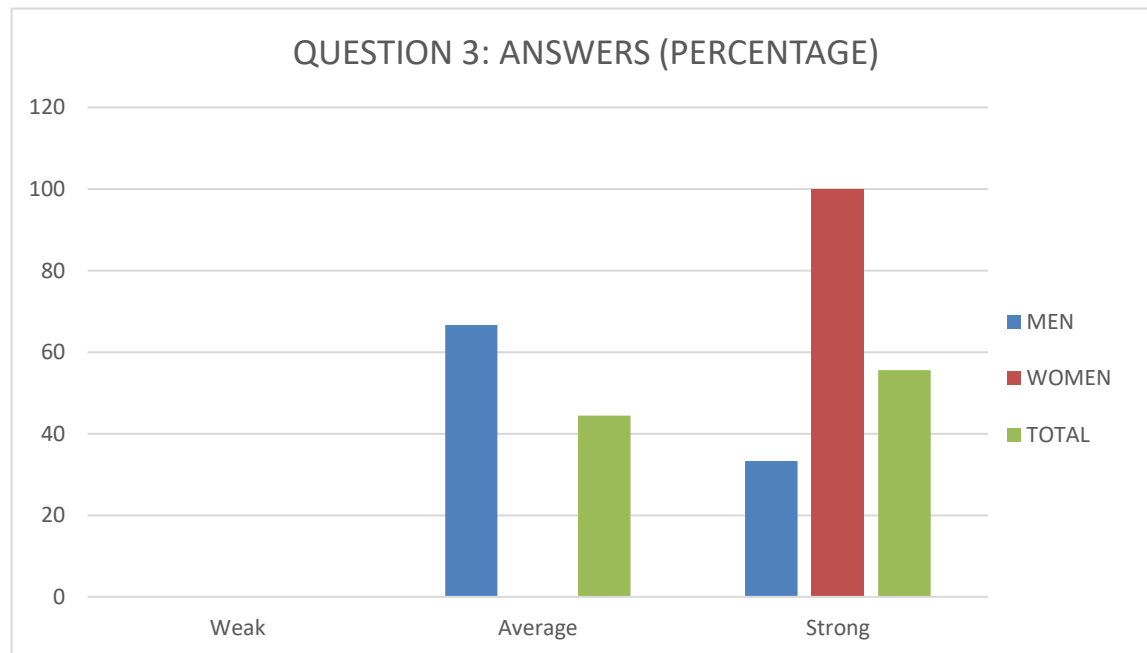
# Social media for education purposes

Do you have any knowledge regarding the use of social media for educational purposes?



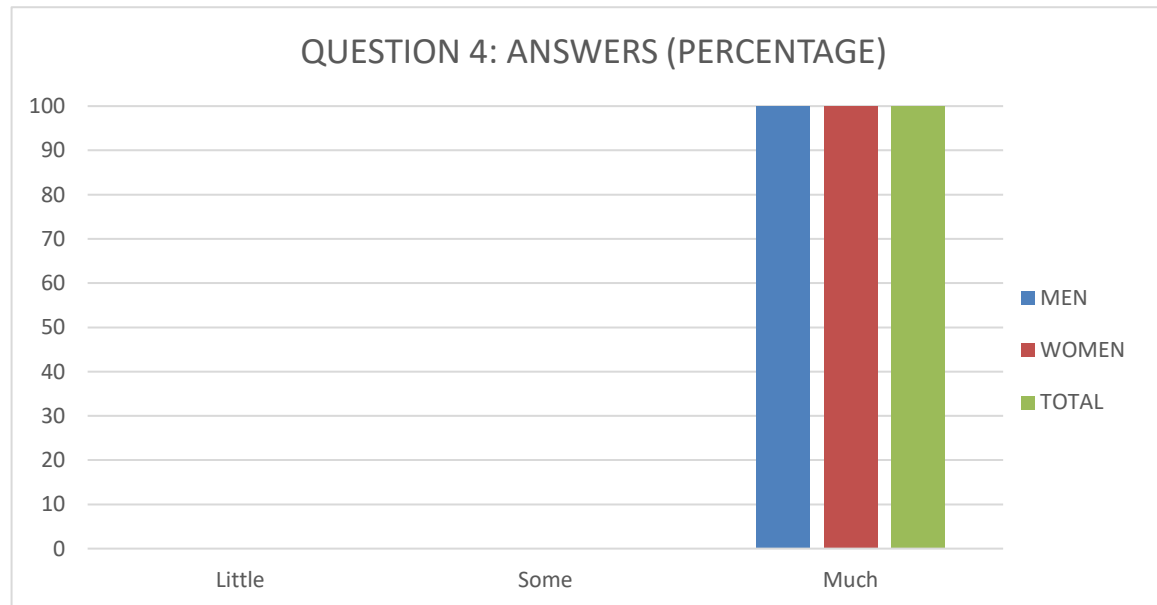
# Physics and audiovisual media

How do you feel about the relationship between Physics and audiovisual media?



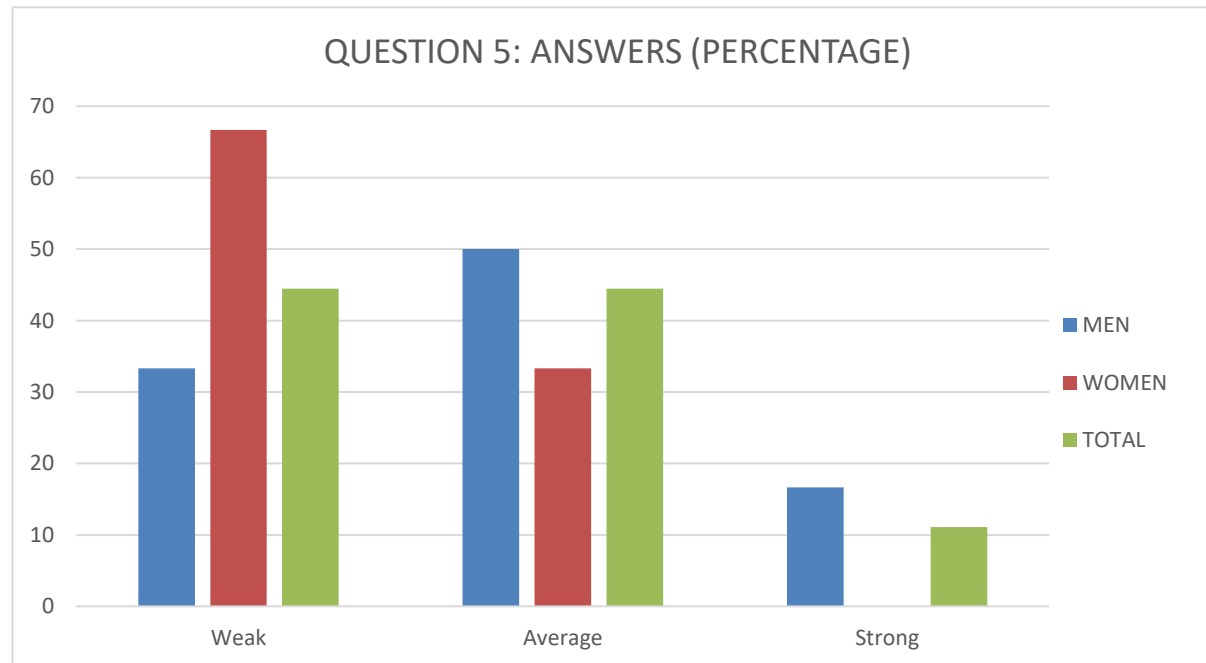
# University and audiovisual media

Do you think audiovisual media are a useful tool when it comes to university teaching?



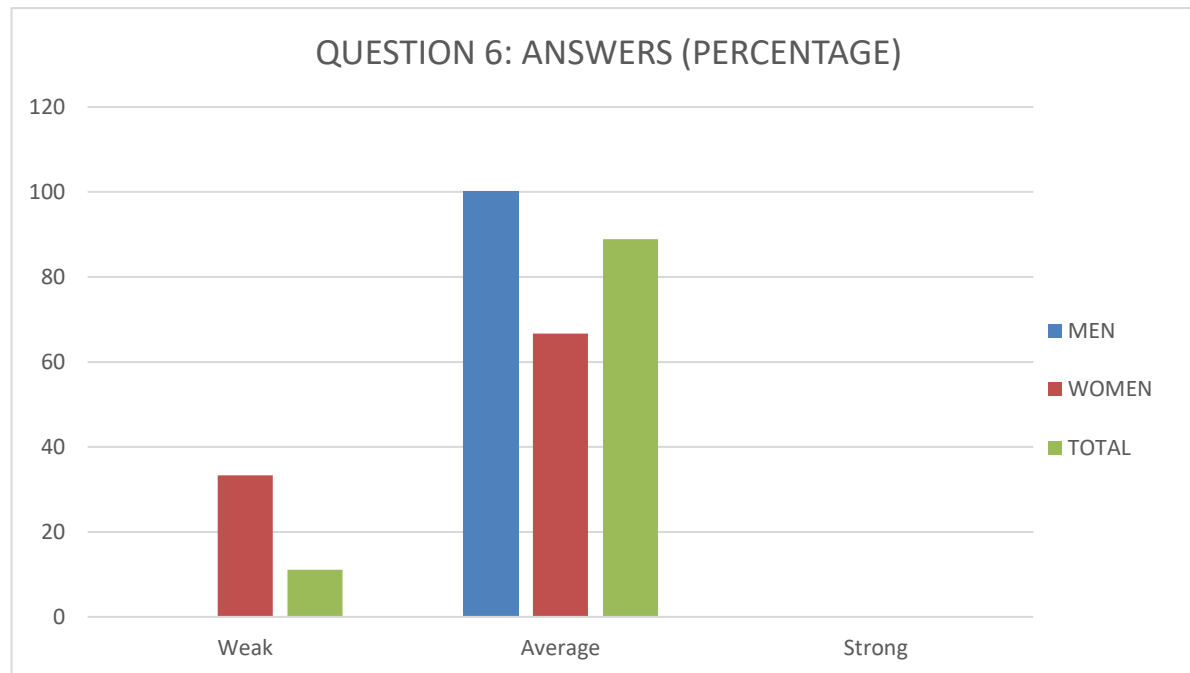
# Communication within university

How would you rate the communication between the several university groups?



# Active participation at the university

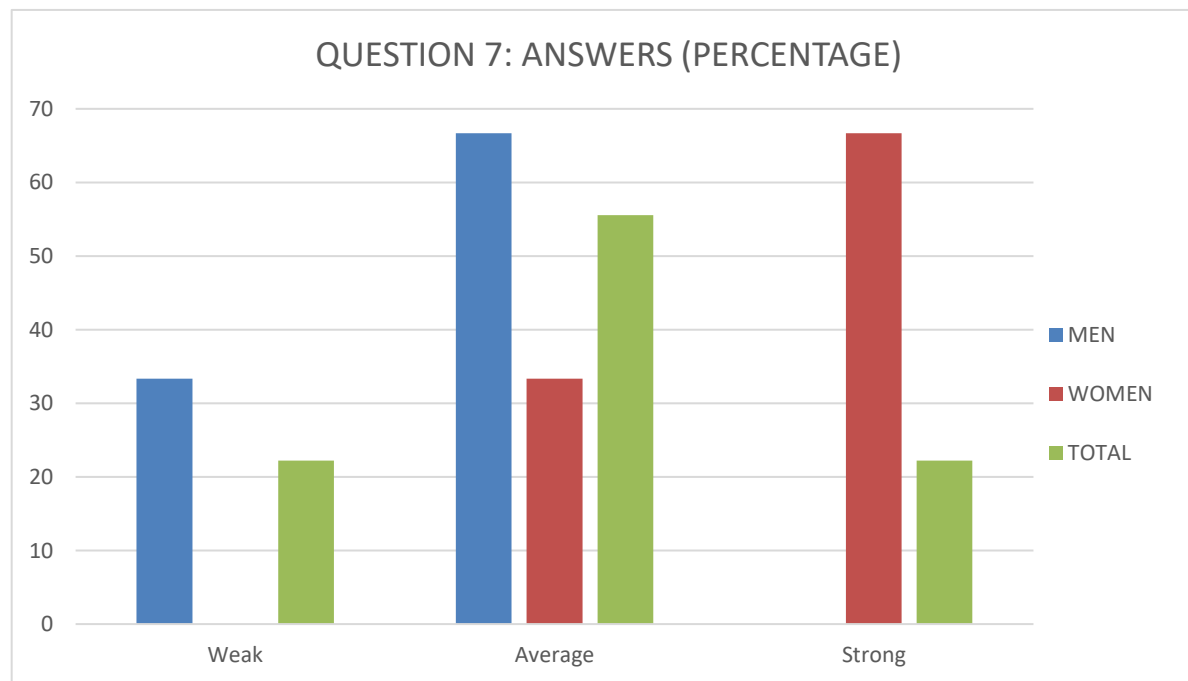
How do you feel about your active participation and intervention in the educative university experience?





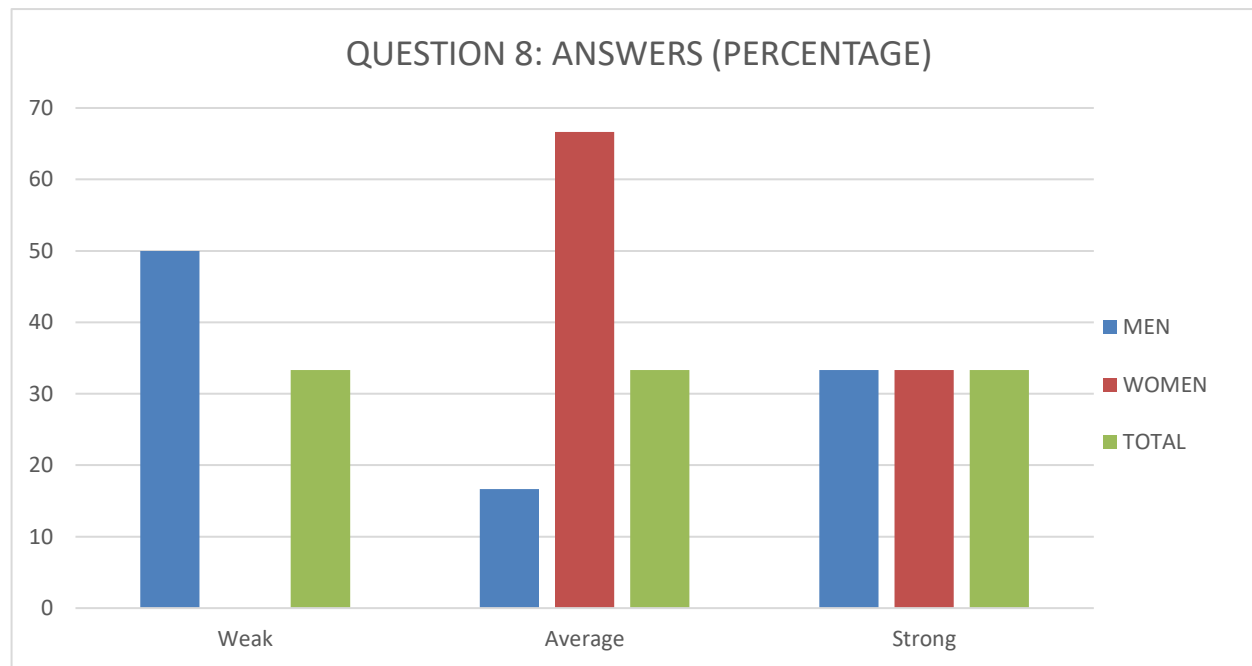
# Collaboration within the university

How do you feel about the integration of students in collaborative and organizational processes at University?



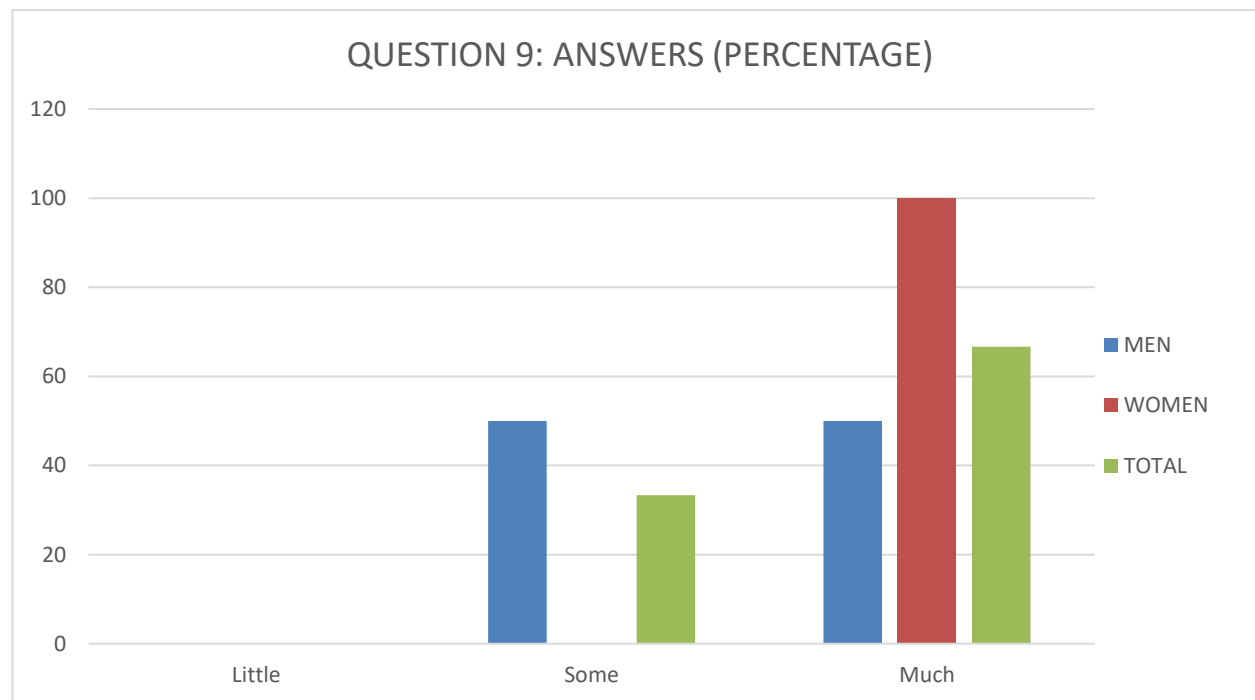
# International education

What do you think about the global and international nature of your academic experience?



# Project usefulness

How do you feel regarding the usefulness and applications of the activities carried out in this project for the future?



# Conclusions

1. In general, more than 80% of the interviewees have some knowledge regarding audiovisual edition. No one claimed to have much knowledge with respect to this topic.
2. With respect to the use of social networks for educational purposes, women said their knowledge regarding this topic was advanced, while more than 60% of men claim to have few knowledge.
3. Every student agrees that physics does have a weak relationship with audiovisual media.
4. 100% of the students agree that audiovisual media are useful for university teaching, regardless of their gender.

# Conclusions

5. Students do not rate the communication between the several university ensembles as strong. It seems like women evaluate communication between the different groups more negatively.
6. No interviewee considers that their active participation in university education is strong. Students think that is medium.
7. Regarding student integration in collaborative and organizational processes and internationalization at University, opinions are diverse.
8. For most of the students, their activities for this project will have strong utility in their future, and no one thinks it will have little usefulness. However, women tend to have a more positive opinion than men.

# General Conclusions

1. Incorporating diverse perspectives and voices from different cultures and traditions in science and art education fosters inclusivity, promotes cultural understanding, and enriches the learning experience for students.
2. The combination of theoretical knowledge and experiential learning, such as observing celestial phenomena and analyzing literary works, offers a well-rounded educational approach that caters to different learning styles.
3. By encouraging students to engage in science and arts, we can nurture their innate curiosity, instill a passion for lifelong learning, and empower them to become critical thinkers in an increasingly complex world.