EINSTEIN TELESCOPE

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI FISICA E ASTRONOMIA "AUGUSTO RIGHI"

INFN Istituto Nazionale di Fisica Nucleare

ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

INAF ISTITUTO NAZIONALE DI ASTROFISICA OAS BOLOGNA

XV Einstein Telescope Symposium

26-30 May 2025, Bologna, Italy

Using Digital Storytelling to Bring Gravitational Waves at School: the GRAVIS project

Matteo Tuveri (Unica & INFN Cagliari)

In collaboration with V. Fanti (UniCa & INFN Ca), A. Steri (UniCa & INFN Ca), A. Contu (INFN Ca), M. Serra (INFN Ca), A. Cardini (INFN Ca), D. D'Urso (UniSs & INFN Ca)

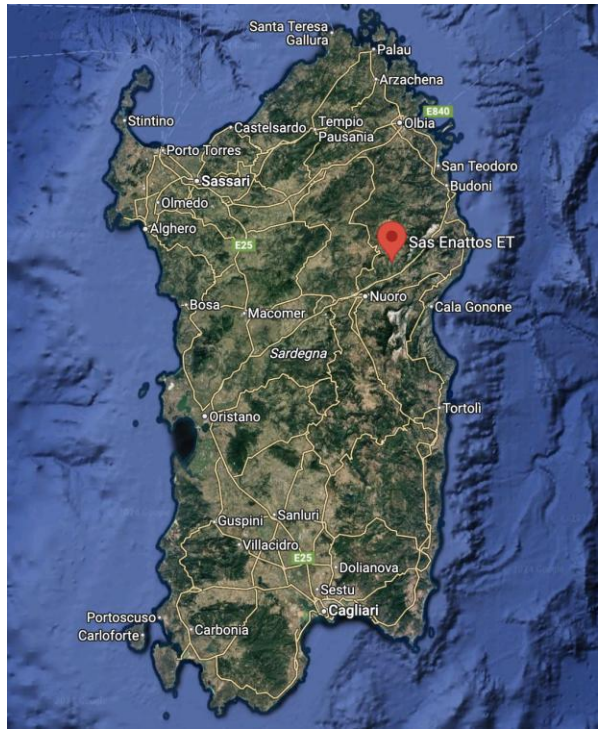
The vision

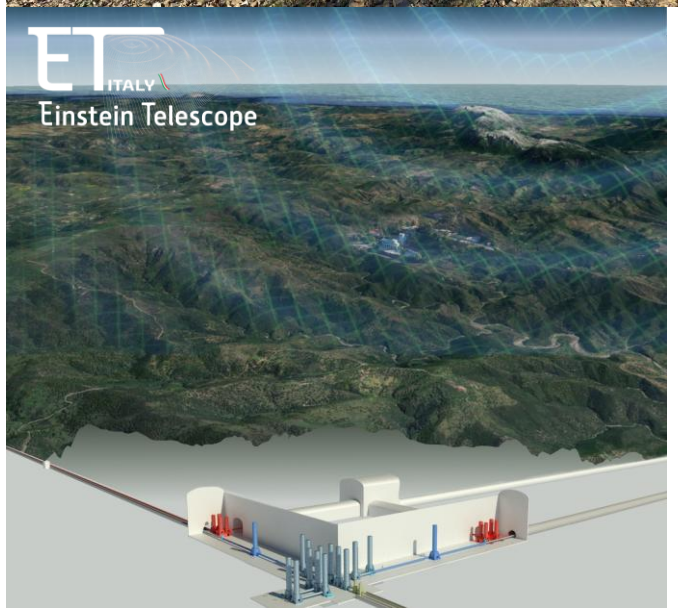
In Europe and, in particular, in Sardinia we can write the future of gravitational waves

Where: Lula – Sos Enathos Mine, Bitti, Onanì

Making ET means build a new society, with anchored roots in its history, but looking to the future!

Einstein Telescope is not just physics - it's society, it's school!

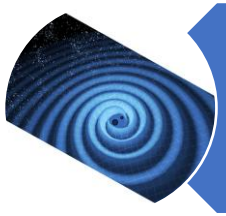




Crediti immagini: Wikipedia (sx); Sos Enathos mine - INFN Cagliari, ET Italia, M. Tuveri (up dx); ET collaboratrion (bot dx)

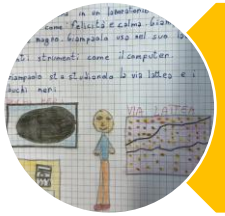
What if kids become part of this future?

GRAVIS (BYE) Project – The structure

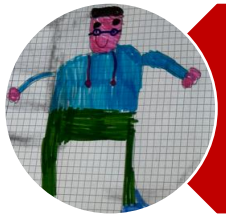


ET Physics

Drawings and Descriptions (tests)



Storytelling



Meeting ET scientists

Experimentation: April – June 2025

2 targets: primary (2 classes, 9-11 y.o.) and middle schools (6 classes, 11-14 y.o.)

100+ students involved

6 hours, 3 meetings for each class

Activities blend ET physics (gravity, spacetime, cosmology, gravitational waves, detectors), history of science, storytelling, emotional learning

Embodied education to work with:
- metaphorical understanding of waves and apply it in many contexts
- represent astrophysical dynamics (from planetary motion to stars/black hole formation and evolution)

We use visual and AI tools (ChatGPT) to engage students in ET physics and stories

“There is no cognition without emotions”
(Damasio, 2011)

Telling

- ET physics
- ET connection with schools and society

Collecting Data (physics education research)

What students feel/know/learn about ET physics

Research goals: studying students’ perception of physics & promoting physics and scientific literacy

Sharing results

With the ET collaboration (and society) to guide ET development on territories fostering a scientificalization process in society

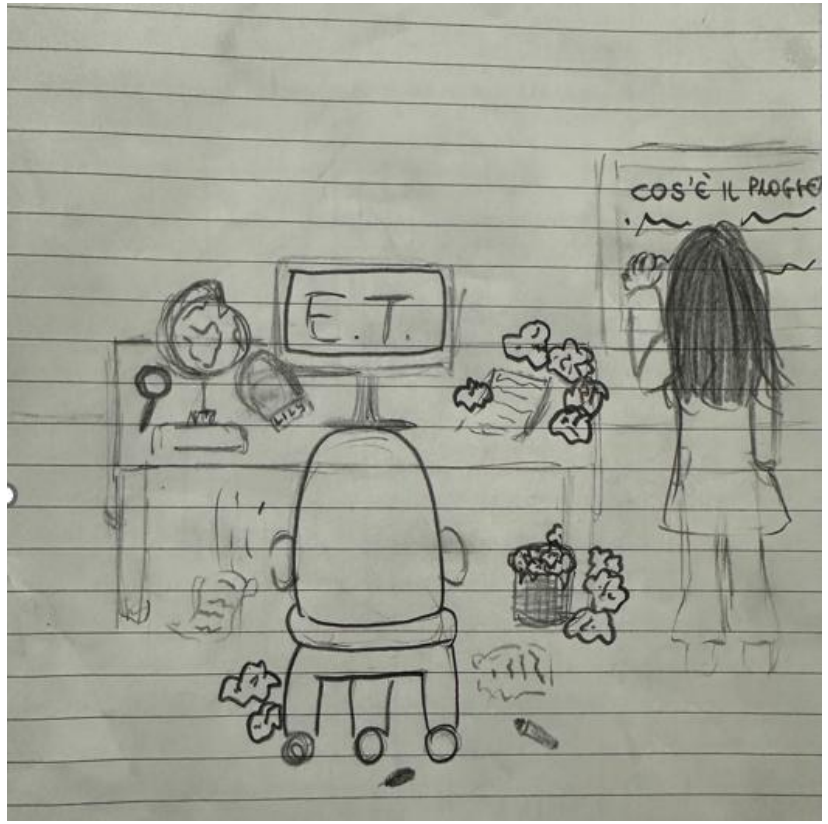
Damasio, A. (2011). Neural basis of emotions. Scholarpedia, 6(3), 1804.; Lambert, J., & Hessler, B. (2018). Digital storytelling: Capturing lives, creating community. Routledge.

Examples of ET stories in Sardinian primary schools

This person works in **Lula**'s ET labs. The lab is spacious with many chemical objects. The walls are light blue and there is a lot of furniture. Giulia works here, a very tall, dark-haired person. She is very kind and a scientist. She uses many chemical objects and is very curious to discover the beginning of the world. Making hypotheses, studying and doing researches makes her very happy. Now she is studying the universe and wants to collaborate in the construction of the ET in Sardinia. She can't wait for the ET to begin.

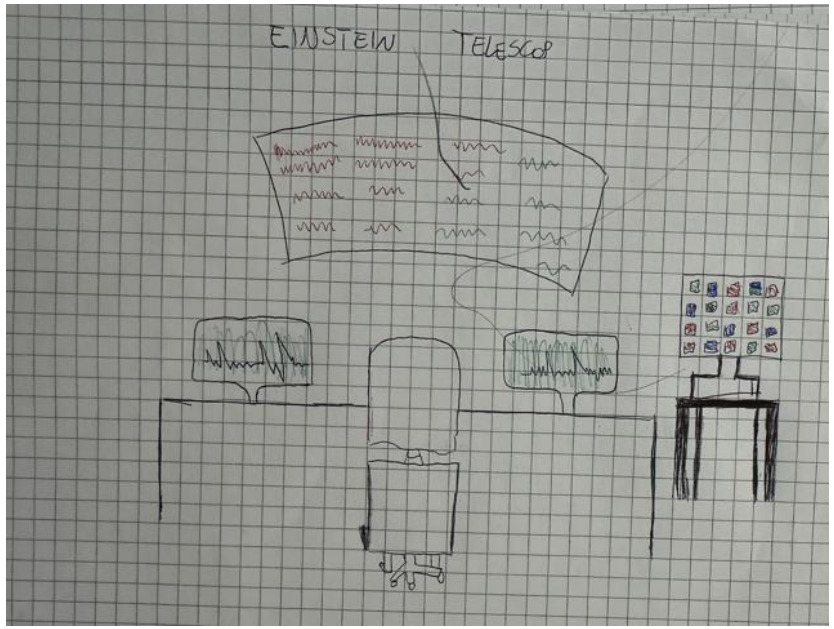
At the Einstein Telescope, in the **Bitti** laboratory, **several people worked**, such as Romolo, an astrophysicist. The laboratory was all white, with various objects such as **telescopes, books, microscopes**. There was everything a scientist needed. Romolo is tall, thin. He has wavy hair, more or less short and black. Finally, he has blue eyes. The astrophysicist studies black holes and his main goal is to find out what it is like inside. However, he does not know how to do it, he mainly uses telescopes. One day, during his research, he discovered a super giant black hole never discovered before a few light years from Earth. It was his chance to discover the inside of the black hole.

Students' storytelling: DDETT – Draw and Describe a person working in Et Test*



Physicist working in ET Laboratory in Sardinia according to a Sardinian middle school student

Credits: Matteo Tuveri, ET Italy Collaboration

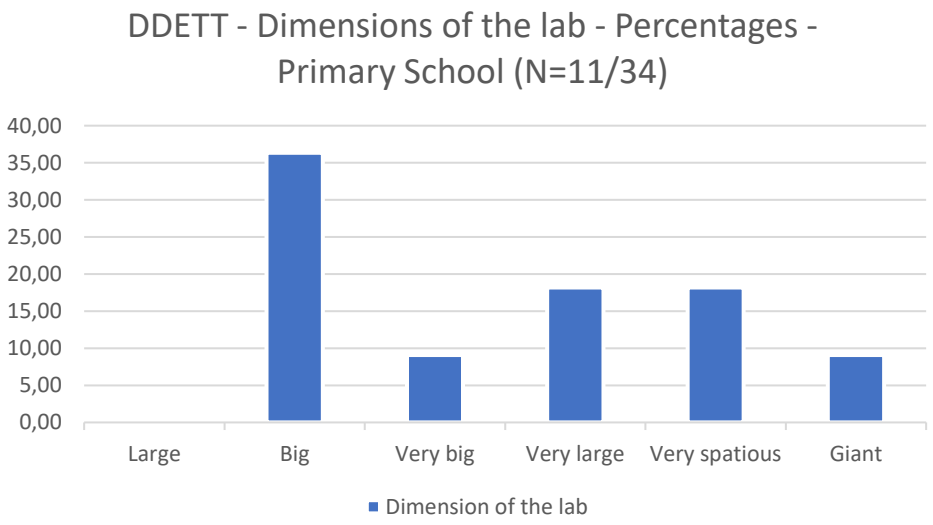


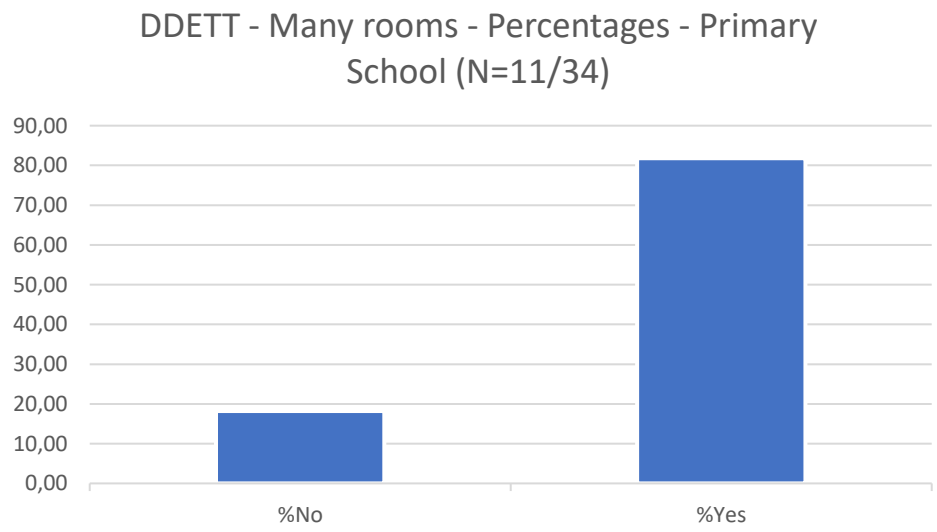
Examples of primary (at the center) and middle (on the right) schools students' ET scientist and labs drawings

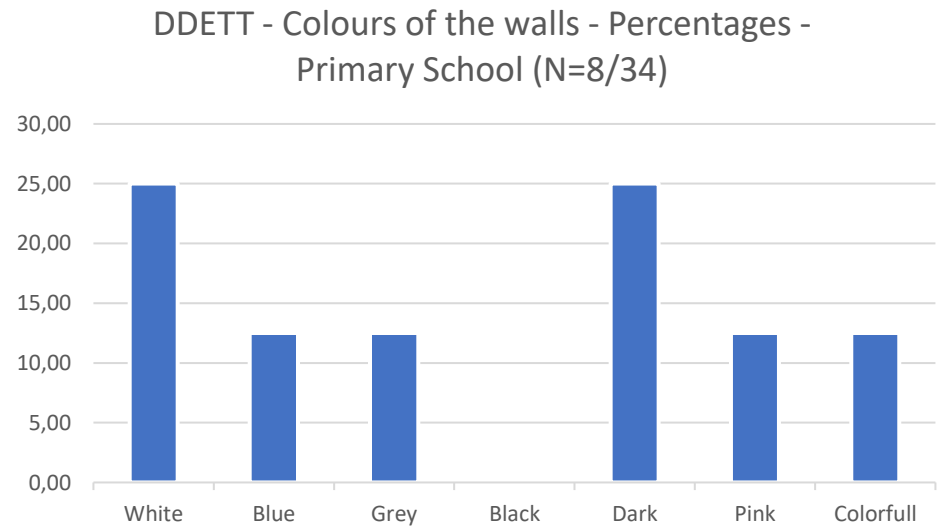
*Based on: Petrucco, C. (2022). Digital Storytelling as a tool for reflecting on university students' future professional competencies. Journal of e-Learning of Knowledge Society, 18(3), 178-185. Inspired by Chambers, D. W. (1983). Stereotypic images of the scientist: The draw-a-scientist test. Science Education, 67(2), 255-265; Finson, K. D., Beaver, J. B., & Cramond, B. L. (1995). Development and field test of a checklist for the Draw-A-Scientist Test. School Science and Mathematics, 95(4), 195-205; Finson, K. D. (2002). Drawing a scientist: What we do and do not know after fifty years of drawings. School Science and Mathematics, 102(7), 335-345

And last but no least ...

DDETT – Lab features



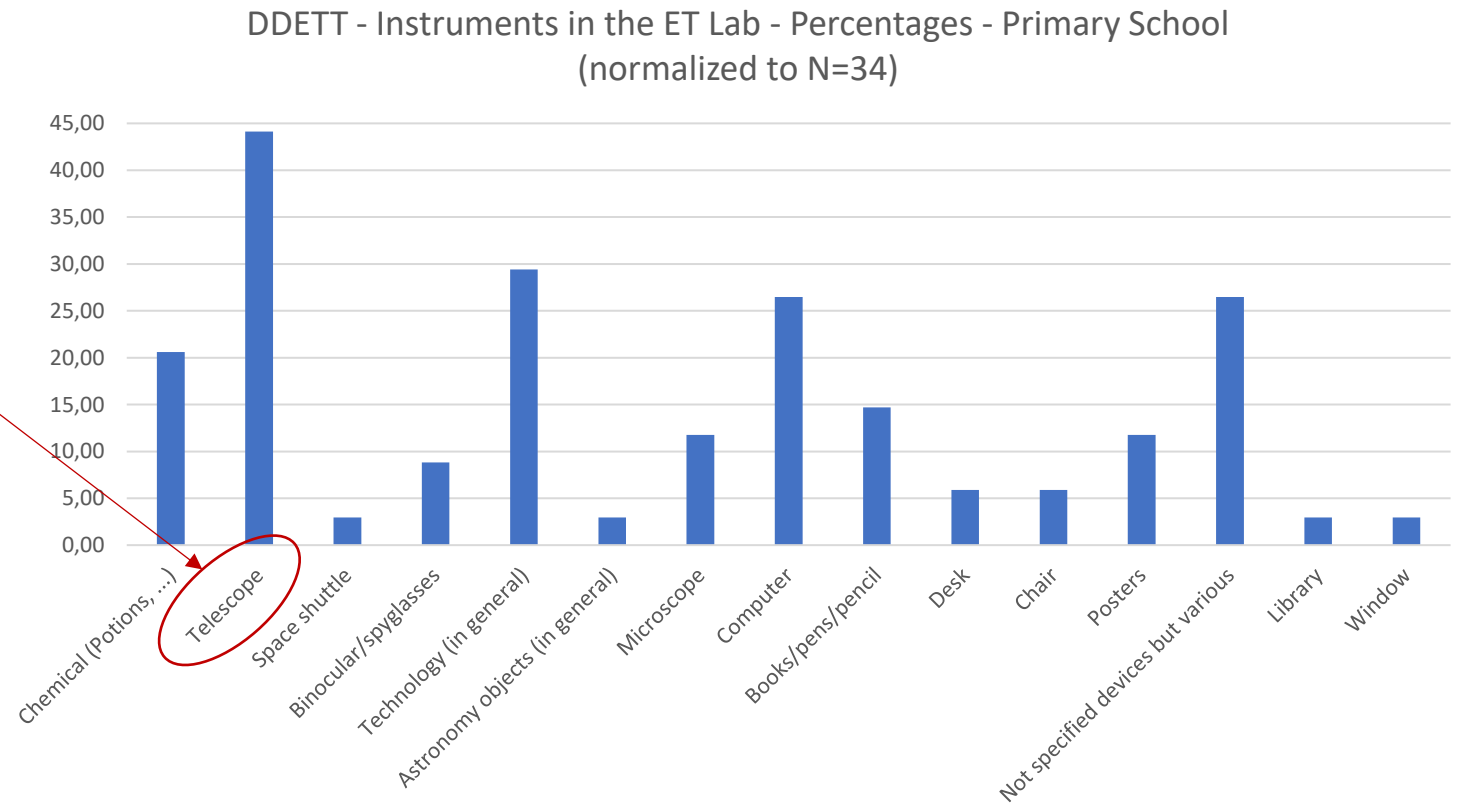




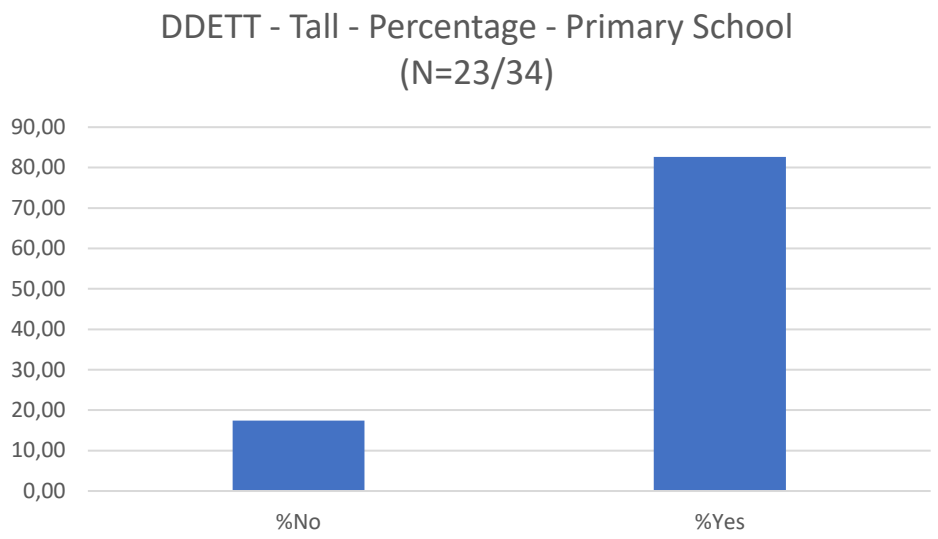
DDETT – Instruments in the ET Lab

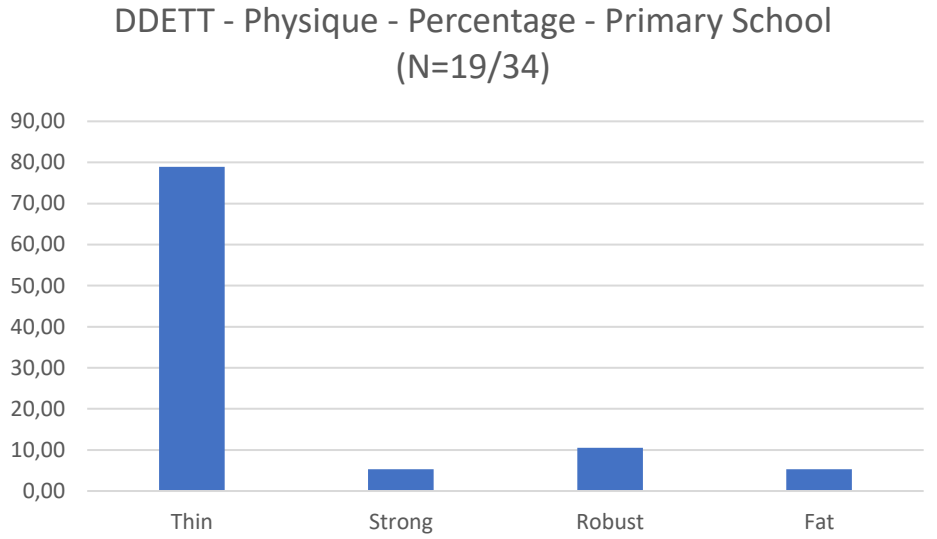
	Chemical (Potions, ...)	Telescope	Space shuttle	Binocular/spyglasses	Technology (in general)	Astronomy objects (in general)	Microscope	Computer	Books/pens/pencil	Desk	Chair	Posters	Not specified devices but various	Library	Window
%Yes	20,59	44,12	2,94	8,82	29,41	2,94	11,76	26,47	14,71	5,88	5,88	11,76	26,47	2,94	2,94
N	7	15	1	3	10	1	4	9	5	2	2	4	9	1	1

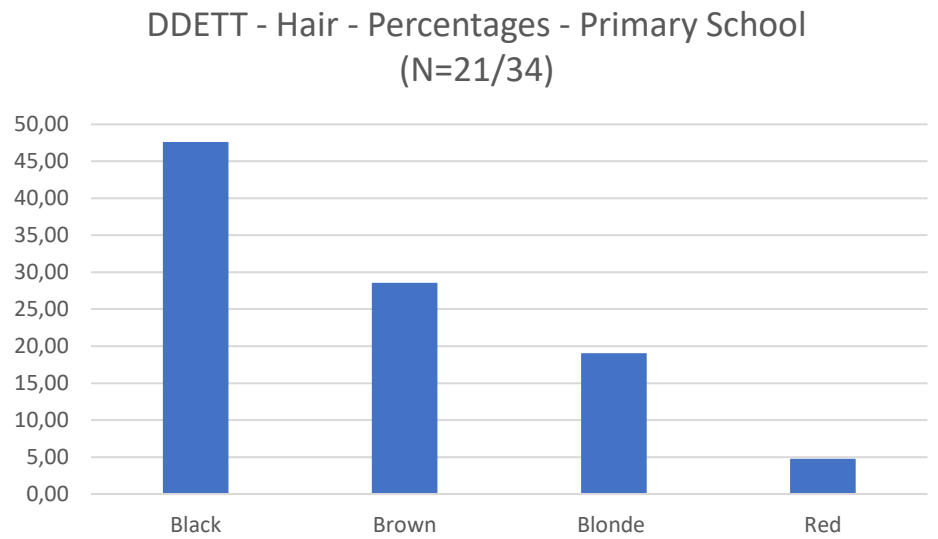
Communicating the right metaphor for Einstein Telescope: **looking far away thanks to gravity!**

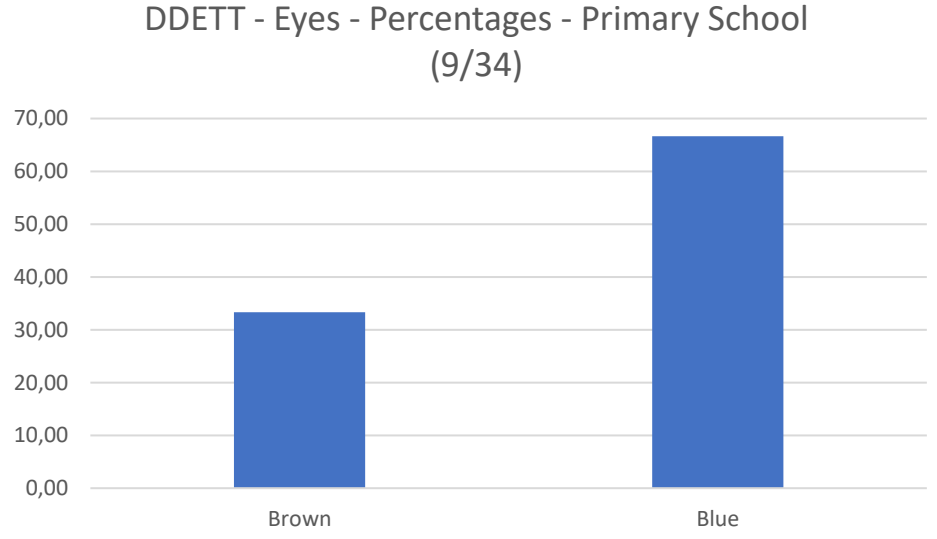


DDETT – Physical Charateristics

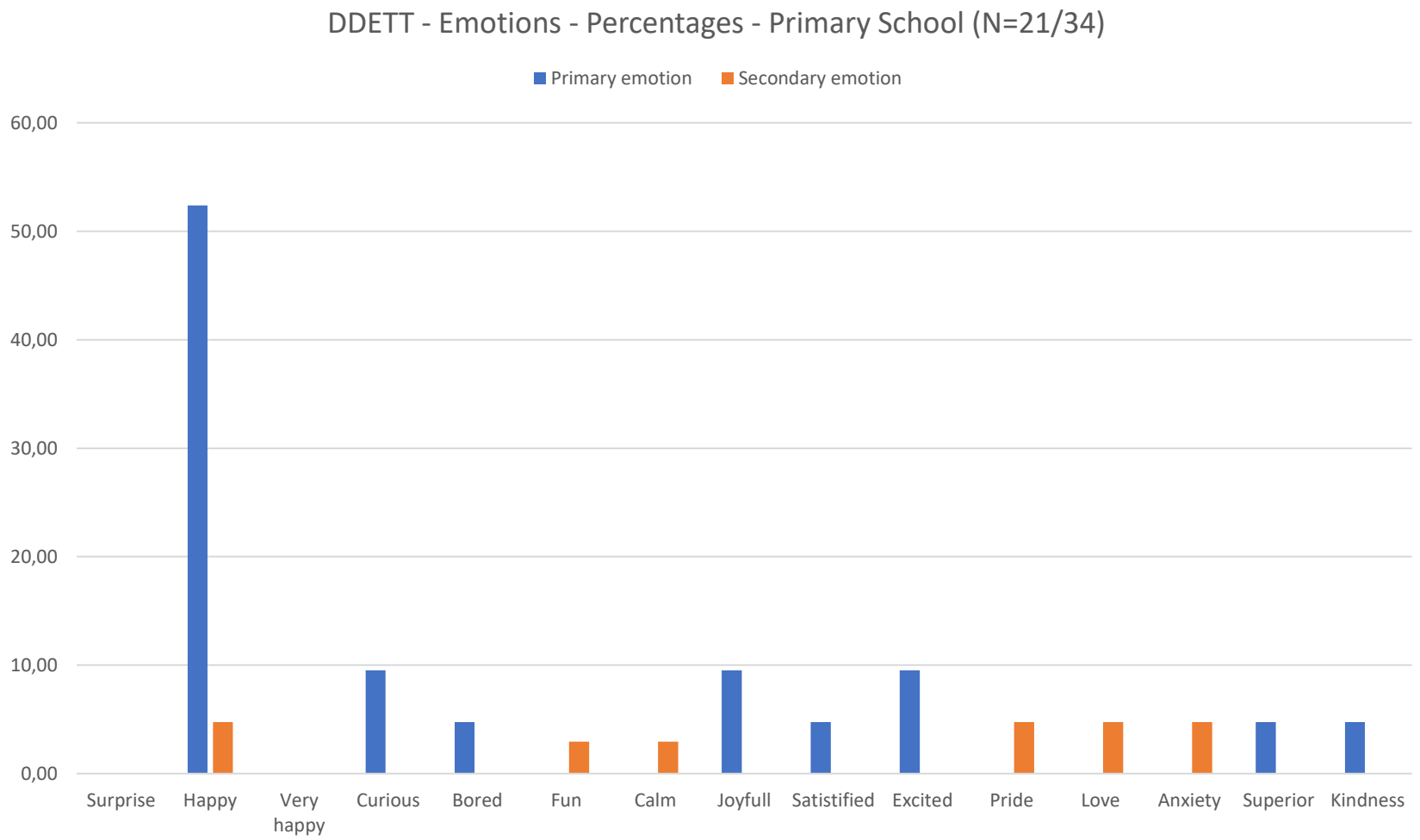




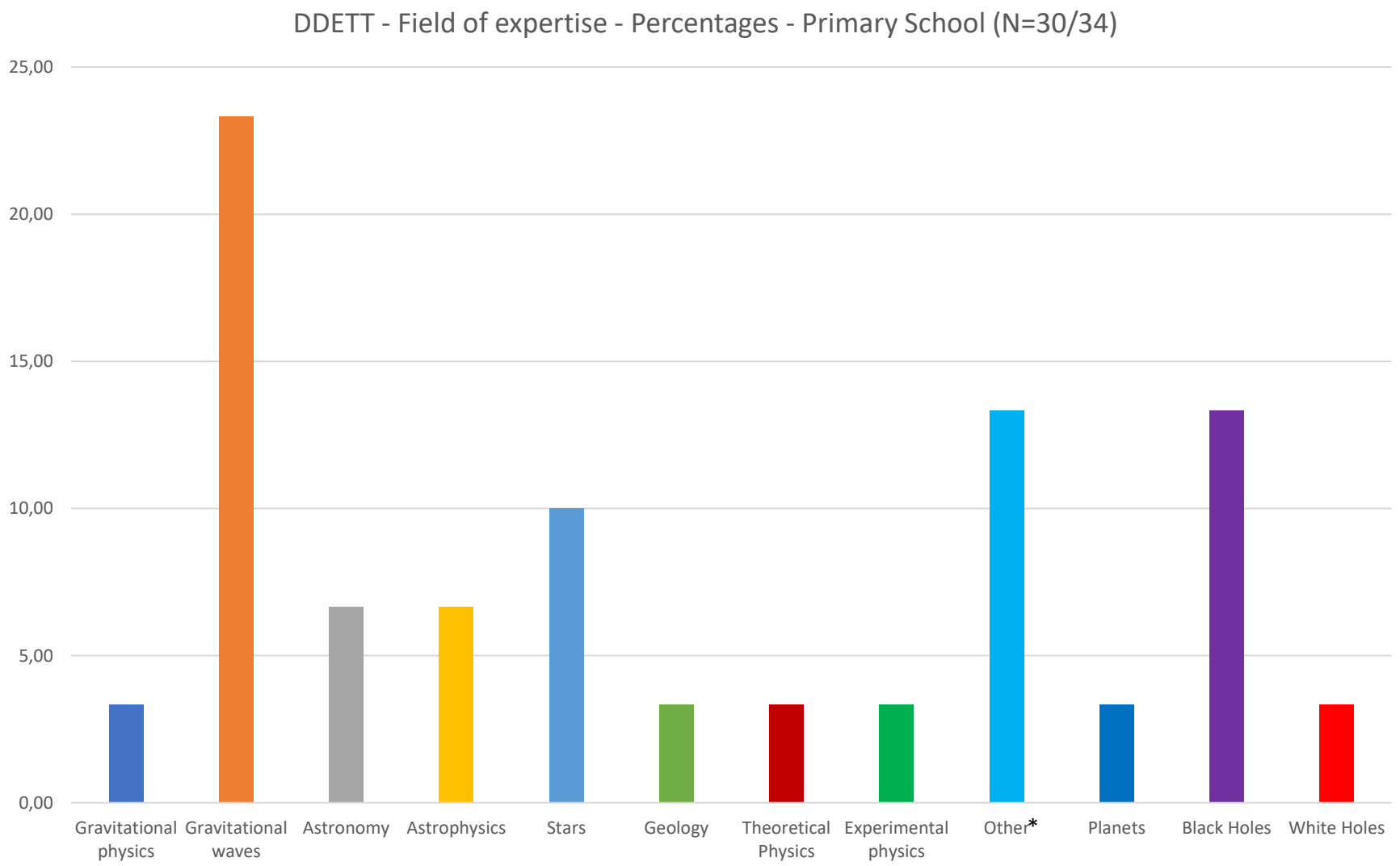




DDET – Emotions felt by the character during his/her work



DDETT – Field of expertise of the character

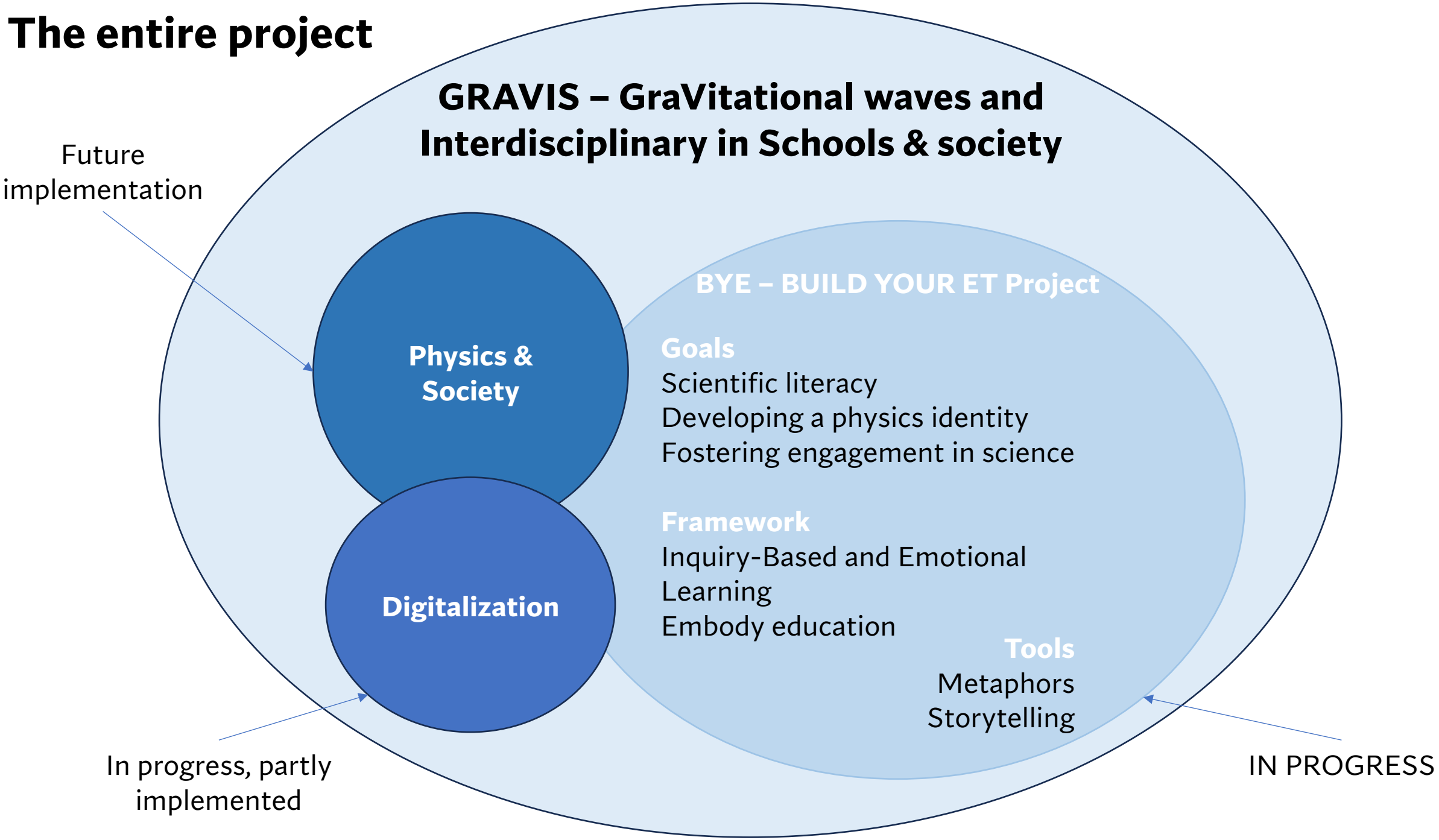


*Chemical engineering, animals, lasers

Gràtzias!

Back-up slides

The entire project



DDETT Analysis - Details

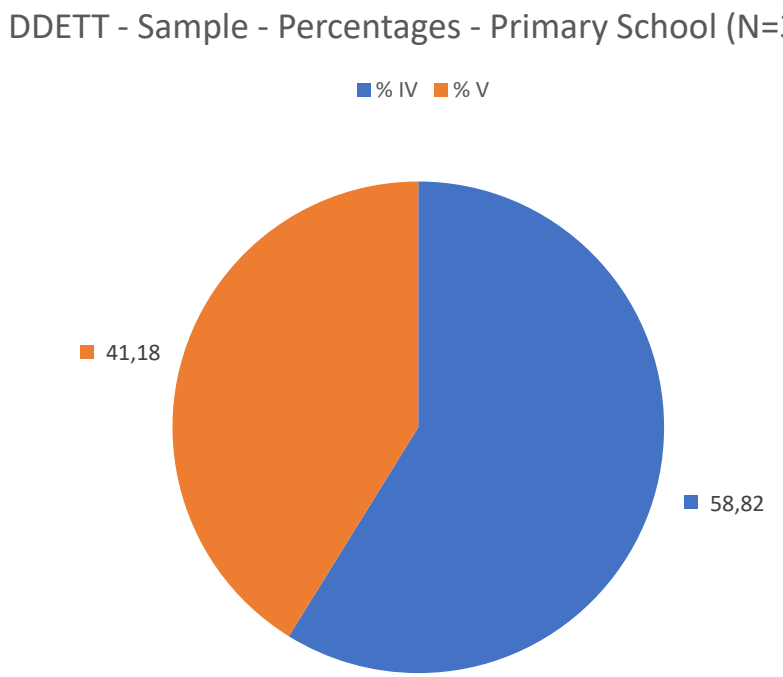
ChatGPT’s story of a person working in ET

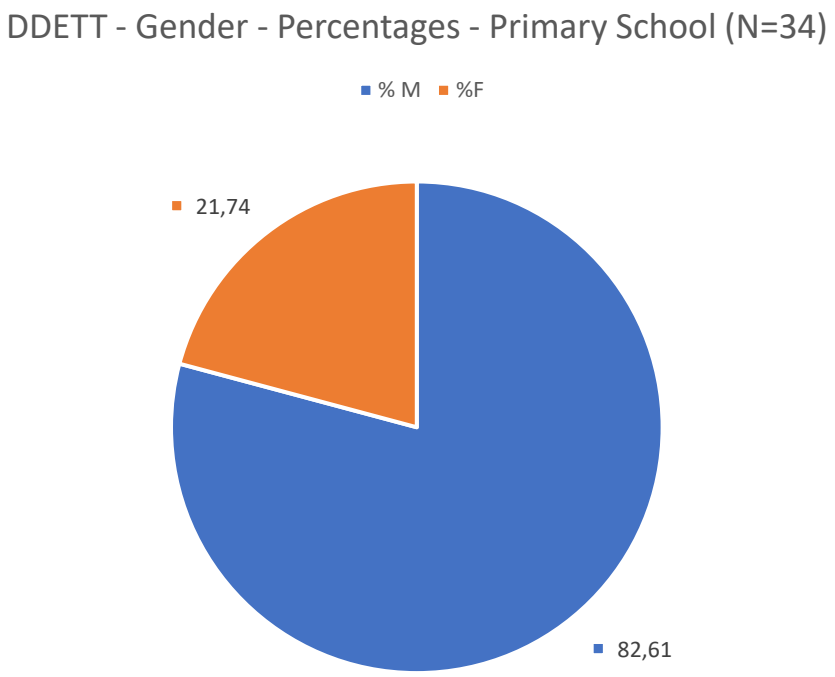
Meeting the scientists working in ET and their research stories

Viviana Fanti (UniCa and INFN Cagliari) working on radioactivity measures in Sos Enathos mine (Lula, Sardinia) according to ChatGPT

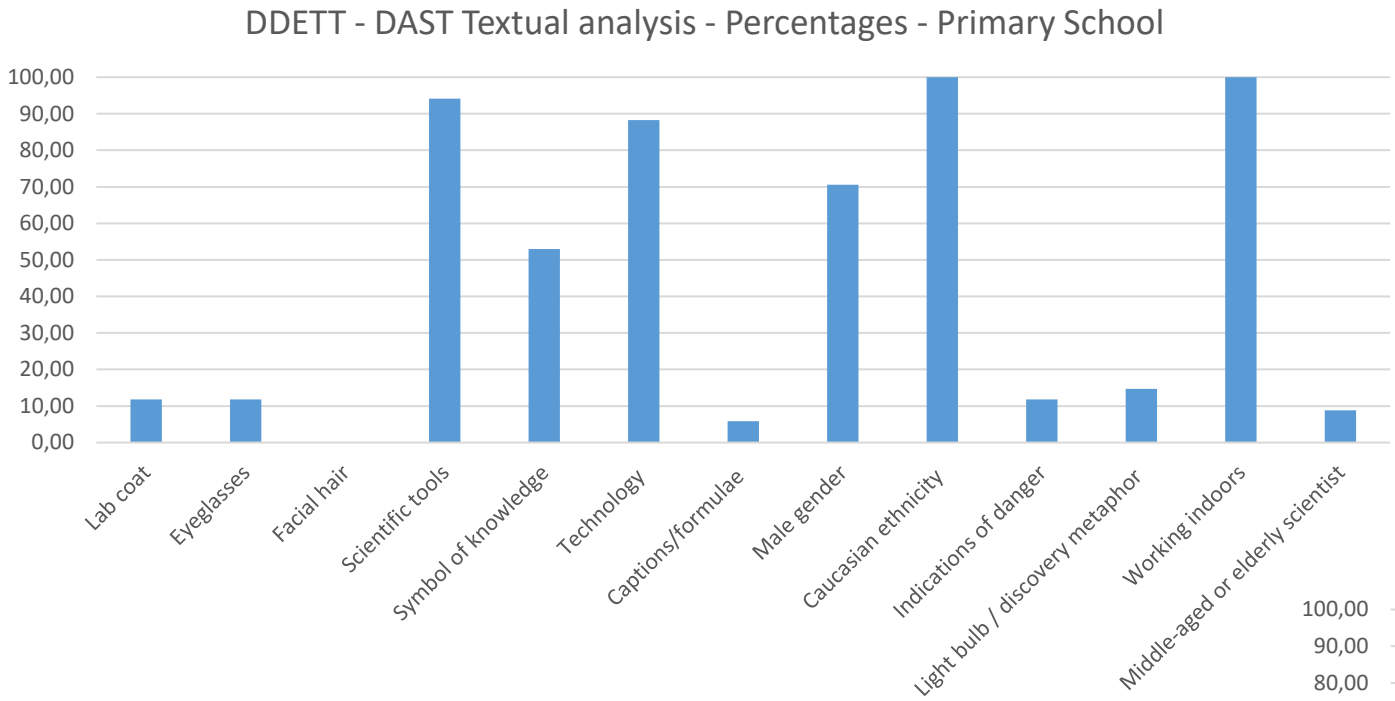
Andrea Contu (INFN Cagliari) working on site characterization measurements in Sos Enathos mine (Lula, Sardinia) according to ChatGPT

DDETT Analysis - Sample

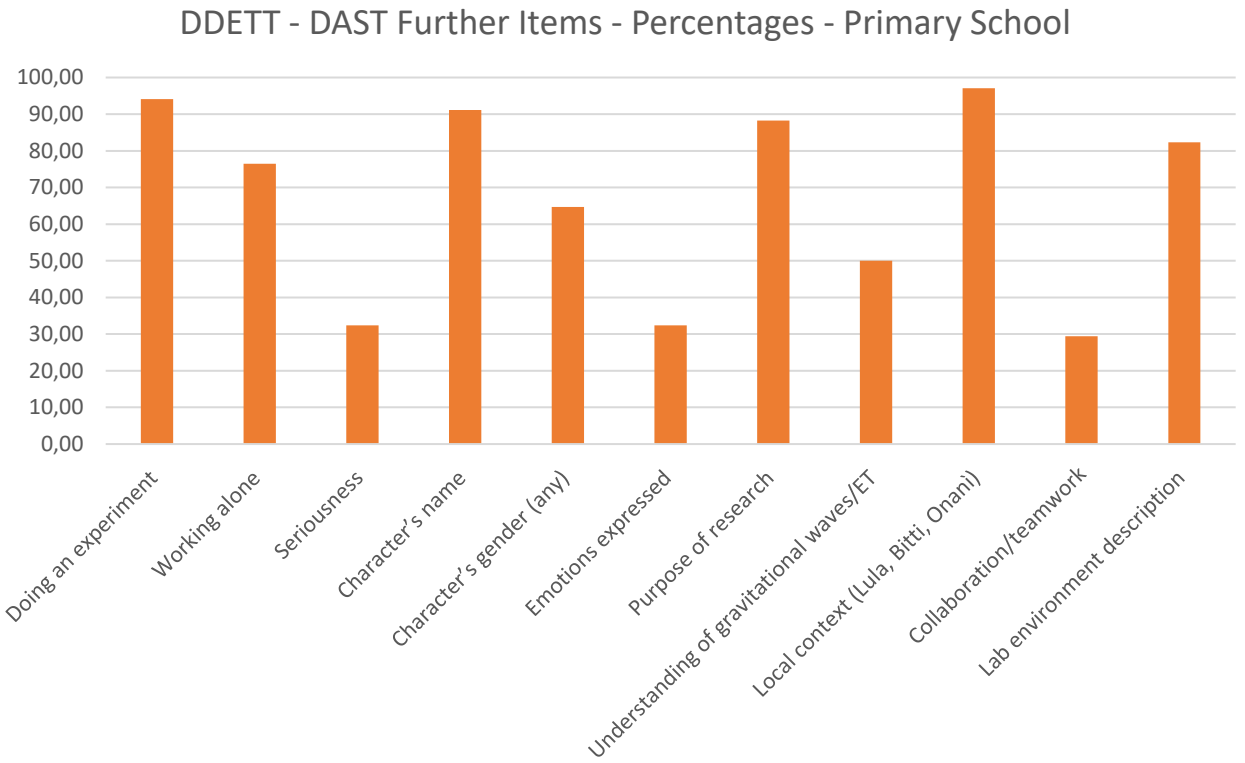




DDETT – DAST Textual Analysis



Total number of stories collected: 34



DDETT – Classification of the ET stories

%	Primary category	Secondary category
Recollection of learning experiences	5,88	20,59
Scientific definition	8,82	14,71
Descriptive	58,82	20,59
Creative	26,47	44,12