



# REINFORCE

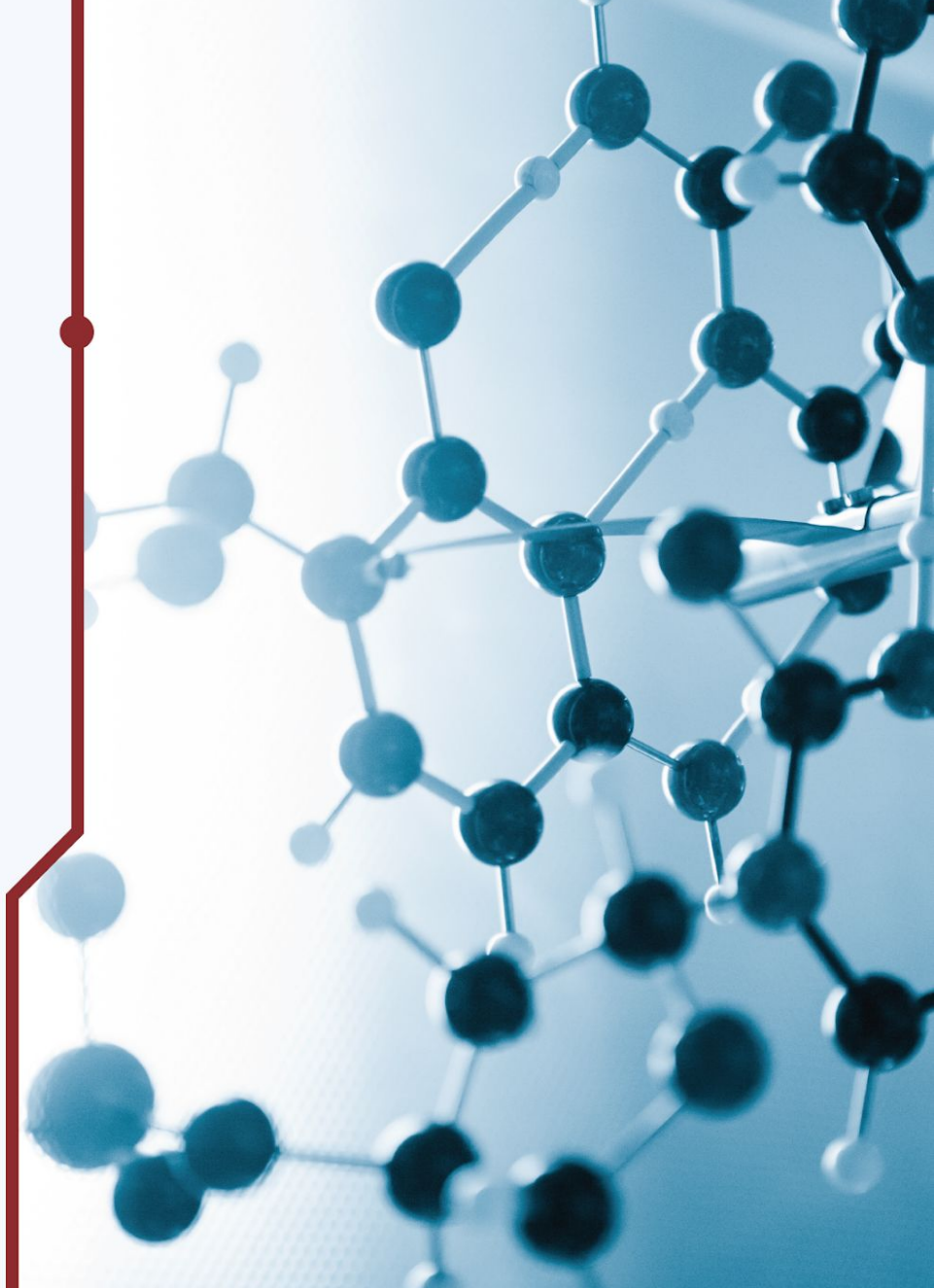
REsearch INfrastructures FOR Citizens in Europe

## Senior Citizen Science

Policy Roadmap Workshop

Pisa, 2 September, 2022

**Gary Hemming (EGO)**





- Lessons took place during afternoon sessions at the communal library in Cascina, near to Pisa.
- Organised in collaboration with the *University of the Age*.
- 10 sessions in total.

📍 **Cascina (PI)**  
**Biblioteca comunale**  
**Viale Comaschi n° 67**

● ● ● ● ● ● 16:00-17:00

Course Programme:

## “ Physics for Senior Citizen Scientists ”

06 OCT 2021

### Classical particle physics

Giancarlo Cella, Pisa University

- ☒ The concept of space and time, in Galileo, Descartes and Newton
- ☒ The concept of particle trajectory, mass, speed, acceleration Laws of Newton, the movement of the planets

08 OCT 2021

### Particles & waves in the XX century

Massimiliano Razzano, Pisa University

- ☒ Einstein special relativity,  $E=mc^2$
- ☒ Quanta, particle-wave duality,  $E=h\nu$ , Heisenberg principle, particle and antiparticles
- ☒ Cosmic ray physics
- ☒ Subnuclear forces, radioactivity, quantum field theory
- ☒ Nuclear and particle reactions , why they produce energy
- ☒ The forces and particles zoo

10 NOV 2021

### Waves: concept and detection

Giancarlo Cella, Pisa University

- ☒ The concept of wave in Hughsen, amplitude, frequency, interference
- ☒ Electromagnetic theory and waves, aether
- ☒ Their detection with the Michelson and Morley interferometer

03 DEC 2022

### The cosmology of the visible universe

Stavros Katsanevas, EGO

- ☒ Formation and evolution of white dwarf stars, black holes and neutron stars
- ☒ Formation and evolution of galaxies, their redshift
- ☒ Formation and evolution of particles, primordial cosmology

09 MAR 2022

### Citizen Science: from theory to practice

Francesco Di Renzo, Pisa University

- ☒ The REINFORCE project
- ☒ Search for glitches: tools and methods
- ☒ Hands-on activity on Zooniverse

06 APR 2021

### General relativity

Valerio Boschi, National Institute for Nuclear Physics

- ☒ New concept of spacetime, GW equations, effects, ways of detection, LIGO and Virgo, sources of noise
- ☒ Sources of Noise, analyses of waves, glitches, FFT etc
- ☒ What have we discovered up to now

29 APR 2022

### Brainstorming and resolution of technical problems

Gary Hemming, EGO

- ☒ Brainstorming with REINFORCE technical manger

06 MAY 2022

### The sonification of gravitational waves

Francesco Di Renzo, Pisa University

- ☒ The sonification of gravitational waves
- ☒ Sonification tools and goals in REINFORCE

11 MAY 2022

### Art & Science

Stavros Katsanevas, EGO

- ☒ Art &Science in REINFORCE
- ☒ Concept, techniques and representation of the nature of space and time
- ☒ The role of humans as observers and actors

10 MAY 2022

### VISIT to EGO and the VIRGO interferometer

Gary Hemming, EGO

- ☒ Visit to the EGO site
- ☒ Visit to the VIRGO interferometer



# Discussion session of the 29th of April

- Listed in programme as, *‘Brainstorming and resolution of technical and theoretical problems’ (Brainstorming e risoluzione di problemi teorici e tecnici)*
- The English version of the programme described the session as, *‘Brainstorming with REINFORCE scientists’*.
- The Italian version was more effusive, *‘I partecipanti discuteranno con gli scienziati di EGO e del progetto REINFORCE delle tematiche affrontate nell’ambito del Corso, con particolare riferimento alle problematiche di natura tecnica e teorica emerse nel contesto dei progetti di citizen science avviati in REINFORCE’*



- 13 participants
- Informal discussion around general questions
- Prepared questions in terms of:
  - prior experience;
  - the structure of the lessons;
  - GWitchHunters;
  - Zooniverse;
  - REINFORCE;
  - results;
  - the future;
  - and potential improvements.

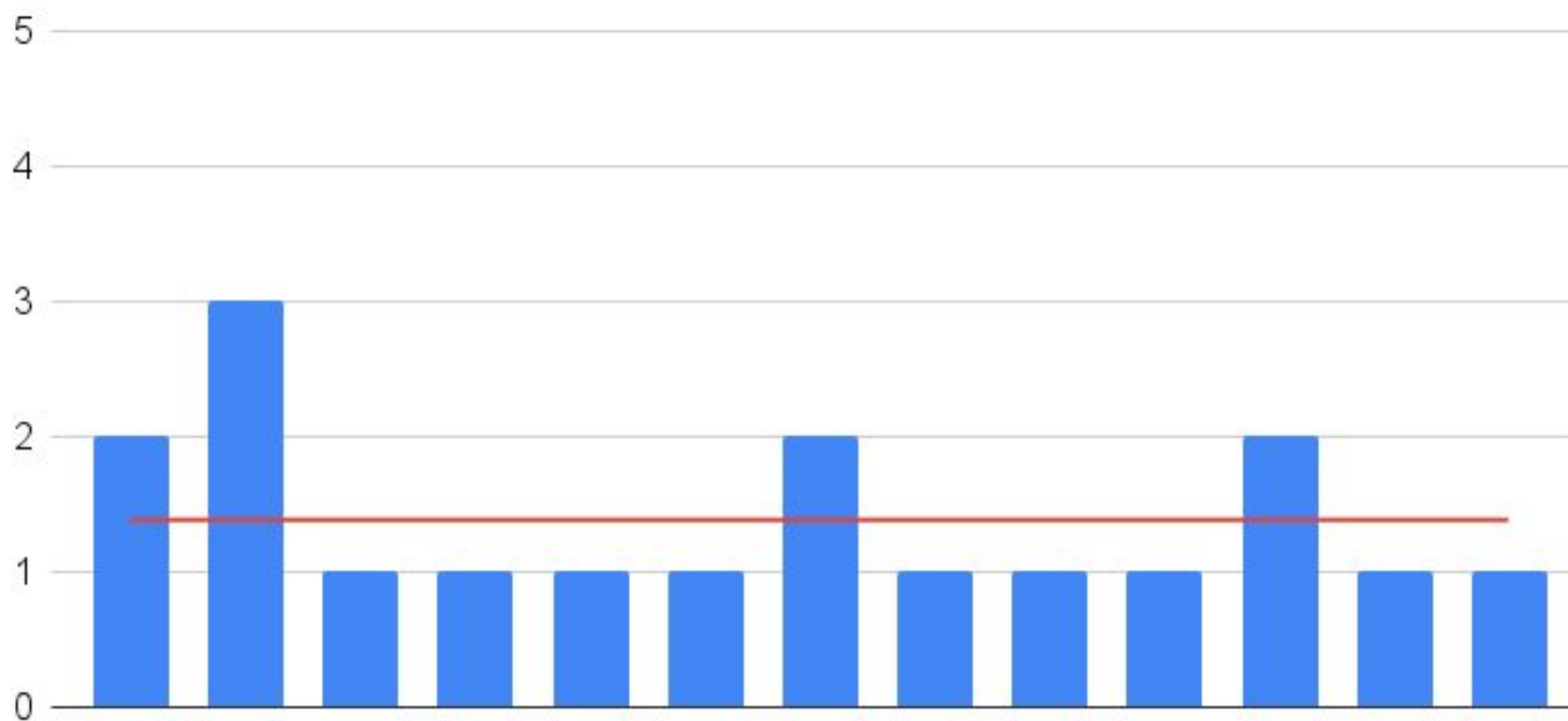




# Experience

How much experience do you have in the sector of scientific research? (1 = None; 5 = Lots) e Average

■ Responses — Average

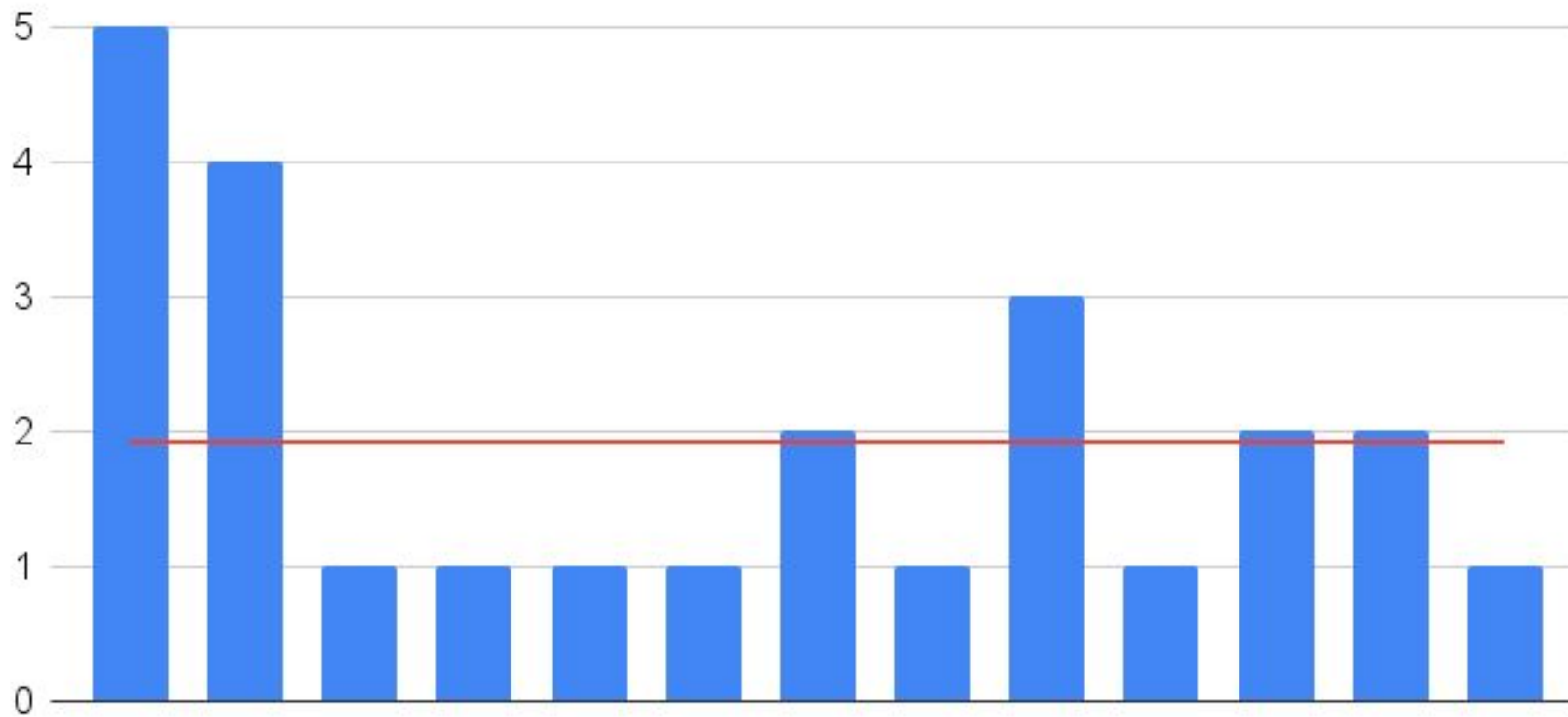




# Experience

How familiar are you with the work of EGO-Virgo? (1 = Not at all; 5 = Very)

■ Responses — Average

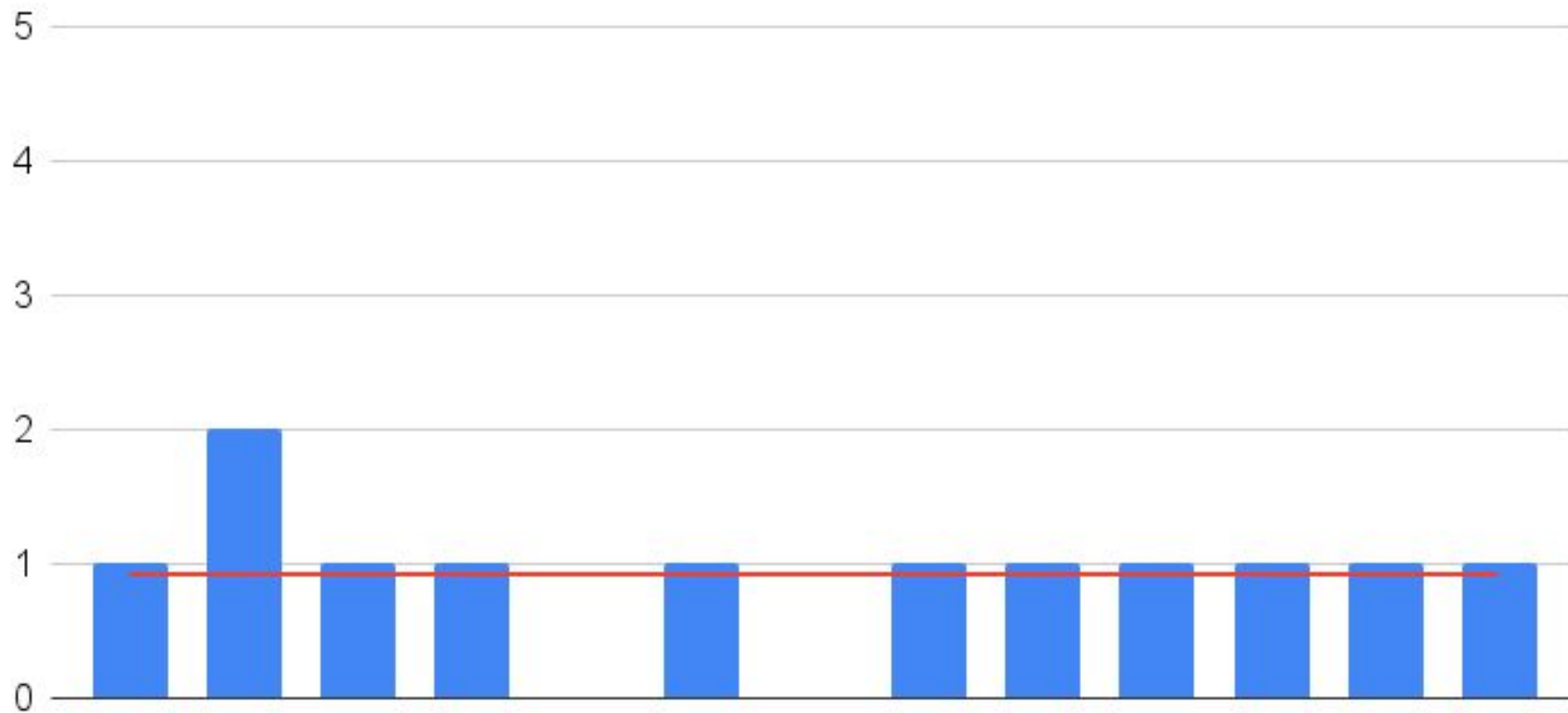




# Experience

How familiar are you with the concept of citizen science (1 = Not at all; 5 = Very)

■ Responses — Average

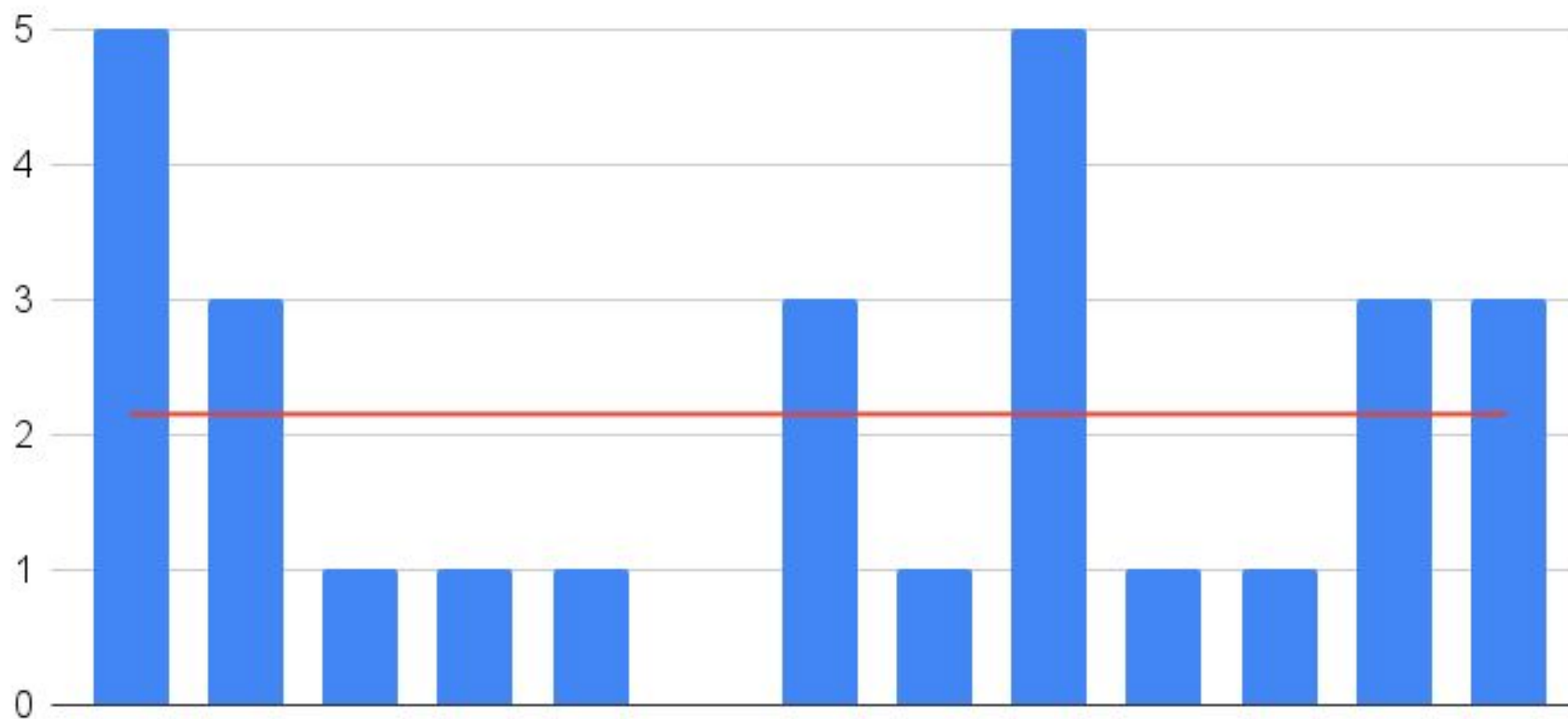




# The lessons

How have you found the level of the lessons? (1 = Very difficult; 5 = Very easy)

■ Responses — Average



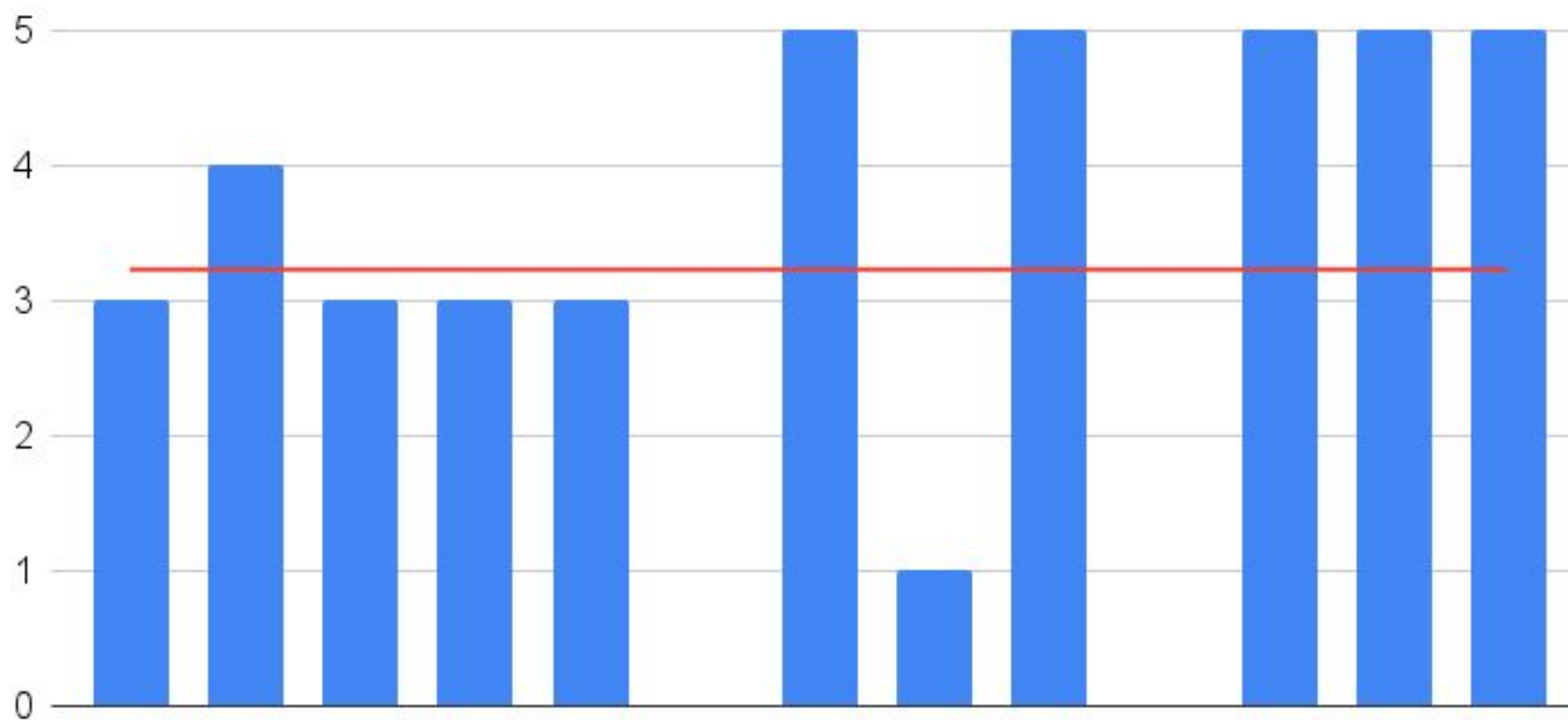




# The lessons

How interesting have you found the lessons? (1 = Not interesting; 5 = Very interesting)

■ Responses — Average

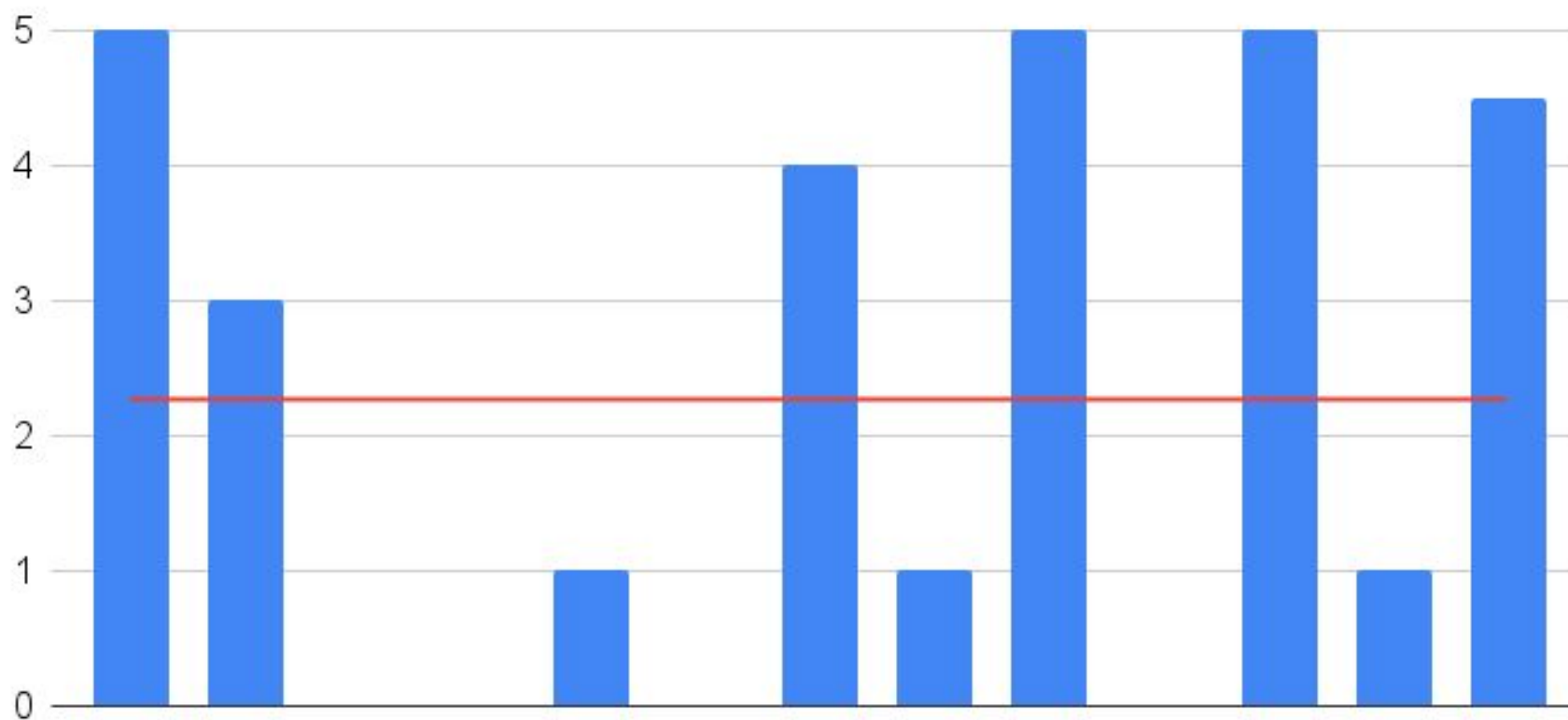




# The lessons

How have you found the format of the lessons? (1 = I would have done things differently; 5 = The format was perfect)

■ Responses — Average

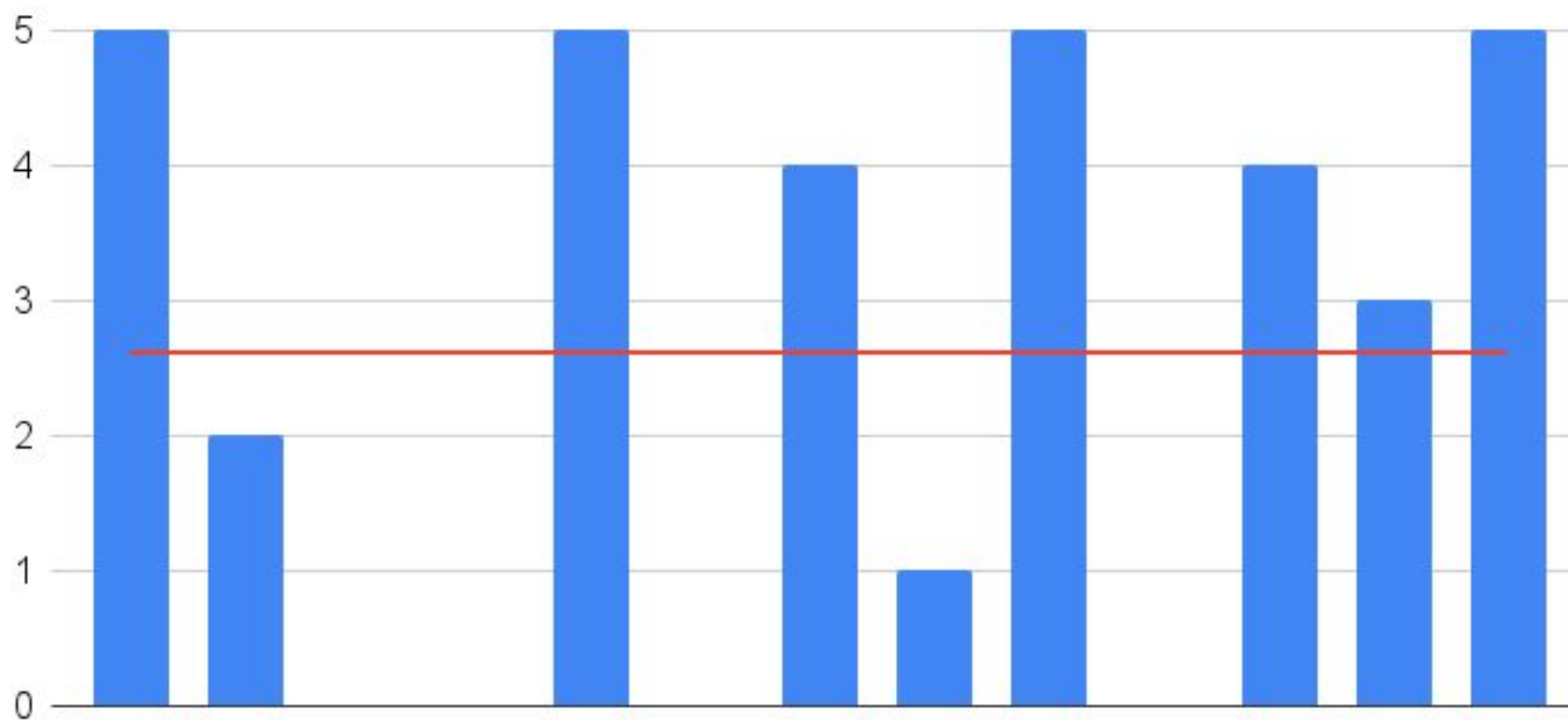




# The lessons

Have the materials used during the lessons been useful and sufficient? (1 = Not sufficient; 5 = Sufficient)

■ Responses — Average



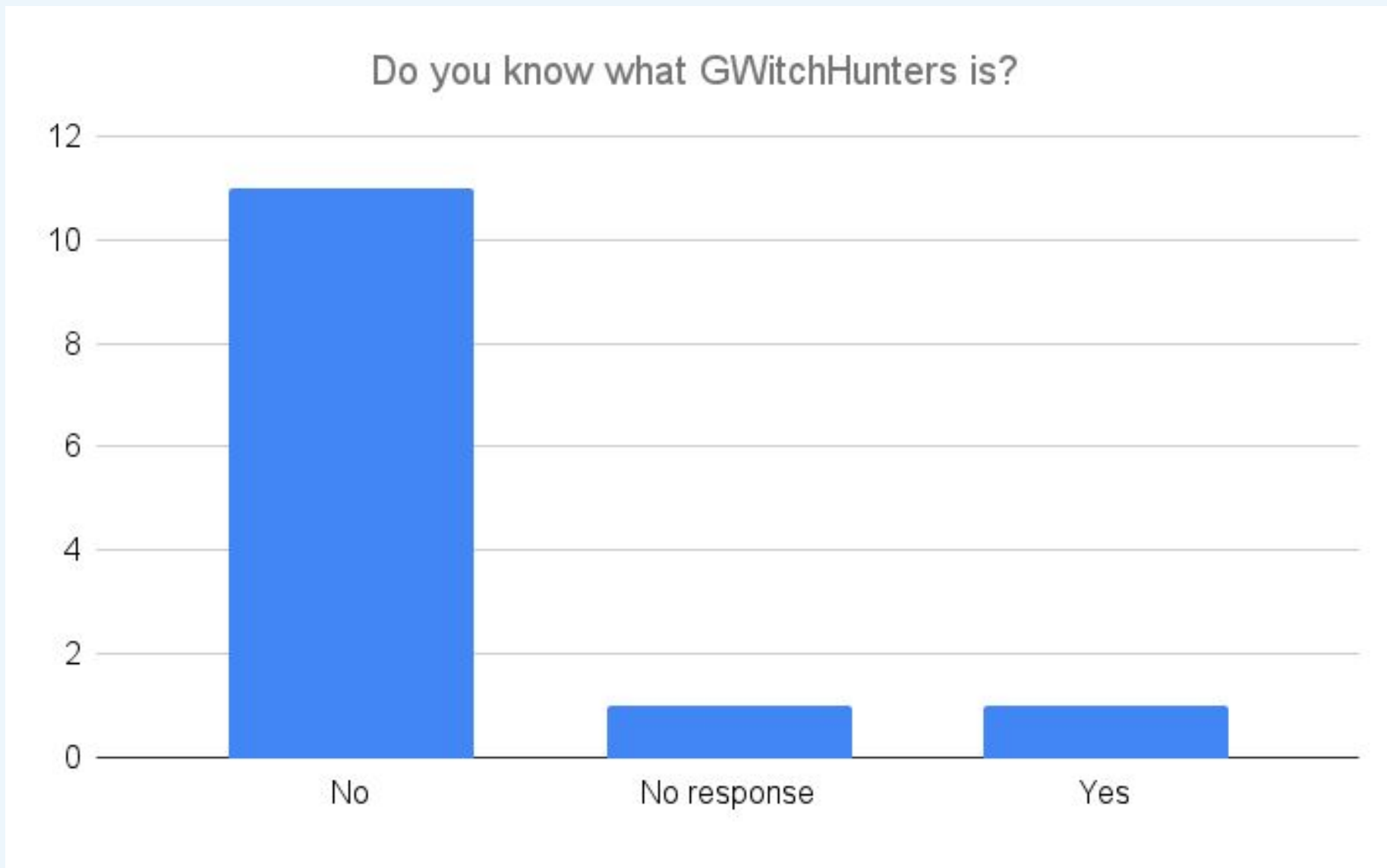


- Which of the lesson themes have you found most interesting?
  - *‘All of them a bit’*
  - *‘In general all of them, despite not have any specific background knowledge’*



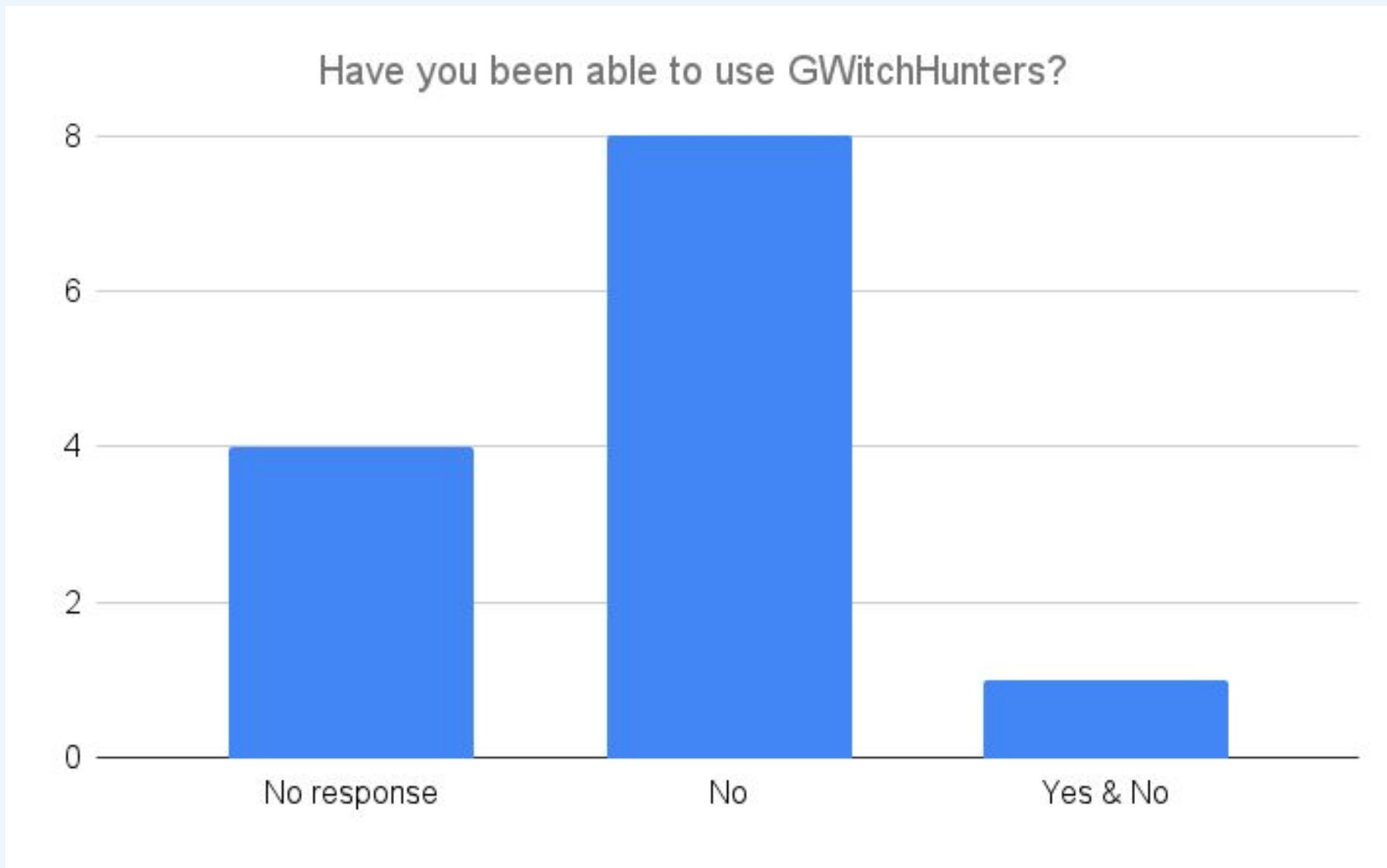


# GWitchHunters





# GWitchHunters

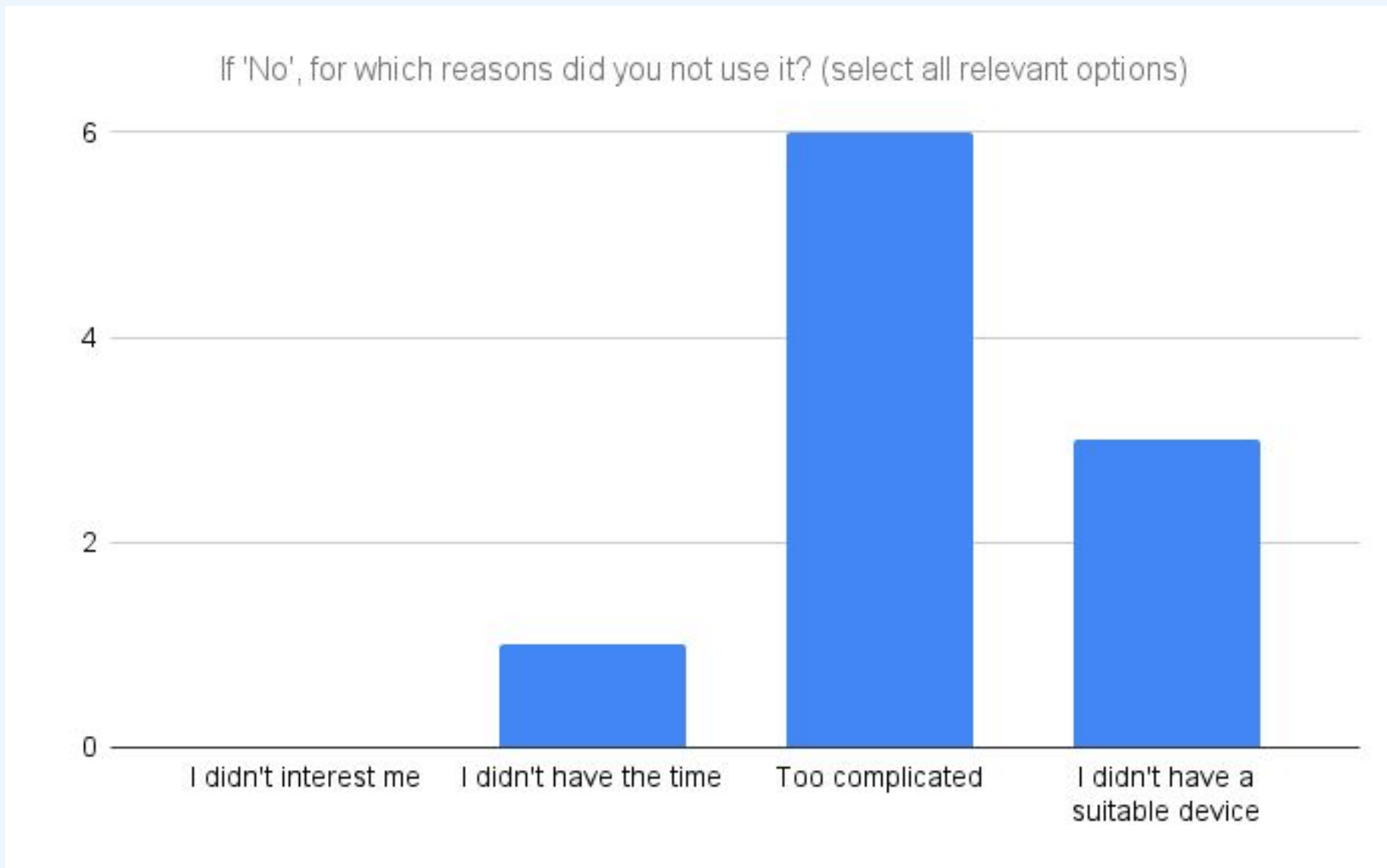




- If you have you been able to use GWitchHunters?
  - how much have you been able to use it? (1 = A little; 5 = A lot) → 1 reply  
(1)
  - which type of device did you use to use it (cellphone, laptop, tablet, etc.)  
→ 1 reply (**‘cellphone’**)
  - Was the fact that it was available in Italian important? (1 = No, even if it was only available in English, it would have been fine; 5 = Yes, if it was not available in Italian, I would not have been able to use it) → 2 replies  
(avg. 5)



# GWitchHunters

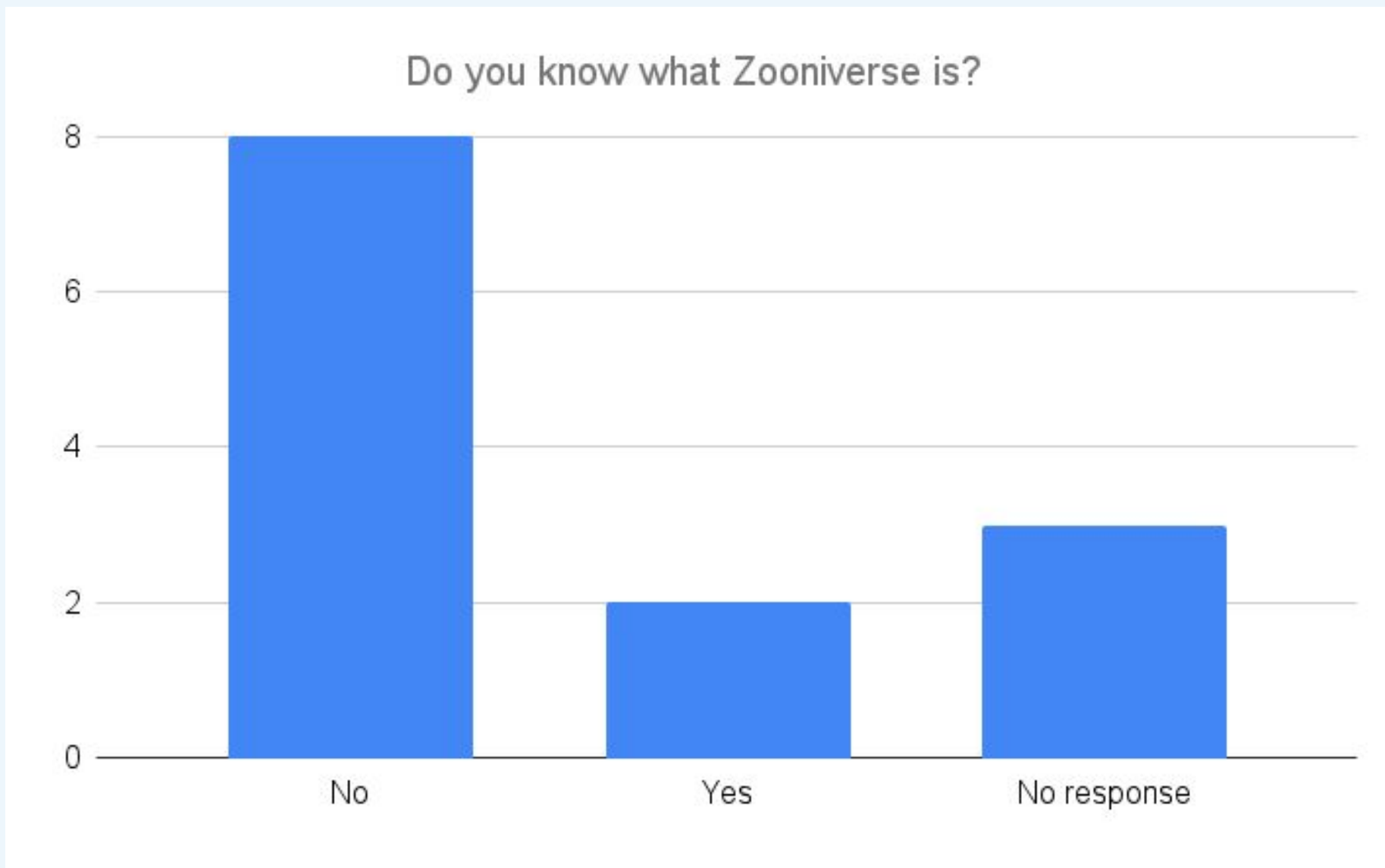


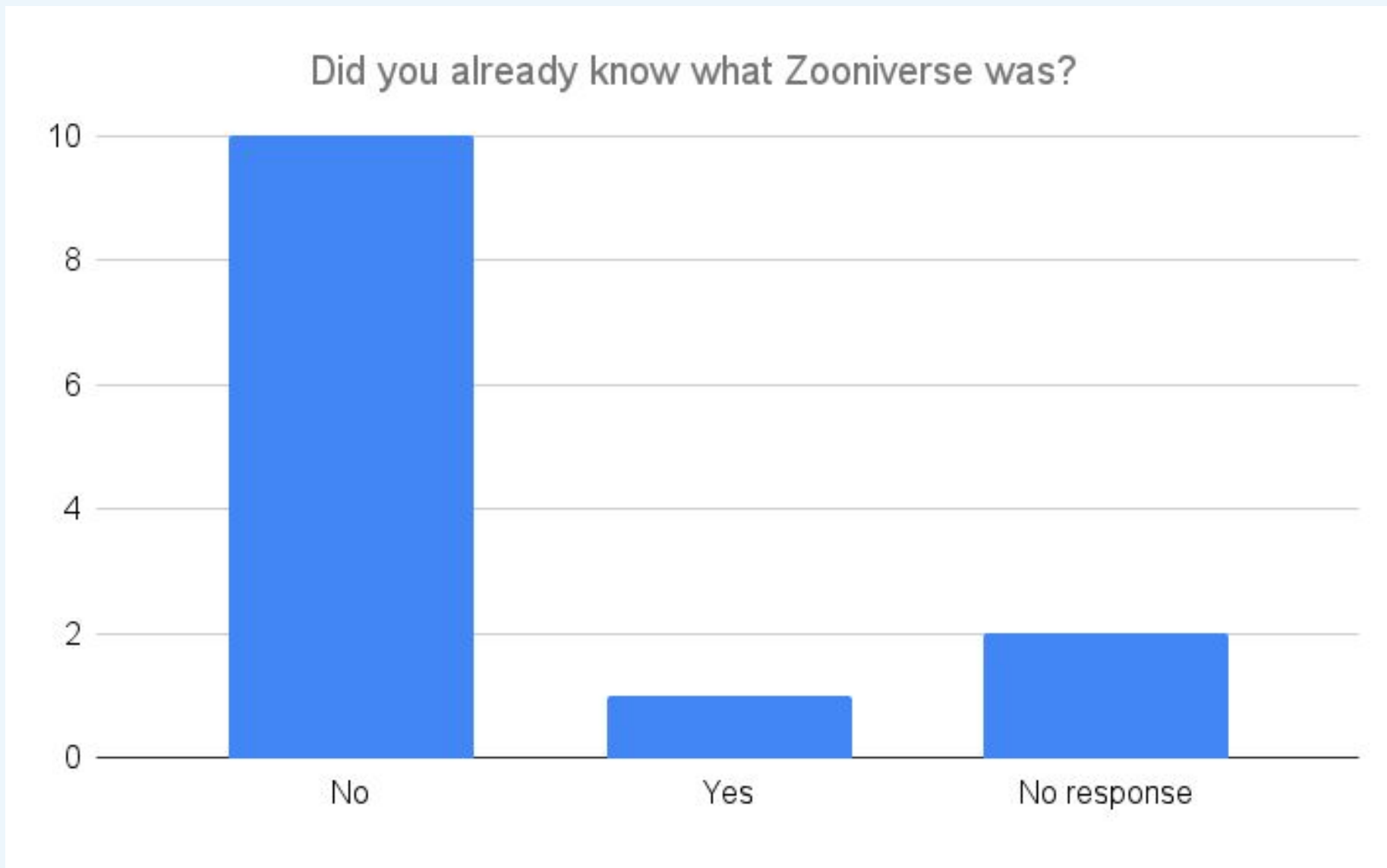




- If you have not been able to use GWitchHunters, for another reason, provide details:
  - 1 reply (*'I am too old'*)

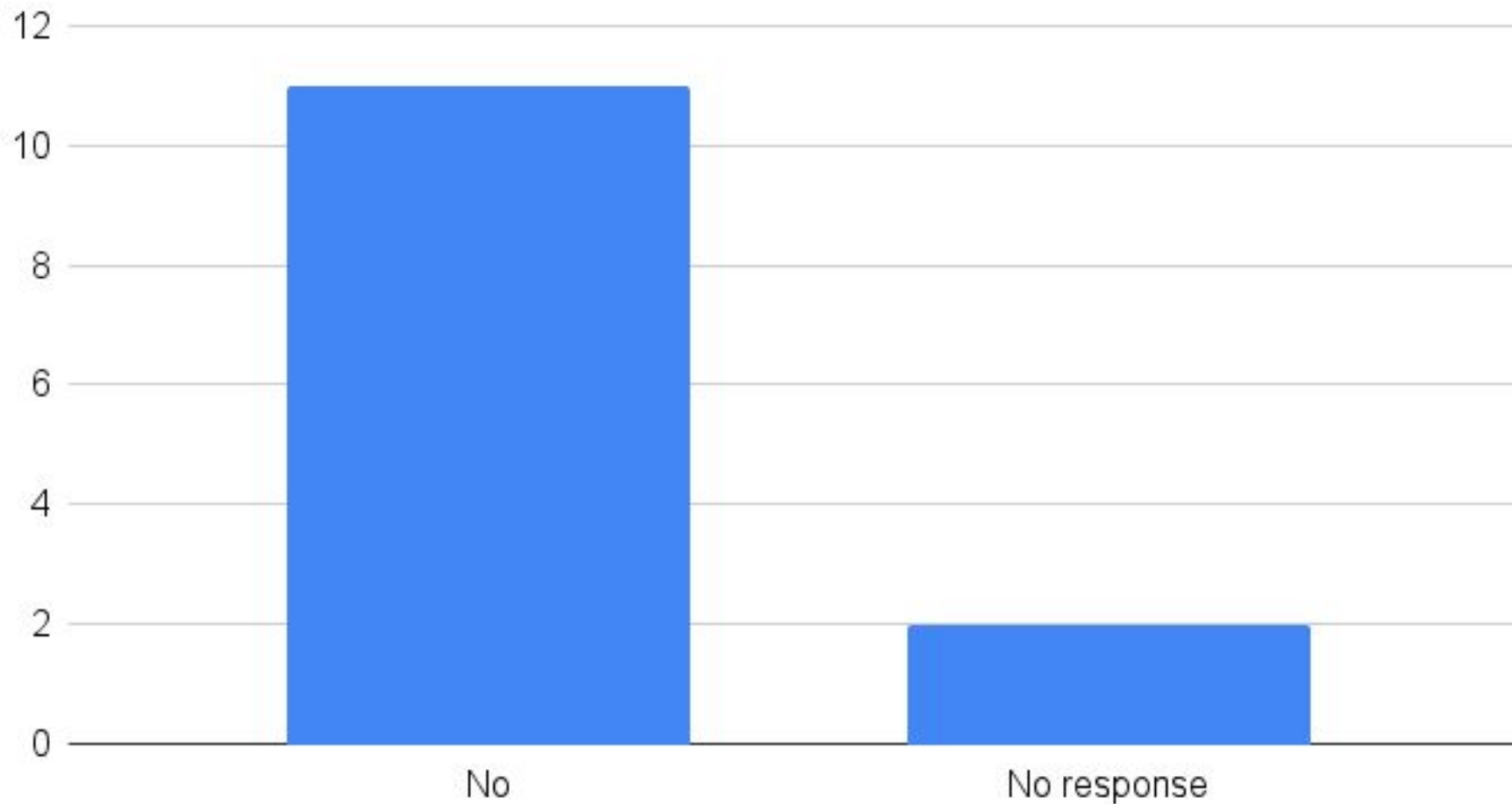






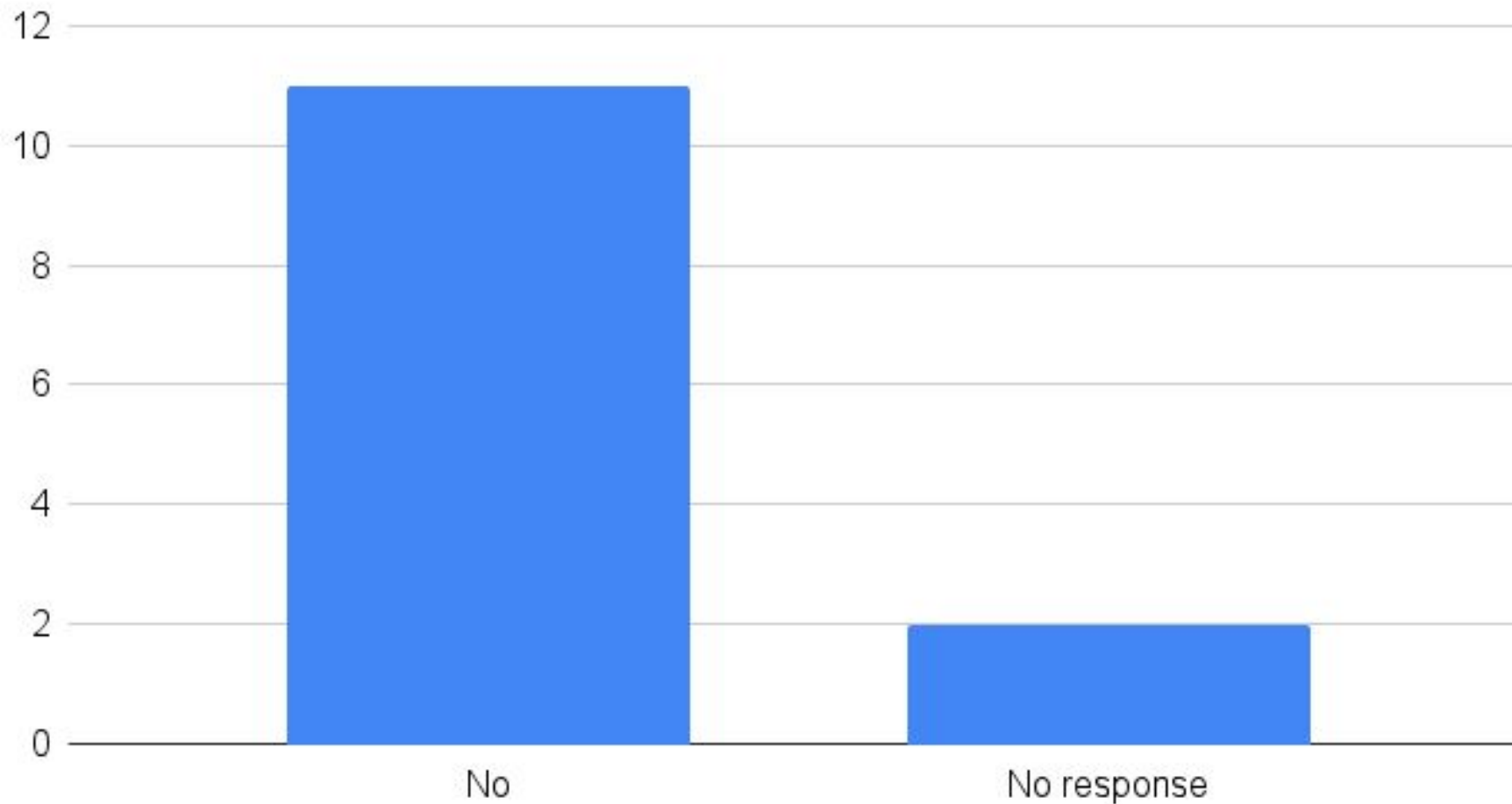


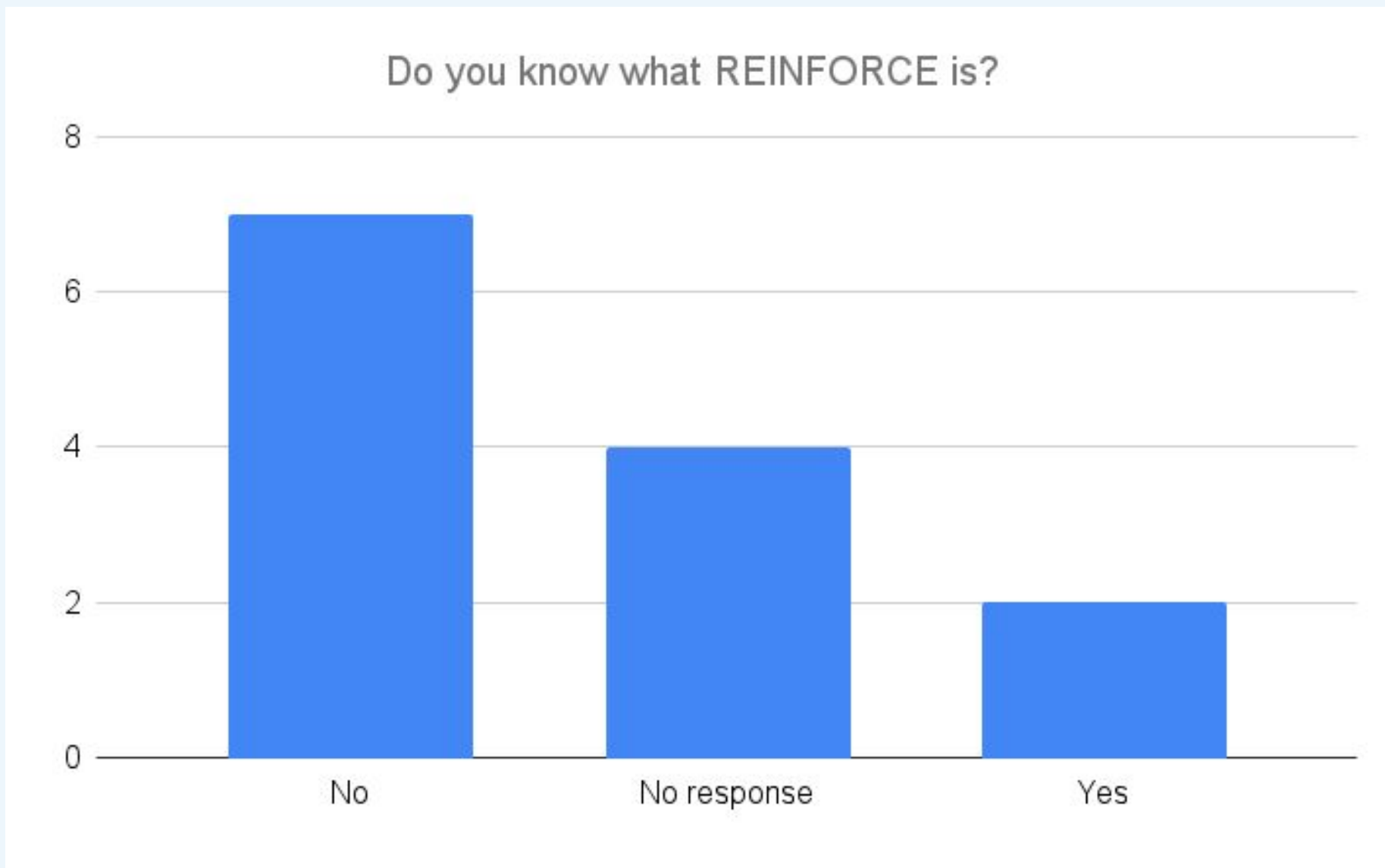
Had you already used Zooniverse in the past?





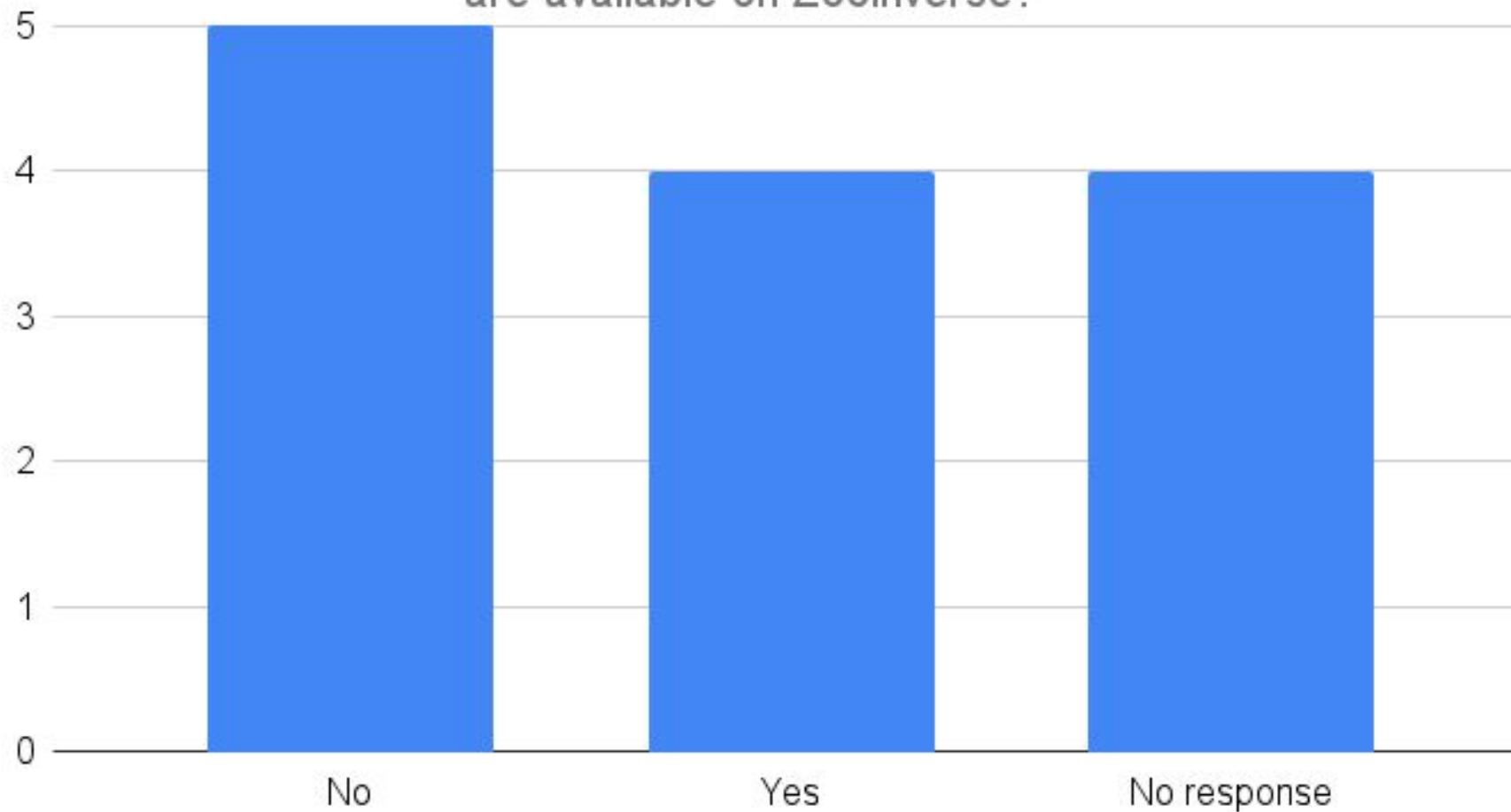
Have you contributed to other projects available on Zooniverse?

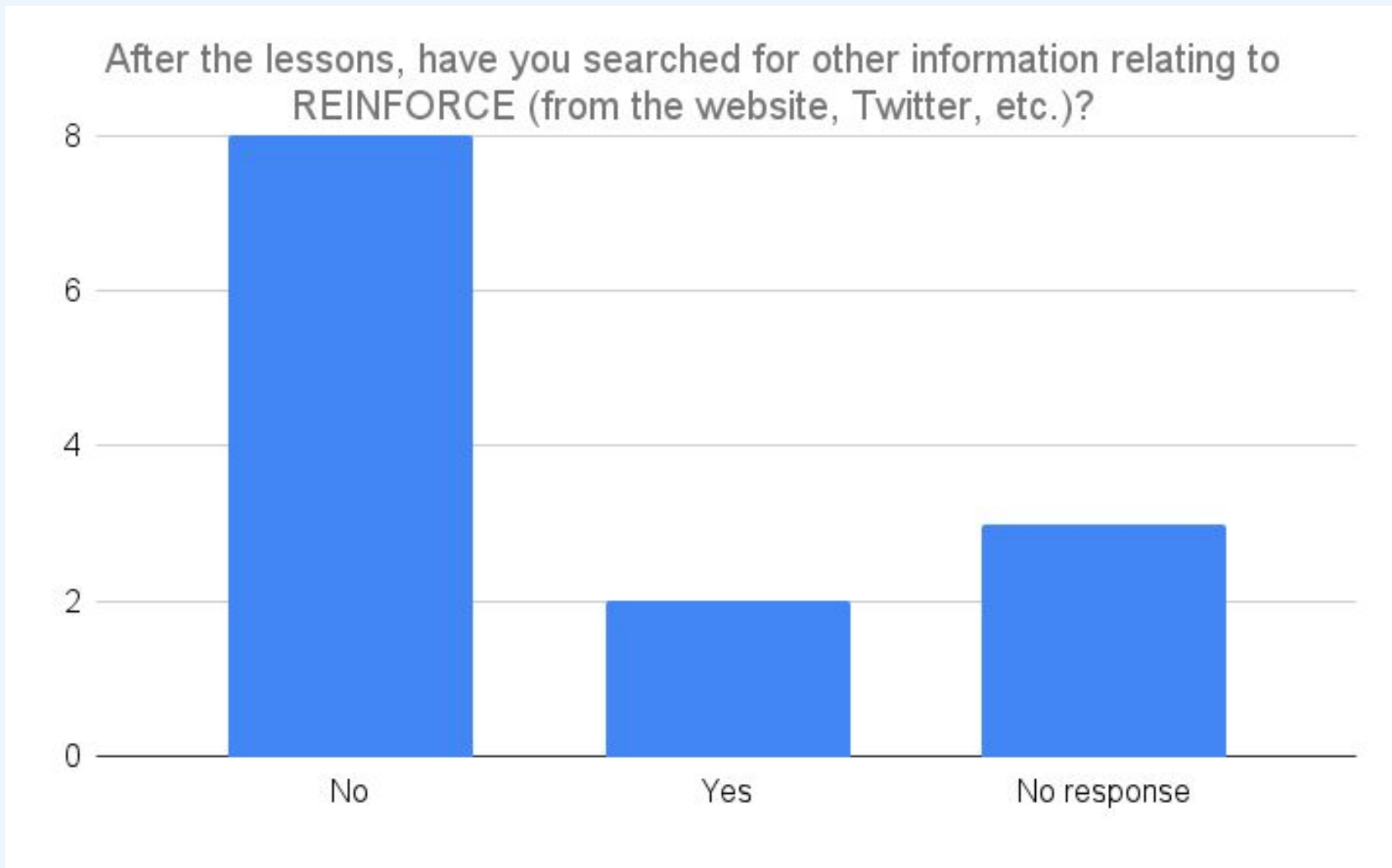






During the lessons have you talked about other REINFORCE projects that are available on Zooinverse?







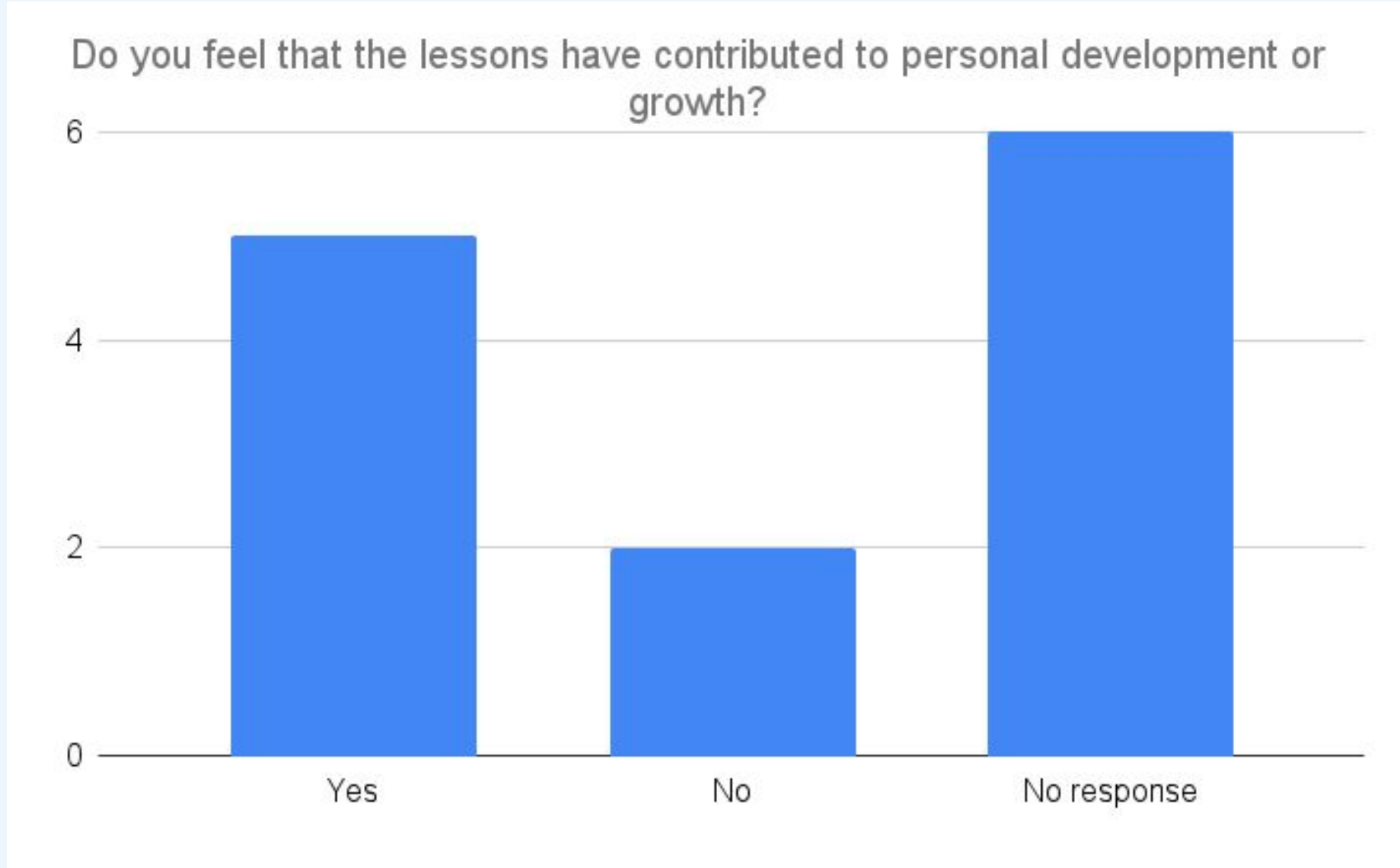


- Can you explain the REINFORCE project (and its objectives) in a few words?:
  - 1 reply (*'I am not able to'*)



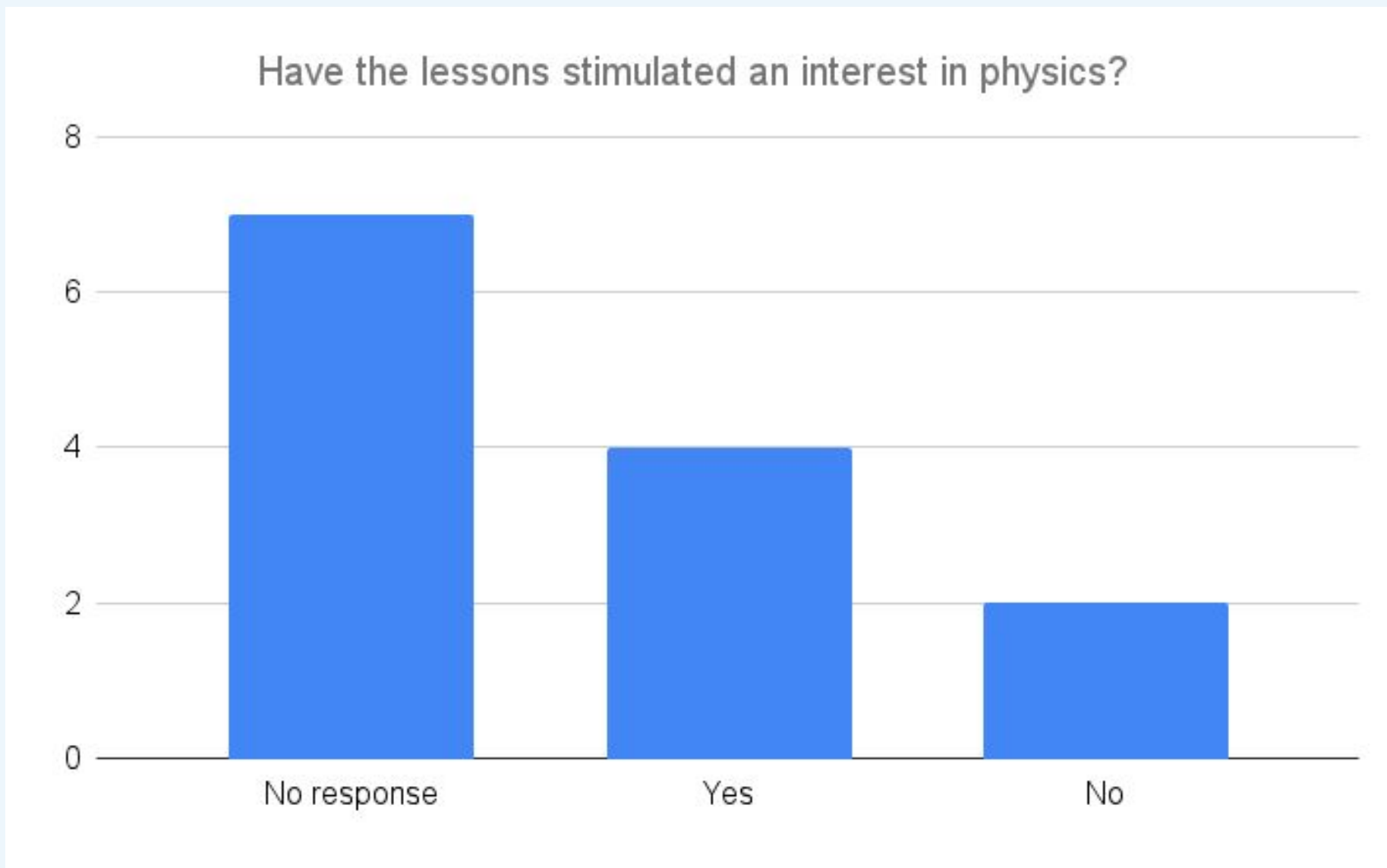


# Results



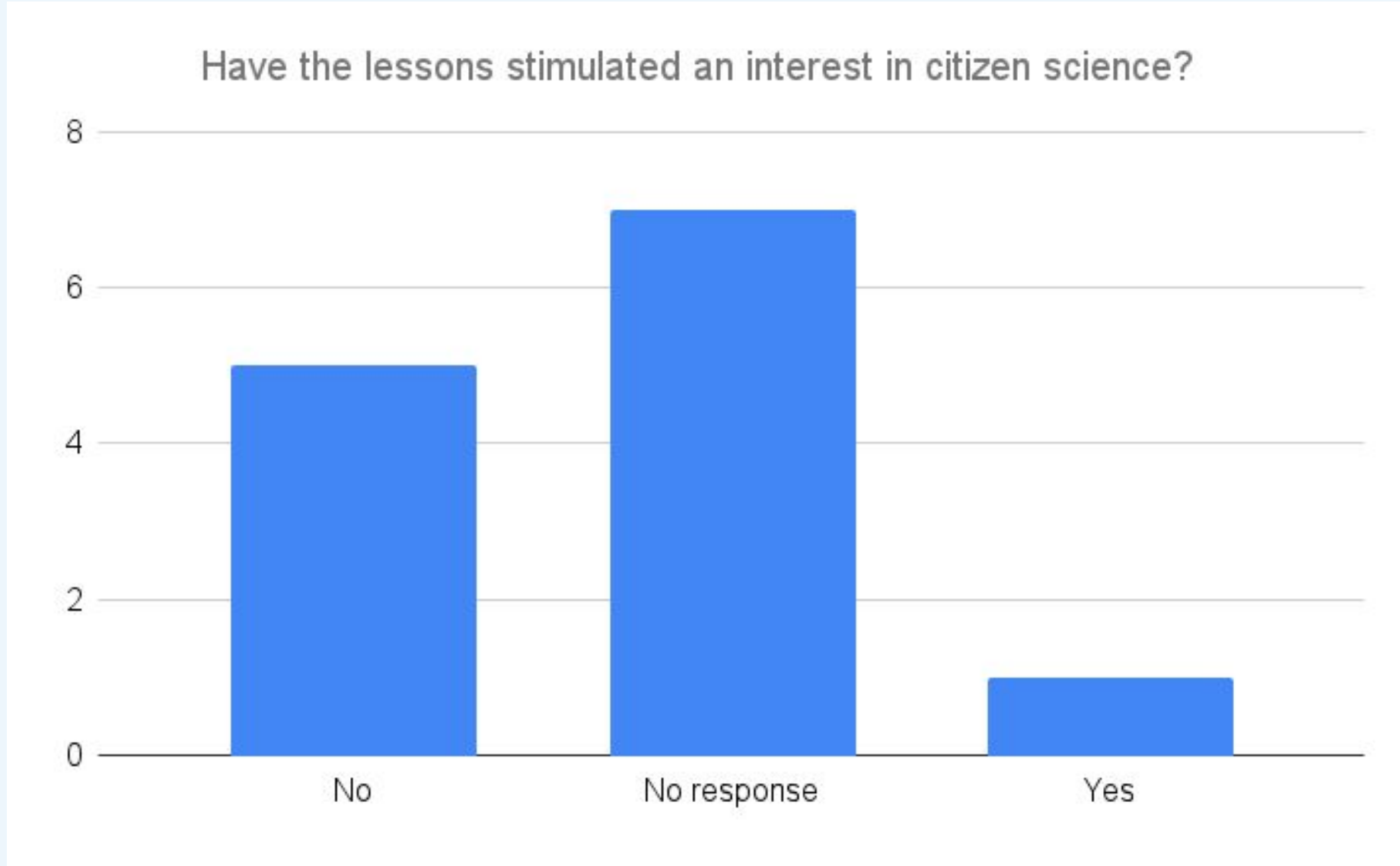


# Results





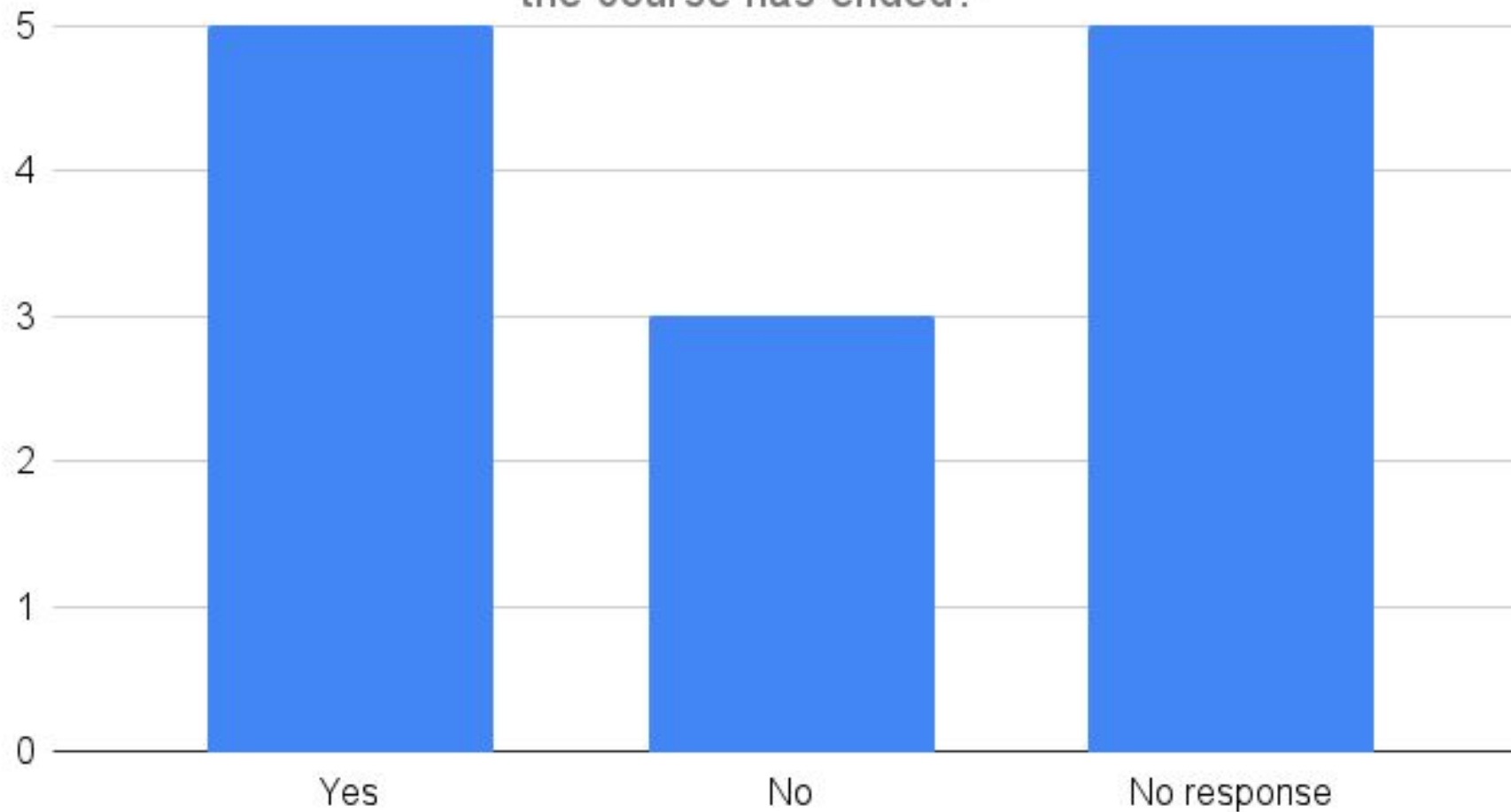
# Results





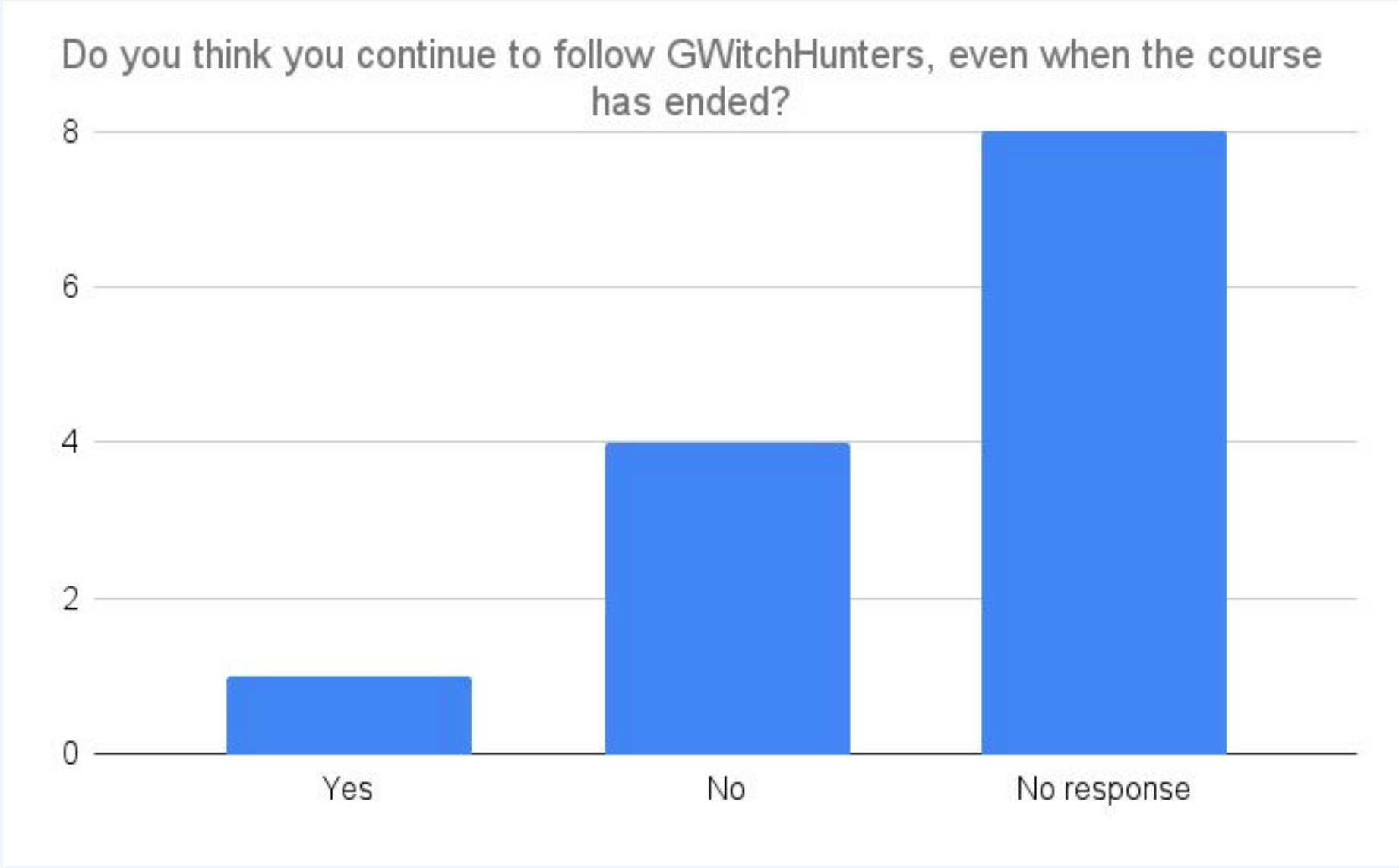
# Results

Do you think you will continue to follow the work of EGO-Virgo, even when the course has ended?



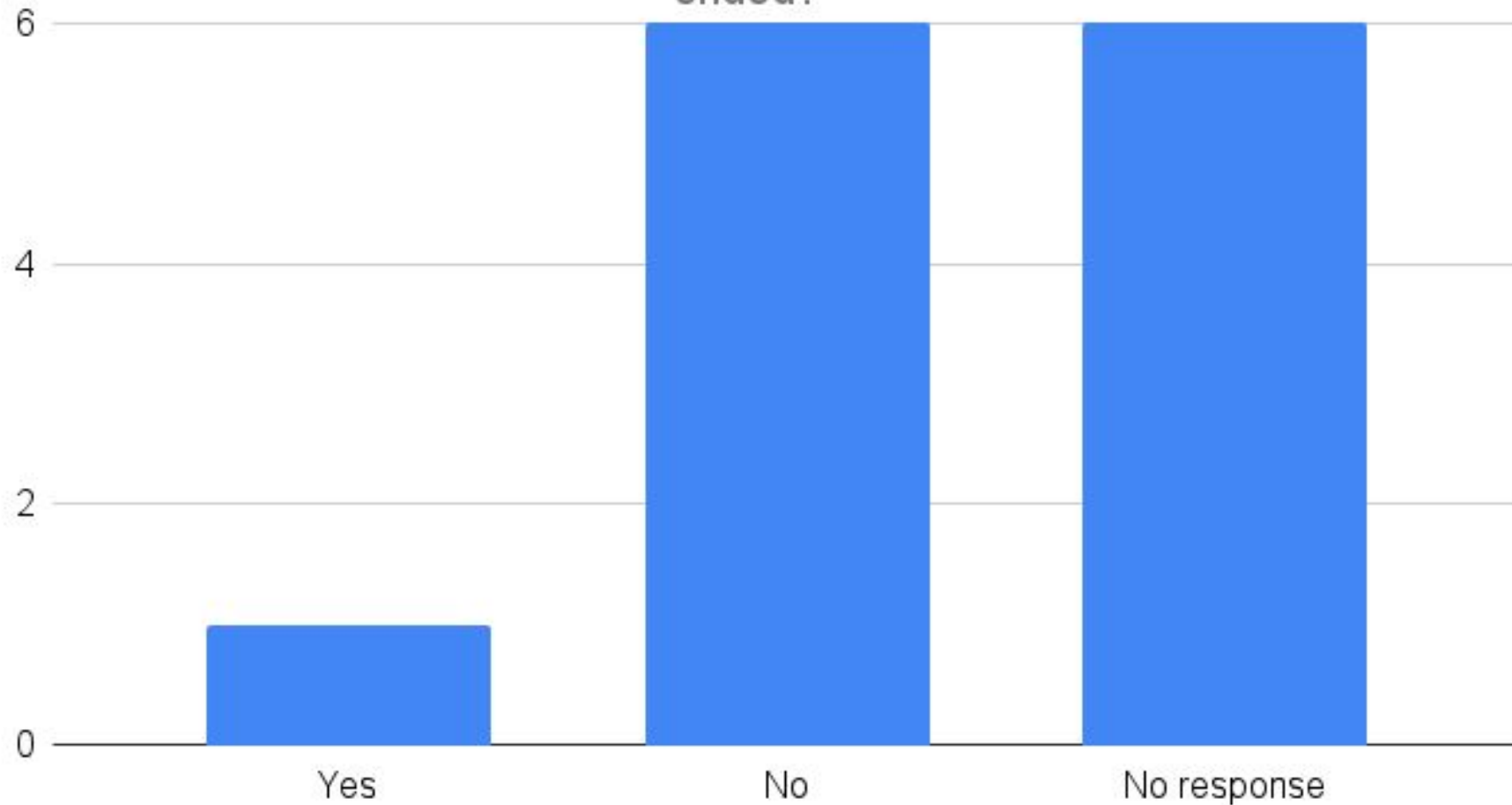


# Results



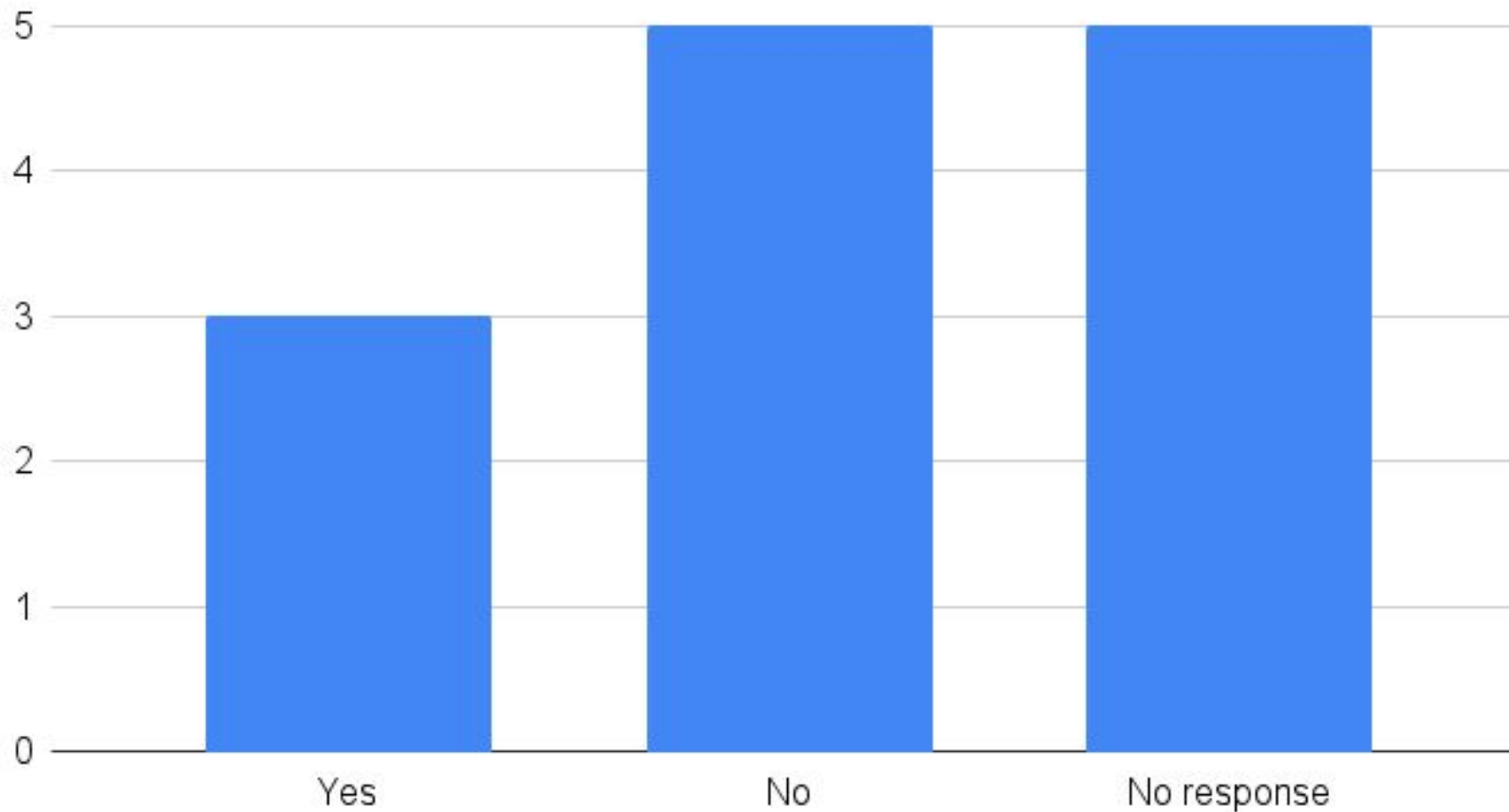


Do you think you will continue to follow Zooniverse, even when the course has ended?





Do you think you will contribute to a citizen science project in the future?







# Suggestions

- Can you provide suggestions on how to improve the lessons?
  - *'Make them easier so that they can be understood better'*
  - *'Maybe make it more understandable, also for those who are less prepared for the different themes'*
  - *'It was very difficult for me'*
- Can you provide suggestions on how to improve GWitchHunters?
  - *'I'm not sure'*
  - *'I'm not able to give suggestions'*





# What worked?

- A number of interesting comments and ideas were put forward.
- A majority of participants were genuinely interested in the lesson themes.
- The *Cosmology of the Visible Universe* lesson was commented on favourably several times. A bit more accessible for a general audience?
- The course served to some degree to build interest in the field.
- Everyone appreciated the effort that had gone in to organising and giving the lessons.
- The importance of GWitchHunters being available in Italian to this demographic group has been underlined.





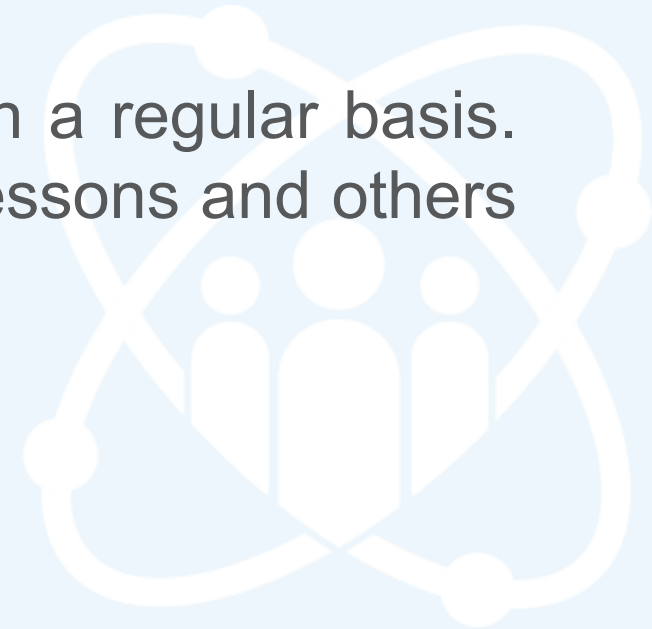
## Where were there issues?

- The level of the lessons - The general consensus was that the level was too high. Two participants attended the first lesson and then didn't return until the discussion session, thinking that the intervening lessons would be too difficult.
- There was a bit of fear of making mistakes, of not being able to understand the content, but not wanting to intervene and disturb the flow of a lesson.
- The classroom-feel to the lesson led to perceptions of the group being passive. In reality, it is far from this. After ~20-30 minutes of the session, the group was really engaged and conversational.



# Where were there issues?

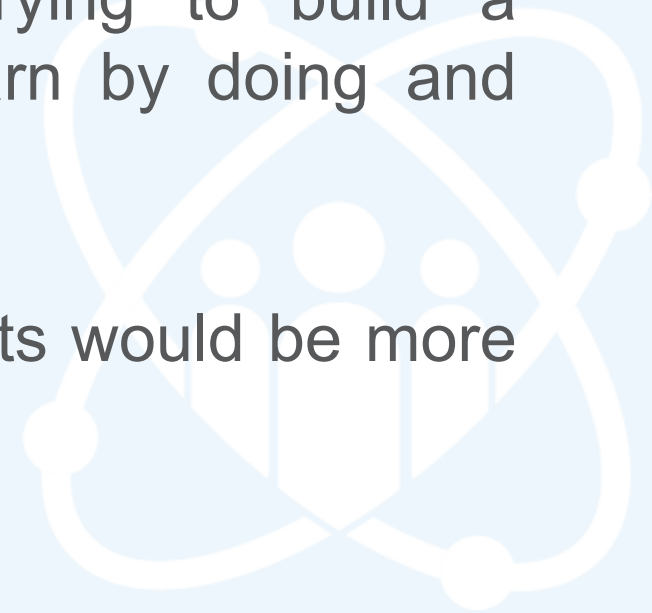
- The pandemic clearly also had an impact, especially in the first ~3 months of the year.
- Difficulty in simply booking the room at the library on a regular basis.
- Organising the presence of the members of the group on a regular basis. Attendance fluctuated and some people attended some lessons and others other lessons.





# What could maybe be done differently?

- The participants would benefit from a less formal approach, covering fewer themes, but with more possibility to have a back-and-forth discussion.
- A shift of target would be beneficial. We don't need to give participants a complete overview of the science, but should be trying to build a community in which they are comfortable and can learn by doing and discussing. Avoid overloading information.
- Hands-on lessons in the case of the demonstrator projects would be more useful.





# What could maybe be done differently?

- It would be very useful if a member of the project team attended all lessons and became a point of reference for the participants. Someone able to field their questions and either provide or get answers for them.
- Ideally, in future, organisation of a group like this should consider also provision of a dedicated space and/or transport for participants.
- Don't get a parking ticket...





# A few of my thoughts following the course

- Know your audience - co-design
- Leave the classroom behind
- Create an environment in which it's OK to fail and it's OK to ask questions
- Don't over-reach
- Personal connection is important







# REINFORCE

REsearch INfrastructures FOR Citizens in Europe

## Join the community



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