

EU space education and skills

Offers, needs and identified gaps

Eurisy Members Days
12 December 2023



or **Space Technology And Research Support** * EU supports DG DEFIS in the field of...

- **Education and skills for space in the EU:** The understanding of educational needs required by the research community and industry is fundamental to ensure that adequate educational standards and a skilled workforce are in place to compete in the future global space ecosystem
- **Creation and dissemination of scientific knowledge:** Fundamental science and research are essential to enable more advanced technology development
- **Analysis of EU-funded projects in the field of space:** Identification of best practices for the upcoming programming cycles
- **Support to the consultation platform:** Support the inclusive and structured process established by the European Commission to elaborate a Strategic Research and Innovation Agenda (SRIA)
- **Support to communication:** Making EU-funded space research more visible and supporting DG DEFIS and HaDEA in their communication activities

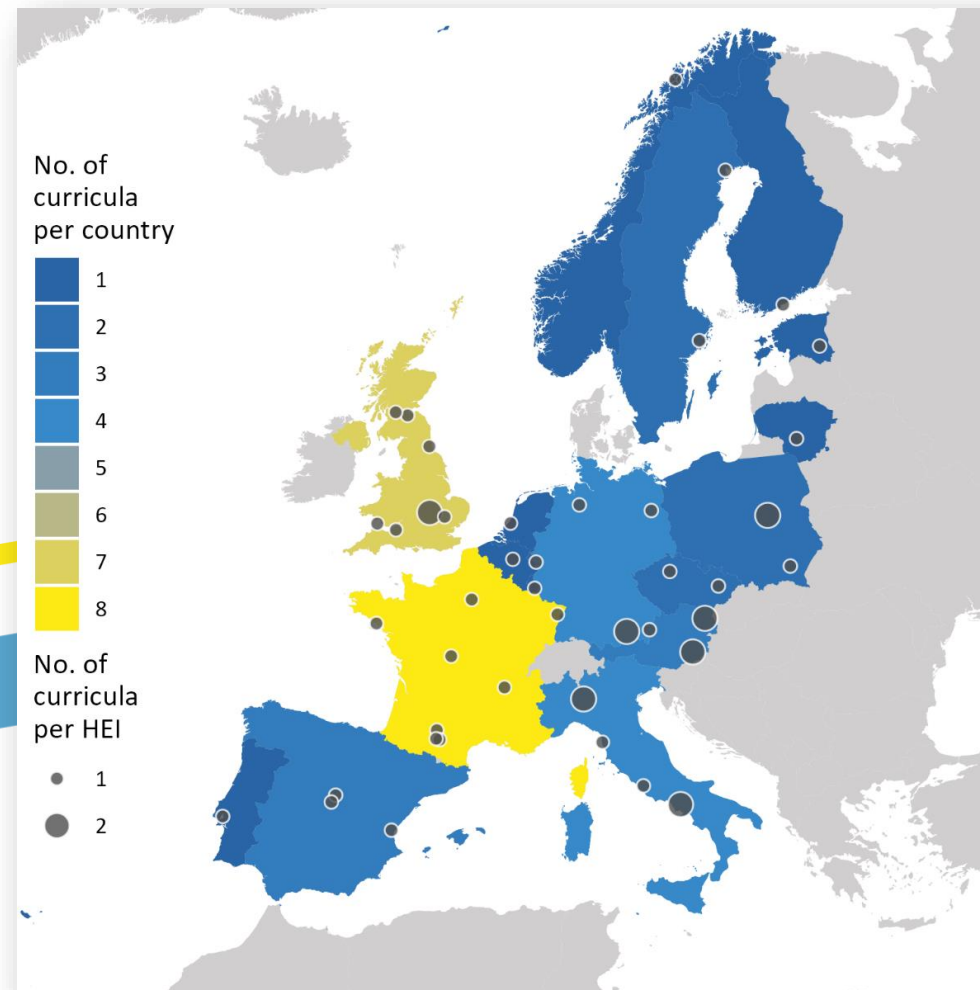
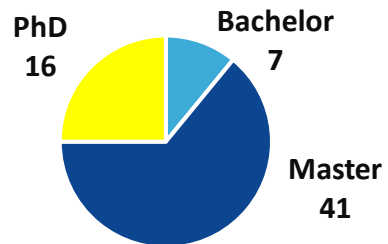




Course offers

Curricula and courses – Status quo

Based on ...



Analysis of European Curricula

- 60+ Bachelor, Master and PhD programmes
- STEAMT (Science, Technology, Engineering, Arts, Mathematics, Transversal) courses with a focus on space

Space vocabulary to make offer and needs comparable

SPACE STEAM&T - Knowledge domains and knowledge areas

Science	
Astronomy	
Chemistry	- Physical chemistry - Material science
Earth science	- Atmosphere - Geodesy
Environmental science	
Space science	- Stars, galaxies, universe - Planetology
	- Astrophysics - Mechanics - Dynamics
Physics	- Nuclear/quantum - Electro



Technology	
Computer science	- Artificial intelligence - Information science - Software engineering - Human-computer interaction - Data management
Geoinformatics	
Remote sensing	- Sensors and instruments - Analysis techniques - Space mission technology - Spacecraft design
Space technology	- Spacecraft propulsion - Aerospace structures - Communication and navigation - Satellite technology

Arts	
Citizen science	
Design	
Humanities	- Languages - Space law
Law	
	- Standards & regulations - Copyright law
Policy	- History
Social science	- Psychology - Communication science

Engineering	
	- Aeronautics - Aircraft systems - Spaceflight - Space habitation - Space architecture - Space environment
Aerospace engineering	- Astronautics - Robotic spacecraft
Automation engineering	
Electrical engineering	
Manufacturing	
Mechanical engineering	
Mechatronic	

Transversal	
Application domains and markets	- Space commercialisation
Business and economics	- Entrepreneurship
Inclusiveness	
Innovation	- Innovation management
Interdisciplinary	
Management	- Project management
Medicine	- Space medicine
Project design	
Sustainability	- Green propulsion

Mathematics	
Algebra	
Analysis	
Calculus	
Statistics	- Simulation
	- Control theory
System science	- Systems engineering

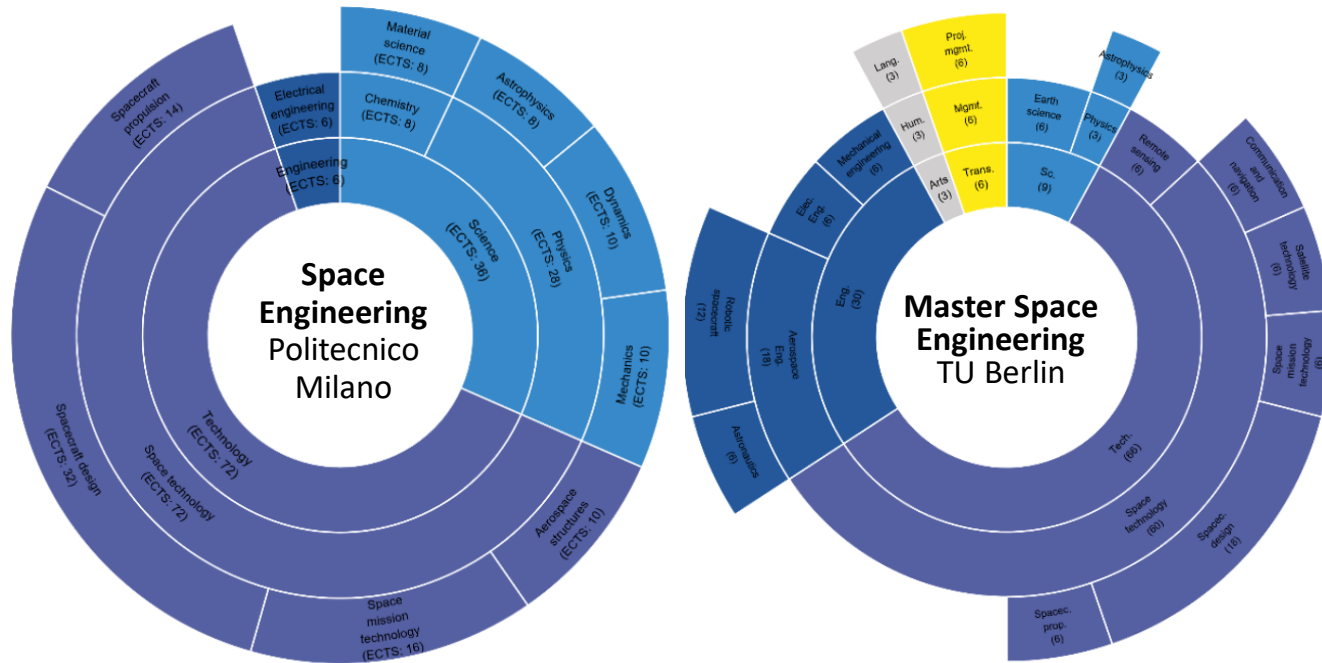



Bottom-up-approach

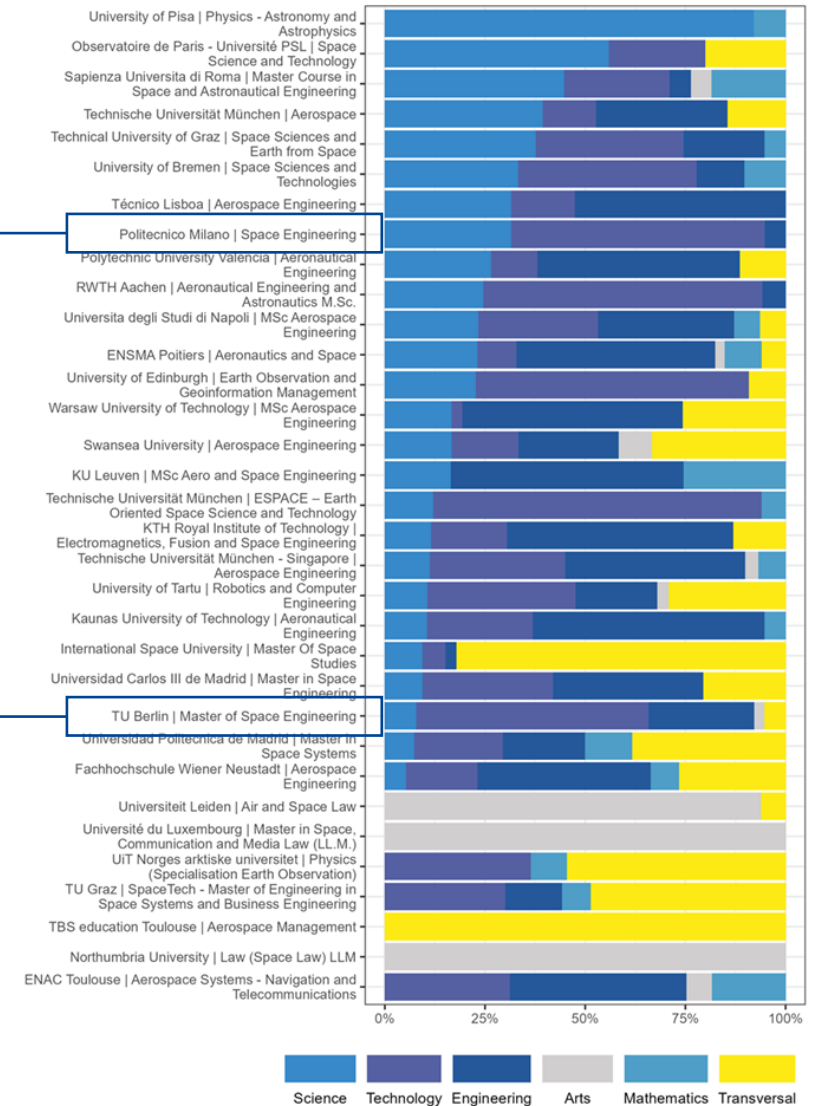
- Concepts found in curricula and courses
- STEAMT categories with knowledge domains and areas

Analysed curricula have a variety of foci

Comparison of 2 aerospace engineering curricula (Master)



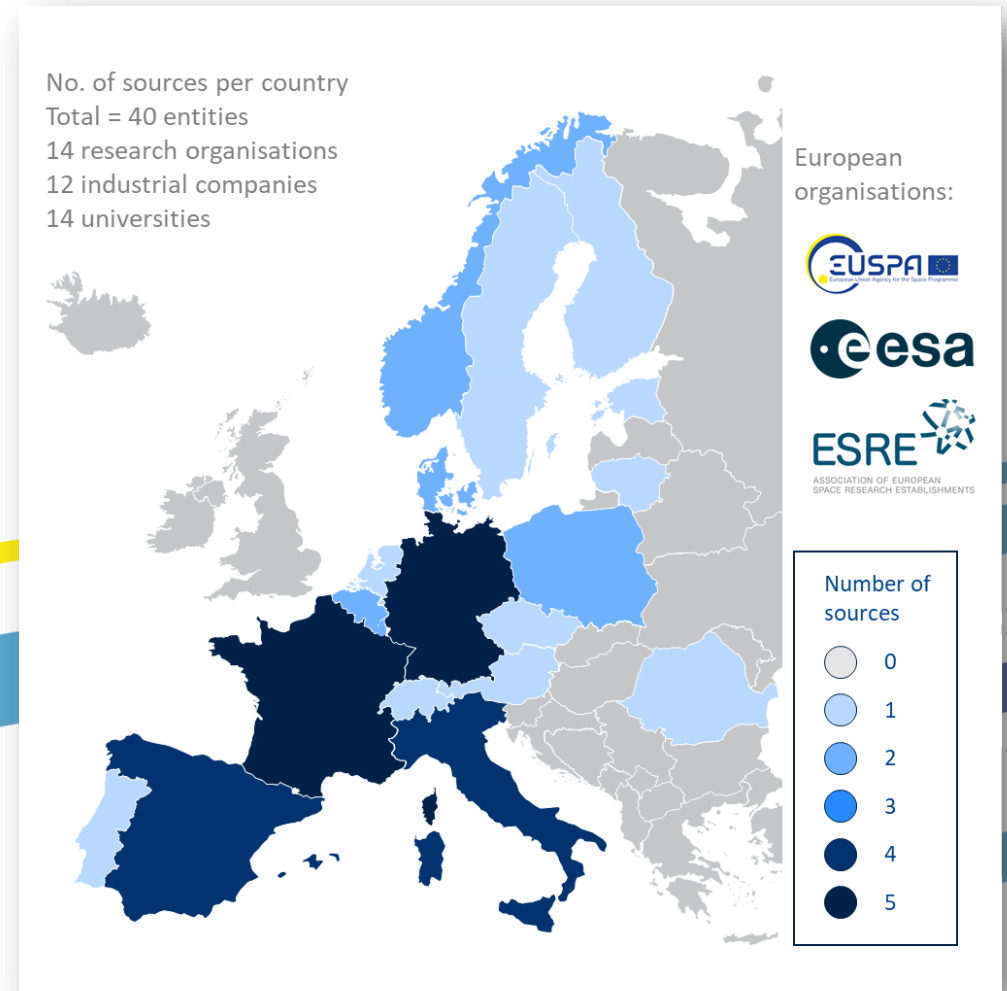
Master curricula per STEAMT category





Skills needs

Skills required by R&I and industry (demand)

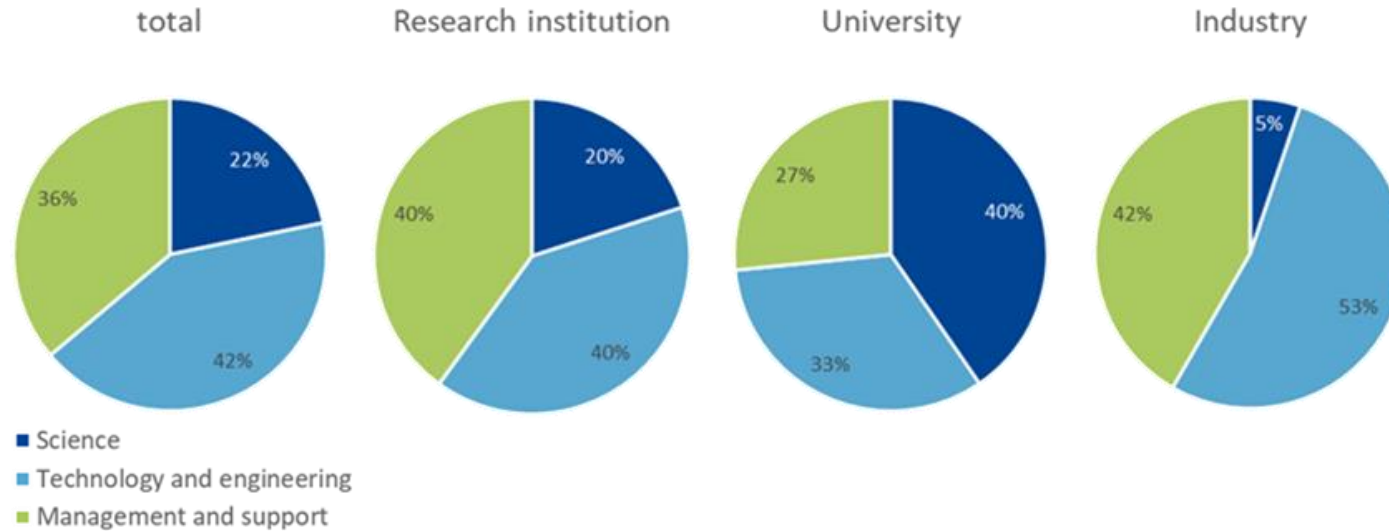


Analysis of required skills

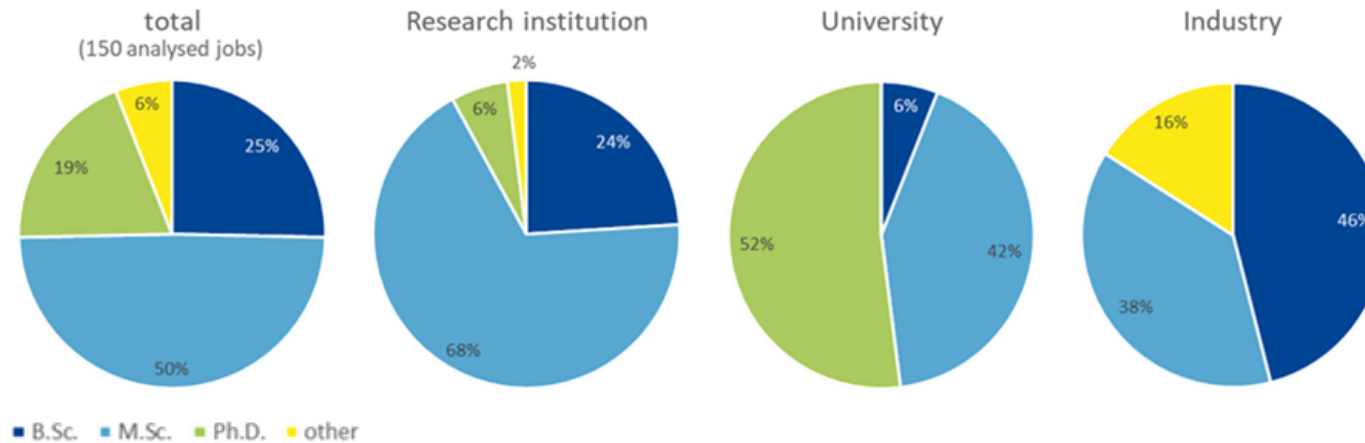
- Sample of 150 space-related job advertisements for open positions
- Job offers from European universities, research institutions and industry

Industry asks for tech skills – academia wants science

Comparison of tasks of space-related positions

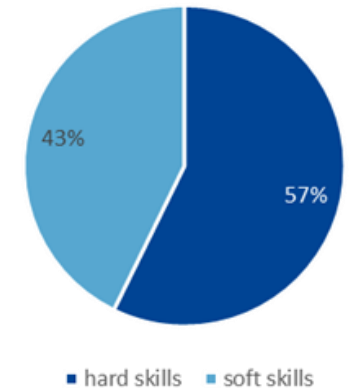


Comparison of required degree of space-related positions

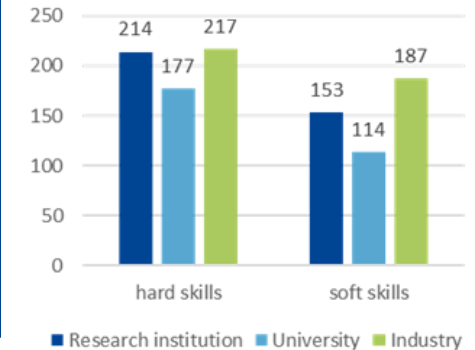


Hard/soft skills for space-related positions

Ratio of required skills (total = 1062 mentioned skills)



Mentioned skills depending on organisation

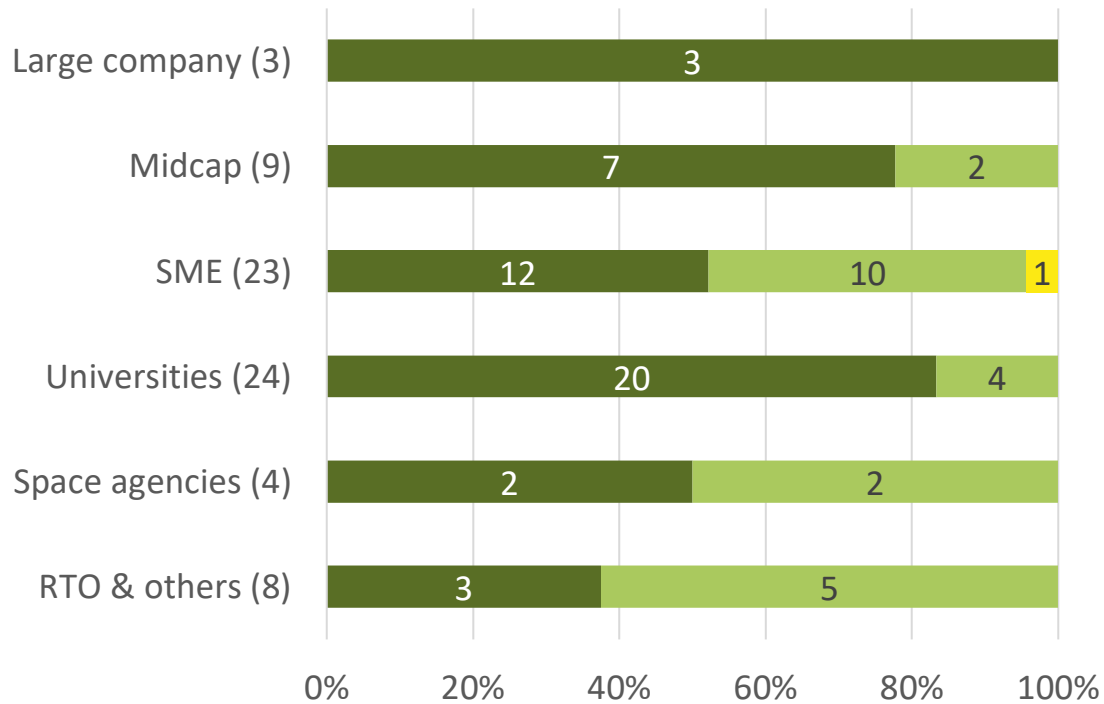




Space as an attractive domain for young professionals, however, positions are difficult to fill

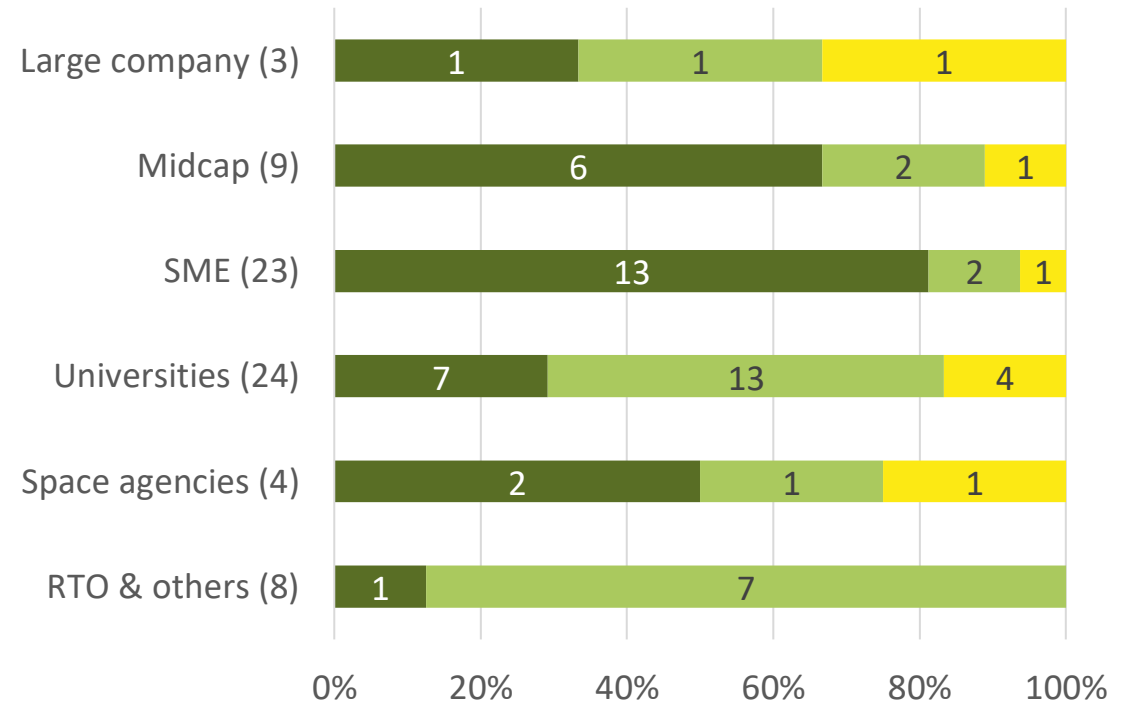
Space is an attractive sector

[R&I community and industry survey, 71 answers]



It is difficult to fill positions

[R&I community and industry survey, 71 answers]

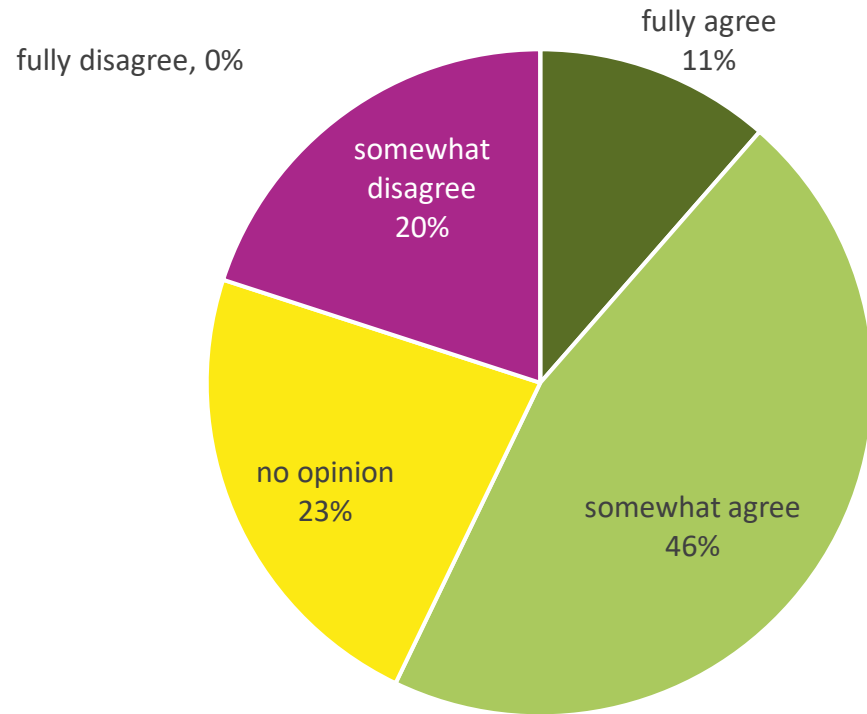


■ fully agree ■ somewhat agree ■ no opinion
■ somewhat disagree ■ fully disagree

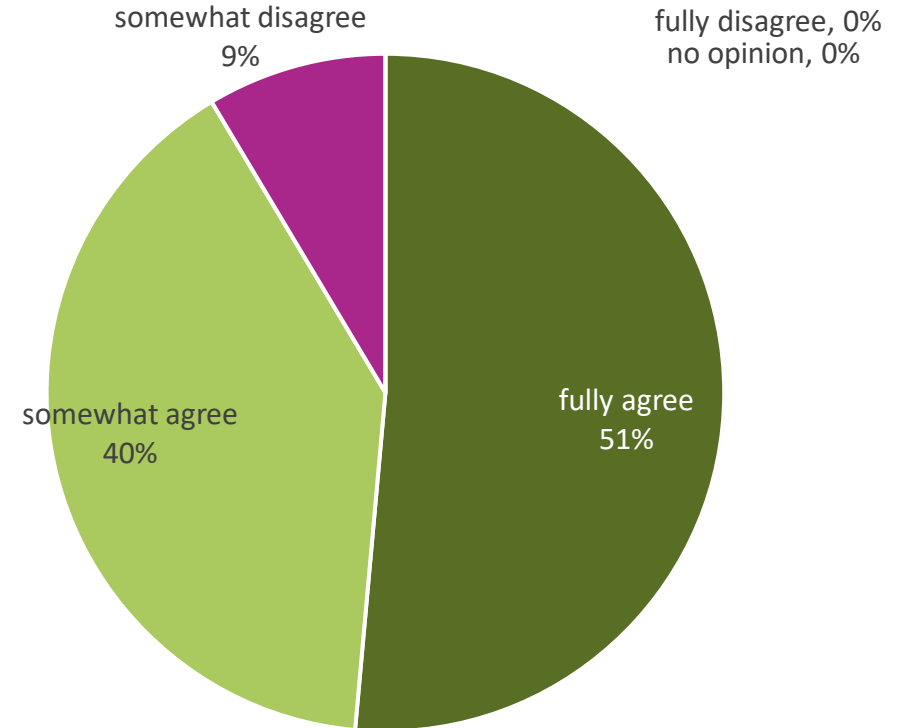


Industry perspective: The current educational offer is good, but graduates could be better prepared for jobs

The current European landscape of curricula and training programmes for space professionals is good
[industry survey, 35 answers]

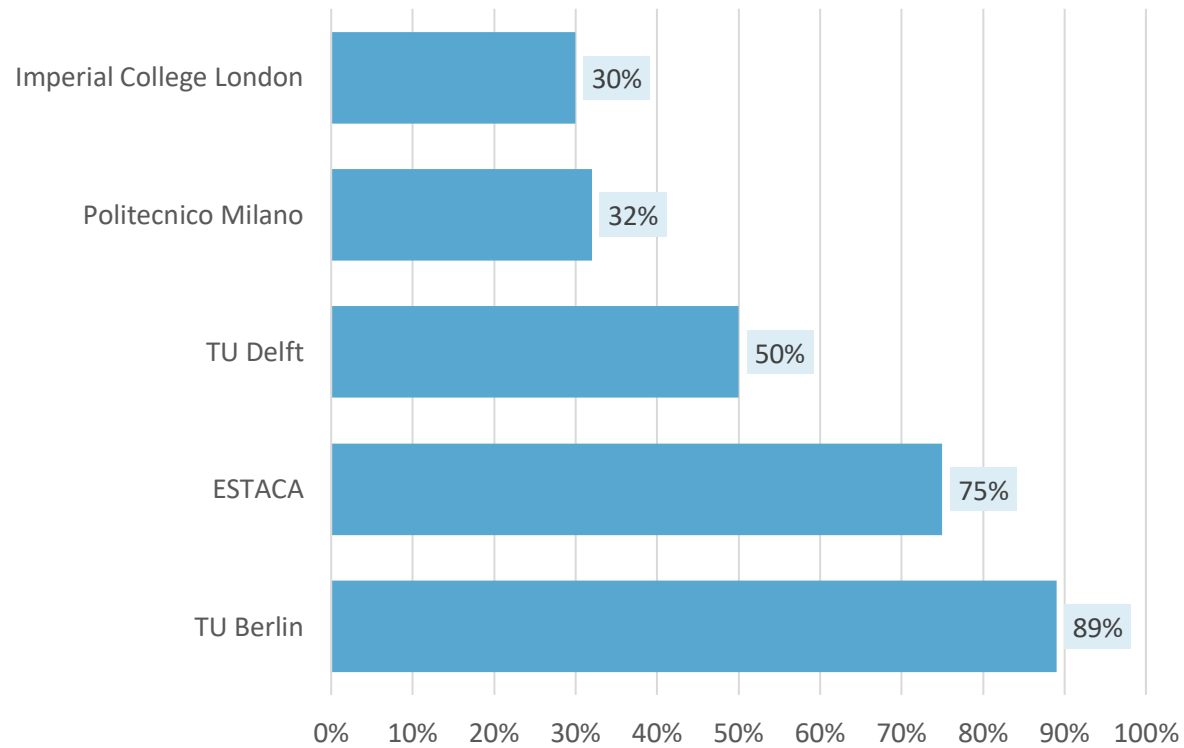


Young graduates must undertake a professional training to become operational
[industry survey, 35 answers]

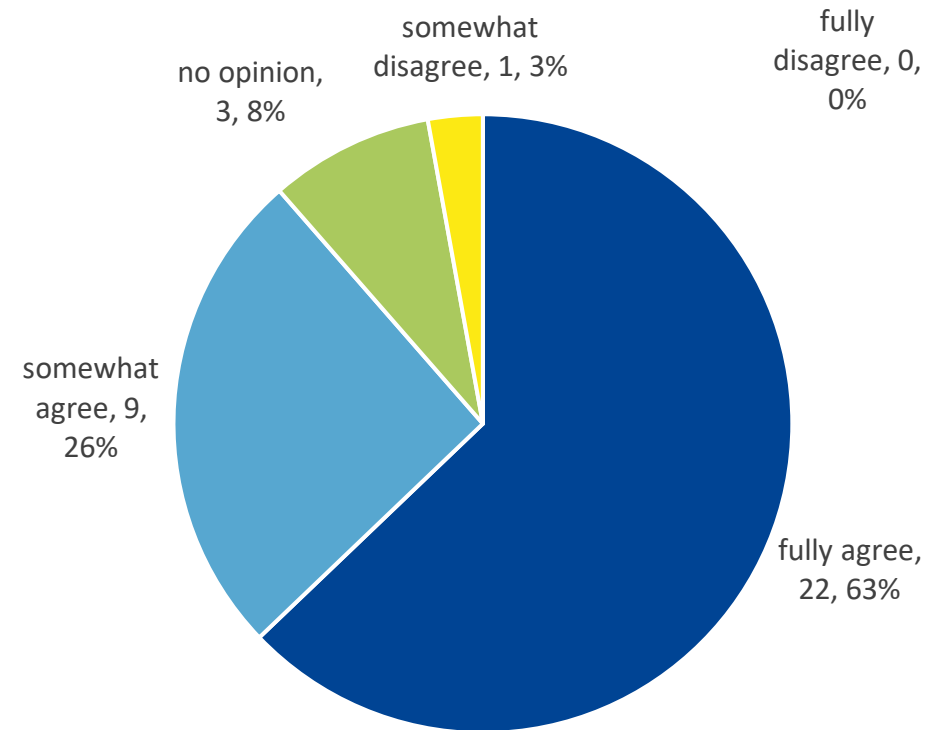


Do graduates fill the shortage of space professionals?

Graduates of (aero)space programmes working in the space sector (estimated)



There is a shortage of space professionals in Europe [industry survey, 35 answers]



The analysis of the educational offer, the skill needs of the space sector, and the workforce composition resulted in these key findings



Space vocabulary

To enable comparison and gap analysis



~15% of students pursue a PhD,
all other students become available for jobs



75% of employees are male,
with women still being underrepresented



EU Space curricula are

- International and regional
- Regular adapted to new developments – within limits to avoid new accreditations
- Different levels of cooperation with industry from placements and internships to master thesis
- Focus primarily on science, technology & engineering – arts rarely represented



57% hard skills vs 43% soft skills
are mentioned in open job advertisements



Shortage of resources

Positions are difficult to fill



SMEs tend to prefer generalists,
while larger companies prefer specialists



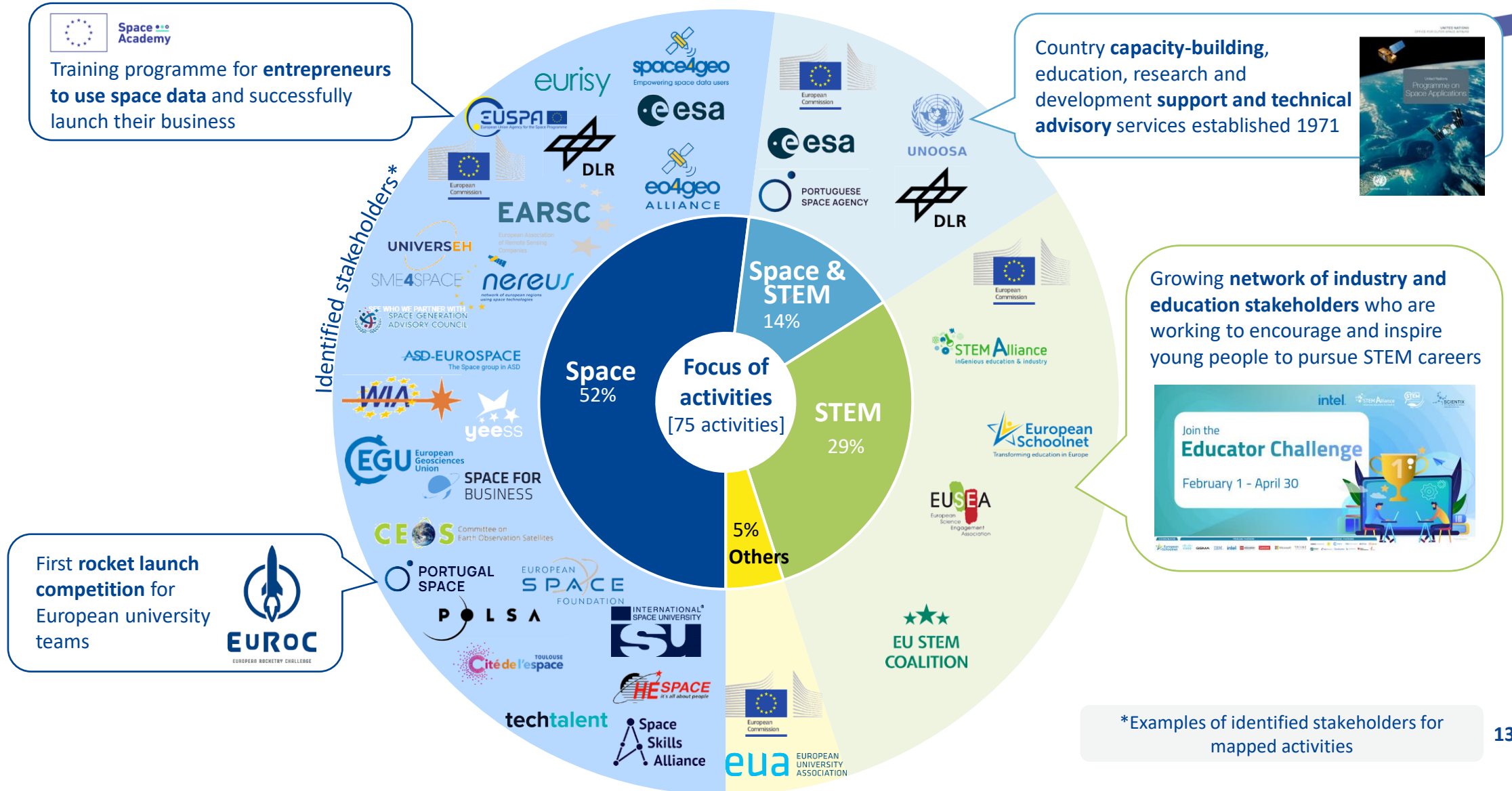
The educational offer is good,
but graduates could be better prepared



Skills & educational initiatives

Closing the gap

We have undertaken a mapping of the 75 most visible STEM/space education and skills activities, with a focus on actions implemented at EU level



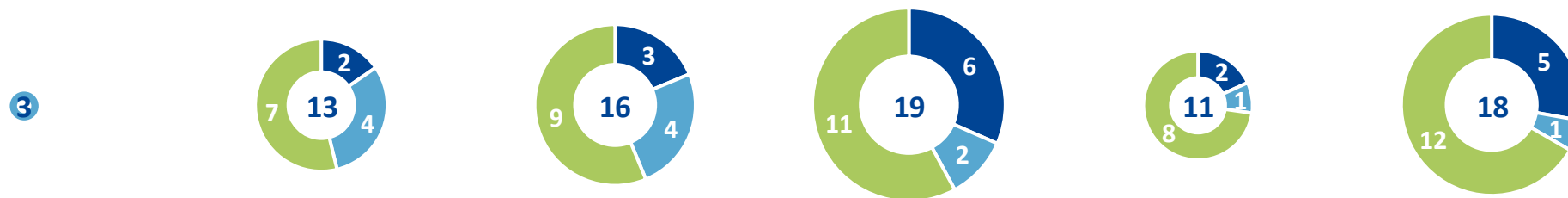
*Examples of identified stakeholders for mapped activities

The mapping shows a particular gap among young professionals

Mapping of activities run at European level by age group (total sample of ongoing activities = 50)



No. of mapped activities*



*Each activity may cater for multiple age groups

● EU ● ESA ● Others

	Preschool (3-6 years old)	Primary school (6-12 years old)	Secondary school (12-18 years old)	Tertiary (18-25 years old)	Young professionals (25+ years old)	Life-long learning (all ages)
Knowledge gap	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Motivation	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓
Reskilling					✓✓	✓✓

The number of ticks (on a scale from 0 to 3) indicates the share of actions targeting each of the three listed goals

A workshop with 41 stakeholders was carried out complementing the identified gaps and potential actions

The objectives of the workshop held on 18/10/2023 were to ...

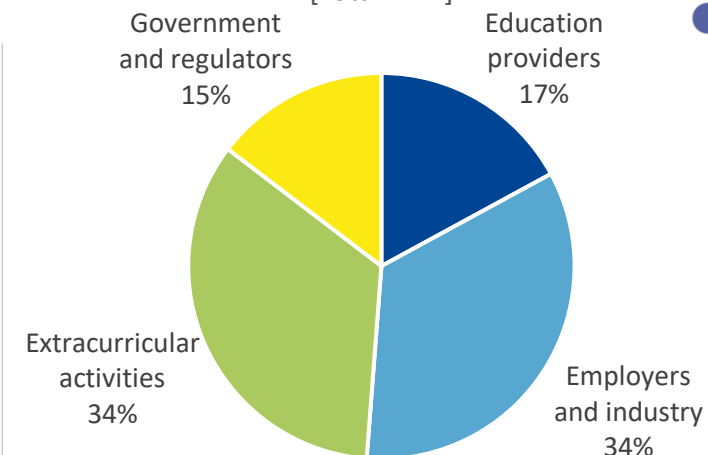
- Consolidate the skills landscape and **identified gaps**
- Learn from **past and existing activities** that have been implemented to address the skills gap in space education and careers and extract **best practices**
- Brainstorm and explore **potential future activities and priorities** for a thriving EU space education and skills ecosystem
- Encourage **cooperation & collaboration** among various stakeholders

New key findings include ...

- Embrace **NewSpace requirements** & ways of working
- Learn also from **non-European best practice examples**
- Boost **visibility of activities, collaboration and alignment of efforts** (e.g., via a space education & skills conference)
- Improve **access to activities** across locations, languages, ...
- Secure **access to funding** to ensure continuity of successful activities
- Support **accreditation of activities** at European and national levels

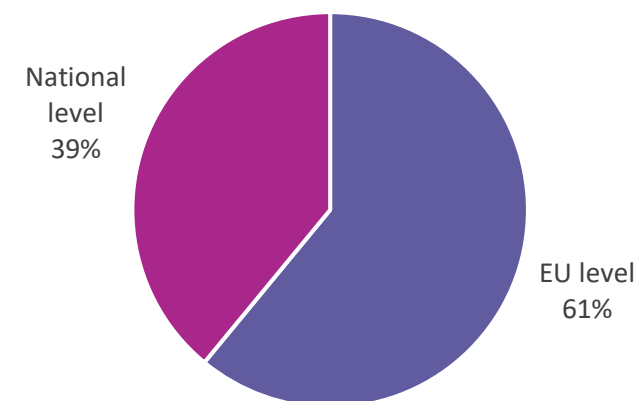
Entity type of participants

[Total = 41]



Reach of participants activities

[Total 41]



Key gaps identified include the need for improved accessibility and to attract new talent to space, with a focus on diversity and inclusivity

Gaps based on mapping and stakeholder workshop

Fragmentation of the skills & education ecosystem

- Limited visibility of existing activities reduces impact
- Lack of standardisation and alignment across various activities

Absence of an established accreditation framework

- Challenges assessing certification validity
- Difficulty selecting reputable courses
- Lack of translation into professional benefits

Lack of leveraging existing resources

- Created resources are not easily accessible
- Loss of material after project closure
- Lack of a centralised database

Only partial inclusivity in the education activities

- Majority of materials in English
- Motivational activities tend to overlook social backgrounds and gender biases' impact on STEM interest

Limited space focus for kids

- Main focus on STEM and space exploration
- Limited and costly teacher training courses
- Inadequate classroom resources

Limited activities towards fresh graduates and young professionals

- Few space career events/actions
- Insufficient industry-academia cooperation
- Low visibility of space entrepreneurship

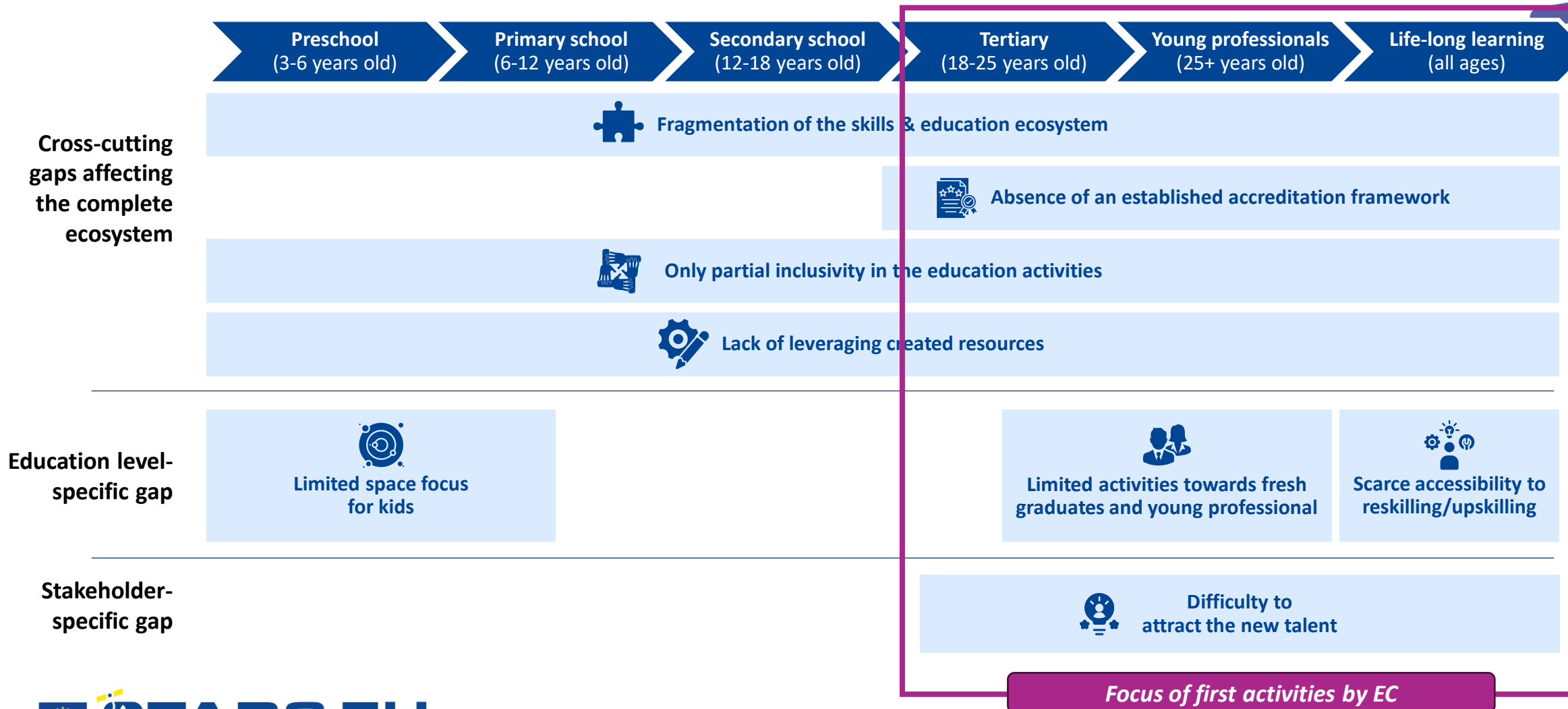
Scarce accessibility to reskilling/upskilling for professionals

- Scarce & costly reskilling/upskilling activities
- Limited open-access, engaging materials
- Lack in knowledge exchange within industry

Difficulty to attract new talent

- Limited access to multidisciplinary workers
- Weak industry-academia communication
- Low visibility of space entrepreneurship

We have categorised the identified gaps along all educational levels and across involved actors to identify overarching and more specific barriers





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