APPENDIX 2: Teacher questionnaire – Science, Technology, Engineering and Mathematics Education Practices

The questionnaire is addressed to Science, Technology, Engineering and Mathematics (STEM) teachers in secondary education (lower secondary and upper secondary – students aged 10 to over 19), and it aims to collect information about teaching practices in STEM education. The results of the study will be made freely available online before the end of 2018 and included in the Scientix Observatory.

As a STEM teacher, you are invited to complete the questionnaire and provide feedback for at least one of the STEM classes you teach. If you teach more than one STEM class, at the end of the survey you will have the option to provide information about up to three additional STEM classes you teach, by revisiting just the class-specific questions of the survey (Questions 1 to 4). By class, we mean the specific group of students who attend a specific lesson. The objective of this questionnaire is to assess the current practices of STEM teachers regarding the way they organise their teaching. More particularly, the questionnaire will investigate areas such as: pedagogical approaches, the type of resources used by teachers and students to facilitate STEM teaching and learning, the use of Information and Communications Technology (ICT) in the teaching process and the need for specific teacher training. You can also contribute further to this study by opting to be contacted to provide a case study. Answering this questionnaire should require no more than 20 minutes.

Data collection and processing

The data collected through this survey will be used strictly in line with the objectives defined above. This questionnaire is supported by Scientix, the community for science education in Europe, and Texas Instruments Education Technology GmbH, and has been developed by EUN Partnership AISBL in collaboration with Deloitte SAS. All anonymous data collected via this survey will be made freely available online (open access).

If they wish, participants can provide their name and email at the end of the survey, only if they are interested in providing follow-up information which would lead to a case study. EUN Partnership AISBL is the controller of this personal data. This information will not be shared outside EUN Partnership AISBL (for example, your name and e-mail address will not be shared with Texas Instruments), will be used only according to the purposes declared and will be deleted at the end of 2018. If you have any questions regarding this survey, please contact Adina Nistor (adina.nistor@eun.org).

CLASS-SPECIFIC INFORMATION

1. Please provide information about one STEM class you teach.

If your subject is not listed, please choose the closest option, or in the case of combined subjects, the option which is dominant in the subject taught.

CLASS 1

Subject taught	Age of the students	How many boys per class?	How many girls per class?	How many lessons/ sessions a week do you teach this class?

1.1. Subject taught

- ☐ Biology
- ☐ Chemistry
- ☐ Physics
- ☐ Earth sciences
- ☐ Combined Biology and Chemistry
- ☐ Combined Physics and Chemistry
- ☐ Combined Biology and Geology
- ☐ Mathematics
- ☐ Technology
- ☐ ICT (computer use only)
- ☐ ICT (database & network design and administration)
- ☐ ICT (software, applications development & analysis)
- ☐ Engineering (chemical engineering and processes)
- ☐ Engineering (environmental protection technology)
- ☐ Engineering (electricity and energy)
- ☐ Engineering (electronics and automation)
- ☐ Engineering (mechanics and metal trades)
- ☐ Engineering (motor vehicles, ships and aircraft)
- ☐ Engineering (nanotechnology, biotechnology, etc.)
- ☐ Architecture and town planning
- ☐ Building and civil engineering
- ☐ Agriculture, Forestry, Fisheries and Veterinary
- ☐ Medicine
- ☐ Medical diagnostic and treatment technology
- ☐ Integrated STEM

1.2. Age of the students

- ☐ 10 – 11
- ☐ 11 – 12
- ☐ 12 – 13
- ☐ 13 – 14
- ☐ 14 – 15
- ☐ 15 – 16
- ☐ 16 – 17
- ☐ 17 – 18
- ☐ 18 – 19
- ☐ Over 19

1.3. How many boys per class?

- ☐ 0-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16-20
- ☐ 21-25
- ☐ >25

1.4. How many girls per class?

- ☐ 0-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16-20
- ☐ 21-25
- ☐ >25

1.5. How many lessons/sessions a week do you teach this class?

- ☐ 1 session
- ☐ 2 sessions
- ☐ 3 sessions
- ☐ 4 sessions
- ☐ 5 or more sessions

2. Which pedagogical approaches are you using in your STEM teaching for this class and how much?

	CLASS 1
Traditional direct instruction (lessons are focused on the delivery of content by the teacher and the acquisition of content knowledge by the students).	
Teaching with experiments (experiments are used in the classroom to explain the subject matter).	
Project-/Problem-based approach (students are engaged in learning through the investigation of real-world challenges and problems).	
Inquiry-Based Science Education (students design and conduct their own scientific investigations).	
Collaborative learning (students are involved in joint intellectual efforts with their peers or with their teachers and peers).	
Peer teaching (students are provided with opportunities to teach other students).	
Flipped classroom (students gain the first exposure to new material outside of class, and then use classroom time to discuss, challenge and apply ideas or knowledge).	
Personalised learning (teaching and learning are tailored to meet students' individual interests and aspirations as well as their learning needs).	
Integrated learning (learning brings together content and skills from more than one subject area).	
Differentiated instruction (classroom activities are designed to address a range of learning styles, abilities and readiness).	
Summative assessment (student learning is evaluated at the end of an instructional unit and compared against a benchmark or standard).	
Formative assessment, including self-assessment (student learning is constantly monitored and ongoing feedback is provided; students are provided with opportunities to reflect on their own learning).	

Answer choices:

- Not at all
- Very little
- To some extent
- A lot

3. To what extent do you use the following aspects of teaching and learning (with or without ICT) when teaching this class?

	CLASS 1
I present and explain scientific ideas to the whole class	
Students work alone at their own pace	
Students work on exercises or tasks individually at the same time	
I demonstrate a scientific idea to the whole class	
Students conduct experiments	
Students discuss ideas with other students and the teacher	
Student make decisions about how they learn	
Students conduct their own scientific study and research activities	
Students work in groups, with well-defined tasks	
Students work collaboratively, working together to find solutions to problems	
Students reflect on their learning	
I support and explain things to individual students	
I use different types of materials (visual, audio, written) in my classes	
I use content from different subjects to explain scientific concepts	
I invite other STEM teachers of different disciplines to coordinate our teaching of certain common topics	
I organise field trips/visits to museums/company visits to contextualise scientific concepts	
Students take tests and assessments	
I give feedback to my students during a learning activity	
Students participate in assessing their own work and the work of their peers	
Students give presentations to the whole class	
I integrate Arts into my STEM teaching to increase student engagement	

Answer choices

- Not at all
- Very little
- To some extent
- A lot

4. Which learning resources / materials are you currently using when teaching this class?

	CLASS 1
Paper-based materials	
Audio/video materials	
Presentations (MS Power Point, Libre Office Impress, Sway…)	
Robots	
Sensors, data loggers	
Calculators	
Graphing calculators	
Manipulation in an experimental lab	
Web-based or computer-based simulations	
STEM-specific software (e.g. Geogebra, Function Plotter…)	
Data sets / Spreadsheets (MS Excel, Libre Office Calc,…)	
Word processors (e.g. MS Word, LibreOffice Write, OneNote, Notepad…)	
Online collaborative tools (Padlet, Mentimeter, Tricider, Kahoot…)	
Resources published by private companies operating in STEM fields	
Resources for special needs learners	
Resources for personalised learning	

Answer choices

- Not at all
- Very little
- To some extent
- A lot

YOUR STEM TEACHING IN GENERAL

5. How do you usually learn about the teaching resources you are using in class?

You can choose more than one answer

- ☐ They are shared by the educational authorities in my country
- ☐ They are shared by my network of peers
- ☐ I actively search for resources in repositories of educational resources (e.g. Scientix)
- ☐ I actively search the Web for relevant teaching resources
- ☐ I subscribe to the information channels of national and international STEM education projects, which are publicly funded (social media, newsletters…)
- ☐ I subscribe to the information channels of private companies who publish STEM education resources (social media, newsletters…)

6. Which learning resources / materials would you like to use, but do not have at your disposal?

	I WILL NOT USE	I COULD USE	I NEED	I ABSOLUTELY NEED	NOT APPLICABLE (I ALREADY HAVE)
Robots	○	○	○	○	○
Sensors, data loggers	○	○	○	○	○
Calculators	○	○	○	○	○
Graphing calculators	○	○	○	○	○
Experimental lab	○	○	○	○	○
Web-based or computer-based simulations	○	○	○	○	○
STEM-specific software (e.g. GeoGebra, Function Plotter, Remote Labs,.)	○	○	○	○	○
Augmented reality/Virtual reality tools (including for example Virtual Labs)	○	○	○	○	○
Resources for personalised learning	○	○	○	○	○
Resources for special needs learners	○	○	○	○	○
Resources published by private companies operating in STEM fields	○	○	○	○	○

7. You would like to see more support for schools from private companies operating in STEM fields in:

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
Facilitating company visits	○	○	○	○
Having STEM professionals presenting to pupils in schools (on-site or on- line, via webinars)	○	○	○	○
Offering teacher placements	○	○	○	○
Offering student placements	○	○	○	○
Making teaching resources available to schools	○	○	○	○
Allowing access to hardware and equipment	○	○	○	○
Professional development	○	○	○	○
Other financial support	○	○	○	○

OBSTACLES TO IMPLEMENTING EFFECTIVE STEM TEACHING

8. Is your use of STEM teaching affected by the following?

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
Insufficient number of computers	○	○	○	○
Insufficient number of Internet-connected computers	○	○	○	○
Insufficient Internet bandwidth or speed	○	○	○	○
Insufficient number of interactive whiteboards	○	○	○	○
Insufficient number of portable computers (laptops/notebooks)	○	○	○	○
School computers out of date and/or needing repair	○	○	○	○
Lack of adequate training of teachers	○	○	○	○
Insufficient technical support for teachers	○	○	○	○
Insufficient pedagogical support for teachers	○	○	○	○
Lack of content in national language	○	○	○	○

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
Lack of pedagogical models on how to teach STEM in an attractive way	○	○	○	○
School time organisation (fixed lesson time, etc.)	○	○	○	○
School space organisation (classroom size and furniture, etc)	○	○	○	○
Pressure to prepare students for exams and tests	○	○	○	○
Lack of interest of teachers	○	○	○	○
Insufficient cross-curricular support from my school colleagues	○	○	○	○
No or unclear benefit from using ICT for STEM teaching	○	○	○	○
Using ICT in teaching and learning not a goal in our school	○	○	○	○
Administrative constraints in accessing adequate content/ material for teaching	○	○	○	○
Budget constraints in accessing adequate content/material for teaching	○	○	○	○

SUPPORT FOR STEM TEACHING

9. In your country / region, STEM teacher training for teachers in your subject(s) is:

- ☐ Compulsory
- ☐ Not compulsory, but recommended
- ☐ At my own discretion

10. In the past two school years, have you undertaken professional development of the following type and for how long?

	LENGTH	TYPE
Introductory courses on Internet use and general applications (basic word- processing, spreadsheets, presentations, databases, etc.)		
Advanced courses on applications (advanced word-processing, complex relational databases, Virtual Learning Environments, etc.)		
Advanced courses on Internet use (creating websites/homepage, video conferencing, etc.)		
Equipment-specific training (interactive whiteboard, laptop, etc.)		
Courses on the pedagogical use of ICT in teaching and learning		

	LENGTH	TYPE
Subject-specific training on learning applications (tutorials, simulations, etc.)		
Course on multimedia (using digital video, audio equipment, etc.)		
Participate in communities (e.g. online: mailing lists, Twitter, blogs; or face to face: working groups, associations…) for professional discussions with other teachers		
Personal learning about innovative STEM teaching in your own time		
Cooperation with industry for the contextualisation of STEM teaching (joint development of learning resources, placement in industry...)		
Other professional development opportunities related to innovative STEM teaching		

LENGTH

- No time at all
- Less than 1 day
- 1-3 days
- 4-6 days
- More than 6 days

TYPE

- Online
- Face to face
- Both
- Not applicable

11. Do you use a computer / tablet / smartphone and the Internet to update your subject knowledge or undertake personal or professional development in any subject (i.e. whether or not related to the subject you teach)?

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
To actively search for information and update your knowledge (teaching resources, news articles, etc.)	○	○	○	○
To undertake professional development courses	○	○	○	○
To participate in online communities (mailing lists, Twitter, Facebook, blogs…)	○	○	○	○
To create new materials either for personal use (e.g. calendar, personal website, own blog) or for my lessons (e.g. I create my own digital learning materials for students).	○	○	○	○

12. To what extent do you receive the support of the following groups to improve your STEM teaching?

	LITTLE/NO SUPPORT	MOSTLY TECHNICAL SUPPORT	MOSTLY PEDAGOGICAL SUPPORT	BOTH TECHNICAL AND PEDAGOGICAL SUPPORT
Other teacher(s) of the same subject	○	○	○	○
Other teacher(s) of a different STEM subject	○	○	○	○
Other teacher(s) of other, non-STEM subjects	○	○	○	○
School ICT / technology coordinator	○	○	○	○
Experts from outside the school (industry…)	○	○	○	○
An online helpdesk, community or website	○	○	○	○
Other school staff	○	○	○	○

13. Do your colleagues and head of school share a positive vision about innovative STEM teaching at your school?

Examples of innovative STEM teaching include: Inquiry-Based Science Education, Project-Based Learning, Flipped Classrooms, the use of ICT tools in STEM education, etc.

☐ Yes ☐ No

TEACHER OPINIONS AND ATTITUDES

14. In your opinion, does innovative STEM teaching (using ICT, and innovative pedagogical approaches) have a positive impact on the following?

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
Students concentrate more on their learning	○	○	○	○
Students try harder in what they are learning	○	○	○	○
Students feel more autonomous in their learning (they can repeat exercises	○	○	○	○
Students understand more easily what they learn	○	○	○	○
Students remember more easily what they've learnt	○	○	○	○
Students develop their critical thinking	○	○	○	○

	NOT AT ALL	VERY LITTLE	TO SOME EXTENT	A LOT
Students become more interested in STEM careers	◯	◯	◯	◯
ICT facilitates collaborative work among students	◯	◯	◯	◯
ICT improves the class climate (students are more engaged, lessdisturbing)	◯	◯	◯	◯

15. To what extent do you disagree or agree with each of the following statements about the use of ICT for STEM teaching at school?

	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
ICT SHOULD BE USED FOR STUDENTS TO: ...do exercises and practise	◯	◯	◯	◯
...retrieve information	◯	◯	◯	◯
...work in a collaborative way	◯	◯	◯	◯
...learn in an autonomous way	◯	◯	◯	◯
ICT USE IN TEACHING AND LEARNING POSITIVELY IMPACTS ON STUDENTS': ...motivation	◯	◯	◯	◯
...achievement	◯	◯	◯	◯
...higher level skills (deep understanding)	◯	◯	◯	◯
...competence in transversal skills (learning to learn, social competences, etc.)	◯	◯	◯	◯
ICT USE IN TEACHING AND LEARNING IS ESSENTIAL: ...to prepare students to live and work	◯	◯	◯	◯
...in the 21st century	◯	◯	◯	◯

PERSONAL BACKGROUND INFORMATION

16. Country in which you teach

- ○ Albania
- ○ Andorra
- ○ Armenia
- ○ Austria
- ○ Azerbaijan
- ○ Belarus
- ○ Belgium
- ○ Bosnia and Herzegovina
- ○ Bulgaria
- ○ Croatia
- ○ Cyprus
- ○ Czech Republic
- ○ Denmark
- ○ Estonia
- ○ Finland
- ○ France
- ○ Georgia
- ○ Germany
- ○ Greece
- ○ Hungary
- ○ Iceland
- ○ Ireland
- ○ Italy
- ○ Kosovo
- ○ Latvia
- ○ Liechtenstein
- ○ Lithuania
- ○ Luxembourg
- ○ Macedonia (FYROM)
- ○ Malta
- ○ Moldova
- ○ Monaco
- ○ Montenegro
- ○ Netherlands
- ○ Norway
- ○ Poland
- ○ Portugal
- ○ Romania
- ○ San Marino
- ○ Serbia
- ○ Slovakia
- ○ Slovenia
- ○ Spain
- ○ Sweden
- ○ Switzerland
- ○ Turkey
- ○ Ukraine
- ○ United Kingdom (UK)
- ○ Other (please specify)

17. Are you

- ○ Female
- ○ Male
- ○ Other

18. Including this school year, how long have you been teaching (at any school)?

- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-10 years
- ○ 11-20 years
- ○ 21-30 years
- ○ 31-40 years
- ○ More than 40 years

19. Age

- ○ 30 or under
- ○ 31-35
- ○ 36-45
- ○ 46-55
- ○ Over 55

20. How often do you use a computer, a tablet or a smartphone for activities other than work (e.g. shopping, organising photos, socialising, entertainment, booking a hotel, contacting family and friends)?

- ○ Never
- ○ A few times a year
- ○ Almost monthly
- ○ Weekly
- ○ Daily

21. How many lessons / sessions do you teach in total each week?

- ○ Fewer than 10 sessions per week
- ○ 10-20 sessions
- ○ 20-38 sessions
- ○ 38 or more sessions

22. What is the duration of one lesson/session in your country?

- ○ 35 minutes
- ○ 40 minutes
- ○ 45 minutes
- ○ 50 minutes
- ○ 55 minutes
- ○ 60 minutes
- ○ Other (please specify)…

23. Would you like to provide class-specific information about between one and three additional classes you teach?

○ Yes ○ No

[OPTIONAL] INFORMATION ABOUT THE ADDITIONAL CLASSES YOU TEACH

24. Please provide information about between one and three additional classes you teach. [Answer per class]

If your subject is not listed, please choose the closest option, or in the case of combined subjects, the option which is dominant in the subject taught.

CLASS 2*

Subject taught	Age of the students	How many boys per class?	How many girls per class?	How many lessons/ sessions a week do you teach this class?

CLASS 3*

Subject taught	Age of the students	How many boys per class?	How many girls per class?	How many lessons/ sessions a week do you teach this class?

CLASS 4*

Subject taught	Age of the students	How many boys per class?	How many girls per class?	How many lessons/ sessions a week do you teach this class?

*Answer choices detailed in Q1

25. Which pedagogical approaches are you using in your STEM teaching and how much? [Answer per class]

	CLASS 2*	CLASS 3*	CLASS 4*
Traditional direct instruction (lessons are focused on the delivery of content by the teacher and the acquisition of content knowledge by the students).			
Teaching with experiments (experiments are used in the classroom to explain the subject matter).			
Project-/Problem-based approach (students are engaged in learning through the investigation of real-world challenges and problems).			

	CLASS 2*	CLASS 3*	CLASS 4*
Inquiry-Based Science Education (students design and conduct their own scientific investigations).			
Collaborative learning (students are involved in joint intellectual efforts with their peers or with their teachers and peers).			
Peer teaching (students are provided with opportunities to teach other students).			
Flipped classroom (students gain the first exposure to new material outside of class, and then use classroom time to discuss, challenge and apply ideas or knowledge).			
Personalised learning (teaching and learning are tailored to meet students' individual interests and aspirations as well as their learning needs).			
Integrated learning (learning brings together content and skills from more than one subject area).			
Differentiated instruction (classroom activities are designed to address a range of learning styles, abilities and readiness).			
Summative assessment (student learning is evaluated at the end of an instructional unit and compared against a benchmark or standard).			
Formative assessment, including self-assessment (student learning is constantly monitored and ongoing feedback is provided; students are provided with opportunities to reflect on their own learning).			

*Answer choices detailed in Q2.

26. To what extent do you use the following aspects of teaching and learning (with or without ICT) when teaching your classes? [Answer per class]

	CLASS 2*	CLASS 3*	CLASS 4*
I present and explain scientific ideas to the whole class			
Students work alone at their own pace			
Students work on exercises or tasks individually at the same time			
I demonstrate a scientific idea to the whole class			
Students conduct experiments			
Students discuss ideas with other students and the teacher			
Student make decisions about how they learn			
Students conduct their own scientific study and research activities			
Students work in groups, with well-defined tasks			
Students work collaboratively, working together to find solutions to problems			
Students reflect on their learning			
I support and explain things to individual students			

	CLASS 2*	CLASS 3*	CLASS 4*
I use different types of materials (visual, audio, written) in my classes			
I use content from different subjects to explain scientific concepts			
I invite other STEM teachers of different disciplines to coordinate our teaching of certain common topics			
I organise field trips/visits to museums/company visits to contextualise scientific concepts			
Students take tests and assessments			
I give feedback to my students during a learning activity			
Students participate in assessing their own work and the work of their peers			
Students give presentations to the whole class			
I integrate Arts into my STEM teaching to increase student engagement			

*Answer choices detailed in Q3.

27. Which learning resources / materials are you currently using when teaching each class? [Answer per class]

	CLASS 2*	CLASS 3*	CLASS 4*
Paper-based materials			
Audio/video materials			
Presentations (MS Power Point, Libre Office Impress, Sway…)			
Robots			
Sensors, data loggers			
Calculators			
Graphing calculators			
Manipulation in an experimental lab			
Web-based or computer-based simulations			
STEM-specific software (e.g. Geogebra, Function Plotter…)			
Data sets / Spreadsheets (MS Excel, Libre Office Calc,…)			
Word processors (e.g. MS Word, LibreOffice Write, OneNote, Notepad…)			
Online collaborative tools (Padlet, Mentimeter, Tricider, Kahoot…)			
Resources published by private companies operating in STEM fields			
Resources for special needs learners			
Resources for personalised learning			

*Answer choices detailed in Q4.