Co-funded by
the European Union

FullSTEaMAhead

De-gendering STEM through STE(A)M and creative thinking in Secondary Education

HANDBOOK FOR TEACHERS

INTEGRATED STEM TEACHING APPROACH GUIDELINES AND COURSE

Project Number
2021-1-HR01-KA220-SCH-000027733

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ACKNOWLEDGEMENTS
We would like to thank all teachers, educators, researchers, and all others that have participated in the project and that have, with their ideas, feedback, and encouragement contributed to the development of this document.

DISCLAIMER
This project has been funded with support from the European Commission, Erasmus+ programme and Croatian national agency for Erasmus+. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

FullSTEaMAhead

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INTRODUCTION

The FULL STEAM AHEAD PROJECT

FULL STEAM AHEAD, "De-gendering STEM through STE(A)M and creative thinking in secondary education" is an ERASMUS+ KA2 (Project number 2021-1-HR01-KA220-SCH-000027733) with an implementation period of 24 months, between November 2021 and November 2023. The project is being conducted by a consortium of seven (7) partners from four (4) European countries: Croatia, Italy, Greece, and Spain.

This project aims at supporting teachers in STEM in secondary education, the proposed project will develop a modular set of educational materials and teaching tools for teachers available in an online learning space (platform) along two main thematic parts:

1. Stem in secondary education as a de-gendered teaching subject
2. Stem as a de-gendered option for girls and boys in terms of personal and professional development complemented by support materials, addressing how schoolteachers can encourage girls and school peer groups to act as facilitators towards interest in STEM, and how parents/significant others can promote a de-gendered approach to STEM.

The need for the project is based on the fact that Gender aspects play an important role in science education, conditioning choices, and beliefs as grounded on self-estimation of one's own capacities. Research has shown that women remain still underrepresented in STEM (Science, Technology, Engineering, Mathematics), while this underrepresentation is evident beyond students across education levels, within the fields of teachers, researchers, academicians, and the labour market. The STEM gender-gap is reflected in ICT-related studies and careers (57% of tertiary graduates in the EU are women, only 24.9% of them graduate in ICT related fields / women make up 13% of the graduates in ICT-related fields working in digital jobs compared to 15% in 2011). Figures indicate that women's participation in the ICT and digital sector are not improving significantly, or even worsening (Women in the Digital Age, EC, 2018).

The **project objectives** are to support teachers to:

- Equally promote STEM studies and careers to girls' and boys' students.
- Deconstruct the notion of STEM as a 'masculine club'.
- Exploit the STEAM framework igniting critical thinking, problem solving and the creative process in STEM teaching, rather than within conventional, isolated knowledge compartments.

These objectives will be achieved by deploying the following **results** -R:

R1 Methodological framework for the definition and development of training material for STEM teachers

R2 Development of digital training and pedagogical modules for a de-gendered STEM teaching approach

R3 Handbook for teachers: Integrated STEM teaching approach guidelines and testing courses

About This Handbook

This document is part of Result 3 (HANDBOOK FOR TEACHERS: Integrated STEM teaching approach guidelines and testing courses) planning elaborated in the frame of the Erasmus + KA2 FULL STEAM AHEAD Project.

To this end, the present document has been structured to address the full understanding and distribution of work of the Result:

- **Section 1** FULL STEAM AHEAD PROJECT SUMMARY briefly presents the overall structure of the project: its objectives, target group and key results followed by the desired impact and the partnership involved to better understand the aim of this Result.
- **Section 2** RESULT 3 introduces the overall description of the result in terms of objectives, activities, distribution of work and days per partner.
- **Section 3** presents a SUMMARY OF the ACTIVITIES proposed.

Finally, as annexes to this document we will find the evaluation instruments, mainly developed to gather qualitative and quantitative evaluation information and data from those participating in evaluation activities. These questionnaires will be the preface to the evaluation data analysis and subsequent assessment of project achievements.

1. THE FULL STEAM AHEAD TRAINING PROVISION: STRUCTURE

The FULL STEAM AHEAD training provision is divided onto 7 topics per age range.

To create the topics and the methodology that would spark students' interest towards STEM education, we first needed to explore what are the actual students' preferences when it comes to school subjects but also topics they are interested in outside of the school.

So, in the first part of the project we conducted a set of questionnaires and interviews among teachers, students, and parents in all partners countries (see the full report IN ENGLISH HERE)

In research with the teachers, we examined the gender preferences on school subjects. The research results show that girls are more attracted towards Art, Literature and language and Psychology, while the boys gravitate more towards: Engineering, Computer science and ICT. As the level of student's interest by gender could be distinguished, according to teachers' experience, there were also subjects for which girls and boys equally shared interest: Nature and Environmental science; Music; Biology and Geography.

The same question was presented to the students (but this time with no gender distinction) and the result showed that the student's interest is highly directed towards Sports followed by History, Music, IT/ITC, Geography and Literature.

Second most rated subjects were also Design and technology, Computer science and Art.

In research with students, we also explored what are their everyday interests and what topics they would like to inquire into in schools. Most students stated that they would like to explore psychology and human emotions, the next highest rated topics were music and movies.

The research results enabled the development of well-thought-out topics that connect the interests for school subjects for both genders as well as the personal interests of the students in general:

1. **Art and science**
2. **Nature science and biology**
3. **Technology**
4. **Movies**
5. **Self-knowledge, human emotions, and psychology**
6. **Language and literature**
7. **Sport and health**

These topics are methodologically connected to balance the relationship between science and humanities. These topics and educational approaches are designed not only to awaken students' interest in STEM, but also to equally stimulate the development of creative and critical thinking.

In the following table we have summarised the topics, the titles of the educational materials and the age range suggested for the students:

EDUCATIONAL MATERIALS		
TOPIC	**TITLE**	**AGE**
ART AND SCIENCE	Waves and sound, edit music and do your own Audio-guide with Audacity	**11-13**
	Art and Science: Siblings of human spirit	**13-16**
	From Physical to Digital - Curating a virtual gallery	**13-16**
	Great Women	**16-18**
NATURE SCIENCE AND BIOLOGY	Maths Experiment: Is the Earth round or flat? How big is it?	**11-13**
	A world waiting to be seen	**13-16**
	Energy balance and metabolism: Food in terms of body fuel	**13-16**
	What can we learn from animals?	**16-18**
	Waste Is not garbage!	**16-18**
TECHNOLOGY	Nature-based solutions: Nature as our ally in climate hazards	**11-13**
	Building Bridges	**13-16**
	SketchUp/ThinkerCad and 3D	**16-18**
MOVIES	How to make stop-motion animated movies with your smartphone using Stop Motion Studio	**11-13**
	Woman in science at the cinema	**13-16**
SELF-KNOWLEDGE, HUMAN EMOTIONS AND PSYCHOLOGY	Emotional effect on human body	**11-13**
	Jung personalities in the 21st Century	**13-16**
	Self-report of personality traits	**16-18**
LANGUAGE AND LITERATURE	Narrative photography: learn to tell stories using pictures	**11-13**
	Break the rules in literature: a role playing on gender in inequality related to women writers	**13-16**
	Neuroscience on language learning	**16-18**
SPORT AND HEALTH	The New Old	**16-18**

2. HOW TO USE THE FULL STEAM AHEAD TRAINING PROVISION

This chapter is organised in 3 parts:

- The **structure of the e-platform** where the reader will find out how to use the FullSteamAhead training platform.
- The **FULL STEAM AHEAD approach**, explaining the de-gendering approach towards STEM, the Arts, creativity, and humanities in STE(A)M and our approach towards personal and professional development.
- **FULL STEAM AHEAD materials** which finalises with a table with the 7 Modules and their Units, complemented by their learning objective and comments/tips for teachers, which are suggested for effective implementation in the class.

2.1 THE STRUCTURE OF THE E-PLATFORM

How to use the FullSteamAhead training platform

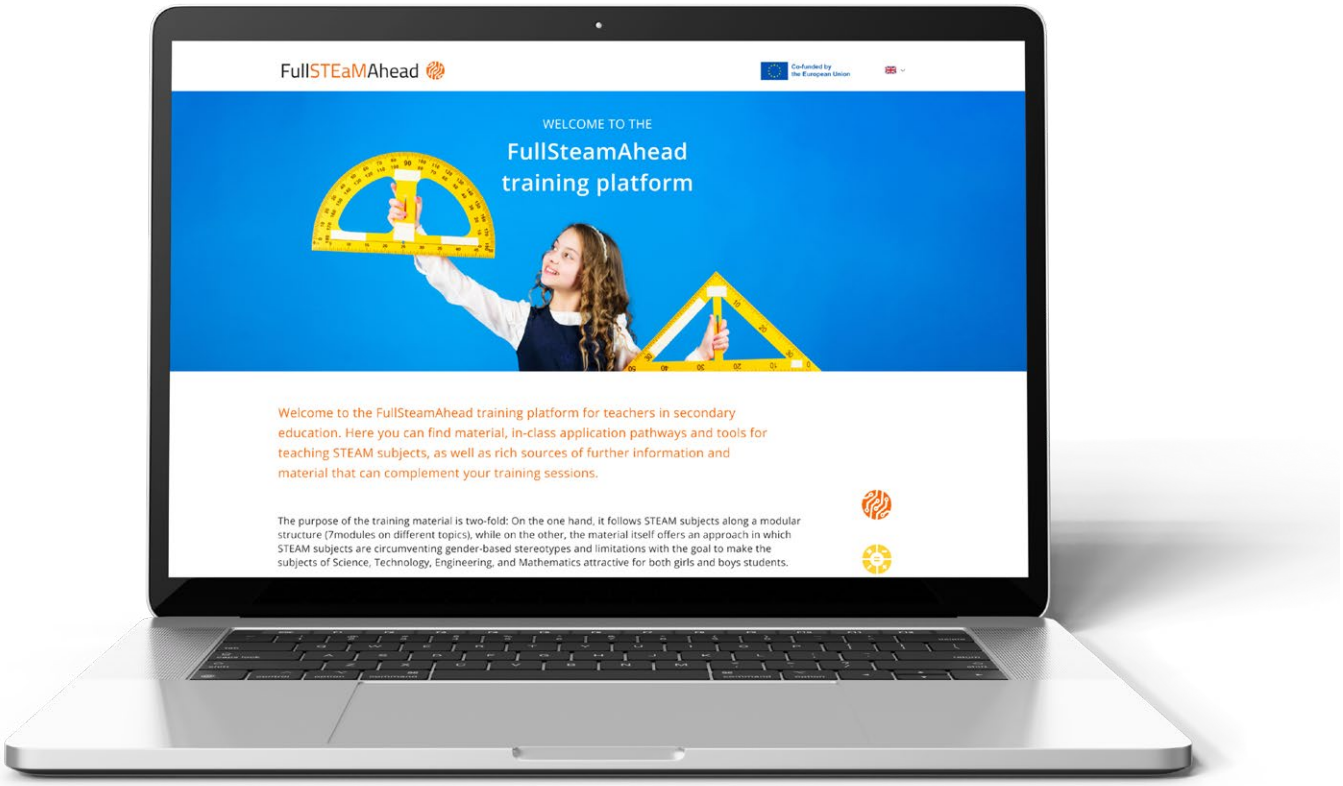

Figure 1: the landing page of the training platform

The URL of the e-platform supporting the training is https://training.fullsteam-ahead.eu/ (Figure 1).

You can also enter the platform by the project's webpage https://fullsteam-ahead.eu/

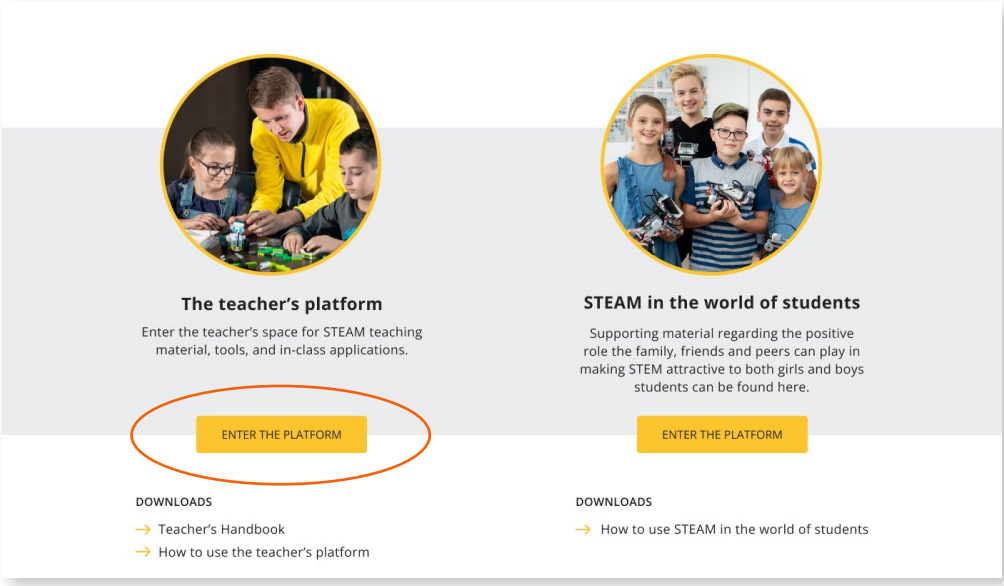

Figure 2: Entering the platform

> Once you enter e e-platform the user should select the area which they need to enter and proceed by pressing the yellow button ENTER THE PLATFORM

Access and registration

To access and register the platform content, the user has to follow these steps:

> Click on "ENTER THE PLATFORM"
> (yellow button on the middle side of the landing page - see Figure 2).
>
> This will open the next page with the offered structure of the lessons (menu on the left).
>
> Click on "login" button on the right (See Figure 3).

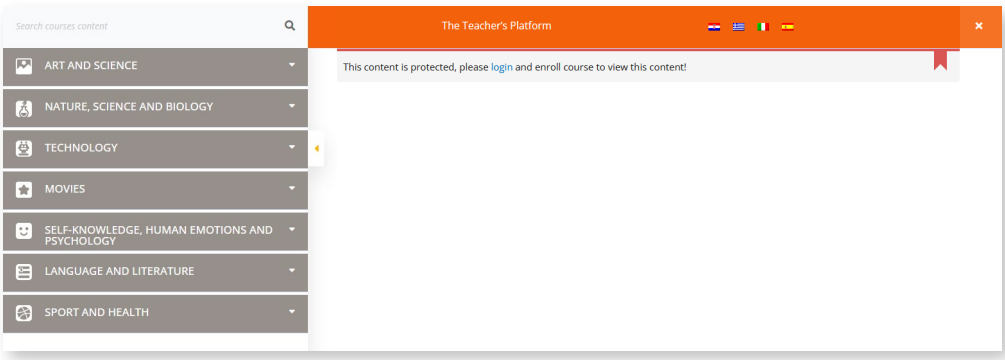

Figure 3: Menu page

In order to create an account, select Signup Now function.

The user should enter a valid email address and a preferable password. Then click on “Register” button (Figure 5).

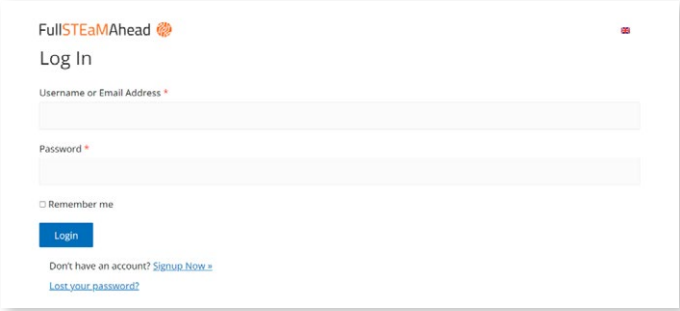

Figure 4: Login page

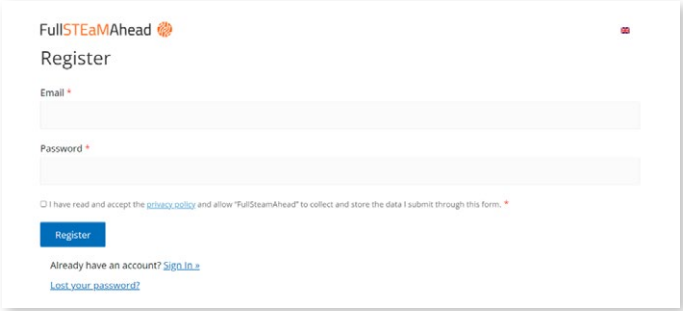

Figure 5: Registration page

Enter the link to set your password. A password is suggested/ generated for you, and you can keep it or you can enter the one you prefer and press “Save Password” (Figure 6i: Password Set Up)

Then the system informs you about the password set up and click on “Log In” (Figure 6ii: Password OK)

You will be re-directed to the log in page to enter your username or email address and password (Figure 6iii) to log in. If you are logging in from a secure pc/laptop we recommend to select Remember me option.

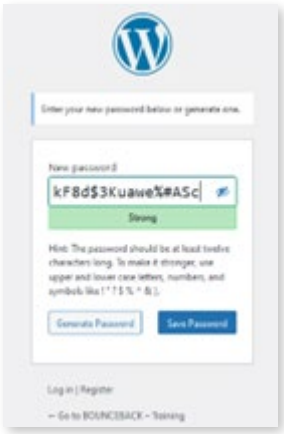

Figure 6i: Password set up

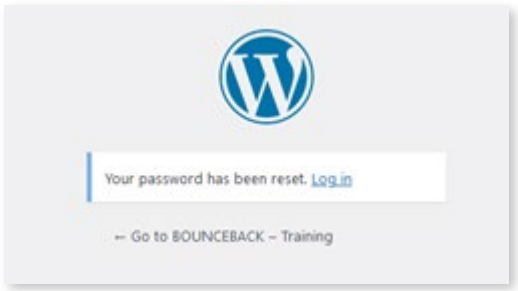

Figure 6ii: Password OK

Figure 6iii: Enter username and password and Log in

You will then enter and see the “Teacher’s platform”.
Click on your right the yellow button “View more”.

This will open the next page with the offered structure of the curriculum (menu on the left).

Click on the yellow button on your right “Start Now” (see Figure 7).

Then you click on the unit of the curriculum” (see Figure 8).

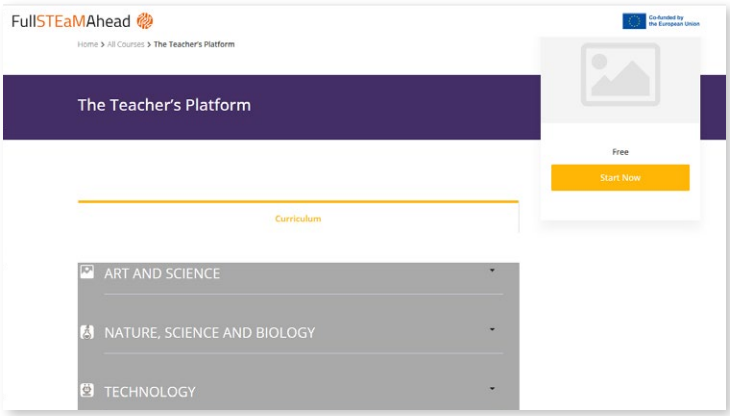

Figure 7: Start Now

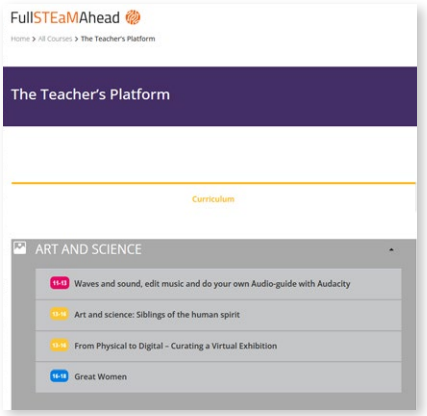

Figure 8: Choice of the Topic

Navigating through the course

Once the user is logged in to the platform, a page with the courses the user can enroll appears (Figure 9). And start navigating through the modules.

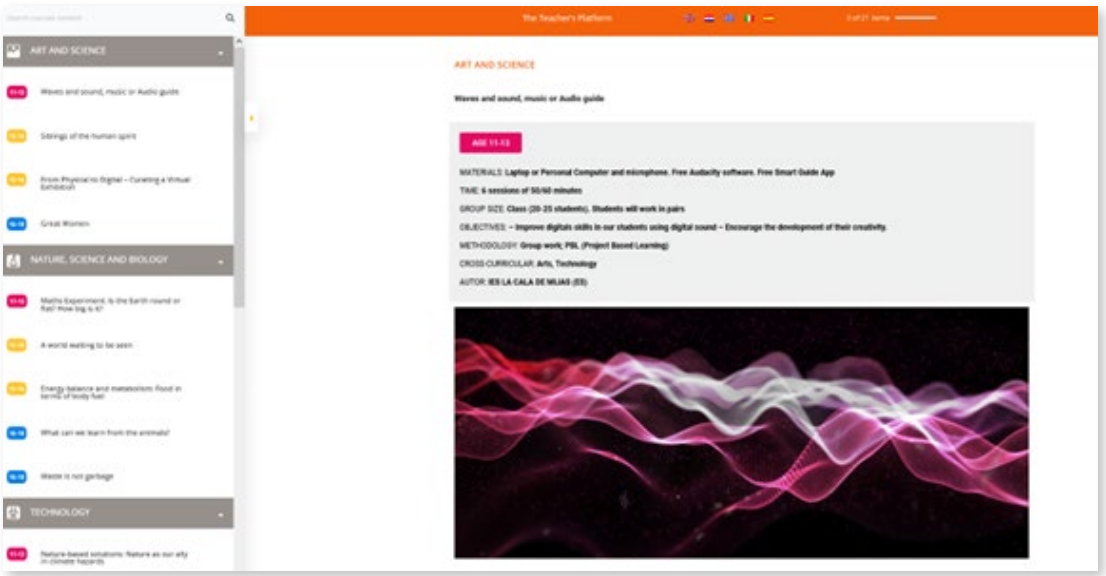

Figure 9: The courses page

There are two alternative ways of navigation: either from the menu, or by clicking the “Next” and “Previous” buttons at the bottom of each course page (figure 10)

At the bottom of each course page is the complete button. Once clicked, a confirmation box appears, asking the users to confirm (Figure 11). Then the progress of study appears on the progress bar, on the top right of the page.

During study, the content menu on the left can be hidden, by clicking on the orange arrow (Figure 12).

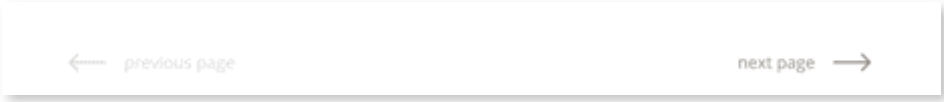

Figure 10: Next – previous page

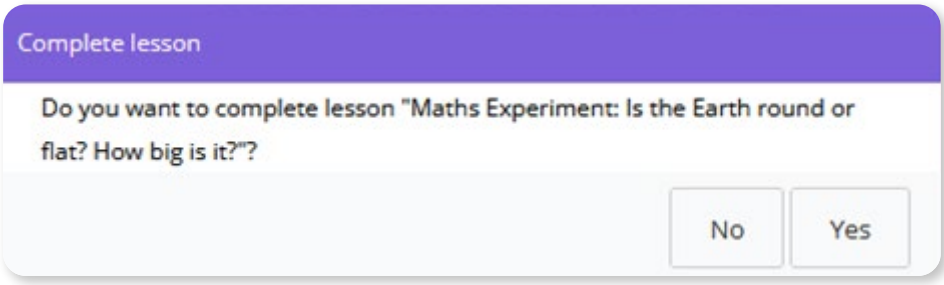

Figure 11: The ‘Complete’ button

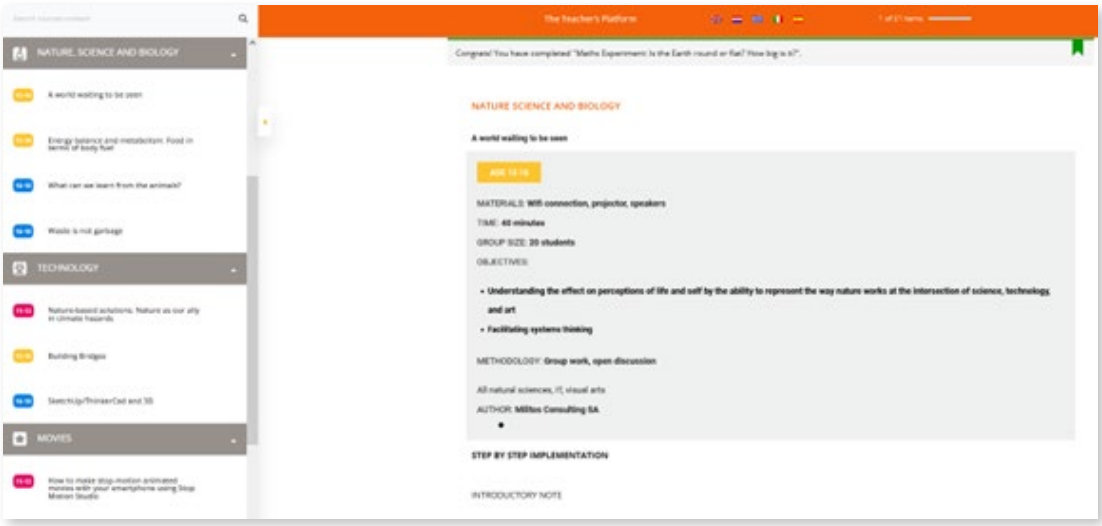

Figure 12: Hiding the menu

2.2 THE FULL STEAM AHEAD APPROACH

De-gendering approach towards STEM

In trying to trace the How to use the FullSteamAhead training platform factors, sources, and determinants of girls' (and boys') relationship with STEM, it seems that students' achievement in STEM up to and during secondary education level don't imply significant, gender-based differentiations in science performance (OECD 2018 and PISA 2015). However, it is during lower and upper secondary level when substantial gender disparities kick-in regarding interest towards STEM, demonstrating that girls gradually start losing interest in STEM at the age of 12-15 and beyond.

Eventually, this gendered pattern extends into tertiary education and career choices (TIMSS 2015; TIMSS Advanced 2015; UNESCO, 2017).

This girls' and boys' engagement and disengagement, as well as persistence in STEM studies can be traced in several factors. In the article: Overcoming Gender Bias in STEM: The Effect of Adding the Arts (STEAM), authors Clara Wajngurt and Pressy J. Sloan lists a couple of crucial elements that affect the lack of women in the STEM field.

STEREOTYPES: There are many different types of bias in subject selection, and schools frequently adhere to old-fashioned notions of what constitutes "feminine" and "masculine" studies. This comes from a notion that women naturally thrive in disciplines requiring linguistic skills while males naturally excel in those involving arithmetic.

DISCONNECTION TO HUMANITIES: Viewing STEM as a strictly scientific discipline with no humanities goals tends to push girls from engaging in STEM education. As stated in Wajngurt & Sloan article: "Morgan, Isaac, and Sansone (2001) found that students viewed STEM careers as less connected to humanitarian ideals and interpersonal goals than non-STEM careers. When choosing a career, women tend to gravitate toward "helping" professions and interpersonal goals (Lackland & De Lisi, 2001); therefore, the perception that STEM fields are not associated with these goals may be one reason that women tend to steer away from STEM subjects."

LACK OF FEMALE ROLE MODELS: It's not just that women have historically been unrepresented and under-emphasised in scientific circles, but the lack of female professors as a role model in STEM education can also discourage girls from STEM education. Increasing female STEM professors in schools can motivate students to dispel the myth of male-female fields in education.

EARLY EXPOSURE: As Wajngurt &Sloan emphasise, each step-in education is important. The lack of STEM in early childhood education can also influence gender preferences in educational subjects. The idea is to expose children to STEM and stimulate interest in STEM subjects before students reach the age when all the above factors already start to influence.

All of these factors that affect girls, of course, also affect boys. To the extent in which girls are culturally navigated to lose interest in STEM subjects, we also have boys dropping out of the humanities. One of the also damaging factors is that science and humanities are being seen as two completely different and separated fields. Leaving each field to his own set of skills, knowledge and goals that accommodates just one set of one's personality, abilities and interest.

So, to what extent could we reach students' full potential if we combine these two fields and take the road of de-gendering approach in STEM education?

Arts, creativity and humanities in STE(A)M

The importance of STEM education is well known today as combining Science, Technology, Engineering and Mathematics that provides multiple perspectives in education and also encourages the teaching of those fields to be more engaging and integrated.

But if we blend arts into STEM fields, can we expect even better educational results and why?

The arts, which encompass visual arts and design in addition to music and the humanities, are represented by the letter "A" in STEAM. Successful collaborations between the sciences and the arts result in innovative discoveries and concepts.

While STEM was designed to enable students to develop their critical thinking, teamwork, problem solving and questioning skills, the arts bring a well needed component of creation and design in the thinking process, creating a multi-disciplinary approach to technology and science development.

Art, along with humanities, creates the field in which the potential of creative thinking comes into play. Thinking outside of the box requires engagement of creativity and imagination which improves the development of STEM's core competencies as well as flexibility, adaptability, productivity and innovation.

After all it was Einstein himself who said: "Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world."

If we look at it through methodological goals, we will see that creative thinking is connected with critical thinking.

Creative thinking is inventive (creating new directions), exploratory (exploring new opportunities and perspectives), developing (developing new ideas), changing (new approaches and ideas change the existing state, ideas, opinions), generating (creating new approaches, ideas that recreate new approaches and ideas) and constructive in a way that new ideas are put into an action.

Critical thinking examines the consistency, foundation and material value of attitudes, problems or opinions. Creative thinking creates a solution to the problem, providing a multitude of alternatives and new opportunities, so that, in the end, with critical reflection, we reach a final decision, attitude or solution.

In the FullSteamAhead project, we went a step further by blending not just arts with science but exploring science through humanities subjects. In the project's educational materials, humanities are placed as a driving force for science and framework for exploring human needs, emotions, thoughts, and personalities.

Exploring STEM through humanities we create the opportunity for students to incorporate science in everyday life as they take interest in human affairs, culture, values, and welfare.

This approach increases students' ability to take a social perspective.

For example, if we explore science and nature from humanities perspectives, our leading question will be how they are inter-affected and what are their effects on human life and experience.

This is where we start thinking on how science can be used for benefiting the quality of life for oneself, community, and environment.

So, when we combine Science, Art and Humanities in an **interdisciplinary approach**, students can explore connections between needs – problems – creations.

Extension of STEM into Art and Humanities also leads to a de-gendering educational approach as it is the road where "girls' and boys' preferences" meet and extend beyond their initial interest.

PERSONAL AND PROFESSIONAL DEVELOPMENT

As very often sciences, humanities and art in school systems are separated, so is the development of one's skills that comes with each subject. Very often science subjects are the ones that develop hard skills (related to specific technical knowledge and training), while in humanities soft skills (impact interpersonal interactions and productivity) are being developed.

But in this interdisciplinary approach, soft and hard skills are blended into development of core skills:

Critical thinking - skills that we need to be able to think critically are varied and include observation, analysis, interpretation, reflection, evaluation, inference, explanation, problem solving, and decision making.

Problem solving - ability to identify problems, brainstorm and analyse answers, and implement the best solutions.

Oral and written communication - abilities that are used when giving and receiving different kinds of information. They involve listening, speaking, observing, and empathising but also expressing yourself clearly, using language with precision; constructing clear sentences; note taking, editing and summarising.

Collaboration skills - ability to cooperate with others to achieve a common objective. Clarity in communication, attentive listening to others, accepting responsibility for errors, and consideration for the diversity of your peers are just a few of them.

Creativity and Innovation - ability to consider something in a new way. Generate new ideas and perspectives to find a solution to a problem. Involves lateral thinking, which is the ability to perceive patterns that are not obvious.

Digital literacy - ability to research, assess, and disseminate data using writing and other media on different digital platforms.

FullSteamAhead educational materials are built on methodology that is student oriented towards practical and experiential learning with activities that very often require group work and collaboration as well as research and design. That way the activities are set to develop listed skills that contribute to personal and professional development as all the core skills are utterly desirable in many STEAM professions.

When it comes to personal development, there cannot be one if we don't question or re-examine values and traditions of the culture in which we live. As well as our own.

For that reason, each educational material has questions or tasks that engages students in group discussion from which they can explore "traditional" man – woman roles in order to understand if they are a result of cultural dogma; distinguish stereotypes; recognize the gender bias and from where it originates; what are the gender-differentiating elements etc.

When we disassemble the concept of girls vs. boy's club, only then can we acknowledge the professional possibilities that are not gender based but rather based on our own preferences, skills and abilities.

To explore professional development, some of the educational materials offer activities that are connected to finding one's professions preferences as well as understanding your own personality traits.

Furthermore, educational materials contain examples of women in science from different fields and historical times, that give a new perception of professional possibilities and set up role models for students from which they can draw inspiration.

2.3 THE FULL STEAM AHEAD MATERIALS

As demonstrated in Section 1 "THE FULL STEAM AHEAD TRAINING PROVISION: STRUCTURE" the Full Steam Ahead training provision consists of 7 Modules with a total of 21 Units.

As a teacher you have the following indicators as they show up online to have information about:

Ⓐ The suggested age group of students/pupils for whom the material is most appropriate. As a teacher and depending on your class mix but also the overall curriculum, and the type of the secondary school you are teaching in, you can consider these age groups not as fixed, but rather as flexible indications. This means that according to the level of your pupils across several ages, it is of course possible to use and apply Units with a designated age group for an older or younger age group/cohort. The three age groups (11-13, 13-16, 16-18) have been created according to both similarities but also different structures of secondary education systems across the project countries, i.e. Croatia, Greece, Italy, Spain. In this process we consulted "The structure of the European education systems 2022/2023: schematic diagrams" of the European Commission (October 2022).

(Please note that the 3 age groups are also shown in different colouring in the overall menu of the learning platform at the left of your screen - See Figure below).

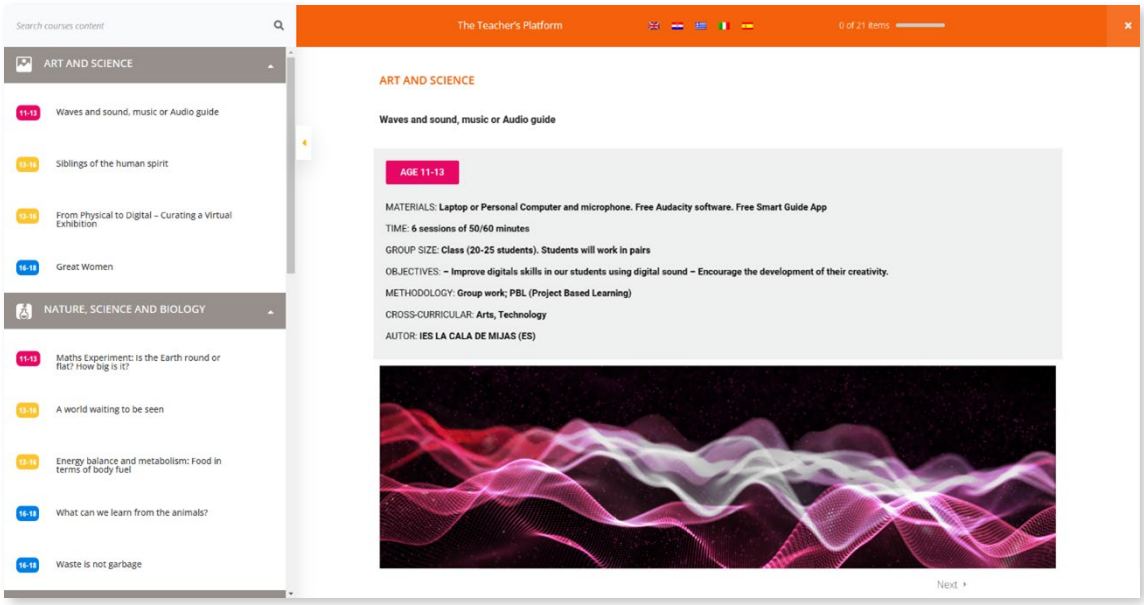

Figure 13: The Full STEAM AHEAD learning platform

11-13 13-16 16-18

B The identity table at the start of each unit giving out information on (See Figure below):

- The title of the Module to which the Unit at hand belongs
- The title of the Unit
- The age group
- The needed materials for in-class implementation
- The approx. time needed
- The suggested group size (students/pupils)
- The objectives of the Unit
- The methodology
- The suggested cross-curricular approach best suited to the content of the actual Unit vis-à-vis other teaching subjects
- The author(s) of the material (FullSteamAhead project partner)

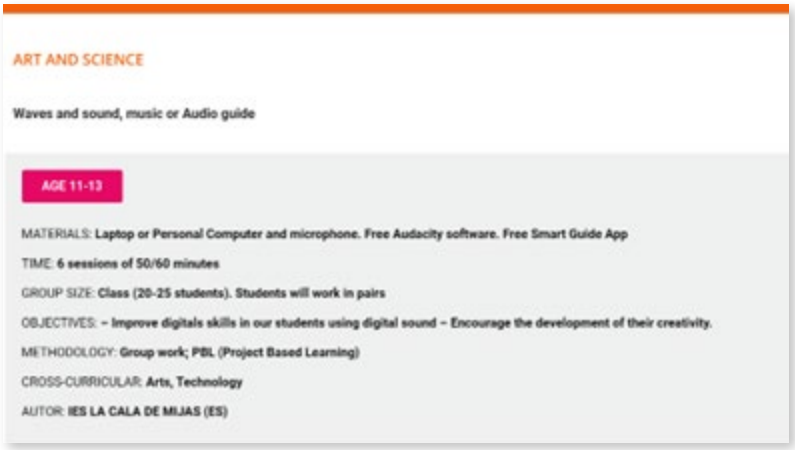

Figure 14: Identity table at the learning platform

In the following table, we present the 7 Modules and their Units, complemented by their learning objective and comments/tips for teachers, which are suggested for effective implementation in the class. The table can be utilised by the teacher as an overview of the material in terms of both its structure, as well as a companion highlighting the didactical purpose of the provision.

The suggested comments and tips are meant to play the role of inspiration and prompts for teachers, rather than instructions on how to go around with the material in terms of a didactical approach. Depending on the class mix, the socioeconomic and cultural background of the pupils/students, these suggestions are and should be subject to adaptations on behalf of the teachers where appropriate at the pedagogical level.

The Full Steam Ahead material - companion for teachers

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
ART AND SCIENCE		
1. Waves and sound, edit music and do your own Audio-guide with Audacity	Improving digital skills. Developing creativity.	This activity offers a great opportunity to help pupils draw the common lines that connect technology and digital skills with narrative, visual and audio stimuli and elements; the aesthetic value of a medium that is facilitated by technology. At the gender front, you can as well prompt pupils to express their opinion on what the effect would be when using a female voice vs a male voice. At the same plane, you could probably ignite a discussion about possibly different perceptions between a male and a female user.
2. Art and science: Siblings of the human spirit	Understanding the mix of human nature characteristics present both in science and art as ways to explain, interpret, or represent the world. Realizing the way gender is transcending rather than differentiating art and science as endeavours of the human spirit and experience.	Highlight the common denominator of human qualities in both arts and science as rather gender-neutral elements. Art and science as such, are not endowed with a specific gender "by nature"; they are rather areas of the human spirit that is inherent in our species.
3. From Physical to Digital – Curating a Virtual Exhibition	Understanding the basics of exhibition curation. Understanding digital transformation aspects at sociocultural level. Acquiring basic digital skills in 3D modelling.	This activity is spread across time in multiple sessions that can be structured and provided according to feasibility in different school and curricula structures. Although the process is long, take advantage of the opening and closing sessions which address the gender gap in Arts and STEM. One fruitful tip would be to monitor behaviours, attitudes, involvement of boys and girls' pupils across the implementation sessions (Sessions 2 -12) as compared to attitudes, involvement, expression of thoughts and opinion in Sessions 1 and 13.
4. Great women	Increasing awareness of women presence in music, films, literature, History, science. Promoting attractiveness of STEM subjects as study and professional subjects for girls and women. Development of self-awareness and self-expression skills.	The activity works through women role models in acting and science. In the concluding part of the activity (Debate on career choices) you can in addition to the suggested flow prompt pupils to elaborate on their opinion by considering the information they identified and included in their zines. How are women represented in the sources they identified and used? What has caught their attention and what was probably different in this process between boys and girls in the class?

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
NATURE SCIENCE AND BIOLOGY		
1. Maths Experiment: Is the Earth round or flat? How big is it?	Development of abstract thinking skills. Understanding the benefits and challenges of Project Based Learning. Development of group working skills.	The activity promotes group working and associated skills, e.g., how to create a working group; how a decision making process can take place; how tasks allocation works; how leadership and representation work. The subject of the activity (a mathematical experiment) cultivates abstract thinking, hence, on behalf of the teacher the activity offers itself as both a STEM related subject, as well as a soft skills development process. It would be important to monitor attitudes and behaviours of the pupils in the group working and leadership process, especially the ways gender aspects are involved, i.e., the "gender" of decision making, the "gender" of leadership, the "gender" of the group representative as spokesman or spokeswoman! This issue could be discussed in the class after the completion of the activity!
2. A world waiting to be seen	Development of systems thinking. Understanding the ways nature is culturally constructed at the intersection of science, technology, and art as symbolic systems.	In Step 2 as demonstrated in the activity, there are specific prompts for in class discussion, taking cues by specific points raised by the narrator (incl. all relevant time marks). As a teacher, you could as well initiate a discussion about possible professions the pupils can see behind this talk. Which professions are here involved for the areas of art, science, and technology? How are they related to each other in coming up with this presentation?
3. Energy balance and metabolism: Food in terms of body fuel	Understanding the concepts of energy and energy balance. Development of basic digital skills (app creation). Understanding the "energy cycle" as mediated by the allegory of the human body.	The concept of energy balance as presented (Energy in vis-à-vis Energy out) by taking the human body and metabolism as application areas can as well serve as an opportunity to develop system thinking skills. A possible discussion thread here could be about the earth as a "system" and how energy balance works in this case. From there on, environmental issues and how the environment, the climate, the flora and fauna of Earth are affected by the elements of energy balance as mediated by human activity could be raised.

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
NATURE SCIENCE AND BIOLOGY		
4. What can we learn from the animals?	Understanding the concept of biomimetics. Understanding the underlying cultural constructions of gender as they interact within the culture vs nature concept.	This activity should be considered as serving two objectives at the same time: The one would be about how humans deploy nature (animals, nature systems etc.) as models of and for the human world (culture), while the other one would be how this process is leading to cultural constructs based on gender differentiations drawing on binary oppositions (male vs female) when humans attribute specific characteristics and qualities to animals and humans at the same time (e.g. strong as a lion, clever as a fox etc.). This second objective could serve as an excellent point of discussion and sharing of perceptions that would touch upon issues of 'totemism' in anthropological terms. For some concise information on totemism you can read here. On the same vein, you can extend the discussion on how animals (as well as in relation to their gender related constructs) are used in our present-day society as emblems, symbols in various aspects such as sports teams, car brands, consumer goods brands, but also fairy tales, anthropomorphic movies with animals etc.
5. Waste is not garbage	Development of green skills at the level of household waste management. Understanding and tackling gender stereotypes and roles within household processes. Development of presentation skills.	The activity offers knowledge on how organic matter functions. This helps pupils think beyond the dichotomy usefulness vs waste. They acquire a heightened awareness of the substances, elements included in products. In Part 5 of the activity, working across the 5 different groups, you can promote entrepreneurial mindsets among pupils within the scope of environment-friendly products for use in a household, as alternative solutions to traditional non-green products. Gender aspects within household management can also be highlighted and discussed, especially under the light of the traditional stereotype of women dealing with the processing cycle of raw material and unprocessed substances (e.g., cooking) and in turn with the waste produced along the way – which is constructed along the dichotomy of nature vs nurture.

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
TECHNOLOGY		
1. Nature-based solutions: Nature as our ally in climate hazards	Acquiring knowledge of what nature-based solutions are. Understanding the difference between traditional/engineering solutions and nature-based solution (grey to green solutions). Promoting convergent and divergent thinking, drawing from the concept and practices of nature-based solutions (intersection of familiar/traditional solution and creative/new solutions).	This activity shows how human beings can exploit knowledge and technology in ways to deal with natural phenomena or change nature towards achieving several goals, which use "what is already there" in nature as elements in the process of doing so. What could be highlighted and stressed is that besides the use of environmental-friendly materials in nature-based solutions, this kind of solutions construct a way of thinking about our own species as part of nature, rather than a species which transforms nature. In a sense, and especially regarding climate change hazards, pupils can be inspired to think that these "hazards" are not nature's "attack" on humans or other living organisms or inorganic matter, but rather a way of nature to respond on changes (either human made or not) in order to reach some kind of equilibrium. And in this case it is this concept of equilibrium or balance that nature-based solutions are looking at, in some sort of compatibility, that is, intervening or transforming by using side by side to our technological means nature's own "vocabulary", which proves as more effective and at the same time more sustainable in the long run.
2. Building Bridges	Development of problem-solving skills (combining science, technology, engineering, mathematics). Development of team-working and communication skills.	This activity spreads across several sessions that most probably have to be scattered along 5-6 days. Besides the course of activities from research and observation, into calculation and modelling, as a teacher you can monitor attitudes and involvement of boys and girls throughout the process. In the provided material, in Session 6, there are specific questions that can lead to a discussion on gender aspects, drawing from this scaled down, modelling activity, and projecting into the real world of engineering.
3. SketchUp/ThinkerCad and 3D	Development of digital skills (3D/SketchUp/ ThinkerCad, file creation, working on cloud, emailing). Exploring aspects of digitalization of art and crafts (at design and production levels). Development of team-working skills. Development of ideation and creativity skills.	This activity involves the development and application of several skills. Although demanding at first look, it is a great opportunity for a teacher to observe the co-working attitudes among pupils while they progress through the sessions, and especially the process of how brainstorming (like the ideation phase in design thinking) is gradually fleshed out into a concrete object. It might be helpful to explain the concept of brainstorming and in particular the linguistic/semantic importance of the concept of 'storm' in the term. Pupils should be encouraged to not limit themselves in the brainstorming process, especially out of fear that an idea might sound absurd or stupid!

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
MOVIES		
1. How to make stop-motion animated movies with your smartphone using Stop Motion Studio	Development of digital skills (animation, use of applications). Development of self-knowledge and self-expression skills. Development of team-working skills.	In this activity (as suggested in the description) you can prompt pupils to create a gender related topic a movie. You can observe how pupils will eventually visualize men and women in the film they create in correspondence to the roles they give to them. At a different level, on the same gender-relevant manner, you can observe, discuss how the pupils put together the working group of directors, actor/actress, the technical "staff" like cameraman/woman, special effects etc. At the end of the activity, you can discuss these aspects and let pupils' express opinion on why they formed their group in the way they did.
2. Woman in science at the cinema	Understanding gender dynamics and stereotypes in representations of women scientists in cinema. Development of narration skills (review, opinion, critique). Acquiring knowledge on the achievements of women in science.	The activity as described in the respective unit offers lots of prompts and tips to the teacher to engage pupils in gender-related discussions. The material offers itself at this age for a deeper understanding of how 'representations' work and the impact they can have as provided in performing arts, in terms of identity construction and stereotyping. You can further discuss this issue with the pupils, by exploring possible cases in their lives when they identified themselves with an actor/actress, public figure, scientist etc. It would be of interest if there emerge any cases of identifying with a figure of a different gender than the actual pupil mentioning the figure.

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
SELF-KNOWLEDGE, HUMAN EMOTIONS AND PSYCHOLOGY		
1. Emotional effect on human body	Understanding the concepts of emotions and feelings, their biological and social underpinnings as expression and impression tools. Developing self-awareness skills and empathy.	In this activity the terminology, the differentiation between what we mean when we talk about emotions on the one hand and feelings on the other is important. This will help pupils not only understanding the nature of emotions and feelings and how they relate to each other, but also how to better understand and express themselves as well as others (leading to empathy). At a further level, a basic, simple elaboration on the cultural/social construction of emotions could be beneficial as well. For example, the "obligatory", sometimes excessive, and not corresponding to an actual person's idiosyncrasy happiness or sorrow or sadness to be expressed and shown to others in specific occasions. E.g., because it is socially expected, or if not present perceived as a negative trait etc. In the same vein the teacher could also let pupils express them freely on how they possibly perceive a gender-related aspect in expressing one's feelings and emotions
2. Jung personalities in the 21st Century	Introducing in psychological theories about human personality types. Development of empathy skills. Development of creativity and abstract thinking (understanding the concept of persona and creating personas). Development of digital skills.	In this activity, following up the main implementation pace on personas creation, the teacher can engage pupils in a discussion about the "gender of traits and characteristics". Further activities as suggested after the end of STEP 6 offer some prompting questions. The teacher can be a bit provocative when working with this age group, by challenging pupils to express possible hesitation in identifying in themselves or others personality traits that "lead" or supposedly "belong" to a male or female person (which they are not respectively). This would in turn towards de-gendering traits and hence de-constructing corresponding stereotypes.
3. Self-report of personality traits	Developing self-awareness, self-knowledge skills. Understanding the plasticity (and lack thereof) of the "personality". Understanding how personality tests function, as well as their limitations (structure, results, correlations, assumptions)	In this activity you can encourage pupils to check each other's personality test results. Let them express themselves about the extent by which they think that results represent traits of classmates as they know them so far. You can also intrigue discussions on the ability of traits to change. To what extent they think that personal traits, the "character" can change or remain the same? What could cause a "character" to change?

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
LANGUAGE AND LITERATURE		
1. Narrative photography: learn to tell stories using pictures	Development of storytelling skills. Development of digital skills.	This activity is a great opportunity to lead a discussion about our Figure saturated world, especially as it is represented in social media. Take for example Instagram. But more than that – take for example school textbooks. It would be good to find and show them an older school textbook, where text was prevailing in comparison with images. How do pupils perceive this change? What are the reasons behind this change?
2. Break the rules in literature: a role playing on gender inequality related to women writers	Understanding gender stereotypes in the world of literature. Development of empathy skills.	Taking a cue from the topic of this activity and the gender inequalities related to women writers in the 19th century you can inform the pupils of other, more important inequalities that were present a 100 years ago. You can prompt the pupils to express their thoughts on that and try to conceive how it would like to live as a woman in those times. What do the boys say about this? What do the girls say about this? You can provide the following examples on what a woman could not do in the late 19th century and even in early 20th century: a. Couldn't vote. b. Couldn't wear pants. c. Couldn't keep their maiden name. d. Couldn't own property if married. e. Couldn't shop without escort. f. Couldn't serve in a jury. g. Couldn't compete in several Olympic sports. You can after that try to help pupils "connect the dots" here between the things women could not do, with the inequalities in literature writers. Why is that? What could be the role of literature in this inequalities context? Why was literature as a means of expression an area for gender inequalities? What is the "power" of a writer?

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
LANGUAGE AND LITERATURE		
3. Neuroscience on language learning	Understanding the biological and cultural elements in human language. Introduction to the challenges of understanding the binary opposition nature vs culture.	In this activity, language as the most distinctive ability and trait of human species is functioning as a tool to introduce pupils in the culture vs nature "dichotomy". The topic is of course of high complexity having been at the centre of sciences like Biology, Sociology, Linguistics, Anthropology to name a few. However, it provides a good opportunity to further elaborate on the symbolic capacity of humans which differentiates them form the world of animals. As is the case with language (the function of signified and signifier e.g. the word and sound 'tree' representing in language the object 'tree) you can bring more examples in a similar fashion, which are more complex symbols, as a 'flag', 'a cross' etc. Looking at a gender perspective you could encourage a discussion about the symbolic relevance of other elements like for example colours. Why for example is pink related to female and blue to male in babies' garments or toys?Examples like this can help pupils to understand the concept of social or cultural constructs, which in turn are fed into gender stereotypes!

MODULES/UNITS	OBJECTIVES	COMMENTS/TIPS
SPORT AND HEALTH		
1. The New Old	Development of digital skills. Understanding and tackling gender stereotyping in games and sports. Understanding cultural representations of 'playing' as community and identity building elements in games.	This activity (building on traditional games) besides its objectives as demonstrated in the activity description offers an opportunity as well to discuss the differences in online and offline games. How do online and offline games involve body and mind? What is the context of peer playing in online and offline worlds? You can as well show traditional group or individual games in their online versions (there are many) as compared to their original, online version and discuss on the differences in terms of body, space, time involvement.

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